AN ISO 9001 & 14001 COMPANY

TENDER DOCUMENT

TENDER No: DLI/CON/720/607

TENDER FOR “DESIGN, SUPPLY, ERECTION, TESTING AND COMMISSIONING OF 5.00 LLPD AUTOMATED DAIRY PLANT AT DEHRI ON SONE, BIHAR ON TURN KEY BASIS”

VOLUME – I

Notice Inviting e-Tender

Addendum to ITT

Special Instructions to Bidders for e-Tendering

Letter of Undertaking

Form of Tender

Memorandum

Integrity Pact

Instructions to Tenderers &
General Conditions of Contract

General Purchase Conditions

COMFED Tender Documents
NOTICE INVITING e- TENDER (NIT)

1.0 Tender for “Design, Supply, Erection, Testing and Commissioning of 5.00 LLPD Automated Dairy Plant at Dehri On Sone, Bihar on Turn Key basis”.

Engineering Projects (India) Ltd. invites the open online turnkey type tenders on behalf of “M/s Shahabad Dugdh Utpadak Sahkari Sangh Limited, Bihar” through e-tendering from the eligible contractors/firms who fulfil the eligibility criteria as per the brief particulars of scope for the “Design, Supply, Erection, Testing and commissioning of 5.00 LLPD Automated Dairy Plant at Dehri On Sone, Bihar on Turn Key basis” in two bid system (Techno-commercial bid & Price Bid) for the following works:

<table>
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<tr>
<th>Sr. No.</th>
<th>NAME OF WORK</th>
<th>ESTIMATED COST (Rs)</th>
<th>TIME OF COMPLETION</th>
<th>EMD (Rs)</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Design, Supply, Erection, Testing and commissioning of 5.00 LLPD Automated Dairy Plant at Dehri On Sone, Bihar.</td>
<td>Rs. 30 Crores. (Rupees Thirty Crores Only)</td>
<td>10 Months (Ten Months)</td>
<td>Rs. 40 Lakhs (Rupees Forty Lakhs Only)</td>
</tr>
</tbody>
</table>

The brief scope of work included in this tender shall include (but not limited to) Design, Engineering, manufacture, shop fabrication, assembly, testing & inspection at manufacturer’s works, packing, dispatch, transportation, delivery to site, required fabrication & assembly at site, Erection, Testing & Commissioning, completion of facilities, performance guarantee testing, final painting and handing over to Shahabad Dugdh Utpadak Sahkari Sangh Limited, Ara Dairy Project, Ara, SMU / Bihar State Milk Cooperative Federation Limited, Patna of 5.00 LLPD Automated Dairy Plant at Dehri On Sone, Bihar.

The details of scope of work is given in the tender document.

Time schedule of Tender activities:

(i) Last Date & Time for Downloading of tender documents: upto 29.01.2018 (5.00 PM).

(ii) Last Date & Time of online submission of Tenders: On or before 30.01.2018 up to 03.00 PM.

(iii) Date & Time of online opening of tender (Technical Bid): 30.01.2018 at 03.30 PM.

(iv) Pre Bid Meeting at EPI, Dairy Plant Project office, Near Sudha Dairy Plant, Industrial Area, Behind BMP -2, Dehri-on-Sone (Rohtas), Bihar on 17.01.2018 at 2.30 PM.
2.0 Contractors/Bidders who fulfill the following requirements are eligible to participate in this tender. The joint ventures/Consortium are not accepted.

a) i. Experience of having completed work during the last 7 (Seven) years following ‘similar work’ ending last day of the month previous to the one in which applications invited:

Single project valued: Rs. 24.00 Crores (minimum).

The ‘similar works’ shall mean “Setting up of Dairy (Milk Processing) plant on Turnkey Basis (minimum Capacity 5 LLPD)”.  

ii. For evaluation purpose, the completion cost of works mentioned in the Completion Certificate shall be enhanced by 7% per annum till the end of month prior to date of NIT.

iii. The cost of free issue materials shall not be included in the completion cost of works.

iv. The experience certificates issued by Government Organizations / Semi Government Organizations / State Government Public Works Department / Central Government / Public Sector Undertakings / Autonomous Bodies / Municipal Bodies / Public Limited Companies listed on BSE / NSE and private party shall be accepted for assessing the eligibility of the tenderer. However, the certificates issued by Public Limited Company & Private Party must be supported by work order & TDS certificates. TDS certificates for full contract value as mentioned in the work order must match failing which the same shall not be considered.

b) Should have average annual financial turnover on works amounting at least 50% of the estimated cost of the work during the last three consecutive financial years ending on 31.03.2017 duly certified by a Chartered Accountant along with audited copies of balance sheets & statement of profit & loss of said financial years.

c) Should not have incurred any losses in more than two years during the immediate last five consecutive financial years, ending 31.03.2017, Copies of Annual report and Audited balance sheet and statement of profit & loss and a Certificate from Chartered Accountant is also to be submitted.

d) Should have a solvency of 40% of estimated cost issued by his bankers in the name of the bidder. The Solvency certificate should not have been issued earlier than one year of last date of submission of tender.

e) Should have valid Permanent Account Number of Income Tax (Copy of PAN to be enclosed).

f) It is desirable that the bidder should have valid PF Registration No. In case, the bidders do not have PF Registration No, the same shall be obtained by successful bidder within one month from the date of LOI or before release of First RA Bill.

g) Should have GST Registration No. (Copy of GST Registration certificate to be enclosed).

h) Bidders have to submit confirmation letter whether they are registered under MSME Act or not and if yes, then relevant copies of the registration letter (Registered under single point registration scheme of NSIC, Govt. of India, Ministry of MSME, New Delhi vide Gazette Notification dated 26.03.2012 along with the form of Memorandum-2 with the concerned
DIC) to be enclosed in Technical Bid and a request letter for claiming exemption from submission of Tender fee and EMD.

i) Bid Capacity: The bidding capacity of the contractor should be equal to or more than the estimated cost of the work put to Tender. The Bidding capacity shall be worked out by the following formula:

\[
\text{Bidding Capacity} = [A \times N \times 2] - B
\]

Where,

- \( A = \) Maximum value of construction works executed in any one year during the last five years taking into account the Completed as well as works in progress ending last day of the month previous to the one in which applications invited:
  
  (Certificate from Charted Accountant be attached for value of construction works of said last 5 years.

- \( N = \) Number of years prescribed for completion of work for which bids have been invited.

- \( B = \) Value of existing commitments and ongoing works to be completed during the period of completion of work for which bids have been invited.

The Tenderers is requested to furnish the existing commitments on works under execution along with stipulated period for completion of remaining for each of the work should be furnished in an affidavit on non-judicial stamp paper of value of Rs. 100/-duly certified that the particulars furnished are correct as per the Perforans in Annexure –A.

j) It is desired that the bidder visits the site before submitting the bid to assess the Ground condition and working conditions at site. Incase bidder decide not to visit site, they shall be responsible for all the consequences there of. Bidder to submit a self-declaration with the bid in respect of the same.

**Contractors to use as much as possible, the materials/services from MSEs.**

The credentials of the Bidders with respect to Technical & Financial criteria shall be verified and inspection of the works, if required, to be carried out by EPI. If not found satisfactory by EPI, their bid will be considered non-responsive and rejected.

3.0 Tender documents comprising of the following are available on the website of EPI:


(i) Notice Inviting Tender, Addendum to Instructions to Tenderers, Special instructions to Bidders for e-Tendering, Letter of Undertaking, Form of tender, Memorandum, Integrity pact, Instructions to Tenderers & General Conditions of Contract, GPC, Comfed Tender Documents (Vol-I).

(ii) Special Conditions of Contract, General Specifications, Technical Specifications, and Tender Drawings- (Vol-II).

(iii) Price Bid /Bill of Quantity - (Vol-III).
4.0 In order to participate, the bidder should have Digital Signature Certificate (DSC) from one of the authorized Certifying Authorities.

5.0 Interested bidders have to necessarily register themselves on the portal https://www.tcilindia-electronic.tender.com through M/s Telecommunications Consultants India Limited, New Delhi to participate in the bidding under this invitation for bids. It shall be the sole responsibility of the interested bidders to get themselves registered at the aforesaid portal for which they are required to contact M/s Telecommunications Consultants India Limited, New Delhi at following address to complete the registration formalities:
M/s Telecommunications Consultants India Limited,
6th Floor, TCIL Bhawan, Greater Kailash – 1,
New Delhi – 110 048
Contact No. : 011-26241790, 98683 93717/75/92, Email-ID: ets_support@tcil-india.com

They may obtain further information regarding this tender from ED (Contracts) at the address given at Clause No.16.0 below from 10:00 hours to 17:00 hours on all working days till the last date of online submission of Bidding Documents.

For proper uploading of the bids on the portal namely https://www.tcil-indiaelectronic.tender.com (hereinafter referred to as the ‘portal’), it shall be the sole responsibility of the bidders to apprise themselves adequately regarding all the relevant procedures and provisions as detailed at the portal as well as by contacting M/s Telecommunications Consultants India Limited, New Delhi directly, as and when required, for which contact details are mentioned above. The EPI in no case shall be responsible for any issues related to timely or properly uploading/submission of the bid in accordance with the relevant provisions of Section Instruction to Bidders of the Bidding Documents.

6.0 Bidders can download the bid document from the portal without registering or paying document fees in advance, any time from 18:00 Hrs. on 09.01.2018; however interested bidders have to pay tender fees for participating in the tendering and submitting the bid. For this purpose the interested bidders shall be required to pay Rs. 25,000.00 (Rupees Twenty Five Thousand only) plus GST @ 18% as non-refundable document fees in the form of demand draft in favour of “Engineering Projects (India) Ltd.” payable at New Delhi.

7.0 E-Bids must be submitted/uploaded along with scanned copies of relevant documents pertaining to Clause no. 2 (a) to 2 (j) & Clause no. 15 (a) to 15 (j) under Single Stage Two Envelope Bidding Procedure on the TCIL portal on or before last date and time of online bid submission. Late bids will not be accepted. Under the above procedure, only the first envelope (Technical Part) shall be opened in the presence of the bidders’ representatives who choose to attend in person at the address given below on schedule date and time of bid opening or may be viewed by the bidders by logging in to the portal as per features available to them. Second envelope i.e. Price part shall be opened of technically qualified bidders.

The bid must be accompanied by an Earnest Money Deposit (EMD) Rs. 40,00,000/- (Rupees Forty Lakhs Only). This can be either in the form of Crossed Demand Draft or Pay Order of any Nationalized Bank/Scheduled Bank for the full amount of EMD payable favouring “Engineering Projects (India) Ltd.”, payable at New Delhi or in the form of Bank guarantee of any Nationalized Bank/Scheduled Banks, in accordance with the prescribed Performa, favouring “Engineering Projects (India) Ltd.”. The EMD shall be valid for minimum period of 150 days (one hundred fifty) from the last day of submission of tender. Tenders submitted without EMD or
inadequate amount of EMD shall be rejected. The bid shall be valid for 90 days from date of opening of Price Bid.

Tender fee, EMD (In original) and Power of Attorney, Annexure-A affidavit of NIT, NSIC certificate as per Clause No. 2 (h) if bidder is claiming EMD/Tender fee exemption and Pass Phrase (Both for technical and financial bid in separate envelope) to decrypt the bid must be submitted in physical form at the address given at Clause No.16.0 below on or before last date and time of online bid submission. If the above documents are not received in time then there offer shall not be considered and EPI shall not be responsible for any postal delay in respect of submission of hard copy part of the bids.

8.0 The Terms & Conditions contained in this NIT and tender documents shall be applicable. In case of any unscheduled holiday taken place on the last day of submission of tender, the next working day will be treated as scheduled day and time for submission of Tender.

9.0 The corrigendum or addendum, extension, cancellation of this NIT, if any, shall be hosted on the EPI’s website/CPP portal as well as on TCIL portal http://www.tcil-india-electronicTender.com the bidders are required to check these websites regularly for this purpose, to take into account before uploading/submission of tender. All Corrigendum and addendum are to be uploaded duly signed & stamped with tender documents as bid Annexure.

10.0 The price bid of those bidders whose bid has been technically accepted on the basis of documents submitted shall be opened with prior intimation to them. However, it is made clear that the offer of the L-1 bidders shall be accepted subject to the confirmation of authentically of the PQ documents/BG from the concerned department/bank.

11.0 The rates quoted by the bidder shall be firm and fixed for the entire period of completion and till handing over of the work. No revision to rates or any escalation shall be allowed on account of any increase in prices of materials, labour, POL and Overheads etc during the entire contract period or extended contract period.

12.0 EPI reserves the right to extend the date of submission of the tender or cancel the tender or accept any tender or reject any or all tenders or split the work of tender or annul this tendering process without assigning any reason and liability whatsoever and to re-invite tender at its sole discretion.

13.0 Disqualification
The tenderers may note that they are liable to be disqualified and not considered for the opening of Price Bid if;

a) Representation in the forms, statements and attachments submitted in the pre-qualification document are proved to be incorrect, false and misleading.

b) They have record of poor performance during the past 10 years such as abandoning the work, rescinding of contract for which the reasons are attributable to the nonperformance of the contractor, inordinate delay in completion, consistent history of litigation / arbitration awarded against the contractor or any of its constituents or financial failures due to bankruptcy etc. in their ongoing / past projects.

c) They have submitted incompletely filled in formats without attaching certified supporting documents and credentials to establish their eligibility to participate in the Tender.
d) If the tenderers attempt to influence any member of the committee. EPI reserves its right to take appropriate action including disqualification of tenderer(s) as may be deemed fit and proper by EPI at any time without giving any notice to the contractor in this regard. The decision of EPI in the matter of disqualification shall be final and binding on the Tenderers.

14.0 In case of tie-tender, where two firms are bidding lowest, EPI reserves the right to split the work among these bidders and / or EPI will reserve the right to award the tender to any one of such bidder.

15.0 Tenderer shall submit duly stamped & signed scan copy of following documents online.

   a) Details of similar works executed along with completion certificate & copy of Work order for qualification as per PQ criteria.
   b) List of works executed during the last 5 years indicating name of the Client, value, date of start and completion along with completion certificate
   c) List of works under execution indicating name of the Client, Total Contract Value, Value of balance work in hand, date of start and completion.
   d) CA certified audited balance sheets and profit and loss accounts along with schedules for the last 5 years.
   e) Copy of PAN Card Certificate
   f) Copy of GST Registration certificate
   g) List of Plant & Equipment’s available with bidder
   h) Details of manpower available with Bidder.
   i) Registration Certificate/Memorandum and Articles of Association/ Partnership Deed /Affidavit
   j) Form of Tender & Letter of Undertaking

16.0 All correspondence with regard to the above shall be to the following address (By Post/In Person)

   Executive Director (Contracts)
   Engineering Projects (India) Ltd.
   Core-3, Scope Complex,
   7 Institutional Area, Lodhi Road,
   New Delhi-110003
   TEL NO. 011-24361666 Extn:2313,2301 FAX NO: 011-24363426
   E-mail- contracts@engineeringprojects.com

17.0 Contact details for site related Queries / Visit:

   Contact and Address is:
   Shri S.K Nayak , AGM,M-9836310618
   Engineering Projects India Ltd.
   Dairy Plant Project, Near Sudha Dairy Plant
   Industrial Area, Behind BMP -2
   Dehri-on-Sone(Rohtas),Bihar-321307

   For more information on EPI, visit our website at: http://www.epi.gov.in
   For more information on the e-tender visit website of M/s Telecommunications Consultants India Limited, New Delhi at: https://www.tcil-india-electronicitender.com

EXECUTIVE DIRECTOR (CONTRACTS) 09.01.2018
### BID CAPACITY

**Name of the Work**: Tender for “Design, Supply, Erection, Testing and Commissioning of 5.00 LLPD Automated Dairy Plant at Dehri On Sone, Bihar on Turn Key basis”.

**NIT No:** DLI/CON/720/607 dated 09.01.2018.

**ESTIMATED COST PUT TO TENDER**: Rs. 30 Crores.

**Bid Capacity**: The bidding capacity of the contractor should be equal to or more than the estimated cost of the work put to Tender. The bidding capacity shall be worked out by the following formula:

\[
\text{Bidding Capacity} = [A \times N \times 2] - B
\]

Where,
- **A** = Maximum value of construction works executed in any one year during the last five years taking into account the completed as well as works in progress
- **N** = Number of years prescribed for completion of work for which bids have been invited
- **B** = Value of existing commitments and ongoing works to be completed during the period of completion of work for which bids have been invited (Format enclosed)

#### BID CAPACITY CALCULATION BY BIDDER

**SIGN & STAMP OF BIDDER**
ANNEXURE-A

AFFIDAVIT

(To be typed on Rs. 100/- non-judicial stamp paper)

I/We ..................................aged ..............years son of .......................................do hereby solemnly affirm and declare as follows for and on behalf of the Firm:

LIST OF EXISTING COMMITMENT AND ONGOING WORKS

<table>
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<tr>
<th>Sr. No.</th>
<th>Name of Works</th>
<th>Client Name &amp; Address</th>
<th>Work Order Value (in Rs)</th>
<th>Work Executed till Date (Rs)</th>
<th>Balance Amount of work to be completed (Rs)</th>
<th>Balance period to complete the works (Total months)</th>
<th>Work to be completed in 10 months (NIT Completion period) (Rs)</th>
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Balance Commitments during 10 months as per NIT Rs

It is certify that the above particulars furnished are true and correct. If any information given is found to be concealed at a later date, the Contract will be terminated forthwith without prejudice to the rights thereon consequent on termination and the bidder will be blacklisted. I/We agree for debarring tendering for one year if any facts are suppressed.

SIGN AND STAMP OF BIDDER

Signature of Notary Public
ADDENDUM TO INSTRUCTIONS TO TENDERERS

Mode of submission of tender is through e-Bids only. Hence Clause No.1.0 of ITT is deleted.

Kindly refer “Special instructions to Bidders for e-Tendering” for downloading & uploading of tender documents as per NIT.
Special instructions to Bidders for e-Tendering

General

The Special Instructions (for e-Tendering) supplement ‘Instruction to Bidders’, as given in these Tender Documents. Submission of Online Bids is mandatory for this Tender.

E-Tendering is a new methodology for conducting Public Procurement in a transparent and secured manner. Now, the Government of India has made e-tendering mandatory. Suppliers/Vendors will be the biggest beneficiaries of this new system of procurement. For conducting electronic tendering, Engineering Projects (India) Ltd. has decided to use the portal https://www.tcil-india-electronic-tender.com through TCIL, a Government of India Undertaking. This portal is based on the world’s most ‘secure’ and ‘user friendly’ software from Electronic Tender®. A portal built using Electronic Tender's software is also referred to as Electronic Tender System® (ETS).

Benefits to Suppliers are outlined on the Home-page of the portal.

Instructions

Tender Bidding Methodology:

Sealed Bid System

- Single Stage Two Envelope

Broad Outline of Activities from Bidder's Perspective:

1. Procure a Digital Signing Certificate (DSC)
2. Register on Electronic Tendering System® (ETS)
3. Create Marketing Authorities (MAs), Users and assign roles on ETS. It is mandatory to create at least one MA.
4. View Notice Inviting Tender (NIT) on ETS
5. For this tender -- Assign Tender Search Code (TSC) to an MA
6. Download Official Copy of Tender Documents from ETS. Note: Official copy of Tender Documents is distinct from downloading ‘Free Copy of Tender Documents’. To participate in a tender, it is mandatory to procure official copy of Tender Documents for that tender.
7. Clarification to Tender Documents on ETS
   - Query to Engineering Projects (India) Ltd.(Optional)
8. View response to queries posted by Engineering Projects (India) Ltd.
9. Bid-Submission on ETS
10. Attend Public Online Tender Opening Event (TOE) on ETS
    - Opening of relevant Bid-Part (PQ Application)
11. Post-TOE Clarification on ETS (Optional)
    - Respond to Engineering Projects (India) Ltd. Post-TOE queries
12. Attend Public Online Tender Opening Event (TOE) on ETS
    - Opening of relevant part (Financial-Part)
      (Only for PQ Responsive Bidders)
For participating in this tender online, the following instructions are to be read carefully. These instructions are supplemented with more detailed guidelines on the relevant screens of the ETS.

**Digital Certificates**

For integrity of data and authenticity/ non-repudiation of electronic records, and to be compliant with IT Act 2000, it is necessary for each user to have a Digital Certificate (DC), also referred to as Digital Signature Certificate (DSC), of Class 2 or above, issued by a Certifying Authority (CA) licensed by Controller of Certifying Authorities (CCA) [refer [http://www.cca.gov.in](http://www.cca.gov.in)].

**Registration**

To use the Electronic Tender® portal [https://www.tcil-india-electronictender.com](https://www.tcil-india-electronictender.com), vendors need to register on the portal. Registration of each organization is to be done by one of its senior persons who will be the main person coordinating for the e-tendering activities. In ETS terminology, this person will be referred to as the Super User (SU) of that organization. For further details, please visit the website/portal, and click on the ‘Supplier Organization’ link under ‘Registration’ (on the Home Page), and follow further instructions as given on the site. Pay Annual Registration Fee as applicable.

**Any Instructions for Online/ Offline Payment of Registration Fee??**

After successful submission of Registration details and Annual Registration Fee, please contact TCIL/ ETS Helpdesk (as given below), to get your registration accepted/activated.

**Important Note:** To minimize teething problems during the use of ETS (including the Registration process), it is recommended that the user should peruse the instructions given under ‘ETS User-Guidance Center’ located on ETS Home Page, including instructions for timely registration on ETS. The instructions relating to ‘Essential Computer Security Settings for Use of ETS’ and ‘Important Functionality Checks’ should be especially taken into cognizance.

Please note that even after acceptance of your registration by the Service Provider, to respond to a tender you will also require time to complete activities related to your organization, such as creation of users, assigning roles to them, etc.

<table>
<thead>
<tr>
<th>TCIL/ ETS Helpdesk</th>
<th></th>
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</table>
| **Telephone/ Mobile** | Customer Support: **011-26241790 (multiple lines)**  
|                      | Emergency Mobile Numbers: +91-9868393775, 9868393717, 9868393792 |
| **E-mail ID** | ets_support@tcil-india.com  
|                  | [Please mark CC: support@electronictender.com] |
Some Bidding related Information for this Tender (Sealed Bid)

The entire bid-submission would be online on ETS (unless specified for Offline Submissions). Broad outline of submissions are as follows:

- Submission of Bid-Parts/ Envelopes
  - Technical-Part
  - Financial-Part

Offline Submissions:

The bidder is requested to submit the following documents offline to the under mentioned address before the start of Public Online Tender Opening Event in a Sealed Envelope.

Contact Persons Name: ED (Contracts)
Address: Engineering Projects (India) Ltd.
Core 3, scope complex, 7 Lodhi Road
New Delhi 110003

The envelope shall bear (the project name), the tender number and the words ‘DO NOT OPEN BEFORE’ (due date & time).

1. Original copy of the Tender Fee of Rs 25,000/- (Rupees Twenty Five Thousand only) plus GST @ 18% in form of DD.
2. Earnest Money Deposit (EMD) of Rs: 40,00,000/- (Rupees Forty Lakhs Only) in the form of Bank Guarantee/DD. (Original).
3. Original copy of the letter of authorization shall be indicated by written power-of-attorney.
4. Annexure-A affidavit (Refer Clause No.2 (i) of NIT).
5. Documentary evidence with regard to registration with NSIC as mentioned in Clause No.2 (h) of NIT for tender fees & EMD waiver.
7. Pass-phrase (Both for technical and financial bid in separate envelope) to decrypt the Bid.

Note: The Bidder should also upload the scanned copies of all the above mentioned original documents as Bid-Annexures during Online Bid-Submission in addition to PQ documents listed in NIT Clause no.2 (a) to 1(j).
Note: Bidders are required to pay applicable ETS bidding fees online at the time of bid submission.

Special Note on Security and Transparency of Bids

Security related functionality has been rigorously implemented in ETS in a multi-dimensional manner. Starting with 'Acceptance of Registration by the Service Provider', provision for security has been made at various stages in ElectronicTender's software. Specifically for Bid Submission, some security related aspects are outlined below:

As part of the ElectronicEncrypter™ functionality, the contents of both the 'ElectronicForms' and the 'Main-Bid' are securely encrypted using a Pass-Phrase created by the Bidder himself. Unlike a 'password', a Pass-Phrase can be a multi-word sentence with spaces between words (eg I love this World). A Pass-Phrase is easier to remember, and more difficult to break. It is recommended that a separate Pass-Phrase be created for each Bid-Part. This method of bid-encryption does not have the security and data-integrity related vulnerabilities which are inherent in e-tendering systems which use Public-Key of the specified officer of a Buyer organization for bid-encryption. Bid-encryption in ETS is such that the Bids cannot be decrypted before the Public Online Tender Opening Event (TOE), even if there is connivance between the concerned tender-opening officers of the Buyer organization and the personnel of e-tendering service provider.

CAUTION: All bidders must fill Electronic Forms™ for each bid-part sincerely and carefully, and avoid any discrepancy between information given in the Electronic Forms™ and the corresponding Main-Bid. For transparency, the information submitted by a bidder in the Electronic Forms™ is made available to other bidders during the Online Public TOE. If it is found during the Online Public TOE that a bidder has not filled in the complete information in the Electronic Forms™, the TOE officer may make available for downloading the corresponding Main-Bid of that bidder at the risk of the bidder. If variation is noted between the information contained in the Electronic Forms™ and the ‘Main-Bid’, the contents of the ElectronicForms™ shall prevail. Alternatively, the Buyer organization reserves the right to consider the higher of the two pieces of information (eg the higher price) for the purpose of short-listing, and the lower of the two pieces of information (eg the lower price) for the purpose of payment in case that bidder is an awardee in that tender.

Typically, ‘Pass-Phrase’ of the Bid-Part to be opened during a particular Public Online Tender Opening Event (TOE) is furnished online by each bidder during the TOE itself, when demanded by the concerned Tender Opening Officer.

Additionally, the bidder shall make sure that the Pass-Phrase to decrypt the relevant Bid-Part is submitted to Engineering Projects (India) Ltd. in a sealed envelope before the start date and time of the Tender Opening Event (TOE).

There is an additional protection with SSL Encryption during transit from the client-end computer of a Supplier organization to the e-tendering server/ portal.
Public Online Tender Opening Event (TOE)

ETS offers a unique facility for ‘Public Online Tender Opening Event (TOE)’. Tender Opening Officers, as well as, authorized representatives of bidders can simultaneously attend the Public Online Tender Opening Event (TOE) from the comfort of their offices. Alternatively, one/ two duly authorized representative(s) of bidders (i.e. Supplier organization) are requested to carry a Laptop with Wireless Internet Connectivity, if they wish to come to Engineering Projects (India) Ltd. office for the Public Online TOE.

Every legal requirement for a transparent and secure ‘Public Online Tender Opening Event (TOE)’, including digital counter-signing of each opened bid by the authorized TOE-officer(s) in the simultaneous online presence of the participating bidders’ representatives, has been implemented on ETS.

As soon as a Bid is decrypted with the corresponding ‘Pass-Phrase’ as submitted offline by the bidder himself (during the TOE itself), salient points of the Bids (as identified by the Buyer organization) are simultaneously made available for downloading by all participating bidders. The tedium of taking notes during a manual ‘Tender Opening Event’ is therefore replaced with this superior and convenient form of ‘Public Online Tender Opening Event (TOE)’.

ETS has a unique facility of ‘Online Comparison Chart’ which is dynamically updated as each online bid is opened. The format of the chart is based on inputs provided by the Buyer for each Bid-Part of a tender. The information in the Comparison Chart is based on the data submitted by the Bidders. A detailed Technical and/ or Financial Comparison Chart enhances Transparency. Detailed instructions are given on relevant screens.

ETS has a unique facility of a detailed report titled ‘Minutes of Online Tender Opening Event (TOE)’ covering all important activities of ‘Online Tender Opening Event (TOE)’. This is available to all participating bidders for ‘Viewing/ Downloading’.

There are many more facilities and features on ETS. For a particular tender, the screens viewed by a Supplier will depend upon the options selected by the concerned Buyer.

SEVEN CRITICAL DO’S AND DON’TS FOR BIDDERS

Specifically for Supplier organizations, the following ‘SEVEN KEY INSTRUCTIONS for BIDDERS’ must be assiduously adhered to:

1. Obtain individual Digital Signing Certificate (DSC or DC) well in advance of your first tender submission deadline on ETS

2. Register your organization on ETS well in advance of the important deadlines for your first tender on ETS viz ‘Date and Time of Closure of Procurement of Tender Documents’ and ‘Last Date and Time of Receipt of Bids’. Please note that even after acceptance of your registration by the Service Provider, to respond to a tender you will also require time to complete activities related to your organization, such as creation of --Marketing Authority (MA) [ie a department within the Supplier/ Bidder Organization responsible for responding to tenders], users for one or more such MAs, assigning roles to them, etc. It is mandatory to create at least one MA. This unique feature of creating an MA enhances security and accountability within the Supplier/ Bidder Organization.
3. Get your organization's concerned executives trained on ETS well in advance of your first tender submission deadline on ETS

4. For responding to any particular tender, the tender (ie its Tender Search Code or TSC) has to be assigned to an MA. Further, an ‘Official Copy of Tender Documents’ should be procured/ downloaded before the expiry of Date and Time of Closure of Procurement of Tender Documents. **Note:** Official copy of Tender Documents is distinct from downloading ‘Free Copy of Tender Documents’. Official copy of Tender Documents is the equivalent of procuring physical copy of Tender Documents with official receipt in the paper-based manual tendering system.

5. Submit your bids well in advance of tender submission deadline on ETS (There could be last minute problems due to internet timeout, breakdown, et al)

6. It is the responsibility of each bidder to remember and securely store the Pass-Phrase for each Bid-Part submitted by that bidder. In the event of a bidder forgetting the Pass-Phrase before the expiry of deadline for Bid-Submission, facility is provided to the bidder to ‘Annul Previous Submission’ from the Bid-Submission Overview page and start afresh with new Pass-Phrase(s)

7. ETS will make your bid available for opening during the Online Public Tender Opening Event (TOE) ‘ONLY IF’ your ‘Status pertaining Overall Bid-Submission’ is ‘Complete’. For your record, you can generate and save a copy of ‘Final Submission Receipt’. This receipt can be generated from ‘Bid-Submission Overview Page’ only if the ‘Status pertaining overall Bid-Submission’ is ‘Complete’.

**NOTE:**
*While the first three instructions mentioned above are especially relevant to first-time users of ETS, the fourth, fifth, sixth and seventh instructions are relevant at all times.*
LETTER OF UNDERTAKING  
(TO BE ENCLOSED IN ENVELOPE-1 ALONGWITH EMD)

To,
EXECUTIVE DIRECTOR (CONTRACTS)
ENGINEERING PROJECTS (INDIA) LTD.
CORE 3, SCOPE COMPLEX, LODHI ROAD
NEW DELHI 110003

REF: Tender for “Design, Supply, Erection, Testing and Commissioning of 5.00 LLPD Automated Dairy Plant at Dehri On Sone, Bihar on Turn Key basis”.

NIT No. : DLI/CON/720/607 dated 09.01.2018

Sir,

UNDERTAKING FOR ACCEPTANCE OF TENDER CONDITIONS

1. The Tender Documents for the work as mentioned in “Memorandum” to “Form of Tender” have been issued to us by ENGINEERING PROJECTS (INDIA) LIMITED and we hereby unconditionally accept the tender conditions and Tender Documents in its entirety for the above work.

2. The contents of clause 1.2 and 1.3 of the Tender Documents (Instructions to Tenderers) have been noted wherein it is clarified that after unconditionally accepting the tender conditions in its entirety, it is not permissible to put any remarks(s) / condition(s) (except unconditional rebate on price, if any) in the ‘Price-Bid’ enclosed in “Envelope-2” and the same has been followed in the present case. In case this provision of the Tender is found violated at any time after opening “Envelope-2”, We agree that our tender shall be summarily rejected and EPI shall, without prejudice to any other right or remedy be at liberty to forfeit the full said Earnest Money absolutely.

3. The required Earnest Money for this work is enclosed herewith.

Yours faithfully,

(Signature of the Tenderer)

Seal of Tenderer

Dated:
FORM OF TENDER

To,
EXECUTIVE DIRECTOR (CONTRACTS)
ENGINEERING PROJECTS (INDIA) LTD.
CORE 3, SCOPE COMPLEX, LODHI ROAD
NEW DELHI 110003

REF: Tender for Tender for “Design, Supply, Erection, Testing and Commissioning of 5.00 LLPD Automated Dairy Plant at Dehri On Sone, Bihar on Turn Key basis”.

NIT No. : DLI/CON/720/607 dated 09.01.2018

1. We hereby tender for execution of work as mentioned in “Memorandum” to this “Form of Tender” as per Tender Documents within the time schedule of completion of work as per separately signed and accepted rates in the Bill of Quantities quoted by us for the whole work in accordance with the Notice Inviting Tender, Conditions of Contract, Specifications of materials and workmanship, Bill of Quantities Drawings, Time Schedule for completion of jobs, and other documents and papers, all as detailed in Tender Documents.

2. It is agreed that the time stipulated for jobs and completion of work in all respects and in different stages mentioned in the “Time Schedule for completion of jobs” and signed and accepted by us is the essence of the contract. We agree that in case of failure on my/our part to strictly observe the time of completion mentioned for jobs and the final completion of work in all respects according to the schedule set out in the said “Time schedule for completion of jobs” and stipulations contained in the contract, the recovery shall be made from us as specified therein. In exceptional circumstances extension of time which shall always be in writing may, however be granted by EPI at its entire discretion for some items, and We agree that such extension of time will not be counted for the final completion of work as stipulated in the said “Time schedule of completion of jobs”.

3. We agree to pay the Earnest Money, Security Deposit /Retention money, Performance Guarantee and accept the terms and conditions as laid down in the “Memorandum” to this “Form of Tender”.

4. Should this Tender be accepted, We agree to abide by and fulfill all terms and conditions referred to above and as conditioned in Tender Documents elsewhere and in default thereof, allow EPI to forfeit and pay EPI, or its successors or its authorized nominees such sums of money as are stipulated in the Tender Documents.

5. We hereby pay the earnest money amount as mentioned in the “Memorandum” to this “Form of Tender” in favour of Engineering Projects (India) Limited payable at place as mentioned in the “NIT/ITT”.

Signature of Bidder
6. If we fail to commence the work within 10 days of the date of issue of Letter of Intent and/or We fail to sign the agreement as per Clause 84 of General Conditions of Contract and/or We fail to submit Performance Guarantee as per Clause 9.0 & 9.1 of General Conditions of Contract, We agree that EPI shall, without prejudice to any other right or remedy, be at liberty to cancel the Letter of Intent and to forfeit the said earnest money as specified above.

7. We are also enclosing herewith the Letter of Undertaking on the prescribed proforma as referred to in condition of NIT.

Date the __________________________ day of __________________________

SIGNATURE OF TENDERER

NAME (CAPITAL LETTERS): ____________________________________________

OCCUPATION: _______________________________________________________

ADDRESS: __________________________________________________________

______________________________________________________________

SEAL OF TENDERER
MEMORANDUM

REF: “Tender for “Design, Supply, Erection, Testing and commissioning of 5.00 LLPD Automated Dairy Plant at Dehri On Sone, Bihar on Turn Key basis”

NIT No.: DLI/CON/720/607

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SIGNATURE OF BIDDER  :

NAME (CAPITAL LETTERS)  :

OCCUPATION  :

ADDRESS  :

SEAL OF BIDDER
INTEGRITY PACT

Between

Engineering Projects (India) Ltd. (EPI) hereinafter referred to as “The Principal”,

And

…………………………………………………………………………………………… hereinafter referred to as “The Bidder / Contractor”

Preamble

The Principal intends to award, under laid down organizational procedures, contract/s for ……………………………. The Principal values full compliance with all relevant laws of the land, rules, regulations, economic use of resources and of fairness / transparency in its relations with its Bidder(s) and / or Contractor(s).

In order to achieve these goals, the Principal will appoint an Independent External Monitor (IEM), who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1 - Commitments of the Principal

1.) The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles:

   a) No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

   b) The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.

   c) The Principal will exclude from the process all known prejudiced persons.
2) If the Principal obtains information on the conduct of any of its employees which is a criminal offence under the IPC/PC Act, or if there be a substantive suspicion in this regard, the Principal will inform the Chief Vigilance Officer and in addition can initiate disciplinary actions.

Section 2 - Commitments of the Bidder(s) / contractor(s)

1) The Bidder(s) / Contractor(s) commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.

   a) The Bidder(s) / Contractor(s) will not, directly or through any other person or firm, offer, promise or give to any of the Principal’s employees involved in the tender process or the execution of the contract or to any third person any material or other benefit which he / she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

   b) The Bidder(s) / Contractor(s) will not enter with other Bidders into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.

   c) The Bidder(s) / Contractor(s) will not commit any offence under the relevant IPC / PC Act; further the Bidder(s) / Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

   d) The Bidder(s) / Contractor(s) of foreign origin shall disclose the name and address of the Agents / representatives in India, if any. Similarly the Bidder(s) / Contractor(s) of Indian Nationality shall furnish the name and address of the foreign principals, if any. Further details as mentioned in the “Guidelines on Indian Agents of Foreign Suppliers” shall be disclosed by the Bidder(s) / Contractor(s). Further, as mentioned in the Guidelines
all the payments made to the Indian agent / representative have to be in Indian Rupees only.

e) The Bidder(s) / Contractor(s) will, when presenting his bid, disclose any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

2) The Bidder(s) / Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

Section 3  - Disqualification from tender process and execution from further contracts

(1) If the Bidder(s) / Contractor(s), before award or during execution has committed a transgression through a violation of Section 2, above or in any other form such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidder(s) / Contractor(s) from the tender process or to terminate the contract, if already signed for such reason.

(2) If the Bidder/ Contractor has committed a serious transgression through a violation of section – 2 such as to put his reliability or credibility into question, the principal is entitled also to exclude the Bidder/ Contractor from future contract award processes. The imposition and duration of the exclusion will be determined by the severity of the transgression. The severity will be determined by the circumstances of the case, in particular the number of transgressions, the position of the transgressors with the company hierarchy of the Bidder and the amount of the damage. The exclusion will be imposed for a minimum of 6 months and maximum of 3 years.

(3) If the Bidder/ Contractor can prove that he has restored/ recouped the damage caused by him and has installed a suitable corruption prevention system, the Principal may revoke the exclusion prematurely.

(4) A transgression is considered to have occurred if in light of available evidence no reasonable doubt is possible.
Section 4 - Compensation for Damages

1) If the Principal has disqualified the Bidder(s) from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover the damages equivalent to Earnest Money Deposit / Bid Security.

2) If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to Section 3, the Principal shall be entitled to demand and recover from the Contractor liquidated damages of the Contract value or the amount equivalent to Performance Bank Guarantee.

Section 5 - Previous Transgression

1) The Bidder declares that no previous transgressions occurred in the last 3 years with any other Company in any country conforming to the anti-corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.

2) If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process.

Section 6 - Equal treatment of all Bidders / Contractors / subcontractors

(1) The Bidder(s) / Contractor(s) undertake(s) to demand from all subcontractors the commitment consistent with this Integrity Pact, and to submit it to the Principal before contract signing.

(2) The Principal will enter into agreements with identical conditions as this one with all Bidders and Contractors.

(3) The Principal will disqualify from the tender process all bidders who do not sign this Pact or violate its provisions.

Section 7 - Criminal charges against violating Bidder(s) / Contractor(s) / Subcontractor(s)

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor which constitutes corruption, or if the Principal has
substantive suspicion in this regard, the Principal will inform the same to the Chief Vigilance Officer.

Section 8 - Independent External Monitor / Monitors

(1) The Principal appoints competent and credible Independent External Monitor for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.

(2) The Monitor is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the Chairman, EPI.

(3) The Bidder(s) / Contractor(s) accepts that the Monitor has the right to access without restriction to all Project documentation of the Principal including that provided by the Contractor. The Contractor will also grant the Monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his project documentation. The same is application to Subcontractors. The Monitor is under contractual obligation to treat the information and documents of the Bidder(s) / Contractor(s) / Subcontractor(s) with confidentiality.

4) As soon as the Monitor notices, or believes to notice, a violation of this agreement, he will so inform the Management of the Principal and request the Management to discontinue or take corrective action, or to take other relevant action. The monitor can in this regard submit non-binding recommendations. Beyond this, the Monitor has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action. However, the independent External Monitor shall give an opportunity to the Bidder/ Contractor to present its case before making its recommendations to the Principal.

5) The Monitor will submit a written report to the Chairman EPI within 8 to 10 weeks from the date of reference or intimation to him by the Principal and
should the occasion arise, submit proposals for correcting problematic situations.

6) Monitor shall be entitled to compensation on the same terms as being extended to / provided to Independent Directors on the EPI Board.

7) If the Monitor has reported to the Chairman EPI, a substantiated suspicion of an offence under relevant IPC / PC Act, and the Chairman EPI has not, within the reasonable time taken visible action to proceed against such offence or reported it to the Chief Vigilance Officer, the Monitor may also transmit this information directly to the Central Vigilance Commissioner.

8) The word “Monitor” would include both singular and plural.

9) Independent External Monitor shall be required to maintain confidentially of the information acquired and gathered during their tenure/ role as independent Monitor. Any breach in this regard would be subject to the legal judicial system of India.

10) Independent External Monitor(s) shall be required to furnish an Undertaking and disclose before taking any assignment that he/ she has no interest in the matter or connected with the party (Bidder/ Contractor) in any manner.

Section 9 - Pact Duration

This Pact begins when both parties have legally signed it. It expires for the Contactor 12 months after the last payment under the contract, and for tall other Bidders 6 months after the contract has been awarded.

If any claim is made / lodged during this time, the same shall be binding and continue to be valid despite the lapse of this pact as specified above, unless it is discharged / determined by Chairman of EPI.

Section 10 - Other provisions

1) This agreement is subject to Indian Law. Place of performance and jurisdiction is the Registered Office of the Principal, i.e. New Delhi

2) Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.
3) If the Contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members.

4) Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

___________________     _____________________
(For & On behalf of the Principal)    (For & On behalf of Bidder / Contractor)

(Office Seal)       (Office Seal)

Place ---------------
Date ---------------

Witness 1 :
(Name & Address) --------------------------------

Witness 2 :
(Name & Address) --------------------------------
ENGINEERING PROJECTS (INDIA) LIMITED

(A Govt. of India Enterprise)

INSTRUCTIONS TO TENDERERS

AND

GENERAL CONDITIONS OF CONTRACT

DECEMBER, 2007

VOLUME-I

Issued to: M/s. ________________________________

____________________________________________

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INSTRUCTIONS TO TENDERERS
1.0 MODE OF SUBMISSION

The Tender is to be submitted in two separate sealed covers marked as under:

ENVELOPE-1 :-

This ENVELOPE shall contain the following:

i) Earnest Money Deposit as per clause 2.0 of ‘Instructions to Tenderers’ (ITT).
ii) Letter of Undertaking for un-conditional acceptance of the tender conditions as per proforma given in ITT.
iii) Pre-Qualification Documents and Credentials as per clause 19.0 of ITT.
iv) Volume-I (ITT, General Conditions of Contract), Volume-II (Notice Inviting Tender, Additional Conditions of Contract, Specifications, Drawings) and Corrigendum/Addendum, if any, duly filled in, signed and stamped on each page by tenderer. Cutting or over-writing, if any, shall be signed and stamped by the person signing the Tender. All pro-forma forming part of Tender Documents shall be filled in, signed and stamped by the tenderer.
v) Copy of power of attorney / partnership deed, duly attested by Notary Public authorizing the person who signs the Tender.
vii) Any other information as required to be submitted along-with the Tender.

This envelope shall be marked as:

ENVELOPE-1 “TECHNO-COMMERCIAL BID” FOR (Name of work as mentioned in “Notice Inviting Tender”)

NIT No. :
DUE ON :
FROM : (Name of the Contractor)

ENVELOPE – 2 :-

This ENVELOPE shall contain only the Volume-III comprising of PRICE-BID.

This envelope shall be marked as:

ENVELOPE-2 : ‘PRICE-BID’ FOR (Name of Work as mentioned in “Notice Inviting Tender”)

NIT No. :
DUE ON :
FROM : (Name of the Contractor)
Both the envelopes / packets shall be individually sealed and kept in an outer envelope marked as:

**TENDER FOR** (Name of Work as mentioned in “Notice Inviting Tender”)

**NIT No.** : ________________________________

**DUE ON** : ________________________________

**FROM** : (Name of the Contractor)

The outer envelope shall be duly sealed and shall be delivered at place of submission of Tender by the date and time fixed for receipt of Tender as mentioned in “Notice Inviting Tender”. The Tenders received after the date and time of Tender receipt shall not be considered and shall be returned to the tenderer unopened. EPI shall not be responsible for any postal or other delays, whatsoever and tenderer should take care to ensure the submission of Tender at place of receipt of Tender by due date and time fixed for Tender receipt. **All the envelopes shall be addressed to the** authority who has invited the Tender as mentioned in “Notice Inviting Tender”.

1.1 First the Envelope-1 of the tenderer shall be opened. Tenderers who unconditionally accept the tender conditions, deposit the required Earnest Money and whose Techno-Commercial Bid along with PQ Documents is found suitable shall be considered for the opening of their Price Bid and Envelope-2 of such tenderers shall only be opened. The Tenders not accompanied by requisite Earnest Money and / or not conveying un-conditional acceptance of tender conditions or whose Techno-Commercial Bid and PQ Documents are not found suitable, shall be rejected and such tenderer shall not be allowed to attend Price Bid opening i.e. opening of Envelope-2.

1.2 Once the tenderer has given an unconditional acceptance to the tender conditions in its entirety, he is not permitted to put any remark(s) / condition(s) (except unconditional rebate on price, if any) in / along with the ‘Price-Bid’ / Tender.

1.3 In case the condition 1.2 mentioned above is found violated at any time after opening of Tender, the Tender shall be summarily rejected and EPI shall, without prejudice to any other right or remedy, be at liberty to forfeit the full said Earnest Money absolutely.

2.0 **EARNEST MONEY DEPOSIT**

Earnest Money Deposit of amount as mentioned in “NIT/ITT/Memorandum” to “Form of Tender” required to be submitted alongwith the Tender shall be in the form of Demand Draft payable at place as mentioned in “NIT/ITT” in favour of EPI Limited from any Nationalized / Scheduled Bank or in the form of Bank Guarantee from any Nationalized / Scheduled Bank in enclosed format. The EMD Bank Guarantee shall be valid for a minimum period of 150 (One Hundred Fifty) days from last day of submission of Tender. The EMD shall be governed by Clause 7.0 of General Conditions of Contract.

3.0 EPI reserves the right to reject any or all the Tenders in part or full without assigning any reason whatsoever thereof. EPI does not bind themselves to
accept the lowest Tender. EPI reserves the right to award the work to a single party or to split the work amongst two or more parties as deemed necessary without assigning any reason thereof. The Contractor is bound to accept the portion of work as offered by EPI after split up at the quoted / negotiated rates.

4.1 FOR ITEM RATE TENDERS

4.1.1 The tenderers should quote the rates for items tendered by them in figures as well as in words and the amounts in figures only. The amount for each item should be worked out and the requisite totals and page totals given.

4.1.2 All corrections/cuttings should be signed by the tenderer. Each page of the Tender should be signed by the tenderer. In the event of discrepancy between rate in figures and words the rate quoted in words shall be treated as correct. In case there is discrepancy between rate and amount worked out, the rate quoted shall be taken as correct and not the amount.

4.1.3 Price shall be entered against each item in Bill of Quantities where quantities or LS (lump-sum) has been mentioned. The cost of item against which the Contractor has failed to enter a rate or price shall be deemed to be covered by rates and prices of other items in the Bill of Quantities and no payment shall be made for the quantities executed for items against which rate has not been quoted by Contractor. No rate is to be quoted against items for which no quantity is given. However, the Contractor has to quote rate against “LS” items.

4.2 FOR PERCENTAGE RATE TENDERS

4.2.1 In case of Percentage Rate Tenders, tenderer shall fill up in the Schedule / Bill of Quantities, percentage Below/Above/Par (in figures as well as in words) to total estimated cost given in Schedule / Bill of Quantities, he will be willing to execute the work. The tenderer should quote a unique single percentage plus / minus over the total estimated amount given in Schedule / Bill of Quantities. In case more than one schedule is given, stipulating quoting of separate percentages (plus or minus) over the estimated amount of each schedule, the tenderer can quote separate percentages for each such schedule. Under no circumstances, tenderer is allowed to quote separate percentages for individual items, trades or group of items. In case tenderer quotes separate percentages for individual items, trades or group of items instead of to the total amount of schedule(s), the Tender shall be rejected and earnest money of the tenderer shall be forfeited in totality.

4.2.2 In case of Percentage Rate Tenders, the tenderer shall also work out the total amount of his offer after adding percentage (plus or minus) over the total schedule amount and the same should be written in figures as well as in words in such a way that no interpolation is possible.

4.2.3 In case of Percentage Rate Tenders, only percentage quoted shall be considered. Any tender containing item rates is liable to be rejected. Percentage quoted by the tenderer in Percentage Rate Tender shall be accurately filled in figures and words. All corrections/cuttings should be signed by the tenderer. Each page of the Tender should be signed by the tenderer. In the event of discrepancy between percentage rate in figures and words, the percentage rate
quoted in words shall be treated as correct. In case there is discrepancy between percentage rate and amount worked out the percentage rate quoted shall be taken as correct and not the amount. For any other discrepancy, the decision of Tender Scrutiny Committee of EPI shall be final & binding on the tenderer including rejection of Tender and forfeiture of EMD.

5.0 The Tenders shall be strictly as per the conditions of contract. Tenders with any additional condition(s)/modification(s) shall be rejected.

6.0 The witnesses to the Tender / Contract Agreement shall be other than the tenderer / tenderers competing for this work and must indicate full name, address, status/occupation with dated signatures.

7.0 The acceptance of Tender will rest with EPI. Tenders in which any of the prescribed conditions are not fulfilled or found incomplete in any respect are liable to be rejected.

8.0 Canvassing whether directly or indirectly in connection with Tenders is strictly prohibited and the Tenders submitted by the Contractors who resort to canvassing will be liable to rejection.

9.0 On acceptance of Tender, the name of the accredited representative(s) of the Contractor who would be responsible for taking instructions from Engineer-In-Charge or its authorised representative shall be intimated by the Contractor within 07 days of issue date of telegram / letter / telex / fax of Intent by EPI.

10.0 The tenderer shall not be permitted to Tender for works if his near relative is posted as an Assistant Manager or any higher ranks in the concerned Regional Office of EPI. The Contractor shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any of the officers in EPI. Any breach of this condition by the tenderer would render him liable to the withdrawal of the work awarded to him and forfeiture of Earnest Money and Security Deposit. This may also debar the Contractor from tendering for future works under EPI.

11.0 No employee of EPI of the rank of Assistant Manager and above is allowed to work as a Contractor or as an employee of a Contractor having interest in EPI for a period of two years after his retirement/relief from the service of EPI, without the prior permission of EPI in writing. This contract is liable to be cancelled if either the Contractor or any of his employee is found at any time to be such a person who had not obtained the permission of EPI as aforesaid before submission of the Tender or engagement in the Contractor’s service.

12.0 The time of completion of the entire work, as contained in contract shall be as mentioned in “Memorandum” to “Form of Tender”, which shall be reckoned from the 10th day from issue of the Letter / Telex / Telegram / Fax of Intent by the EPI.

13.0 The Tender award, execution and completion of work shall be governed by Tender Documents consisting of (but not limited to) Letter of Intent / Letter of work Order, Bill of Quantities, Additional Conditions of Contract, General Conditions of Contract, Specifications, Drawings, etc. The tenderers shall be
deemed to have gone through the various conditions and clauses of the Tender and visited the Site and satisfied itself with Site conditions including sub-soil water conditions, topography of the land, drainage and accessibility etc. or any other condition which in the opinion of Contractor will affect his price / rates before quoting their rates. No claim whatsoever against the foregoing shall be entertained by EPI.

14.0 The Drawings given with the Tender Documents are TENDER DRAWINGS and are indicative only.

15.0 Transfer of bid documents purchased by one intending bidder to another is not permissible.

16.0 Tenders must be duly signed with date and sealed. An attested copy of power of attorney/affidavit/Board Resolution executed as under shall accompany the ‘Tender Documents’.

   a) In case of Sole Proprietorship, an affidavit of Sole Proprietorship and if the Tender is signed by any other person Power of Attorney by the Sole Proprietor in favour of signatory.

   b) In case of Partnership firm, if Tender is not signed by all the partners, Power of Attorney in favour of the Partner/person signing the tender/documents by all the partners authorizing him to sign the tender/documents.

   c) In case of Company, copy of the Board Resolution authorizing the signatory to sign on behalf of the Company.

17.0 Tenders with following discrepancies are liable for rejection:

   a) Tenders with over-written or erased rates, percentages, amounts or rates, percentages not written in both figures and words.

   b) Tender that is incomplete, ambiguous, and not accompanied by the documents asked for or submitted without EMD or with inadequate EMD.

   c) Tender received after specified date/time whether due to postal or other delays.

   d) Tender in respect of which canvassing in any form is resorted to by the tenderer whatsoever.

   e) If the tenderer deliberately gives wrong information in his tender or resorts to unfair methods in creating circumstances for the acceptance of his tender, EPI reserves the right to reject such tender at any stage.

18.0 Submission of a tender by the tenderer implies that he has read the complete contract documents and has made himself aware of the scope, terms & conditions and specifications of the work to be done and of conditions at which stores, tools, plant, etc. will be issued to him by EPI (if any), local conditions and
political situations and other factors having bearing on the execution of the works. No claim of Contractor whatsoever, within the purview of this clause, shall be entertained at any stage of the project.

19.0 Tenderer shall submit the following documents along with their Tenders in the first envelope (Techno-Commercial Bid) :-

a) List of works executed during the last 5 years indicating name of the Client, value, date of start and completion.

b) List of works under execution indicating name of the Client, Total Contract Value, Value of balance work in hand, date of start and completion.

c) Details of similar works executed.

d) Audited balance sheets and profit and loss accounts alongwith schedules for the last 3 years.

e) Copy of latest income-tax returns filed along with PAN.

f) Details of manpower available.

g) Details of equipments, tools and plant available.

h) Credentials and completion certificates.

i) Registration Certificate/Memorandum and Articles of Association/Partnership Deed/Affidavit.

j) Copy of Provident Fund Number allotted by PF authorities.

k) Copy of letters of registration with various authorities like CPWD, State PWD, MES and Public Sector Undertakings, etc.

l) Latest Solvency certificate from Nationalised/Scheduled Bank.

m) Latest Sales Tax Registratin and Clearance Certificate.

n) Any other document as stipulated above and in “Tender Documents’

20. Purchase Preference may be granted to the Central Public Sector Enterprises as per the applicable guidelines in force in this regard issued by the Government of India.
LETTER OF UNDERTAKING

(TO BE ENCLOSED IN ENVELOPE-1 ALONGWITH EMD)

ENGINEERING PROJECTS (INDIA) LIMITED
(Address of submission as mentioned in “Notice Inviting Tender”)

REF. : TENDER FOR (Name of Work as mentioned in “Notice Inviting Tender”)

NIT No. : __________________________

Sir,

UNDERTAKING FOR ACCEPTANCE OF TENDER CONDITIONS

1. The Tender Documents for the work as mentioned in “Memorandum” to “Form of Tender” have been issued to me / us by ENGINEERING PROJECTS (INDIA) LIMITED and I / We hereby unconditionally accept the tender conditions and Tender Documents in its entirety for the above work.

2. The contents of clause 1.2 and 1.3 of the Tender Documents (Instructions to Tenderers) have been noted wherein it is clarified that after unconditionally accepting the tender conditions in its entirety, it is not permissible to put any remark(s) / condition(s) (except unconditional rebate on price, if any) in the ‘Price-Bid’ enclosed in “Envelope-2” and the same has been followed in the present case. In case this provision of the Tender is found violated at any time after opening “Envelope-2”, I / We agree that my/our tender shall be summarily rejected and EPI shall, without prejudice to any other right or remedy be at liberty to forfeit the full said Earnest Money absolutely.

3. The required Earnest Money for this work is enclosed herewith.

Yours faithfully,

(Signature of the Tenderer)

Seal of Tenderer

Dated : _______________________

Signature of Contractor
FORM OF TENDER

To,

Engineering Projects (India) Limited
(Address of submission as mentioned in “Notice Inviting Tender”)

REF. :      TENDER FOR (Name of Work as mentioned in “Notice Inviting Tender”)

NIT No. : ________________________________

1. I/We hereby tender for execution of work as mentioned in “Memorandum” to this “Form of Tender” as per Tender Documents within the time schedule of completion of work as per separately signed and accepted rates in the Bill of Quantities quoted by me / us for the whole work in accordance with the Notice Inviting Tender, Conditions of Contract, Specifications of materials and workmanship, Bill of Quantities Drawings, Time Schedule for completion of jobs, and other documents and papers, all as detailed in Tender Documents.

2. It is agreed that the time stipulated for jobs and completion of works in all respects and in different stages mentioned in the “Time Schedule for completion of jobs” and signed and accepted by me/us is the essence of the contract. I/We agree that in case of failure on my/our part to strictly observe the time of completion mentioned for jobs and the final completion of works in all respects according to the schedule set out in the said “Time Schedule for completion of jobs” and stipulations contained in the contract, the recovery shall be made from me/us as specified therein. In exceptional circumstances extension of time which shall always be in writing may, however be granted by EPI at its entire discretion for some items, and I/We agree that such extension of time will not be counted for the final completion of work as stipulated in the said “ Time schedule of completion of jobs”.

3. I/We agree to pay the Earnest Money, Security Deposit cum Performance Guarantee, Retention Money and accept the terms and conditions as laid down in the “Memorandum” to this “Form of Tender”.

4. Should this Tender be accepted, I/We agree to abide by and fulfill all terms and conditions referred to above and as contained in Tender Documents elsewhere and in default thereof, allow EPI to forfeit and pay EPI, or its successors or its authorized nominees such sums of money as are stipulated in the Tender Documents.

5. I/We hereby pay the earnest money amount as mentioned in the “Memorandum” to this “Form of Tender” in favour of Engineering Projects (India) Limited payable at place as mentioned in the “NIT/ITT”.

Signature of Contractor

Page 8
6. If I/we fail to commence the work within 10 days of the date of issue of Letter of Intent and / or I/We fail to sign the agreement as per Clause 84 of General Conditions of Contract and/or I/We fail to submit Security Deposit cum Performance Guarantee as per Clause 9.0 & 9.1 of General Conditions of Contract, I/We agree that EPI shall, without prejudice to any other right or remedy, be at liberty to cancel the Letter of Intent and to forfeit the said earnest money as specified above.

7. I/We are also enclosing herewith the Letter of Undertaking on the prescribed pro-forma as referred to in condition of NIT.

Date the __________________________ day of _______________________________

SIGNATURE OF TENDERER

NAME (CAPITAL LETTERS) : _________________________________________

OCCUPATION _________________________________________

ADDRESS _______________________________________

_______________________________________

SEAL OF TENDERER
MEMORANDUM

(ENCLOSURE TO FORM OF TENDER)

REF. : TENDER FOR (Name of Work as mentioned in “Notice Inviting Tender”)

NIT No. : ________________________________

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Cl. No.</th>
<th>Values / Description to be applicable for relevant clause(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td>Name of work</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii)</td>
<td>Owner/Client / Employer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii)</td>
<td>Type of Tender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iv)</td>
<td>Earnest Money Deposit</td>
<td>NIT</td>
<td>Rs.________ (Rupees__________ ______________________ only).</td>
</tr>
<tr>
<td>v)</td>
<td>Estimated Cost</td>
<td>NIT</td>
<td>Rs.________ (Rupees__________ ______________________ only).</td>
</tr>
<tr>
<td>vi)</td>
<td>Time for completion of work</td>
<td>NIT</td>
<td>Total work to be completed in ____________________________ (____________________) in accordance with the time schedule of completion of work in the Tender Documents.</td>
</tr>
<tr>
<td>vii)</td>
<td>Mobilization Advance</td>
<td>8.0</td>
<td>_____ % (______________ Percent) of Contract Value.</td>
</tr>
<tr>
<td>viii)</td>
<td>Interest Rate on Mobilization Advance</td>
<td>8.0</td>
<td>Simple Interest Rate of <em><strong><strong>%(</strong></strong></em>_____ percent only) per annum.</td>
</tr>
<tr>
<td>ix)</td>
<td>Number of Instalments for recovery of Mobilisation Advance</td>
<td>8.0</td>
<td></td>
</tr>
</tbody>
</table>
| x)     | Schedule of Rates applicable                     | 69.0    | Civil Works : ____________________________  
Sanitary Works : ____________________________  
Electrical Works : ____________________________ |
| xi)    | Validity of Tender                               | 4.0     | 90 (Ninety) Days                                            |
| xii)   | Security Deposit cum Performance Guarantee       | 9.0     | 5.00% (Five Percent only) of Contract Value within 10 days from the date of issue of telegram / letter / telex / FAX of Intent of acceptance of Tender. |

Signature of Contractor

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### Instructions to Tenderers

**Engineering Projects (India) Limited**

#### xi) Retention Money

| 10.0 | 5.00% (Five percent only) of the contract amount, which shall be deducted in the manner set out in this contract. |

#### xii) Time allowed for starting the work

| 43.0 | The date of start of contract shall be reckoned 10 days from the date of issue of telegram / letter / telex / FAX of Intent of acceptance of Tender. |

#### xiii) Defect Liability Period

| 74.0 | 12 (Twelve) Months from the date of taking over of works. |

#### xiv) Arbitration

| 76 | Arbitration shall be as per provisions of Clause no.76 of GCC. The Venue of Arbitration shall be ……………………………… |

#### xv) Jurisdiction

| 76.3 | Courts in ------------------------------- |

---

**SIGNATURE OF TENDERER**

**NAME (CAPITAL LETTERS):**

| _____________________________________________ |

**OCCUPATION:**

| _____________________________________________ |

**ADDRESS:**

| _____________________________________________ |

| _____________________________________________ |

**SEAL OF TENDERER**

---
ENGINEERING PROJECTS (INDIA) LIMITED
(A Govt. of India Enterprise)

GENERAL CONDITIONS OF CONTRACT
AND
LABOUR SAFETY PROVISIONS, MODEL RULES
CONTRACTOR'S LABOUR REGULATIONS
& PRESCRIBED PROFORMAS
GENERAL CONDITIONS OF CONTRACT

1.0 GENERAL

The Contract means the documents forming the Tender and acceptance thereof and the formal agreement executed between the competent authority on behalf of EPI and the Contractor, together with the documents referred to therein including these conditions, the Specifications, Designs, Drawings and Instructions issued from time to time by the Engineer-In-Charge and all these documents taken together, shall be deemed to form one contract and shall be complementary to one another.

1.1 In the contract, the following expressions shall, unless the context otherwise requires, have the meanings, hereby respectively assigned to them.

1.2 Engineering Projects (India) Limited, hereinafter called 'EPI' proposes to get the works executed as mentioned in the Contract on behalf of Owner/Client.

1.3 The work will be executed as per Drawings “GOOD FOR CONSTRUCTION” to be released by EPI unless otherwise specified elsewhere in the Tender Documents.

1.4 OTHER DEFINITIONS

a) ENGINEER-IN-CHARGE means the Regional Office In-Charge of EPI himself or an engineer of EPI nominated by the Regional Office In-Charge for supervision and/or project management of the project from time to time.

b) WORKS OR WORK The expression works or work shall unless there be something either in the subject or context repugnant to such construction, be construed and taken to mean the works by or by virtue of the contract contracted to be executed whether temporary or permanent, and whether original, altered, substituted or additional.

c) CONTRACTOR The Contractor shall mean the individual, firm or company, whether incorporated or not, undertaking the works and shall include the legal personal representative of such individual or the persons composing such firm or company, or the successors of such firm or company and the permitted assignees of such individual, firm or company.

d) DRAWINGS mean the Drawings referred to in the Bill of Quantities, specifications and any modifications of such Drawings or such other Drawings as may from time to time be approved or furnished by EPI.

e) 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 EPI or used for the purpose of the agreement.

f) APPROVAL means approved in writing including subsequent written confirmation of previous verbal approval.
g) WRITING means any manuscript typed, written or printed statement under or over signature and/or seal as the case may be.

h) MONTH means English Calendar month. ‘Day’ means a Calendar day of 24 Hrs each.

i) CONTRACT VALUE means the sum for which the Tender is accepted as per the Agreement/ Letter of Acceptance/ Letter of Intent.

j) LANGUAGE: All documents and correspondence in respect of this contract shall be in English Language. In case of any discrepancy between the English version and the Hindi version of these documents, the provisions contained in the English version shall be applicable.

k) BILL OF QUANTITIES or SCHEDULE OF QUANTITIES means the priced and completed Bill of Quantities or Schedule of Quantities forming part of the Tender.

l) OWNER/ CLIENT / EMPLOYER means the Government, Organization, Authority, Company, Ministry, Department, Society, Cooperative etc. who has awarded the work/ project to EPI and/ or appointed EPI as Implementing / Executing Agency/ Project Manager and/ or for whom EPI is acting as an agent and on whose behalf EPI is entering into the contract and getting the work executed.

m) IMPLEMENTING/ EXECUTING AGENCY means EPI

n) TENDER means the Contractor’s priced offer to EPI for the execution and completion of the work and the remedying of any defects therein in accordance with the provisions of the Contract, as accepted by the Letter of Intent or Award letter. The word TENDER is synonymous with Bid and the word TENDER DOCUMENTS with “Bidding Documents” or “offer documents”.

o) The headings in the clauses/ conditions of Tender Documents are for convenience only and shall not be used for interpretation of the clause/ condition.

p) Words imparting the singular meaning only also include the plurals and vice versa where the context requires. Words imparting persons or parties shall include firms and corporations and organizations having legal capacities.

q) APPROVED INSURANCE COMPANY means any Insurance Company registered with ‘Insurance Regulatory & Development Authority’ (IRDA) of India and meeting insurance needs of the projects of EPI.

2.0 SITE VISIT AND COLLECTING LOCAL INFORMATION

Before tendering, the tenderer is advised to visit the Site, its surroundings to assess and satisfy themselves about the local conditions such as the working and other constraints at Site, approach roads to the Site, availability of water & power supply, applicability of taxes, duties and levies etc., nature of ground, soil and sub-soil condition, underground water table level, accommodations they may
require etc., river regime, river water levels, other details of river, streams & any other relevant information required by them to execute the complete scope of work. The tenderer may obtain all necessary information as to risks, weather conditions, contingencies & other circumstances (insurgencies etc.) which may influence or affect their tender prices. Tenderer shall be deemed to have considered Site conditions whether he has inspected it or not and to have satisfied himself in all respects before quoting his rates and no claim or extra charges whatsoever in this regard shall be entertained / payable by EPI at a later date.

2.1 ACCESS BY ROAD

Contractor, if necessary, shall build temporary access roads to the actual Site of construction for the works at his own cost to make the Site accessible. The Contractor shall maintain the same in motorable condition at all times as directed by Engineer-In-Charge at his own cost. The Contractor shall be required to permit the use of any roads so constructed by him for vehicles of EPI or any other agencies/ Contractors who may be engaged on the project Site, free of cost.

Non-availability of access roads or approach to Site, for the use of the Contractor shall in no case condone any delay in the execution of work nor be the cause for any claim for compensation.

2.2 HANDING OVER & CLEARING OF SITE

2.2.1 The Contractor should note that area for construction may be made available in phases as per availability and in conjunction with pace of actual progress of work at Site. The work may be required to be carried out in constrained situations. The work is to be carried out in such a way that the traffic, people movement, if any, is kept operative and nothing extra shall be payable to the Contractor due to this phasing / sequencing of the work. The Contractor is required to arrange the resources to complete the entire project within total stipulated time. Traffic diversion, if required, is to be done and maintained as per specification by the Contractor at his own cost and the Contractor shall not be entitled for any extra payment, whatsoever, in this regard.

2.2.2 Efforts will be made by EPI to handover the Site to the Contractor free of encumbrances. However, in case of any delay in handing over of the Site to the Contractor, EPI shall only consider suitable extension of time for the execution of the work. It should be clearly understood that EPI shall not consider any revision in contract price or any other compensation whatsoever viz. towards idleness of Contractor’s labour, equipment etc.

2.2.3 The Contractor shall be responsible for removal of all over-ground and underground structures (permanent, semi-permanent and temporary) and constructions from the Site. The cost to be incurred in this regard shall be deemed to be included in the quoted rates of Bill of Quantities items and Contractor shall not be entitled for any extra payment whatsoever, in this regard.

Old structures on the proposed Site, if required, shall be demolished by the Contractor properly. The useful material obtained from demolition of structures &
services shall be the property of the Owner/EPI and these materials shall be stacked in workmanship like manner at the place specified by the Engineer-in-Charge.

2.2.4 If required, the Contractor has to do site clearance, enabling work, barricading, diversion of Roads, shifting/realignment of existing utility services, drains, nallahs etc. at his own cost as per direction of Engineer-In-Charge and the Contractor shall not be entitled for any extra payment whatsoever in this regard.

2.2.5 Necessary arrangements including its maintenance are to be made by the Contractor for temporary diversion of flow of existing drain and road, as the case may be. The existing drain, road would be demolished, wherever required, with the progress of work under the scope of proposed project. The existing Road and Drain, which are not in the alignment of the said project but are affected and/or need to be demolished during execution for smooth progress of the project, shall be restored to its original status and condition (including black topping) by the Contractor at his own. The cost to be incurred by Contractor in these regards shall be deemed to be included in the quoted rates of the Bill of Quantities items and Contractor shall not be entitled for any extra payment whatsoever, in these regards.

2.2.6 The Contractor shall be responsible to co-ordinate with service provider/concerned authorities for cutting of trees, shifting of utilities and removal of encroachments etc. and making the site unhindered for completion of work. This shall include initial and frequent follow up meetings/actions/discussions with each involved service provider/concerned authorities. The Contractor shall not be entitled for any additional compensation for delay in cutting of trees, shifting of utilities and removal of encroachments by the service provider/concerned authorities.

2.2.7 The information about the public utilities (whether over ground or underground) like electrical/telephone/water supply lines, OFC Cables, sewer lines, open drains etc. is the responsibility of Contractor who has to ascertain the utilities that are to be affected by the works through the site investigation and collection of information from the concerned utility Owners.

2.2.8 The Contractor shall be responsible to obtain necessary approval from the respective authorities for shifting/re-alignment of existing public utilities. EPI shall only provide necessary letters required for liaisoning by the Contractor in obtaining the approval from the concerned authorities.

2.2.9 Any services affected by the works must be temporarily supported by the Contractor who must also take all measures reasonably required by the various bodies to protect their services and property during the progress of works. It shall be deemed to be the part of the contract and no extra payment shall be made to the Contractor for the same. Shifting/re-alignment of public utilities should be done without disturbing the existing one. New service lines should be laid and connected before dismantling the existing one.

2.2.10 Shifting/re-alignment of existing public utilities shall be done by the Contractor as per technical requirement of respective bodies or as per direction of Engineer-In-Charge. Shifting/re-alignment of public utilities includes all materials, labours,
tools and plants and any other expenses whatsoever for the same. The cost to be incurred in this regard shall be deemed to be included in his quoted rates of BOQ items and the Contractor shall not be entitled for any extra payment, whatsoever, in this regard. In case any of these services are shifted by the State Govt/ local authorities themselves for which deposit as per their estimates is to be made to them, the Contractor shall deposit the same and the Contractor shall be paid only at the rates quoted by him in BOQ for quantity specified in the BOQ, if such items are included in the BOQ irrespective of amount paid by him to the State Govt./ local authorities for execution of these works. In case such provision is not made in the BOQ or the quantity exceeds those specified in the BOQ, the same is deemed to be included in the rates quoted by him for other items in BOQ and nothing extra shall be payable to Contractor on this account.

3.0 SCOPE OF WORK

3.1 The scope of work covered in this Tender shall be as per the Bill of Quantities, Specifications, Drawings, Instructions, Orders issued to the Contractor from time to time during the pendency of work. The Drawings for this work, which may be referred for tendering, provide general idea only about the work to be performed under the scope of this contract. These may not be the final drawings and may not indicate the full range of the work under the scope of this contract. The work will be executed according to the Drawings to be released as “GOOD FOR CONSTRUCTION” from time to time by the Engineer-In-Charge of EPI and according to any additions/ modifications/ alterations/deletions made from time to time, as required by any other drawings that would be issued to the Contractor progressively during execution of work. It shall be the responsibility of the Contractor to incorporate the changes that may be in the scope of work, envisaged at the time of tendering and as actually required to be executed.

3.2 The quantities of various items as entered in the “BILL OF QUANTITIES” are indicative only and may vary depending upon the actual requirement. The Contractor shall be bound to carry out and complete the stipulated work irrespective of the variation in individual items specified in the Bill of Quantities. The variation of quantities will be governed as per clause No.69 of GCC.

4.0 VALIDITY OF TENDER

The Tender for the works shall remain open for acceptance for a period of ninety days from the date of opening of Price Bid of Tenders. The earnest money will be forfeited without any prejudice to any right or remedy, in case the Contractor withdraws his Tender during the validity period or in case he changes his offer to his benefits, which are not acceptable to EPI. The validity period may be extended on mutual consent.

5.0 ACCEPTANCE OF TENDER

EPI reserves to itself the authority to reject any or all the Tenders received without assigning any reason. The acceptance of a Tender shall be effective w.e.f. the date on which the telegram/ letter of intent or acceptance of the Tender is put in the communication by EPI. EPI also reserves the right to split the work
among two or more parties at lowest negotiated rate without assigning any reason thereof. The Contractor is bound to accept the portion of work as offered by EPI after split up at the quoted/ negotiated rates.

6.0 SET OF TENDER DOCUMENTS:

The following documents will complete a set of Tender Documents.

A) VOLUME I:
   a) Instructions to tenderers
   b) General Conditions of Contract

B) VOLUME II:
   a) Notice Inviting Tenders
   b) Additional Conditions of Contract
   c) Technical Specifications (General, Additional & Technical specifications)
   d) Tender Drawings

C) VOLUME III:
   a) Schedule of Rates/ Bills of quantities (Price-Bid)

7.0 EARNEST MONEY DEPOSIT

Earnest Money Deposit (EMD) of amount as mentioned in “Memorandum” to “Form of Tender” required to be submitted along with the Tender shall be in the form of Demand Draft payable at place as mentioned in “Notice Inviting Tender”/ “Instructions to Tenderers” in favour of ‘Engineering Projects (India) Limited’ from any Nationalised bank / Scheduled Bank or in the form of Bank Guarantee from any Nationalised bank / Scheduled Bank as per the enclosed format. The EMD shall be valid for minimum period of 150 days (One hundred fifty Days) from last day of submission of Tender.

7.1 EMD shall accompany the offer and placed in the sealed envelope cover of the offer as detailed in Instructions to Tenderer. Any tender not accompanied with the requisite Earnest Money Deposit alongwith ‘Letter of Undertaking’ shall be rejected and such tenderer(s) will not be allowed to attend the opening of bids.

7.2 The EMD of all unsuccessful tenderers (i.e. except evaluated lowest tenderer) shall be returned within Seven (7) days of the opening of price bids by EPI. Subject to clause 7.6 herein below, EMD of successful tenderer shall be refunded after submission of Security Deposit cum Performance Guarantee by him.

7.3 Once the tenderer has given an unconditional acceptance to the tender conditions in its entirety, he is not permitted to put any remark(s)/conditions(s) (except unconditional rebate on price, if any) in/ along-with the Tender.

7.4 In case the condition 7.3 mentioned above is found violated at any time after opening of Tender, the Tender shall be summarily rejected and EPI shall, without
prejudice to any other right or remedy, be at liberty to forfeit the full said Earnest Money absolutely.

7.5 No interest will be payable by EPI on the said amount covered under EMD/Other security documents.

7.6 EMD of successful tenderer, if deposited in the form of Demand Draft, shall be treated as part of Retention Money.

7.7 At any time after the due date of the Tender, if any tenderer alters /modifies/withdraws his tender within the validity period (or the extended validity period) of his tender or fails to furnish the “Security Deposit cum Performance Guarantee” or the “Additional Performance Guarantee” or fails to execute the “Contract Agreement” within the prescribed time period after the placement of LOI on him, EPI without prejudice to any other rights or remedies shall be at liberty to forfeit the Earnest Money deposited by the tenderer. In the event of re-tender, such tenderer shall not be allowed to submit tender.

8.0 MOBILIZATION ADVANCE

8.1 Mobilization advance up to maximum of amount as mentioned in the “Memorandum” to the “Form of Tender” shall be paid to the Contractor on submission of non-revocable and unconditional Bank Guarantee of an equivalent amount in case of interest free Mobilization Advance or for an amount equal to 110% of the Mobilization Advance in case of interest bearing Mobilization Advance, from a Nationalized Bank / Scheduled Bank as per the enclosed Performa subject to conditions given hereunder. The Mobilization Advance shall be at the Interest Rate as mentioned in the “Memorandum” to the “Form of Tender”. This advance shall be paid in three installments as follows: -

i) First installment of fifty percent of total mobilization advance shall be paid after fulfillment of the following conditions:

   a) Signing of the agreement.
   b) Submission of Security Deposit cum Performance Guarantee as per Clause No. 9.

ii) Second installment of twenty five percent of total mobilization advance will be paid after the setting up of site office and providing facilities to EPI as per contract, and completion of enabling works required for taking up the construction. These include construction of store, labour hutments, etc.

iii) The balance twenty five percent of total mobilization advance shall be paid on mobilization of manpower, plant & equipment etc. to the satisfaction of Engineer-In-Charge of EPI.

8.2 The Advance shall be recovered on monthly installment basis. The installments shall commence when 20% of the scheduled contract period has elapsed and fully recovered when 80% of the scheduled contract period is over, both from
date of start. (The month of start & completion of recovery of mobilization advance to be rounded off to nearest full month).

8.3 Part ‘Bank Guarantees’ (BGs) against mobilization advance shall be furnished in as many numbers as the number of recovery installments as given in “Memorandum” to the “Form of Tender” and should be equivalent to the amount of each recovery installment. At any point of time, if the Contractor's payable amount on account of work done is not available with EPI or the amount payable is less than the recovery installment, recovery of such advance shall be effected by encashing the BG of equivalent recovery amount. The decision of EPI in this regard shall be final and binding on the Contractor. The validity period for the part BGs shall be till three months after the end of the month in which instalment is due to be recovered with further three months claim period.

8.4 In case recovery of Mobilization Advance is delayed, interest shall be charged @12% (Twelve percent) per annum on delayed recoveries due to late submission of bills by the Contractor or due to delayed encashment of Bank Guarantee, as stated above or due to any other reasons whatsoever.

8.5 Contractor is required to furnish the Utilization Certificate for each installment of mobilization advance to the satisfaction of Engineer-In-Charge. Subsequent installments of mobilization advance shall be released only after getting satisfactory utilisation certificate from the Contractor for the earlier released installment.

8.6 Notwithstanding what is contained in aforesaid clauses, no mobilization advance whatsoever shall be payable, if payment of mobilization advance is not mentioned in the “Memorandum” to the “Form of Tender”.

9.0 SECURITY DEPOSIT CUM PERFORMANCE GUARANTEE

“Within 10 (ten) days from the date of issue of letter of Intent or within such extended time as may be granted by EPI in writing, the Contractor shall submit to EPI a Security Deposit cum Performance Bank Guarantee in the form appended, from any Nationalised bank / Scheduled Bank equivalent to 5% (five percent only) of the Contract Value for the due and proper execution of the contract. This bank guarantee shall remain valid up to 90 (ninety) days after the end of defects liability period.

In case the Contractor fails to submit the Security Deposit cum Performance Guarantee of the requisite amount within the stipulated period or extended period, letter of intent will stand withdrawn and EMD of Contractor shall be forfeited.

9.1 ADDITIONAL PERFORMANCE GUARANTEE FOR EXISTING CONTRACTORS

In case bidder is a working Contractor of EPI at the time of issuance of Letter of Intent (LOI) for the work, the bidder has to furnish an additional Performance Guarantee of 1% (One Percent) of the Contract Value of the work, in case working capacity of the bidder is less than the aggregate of balance work-load of all the works of the bidder with EPI as on date of placement of LOI for this work. The balance workload shall also include the value of work awarded but not yet
started and finally approved value of this work. This additional Performance Guarantee shall be in addition to the Security Deposit cum Performance Guarantee of the works to be furnished by the bidder as specified in the clause no. 9 of General Conditions of Contract. Further, no relaxation in Security Deposit cum Performance Guarantee as in clause no. 9 of General Conditions of Contract shall be made in case working capacity works-out to be more than the balance value of works as mentioned above. The working capacity of the Contractor shall be calculated as under:

\[
\text{WORKING CAPACITY} = 2.5 \times \text{(Average Turnover of the party as per latest three audited Balance Sheets)}.
\]

NOTE: The decision of amount of additional Performance Guarantee as above shall be taken by EPI and shall be final & binding to the Contractor.

In case the Contractor fails to submit the additional performance guarantee of the requisite amount within 10 days from the date of issue of letter of Intent or within such extended time as may be granted by EPI in writing, the letter of intent will stand withdrawn and EMD of the Contractor shall be forfeited.

9.2 **ABNORMALLY HIGH AND LOW RATED ITEMS**

For item rate tenders if, the rates quoted by the lowest bidder for certain items of the Bill of Quantities of the Tender are found to be abnormally high or low in comparison to the Market Rate analysis of the item done by EPI and/or in comparison to EPI's method of working out market rate justification for the items, the same shall be governed as under:

For Abnormally High Rated items (AHR), the progressive payment shall be 80% (Eighty percent) of the payment due to the Contractor against execution of the AHR items. The balance withheld 20% (twenty percent) payment shall be released after 80% of total value of the original contract is completed in financial terms in order to ensure that the Abnormally Low Rated (ALR) items identified at the time of Award of work have been executed as per requirement of project and as per terms of Contract. Further, deviation limit for AHR items shall be nil on plus side and 100% on minus side. The provision of deviation limit of clause 69.1(v) shall not apply to AHR items. In case of deviation of quantities given in schedule of quantities for AHR items on plus side, the same shall be governed by clause 69.2. The decision of Engineer-In-Charge of EPI in this regard shall be final and binding on the Contractor.

The provision of para 9.2 shall not be applicable on tenders invited on Percentage Rate/lump Sum basis.
The decision of EPI on identification/marking of AHR and ALR items is final and binding on the Contractor. In case the Contractor does not agree to the identified AHR and ALR items, at the time of award of works, the EMD/Security Deposit cum Performance Guarantee of the Contractor shall be forfeited and decision of EPI in this regard shall be final & binding on the Contractor.

10.0 RETENTION MONEY

The Retention Money shall be deducted from each running bill of the Contractor at 5% (five percent only) of the gross value of the Running Account bill. The Earnest Money Deposited by the tenderer in the form of Demand Draft will be treated as part of the Retention Money. The Retention Money shall be refunded to the Contractor after expiry of defects liability period (referred to in Clause No. 74) or on payment of the amount of the final bill whichever is later. If the amount of Retention Money deduction in cash is more than Rs.10.00 lakhs (Rupees Ten lakhs only), the excess amount can be refunded to Contractor against submission of Bank Guarantee of equivalent amount from a Nationalised bank / Scheduled Bank in the prescribed proforma of Performance Guarantee of EPI.

11.0 MOBILIZATION OF MEN, MATERIALS AND MACHINERY:

11.1 All expenses towards mobilization at Site and de-mobilization including bringing in equipment, work force, materials, dismantling the equipments, clearing the Site etc. shall be deemed to be included in prices quoted and no separate payment on account of such expenses shall be entertained.

11.2 It shall be entirely the Contractor’s responsibility to provide, operate and maintain all necessary construction equipments, scaffolding and safety gadget, lifting tackles, tools and appliances to perform the work in a workman like and efficient manner and complete all jobs as per the specifications and within the schedule time of completion of work. Further, Contractor shall also be responsible for obtaining temporary electric and water connection for all purposes. The Contractor shall also make standby arrangement for water & electricity to ensure un-interrupted supply.

11.3 It shall be the responsibility of the Contractor to obtain the approval for any revision and/or modification desired by him from EPI before implementation. Also such revisions and/or modifications if accepted / approved by EPI shall be carried at no extra cost to EPI.

11.4 The procurement and supply in sequence and at the appropriate time of all materials and consumable shall be entirely the Contractor’s responsibility and his rates for execution of work shall be inclusive of supply of all these items.
11.5 It is mandatory for the Contractor to provide safety equipments and gadgets to its all workers, supervisory and Technical staff engaged in the execution of the work while working. The minimum requirement (but not limited to) shall be gumboots, safety helmets, Rubber hand gloves, facemasks, safety nets, belts, goggles etc. as per work requirements. Sufficient nos. of these equipments and gadgets shall also be provided to EPI by the Contractor at his own cost for use of EPI Officials and/ or workforce while working/ supervision at Site. No staff/ worker shall be allowed to enter the Site without these equipments/ gadgets. The cost of the above equipments/ gadgets are deemed to be included in the rates quoted by the Contractor for the items & works as per Bill of Quantities and Contractor shall not be entitled for any extra cost in these regard. The above norm is to be strictly complied with at Site. In case the Contractor is found to be deficient in providing Safety Equipments/ Gadgets in the opinion of Engineer-In-Charge, the Engineer-In-Charge at his option can procure the same at the risk & cost of Contractor and provide the same for the use of worksite and shall make the recoveries from the bills of the Contractor for the same. The decision of the Engineer-In-Charge shall be final and binding on Contractor in this regard.

11.6 All Designs, Drawings, Bill of Quantities, etc. (except Bar Bending Schedule, Shop & Fabrication Drawings) for all works shall be supplied to the Contractor for all buildings services and development works by EPI in phased manner as the works progress. However it shall be the duty and responsibility of the Contractor to bring to the notice of EPI in writing as to any variation, discrepancy or any other changes required and to obtain revised drawings and designs and / or approval of EPI in writing for the same.

11.7 One copy of contract documents including Drawings furnished to the Contractor shall be kept at the Site and the same shall at all reasonable times be available for inspection.

11.8 All materials, construction plants and equipments etc. once brought by the Contractor within the project area, will not be allowed to be removed from the premises without the written permission of EPI. Similarly all enabling works built by the Contractor for the main construction undertaken by him, shall not be dismantled and removed without the written authority of EPI.

11.9 Contractor shall have to prepare the Bar Bending Schedule, Shop and Fabrication Drawings free of cost, if required for any of the items of work. Five copies of these Drawings each including for revision will be submitted to EPI for approval. Before executing the item, Bar Bending Schedule, Shop & Fabrication Drawings should be got approved from EPI.

12.0 **INCOME TAX DEDUCTION**

Income tax deductions shall be made from all payments made to the Contractor including advances against work done, in accordance with the Income Tax act prevailing from time to time.
13.0 **TAXES AND DUTIES**

13.1 The Contractor shall be responsible for the payment, wherever payable, at his own cost of all taxes such as excise duty, custom duty, sales tax, including the purchase tax, consignment tax, work contract tax, service tax, VAT or any other similar tax in the state concerned, turnover tax, toll tax, octroi charges, royalty, cess, levy and other tax (es) or duty (ies) which may be specified by local/ state/ central government from time to time on all materials, articles which may be used for this work. The rates quoted by him in the Tender in Bill of Quantities shall be inclusive of all such taxes, duties, etc. The imposition of any new and/ or increase in the aforesaid taxes, duties, levies (including fresh imposition of Work Contract Tax, Turnover Tax, Sales Tax on Work Contract, VAT or any other similar Tax) etc. during the currency of the contract shall be borne by Contractor and shall not be paid or reimbursed to the Contractor by EPI. In the event of non-payment/default in payment of any octroi, royalty, cess, turnover tax, sales tax, including the purchase tax, consignment tax, work contract tax, VAT, Service Tax or any other similar tax in the state concerned, customs, excise or any other levy/tax including labour dues etc. by Contractor, EPI reserves the right to withhold the dues/ payments of Contractor and make payment to local/state/ Central Government authorities or to labourers as may be applicable. The Contractor should submit along with the Tender Registration Certificates with Sales Tax on works contract authority etc. other wise appropriate recovery shall be made from his bills.

13.2 The rate quoted by the Contractor shall be deemed to be inclusive of all Taxes and duties as mentioned in clause no.13.1 given above or any other tax as applicable and the same shall not be reimbursed by EPI. Tax deductions at source shall be made as per laws prevalent in the State.

13.3 The stamp duty and registration charges, if any, on the contract agreement levied by the Government or any other statutory body, shall be paid by the Contractor.

13.4 It will be incumbent upon the Contractor to obtain a registration certificate as a dealer under the Local Sales Tax Act and the Central Sales Tax Act, Service Tax, etc. and necessary evidence to this effect shall be furnished by the Contractor to EPI. Sales Tax on the transactions between the Contractor and his Sub-Contractor/Vendors etc. shall be borne by the Contractor. The Contractor shall be responsible for any taxes that may be levied hereunder on the transaction between Contractor and EPI.

13.5 The bidder shall quote his rates inclusive of Turnover Tax/ Sales Tax on Works Contract payable to State Govt. along-with other taxes, duties, levies etc. in conjunction with other terms and conditions. In case, the Turnover Tax/ Sales Tax on Works Contract on execution of works is waived off by the State Govt. at later stage for this project, the equivalent amount from the date of waiver of such tax (as per prevailing rate as on the date of waiver of Turnover Tax/ Sales Tax on Works Contract) shall be deducted from the amount payable to the Contractor from subsequent RA Bills.
13.6 VALUE ADDED TAX (VAT)

The consideration agreed for the execution of said contract shall include the taxes, duties, cess, etc. such as excise duty, service tax, VAT, which is leviable or may be levied in future under any State Law or the Central Law on execution of said contract, such taxes shall be borne by the Contractor and shall not be reimbursed by EPI. Further, if due to any variance in such tax, duties, cess etc. there is any increase in the taxes, the same shall also be borne by the Contractor. Where under any of the State or the Central Law, there is requirement of deduction of tax at source, the same shall be deducted from the amount paid or payable to the Contractor pursuant to this contract and shall be deposited to the Government authorities by EPI. EPI shall issue the documents/forms/certificate as prescribed under the relevant law, in respect of the amount so deducted from the amount paid or payable to the Contractor. EPI shall have full rights to withhold the amount payable to the Contractor in pursuant to this contract, if Contractor does not fulfill his obligation under any State or Central Law relating to execution of said contract, in case the amount has already been paid by EPI, EPI has the right to recover such payments from the Contractor.

14.0 ROYALTY ON MATERIALS:

The Contractor shall deposit royalty and obtain necessary permit for supply of bajri, stone, kankar, sand, etc. from the local authorities and quoted rates shall be inclusive of royalty.

15.0 RATES TO BE FIRM

15.1 The rates quoted by the tenderer shall be firm and fixed for the entire period of completion and till handing over of the work. No revision to rates or any escalation shall be allowed on account of any increase in prices of materials, labour, POL and Overheads etc or any other statutory increase during the entire contract period or extended contract period.

15.2 The Contractor shall be deemed to have inspected the Site, its surrounding and acquainted itself with the nature of the ground, accessibility of the Site and full extent and nature of all operations necessary for the full and proper execution of the contract, space for storage of materials, construction plant, temporary works, restrictions of working time, restrictions on the plying of heavy vehicles in area, supply and use of labour, materials, plant, equipment and laws, rules and regulations, if any, imposed by the local authorities.

15.3 The rates and prices to be tendered in the Bill of Quantities are for completed and finished items of works complete in all respects. It will be deemed to include all construction plant, labour, supervision, materials, transport, all temporary works, erection, maintenance, Contractor’s profit and establishment/overheads, together with preparation of designs & drawings pertaining to casting yard, shop drawing, fabrication drawing (if required), staging form work, stacking yard, etc. all general risk, taxes, royalty, duties, cess, octroi and other levies, insurance,
liabilities and obligations set out or implied in the Tender Documents and contract.

15.4 Unless otherwise specified in the Bill of Quantities (BOQ), the Contractor has to make his own arrangement for dewatering/bailing out of water, effluent including strutting, shoring etc at every stage of work wherever required (including Tunnel work) including working under foul condition as per direction of Engineer-In-Charge at his own cost and the Contractor shall not be entitled for any extra payment, whatsoever, in this regard.

15.5 If required to make work site suitable for execution, Contractor shall have to clear jungle including of rank vegetation, grass, trees etc., clear & clean existing drains/canals (including strutting, shoring and packing cavities) and dispose them out of the Site up-to any lead and lift as per direction of Engineer-In-Charge. The Contractor should inspect the Site of work from this point of view. Unless otherwise specified in the Bill of Quantities, the cost to be incurred in this regard shall be deemed to be included in his quoted rates of BOQ items and the Contractor shall not be entitled for any extra payment in this regard.

15.6 If any temporary/permanent structure is encountered or safety of such structure in the vicinity is endangered due to execution of the project, the Contractor has to protect the structures by any means as per direction of Engineer-in-Charge. If any damage caused to any temporary or permanent structure(s) in the vicinity is caused due to execution of the project, the Contractor has to make good the same by any means as per direction of Engineer-in-Charge. The Contractor should inspect the Site of work from this point of view. The cost to be incurred in this regard shall be deemed to be included in his quoted rates of BOQ items and the Contractor shall not be entitled for any extra payment in this regard.

16.0 ESCALATION / PRICE VARIATION

No claim on account of any Price Variation/Escalation on whatsoever ground shall be entertained at any stage of works. All rates as per Bill of Quantities (BOQ)/Price-Bid quoted by Contractor shall be firm and fixed for entire contract period as well as extended period for completion of the works. No escalation/price variation clause shall be applicable on this contract.

17.0 INSURANCE OF WORKS ETC.

Contractor is required to take Contractor’s All Risk Policy or Erection All Risk Policy (as the case may be) including Marine Insurance from an Approved Insurance Company in the joint name with EPI and bear all costs towards the same for the full period of execution of works including the defect liability period for the full amount of contract against all loss or damage from whatever cause arising for which he is responsible under the terms of the contract and in such manner that EPI and the Contractor are covered during the period of construction of works and/or also covered during the period of defect liability for the loss or damage as under:

a. The work and the temporary works to the full value of such works.
b. The materials, construction plant, centering, shuttering and scaffolding materials and other things brought to the Site for their full value. Whenever required by EPI, the Contractor shall produce the policy or the policies of insurance and the receipts for payment of the current premiums.

18.0 INSURANCE UNDER WORKMEN’S COMPENSATION ACT

Contractor is required to take insurance cover as per requirement of the Workmen’s Compensation Act, 1923 amended from time to time from an Approved Insurance Company and pay premium charges thereof. Wherever required by EPI the Contractor shall produce the policy or the policies of Insurance and the receipt of payment of the current premiums.

19.0 THIRD PARTY INSURANCE

Contractor is required to take third party insurance cover for an amount of 5% (five percent) of Contract Value from an Approved Insurance Company for insurance against any damage, injury or loss which may occur to any person or property including that of EPI, arising out of the execution of the works or temporary works. Wherever required by EPI the Contractor shall produce the policy or the policies of Insurance and the receipt of payment of the current premiums.

In case of failure of the Contractor to obtain insurance for works, insurance under Workman Compensation Act and Third Party insurance as described above within one month from the date of commencement of work, running account payments of the Contractor shall be withheld till such time the aforesaid insurance covers are obtained by the Contractor.

20.0 INDEMNITY AGAINST PATENT RIGHTS

The Contractor shall fully indemnify EPI from and against all claims and proceedings for or on account of any infringement of any patent rights, design, trademark or name or other protected rights in respect of any construction plant, machine, work or material used for in connection with the works or temporary works.

21.0 LABOUR LAWS TO BE COMPLIED WITH BY THE CONTRACTOR

The Contractor shall obtain a valid licence under the contract labour (Regulation & Abolition) Act 1970 and the Contract Labour Act (R&A) Central Rules 1971 and amended from time to time, and continue to have a valid licence until the completion of the work including defect liability period. The Contractor shall also abide by the provision of the child labour (Prohibition and Regulation) Act. 1986 and as amended from time to time. Any failure to fulfill this requirement shall attract the penal provisions of this contract arising out of the resultant non-execution of the work.
The Contractor shall comply with the provisions of the payment of Wages Act, 1936, Minimum Wages Act, 1948, Employer's Liability Act, 1938, Workmen's Compensation Act, 1923, Maternity Benefit Act, 1961 and Mines Act -1932, Industrial Disputes Act, 1947 or any modifications thereof or any other law relating thereto and rules made there under from, time to time.

21.1 No labour below the age of 18 years shall be employed on the work.

22.0 LABOUR SAFETY PROVISION

The Contractor shall be fully responsible to observe the labour safety provisions.

23.0 OBSERVANCE OF LABOUR LAWS

23.1 The Contractor shall be fully responsible for observance of all labour laws applicable including local laws and other laws applicable in this matter and shall Indemnify and keep indemnified EPI against effect of non observance of any such laws. The Contractor shall be liable to make payment to all its employees, workers and sub-Contractors and make compliance with labour laws. If EPI or the Client/ Owner/ Employer is held liable as "Principal Employer" to pay any amount or contributions etc. under legislation of Govt. or Court decision in respect of the employees of the Contractor, then the Contractor would reimburse the amount of such payments, contribution etc. to EPI and/ or same shall be deducted from the payments, Retention Money etc. of the Contractor.

23.2 The Contractor shall submit proof of having valid EPF registration certificate. In absence of the said certificate payment to the extent of 4.70% (four point seven percent) of the value of all the Running Account bills may be withheld by EPI and shall be released only after the production of the EPF registration certificate from the concerned authorities. If it is incumbent upon EPI to deposit withheld amount with EPF authorities, the withheld amount shall be deposited by EPI with EPF authorities. In such a case EPI shall not refund this withheld amount to the Contractor even after the production of EPF registration certificate.

23.3 The Contractor shall be liable to pay cess levied under the Building and other Construction Workers Welfare Cess Act, 1996, at such rates as may be notified by the Government from time to time. EPI shall deduct at source from every Running Account Bill of the Contractor, the said cess, at such rates for the time being prevailing, which shall not exceed 2% (two percent) but not be less than 1% (one percent) of the cost of construction incurred by EPI.

24.0 LAWS GOVERNING THE CONTRACT

This contract shall be governed by the Indian Laws for the time being in force and amended from time to time.

25.0 LAWS, BYE LAWS RELATING TO THE WORK

The Contractor shall strictly abide by the provisions, for the time being in force, of law relating to works or any regulations and bye laws made by any local authority or any water & lighting agencies or any undertakings within the limits of the
jurisdiction of which the work is proposed to be executed. The Contractor shall be bound to give to the authorities concerned such notices and take all approvals as may be provided in the law, regulations or bye laws as aforesaid, and to pay all fees and taxes payable to such authorities in respect thereof.

26.0 EMPLOYMENT OF PERSONNEL

26.1 The Contractor shall employ only Indian Nationals as his representatives, servants and workmen after verifying their antecedents and loyalty. He shall ensure that no personnel of doubtful antecedents & integrity and any other nationality in any way are associated with the works.

26.2 EPI shall have full power to get removed immediately any representative, agent, servant and workmen or employees of the Contractor on account of misconduct, negligence or incompetence or whose continued employment may in the opinion of the Engineer-In-Charge be undesirable without assigning any reason for the removal. The Contractor shall not be allowed any compensation on this account whatsoever.

27.0 TECHNICAL STAFF FOR WORK

27.1 The Contractor shall employ at his cost the adequate number of technical staff during the execution of this work depending upon the requirement of work. For this purpose the numbers to be deployed, their qualification, experience as decided by EPI shall be final and binding on Contractor. The Contractor shall not be entitled for any extra payment in this regard. The technical staff should be available at Site, whenever required by EPI to take instructions.

27.2 Within 15 days from the date of letter of intent, the Contractor shall submit a site organizational chart and Resume including details of experience of the Project-in-Charge and other staff proposed by him and shall depute them on the Project after getting approval from Engineer-In-Charge. If desired by the Contractor at later date, the Project-in-Charge and other staff whose resume is approved by EPI can be replaced with prior written approval of EPI and replacement shall be with equivalent or superior candidate only. Decision of Engineer-In-Charge shall be final and binding on the Contractor.

Even after approving the site organizational chart, the Engineer-In-Charge due to nature and exigency of work can direct the Contractor to depute such additional staff as in view of Engineer-In-Charge is necessary and having qualification and experience as approved by the Engineer-In-Charge. The removal of such additional staff from the Site shall only be with the prior written approval of Engineer-In-Charge. The Contractor shall not be paid anything extra whatsoever on account of deployment of additional staff and decision of the Engineer-In-Charge shall be final and binding on the Contractor.

27.3 In case the Contractor fails to employ the staff as aforesaid, he shall be liable to pay a reasonable amount not exceeding a sum of Rs. 25,000 (Rupees Twenty Five Thousand only) for each month of default in the case of each person. The
decision of the Engineer-In-Charge as to number of Technical Staff to be adequate for the project and the period for which the required technical staff was not employed by the Contractor and as to the reasonableness of the amount to be deducted on this account shall be final and binding on the Contractor.

28.0 LAND FOR LABOUR HUTS/ SITE OFFICE AND STORAGE ACCOMMODATION

28.1 The Contractor shall arrange the land for temporary office, storage accommodation and labour huts at his own cost and get the clearance of local authorities for setting up of labour camp and cost of same is deemed to be included in the rates quoted by the Contractor for the works. The Contractor shall ensure that the area of labour huts is kept clean and sanitary conditions are maintained as laid down by the local authorities controlling the area. The labour huts shall be so placed that it does not hinder the progress of work or access to the worksite. The vacant possession of the land used, for the purpose shall be given back by Contractor after completion of the work. The Retention Money of the Contractor shall be released only after Contractor demolishes all structures including foundations and gives back clear vacant possession of this land.

28.2 In the event the Contractor has to shift his labour camp at any time during execution of the work on the Instructions of local authorities or as per the requirement of the work progress or as may be required by EPI, he shall comply with such instructions at his cost and no claim whatsoever shall be entertained on this account.

28.3 FURNISHED OFFICE ACCOMMODATION & MOBILITY AND COMMUNICATION TO BE PROVIDED BY CONTRACTOR TO EPI

On acceptance of Tender, the Contractor at his own cost will construct a suitable furnished office at Site equipped with basic facilities such as telephone(s), fax, internet, photocopier, computer(s) & printer(s) alongwith operator(s), regular electricity & drinking water supply and vehicles for staff etc. as per the requirement of the project. The Contractor shall provide consumable as required and maintain the aforesaid facilities intact/operational during the currency of the contract including the defects liability period. The Contractor shall also make sufficient arrangement for photography/ videography preferably by maintaining a camera/video camera at Site so that photographs video can be taken of any specific activity at any point of time. The Contractor shall also provide software like MS Project etc. for the purpose of preparing progress report, etc.

28.4 The Contractor shall make all arrangements for ground breaking ceremony/ inaugural function etc for the project as required and the cost towards it is deemed to be included in his rates/offer. Any expenditure already incurred/to be incurred by EPI, shall be recovered from the Contractor.

28.5 PROTECTION OF TREES

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

29.0 WATCH & WARD AND LIGHTING

The Contractor shall at his own cost take all precautions to ensure safety of life and property by providing necessary barriers, lights, watchmen etc. during the progress of work as directed by Engineer-In-Charge.

30.0 HEALTH & SANITARY ARRANGEMENTS

In case of all labour directly or indirectly employed in work for the performance on the Contractor’s part of this contract, the Contractor shall comply with all rules and regulations framed by Govt. from time to time for the protection of health and sanitary arrangements for workers.

31.0 WORKMEN’S COMPENSATION ACT

The Contractor shall at all times indemnify EPI and Owner against all claims for compensation under the provision of Workmen’s Compensation Act, 1923 or any other law in force, for any workmen employed by the Contractor or his sub-Contractor in carrying out the contract and against all costs and expenses incurred by EPI therewith.

32.0 MINIMUM WAGES ACT

The Contractor shall comply with all the provisions of the Minimum Wages Act, 1948, Contract Labour Act (R&A) 1970, and rules framed thereunder and other labour laws/local laws affecting contract labour that may be brought into force from time to time.

33.0 LABOUR RECORDS

The Contractor shall submit by the 4th & 19th of every month to the Engineer-In-Charge of EPI a true statement, showing in respect of the second half of the preceding month and the first half of the current month, respectively, of the following data :-

a) The number of the labour employed by him (category-wise).

b) Their working hours.

c) The wages paid to them.

d) The accidents that occurred during the said fortnight showing the circumstances under which they happened and the extent of damage and injury caused.
e) The number of female workers who have been allowed Maternity Benefits under the Maternity Benefit Act, 1962 and the amount paid to them.

f) Any other information required by Engineer-In-Charge.

34.0 RELEASE OF RETENTION MONEY AFTER LABOUR CLEARANCE

Retention Money of the work shall not be refunded till the Contractor produces a clearance certificate from the concerned Labour Officer. As soon as the work is virtually complete, the Contractor shall apply for the clearance certificate to the concerned Labour Officer under intimation to the Engineer-In-Charge. The Engineer-In-Charge, on receipt of the said communication, shall write to the Labour Officer to intimate if any complaint is pending against the Contractor in respect of the work. If no complaint is pending, on record till three months after completion of the work and/or no communication is received from the Labour Officer to this effect till six months after the date of completion, it will be deemed to have received the clearance certificate and the Retention Money will be released if otherwise due.

35.0 SECURED ADVANCE AGAINST NON-PERISHABLE MATERIALS

Interest free secured advance up-to a maximum of 75% (seventy five percent) of the Market Value of the materials or the cost of materials as derived from the tendered item rate of the Contractor, whichever is less, required for incorporation in the permanent works and brought to Site and duly certified by EPI Site Engineer shall be paid to the Contractor for all non-perishable items as per CPWD/MORTH (as the case may be) norms. The advance will be paid only on submission of Indemnity Bond in the prescribed pro-forma. The advance shall be recovered in full from next Running Account bill and fresh advance paid for the balance quantities of materials. The Contractor shall construct suitable godown at the Site of work for safe storage of the materials against any possible damages due to sun, rain, dampness, fire, theft etc. at his own cost. He shall also employ necessary watch & ward establishment for the purpose at his costs and risks. Such secured advance shall be payable on other items of perishable nature, fragile and combustible with the approval of the Engineer-In-Charge provided the Contractor provides a comprehensive insurance cover for the full cost of such materials. The decision of the Engineer-In-Charge shall be final and binding on the Contractor in this matter. No secured advance shall however, be paid on high-risk materials such as ordinary glass, sand, petrol, diesel etc.

36.0 MEASUREMENTS OF WORKS

36.1 Unless otherwise mentioned in the Bill of Quantities the measurements of works shall be done as per CPWD/MORTH specifications (as specified in Technical Specification of the Tender) and if the same is not given in the CPWD/MORTH Specifications, the same shall be measured as per latest relevant BIS codes in force. The quantity of steel reinforcement and the structural steel sections incorporated in the work shall be measured & paid on the basis of standard coefficients of sections as per BIS Codes of practice.
36.2 The Engineer-In-Charge shall except as otherwise stated ascertain and determine by measurement the value of work done in accordance with the contract.

36.3 All items having financial value shall be entered in Measurement Book, level book, etc. prescribed by EPI so that a complete record is obtained of all work performed under the contract. Items of non-financial value (which are not payable) may also be entered in Measurement Book at the sole discretion of the Engineer-In-Charge.

36.4 Measurements shall be taken jointly by the Engineer-In-Charge or his authorized representative and by the Contractor or his authorized representative.

36.5 Before taking measurements of any work the Engineer-In-Charge or the authorized person deputed by him for the purpose shall give a reasonable notice to the Contractor. If the Contractor fails to attend or send an authorized representative for measurement after such a notice or fails to countersign or to record the objection within a week from the date of measurement, then in any such event measurement taken by the Engineer-In-Charge or by the person deputed by him shall be taken to be correct measurements of the work.

36.6 The Contractor shall, without extra charge provide assistance with every appliance, labour and other things necessary for measurement.

Measurements shall be signed and dated by both parties each day on the Site on completion of measurement.

37.0 PAYMENTS

37.1 The bill shall be submitted by Contractor each month on or before the date fixed by the ENGINEER-IN-CHARGE for all works executed in previous months. The Contractor shall prepare computerized bills using the program as approved by Engineer-In-Charge as per prescribed format/ pro-forma. The Contractor shall submit five numbers of hard copies and one soft copy of floppy/ CD for all bills. Subject to clause 37.3 herein below, the payment due to the Contractor shall be made within fifteen days of getting the measurements verified from the Engineer-In-Charge or his subordinate/ representative and certification of bill by the Engineer-In-Charge.

37.2 All running payments shall be regarded as ‘on account’ payments against the final payment only and not as payments for work actually done and completed and / or accepted by EPI and shall not preclude the recovery for bad, unsound and imperfect or unskilled work to be removed and taken away and reconstructed or re-erected or be considered as an admission of the due performance of the Contract, or any part thereof, in this respect, or the accruing of any claim, nor shall it conclude, determine or affect in any way the powers of EPI under these conditions or any of them as to the final settlement and adjustments of the accounts or otherwise, or in any other way vary/ affect the contract. The final bill shall be submitted by the Contractor within three months of
the completion of work, otherwise EPI’s certificate of the measurement and of the total amount payable for the work accordingly shall be final and binding on Contractor. Each Running Bill should be accompanied by two sets of at-least 20 (twenty) photographs as per direction of Engineer-In-Charge taken from various points depicting status of work as on Report/ Bill date along with Monthly Progress Report for the concerned month in the pro-forma to be given/ approved by Engineer-In-Charge. Intermittent progress photographs as and when required shall also be provided by the Contractor at his own cost as per direction of Engineer-In-Charge. No payment of running account bill shall be released unless it is accompanied by progress photographs and Monthly Progress Report as above.

37.3 It is clearly agreed and understood by the Contractor that notwithstanding anything to the contrary that may be stated in the agreement between EPI and the Contractor, the Contractor shall become entitled to payment only after EPI has received the corresponding payment(s) from the Client/ Owner for the work done by the Contractor. Any delay in the release of payment by the Client/ Owner to EPI leading to delay in the release of the corresponding payment by EPI to the Contractor shall not entitle the Contractor to any compensation/ interest from EPI.

37.4 All payments shall be released by EPI by Account Payee Cheque from any of its offices in India directly at the address notified by the Contractor (Postage charges shall be charged to the Contractor’s account). In case of Payments is made by Demand Draft at the request of the Contractor, Bank Commission charges shall be debited to the account of Contractor.

38.0 WORK ON SUNDAYS, HOLIDAYS AND DURING NIGHT

For carrying out work on Sunday and Holidays or during night, the Contractor will approach the Engineer-In-Charge or his representative at least two days in advance and obtain his permission. The Engineer-In-Charge at his discretion can refuse such permission. The Contractor shall have no claim on this account whatsoever. If work demand, the Contractor shall make arrangements to carry out the work on Sundays, Holidays and in two, three shifts with the approval of Engineer-in-Charge at no extra cost to EPI.

39.0 NO IDLE CHARGES TOWARDS LABOUR OR PLANT & MACHINERY ETC.

No idle charges or compensation shall be paid for idling of the Contractor’s labour, staff or Plant & Machinery etc. on any ground or due to any reason whatsoever. EPI will not entertain any claim in this respect.

40.0 WORK TO BE EXECUTED IN ACCORDANCE WITH SPECIFICATIONS, DRAWINGS, ORDERS, ETC.

The Contractor shall execute the whole and every part of the work in the most substantial and workman like manner both as regards materials and otherwise in every respect in strict accordance with the specifications. The Contractor shall also conform exactly, fully and faithfully to the Design, Drawings and Instructions
in writing in respect of the work assigned by the Engineer-In-Charge and the Contractor shall be furnished free of charge one copy of the Contract Documents together with Specifications, Designs, Drawings.

The Contractor shall comply with the provisions of the contract and execute the works with care and diligence and maintain the works and provide all labour and materials, tools and plants including for measurements and supervision of all works, structural plans and other things of temporary or permanent nature required for such execution and maintenance in so far as the necessity for providing these is specified or is reasonably inferred from the contract. The Contractor shall take full responsibility for adequacy, suitability and safety of all the works and methods of construction.

41.0 DIRECTION FOR WORKS

41.1 All works to be executed under the contract shall be executed under the direction and subject to approval in all respect of the Engineer-In-Charge of EPI who shall be entitled to direct at what point or points and in what manner works are to be commenced and executed.

41.2 The Engineer-In-Charge and his representative shall communicate or confirm their instructions to the Contractor in respect of the execution of work during their Site inspection in a ‘Works Site Order Book’ maintained at the site office of Engineer-In-Charge. The Contractor or his authorized representative shall confirm receipt of such instructions by signing against the relevant orders in the book. The Contractor shall be bound to sign the site order book as and when required by Engineer-In-Charge and carry out compliance of instructions promptly to the satisfaction of Engineer-In-Charge.

42.0 ORDER OF PRECEDENCE OF DOCUMENTS

42.1 In case of difference, contradiction, discrepancy, dispute with regard to Conditions of Contract, Specifications, Drawings, Bill of Quantities and Rates quoted by the Contractor and other documents forming part of the contract, the following shall prevail in order of precedence.

i) Contract Agreement
ii) Fax, Telegram or Letter of Intent, detailed letter of Work Order along with statement of agreed variations and its enclosures.
iii) Description in Bill of Quantity / Schedule of Quantities
iv) Additional Conditions of Contract.
v) Technical specifications (General / Special Technical Specification) as given in the Tender Documents.
vi) General Conditions of Contract.
vii) Drawings
viii) CPWD/ MORTH specifications (as specified in Technical Specification of the Tender) update with correction slips issued up to last date of receipt of Tenders.
ix) Relevant B.I.S. Codes.

42.2 If there are varying or conflicting provisions made in any one document forming part of the contract, the Engineer-In-Charge shall be the deciding authority with regard to the intention of the document which shall be final and binding on the Contractor.

42.3 Any error in description, quantity or rate in the Schedule of Quantities/items or Bill of Quantities or any omission there from shall not vitiate the contract or release the Contractor from the execution of the whole or any part of the works comprised therein according to the Drawings and Specifications or from any of his obligations under the contract.

43.0 TIME SCHEDULE & PROGRESS

43.1 Time allowed for carrying out all the works as entered in the Tender shall be as mentioned in the “Memorandum” to the “Form of Tender” which shall be reckoned from the 10th day from the date on which the letter/telegram of Intent is issued to the Contractor. Time shall be the essence of the contract and Contractor shall ensure the completion of the entire work within the stipulated time of completion.

43.2 The Contractor shall also furnish within 10 days from the date of letter/telegram of Intent, a CPM network/PERT chart/Bar Chart for completion of work within stipulated time. This will be duly got approved from EPI. This approved Network/PERT Chart shall form a part of the agreement. Achievement of milestones as well as total completion has to be within the time period allowed.

43.3 Contractor shall mobilize and employ sufficient resources for completion of all the works as indicated in the agreed BAR CHART/Network. No additional payment will be made to the Contractor for any multiple shift work or other incentive methods contemplated by him in his work schedule even though the time schedule is approved by the Engineer-In-Charge.

43.4 During the currency of the work the Contractor is expected to adhere to the time schedule on milestones and total completion and this adherence will be a part of Contractor’s performance under the contract. During the execution of the work Contractor is expected to participate in the review and updating of the Network/BAR CHART undertaken by EPI. These reviews may be undertaken at the discretion of EPI either as a periodical appraisal measure or when the quantum of work order on the Contractor is substantially changed through deviation orders or amendments. The review shall be held at Site or any of the offices of EPI/Owner or Consultant of EPI/Owner at the sole discretion of EPI.

43.5 If at any time, it appears to the Engineer-In-Charge that the actual progress of work does not conform to the approved programme referred above, the Contractor shall produce a revised programme showing the modifications to the approved programme by additional inputs to ensure completion of the work within the stipulated time. The Contractor will adhere to the revised schedule thereafter. The approval to the revised schedule resulting in a completion date beyond the
stipulated date of completion shall not automatically amount to a grant of extension of time to the Contractor.

43.6 Contractor shall submit fortnightly/ Monthly (as directed by Engineer-In-Charge) progress reports (5 copies) on a computer based program (program and software to be approved by Engineer-In-Charge) highlighting status of various activities and physical completion of work.

43.7 The Contractor shall send completion report along with as built drawings and maintenance schedule to the office of Engineer-In-Charge, of EPI in writing within a period of 30 days of completion of work.

44.0 WATER AND ELECTRICITY

The Contractor shall make his own arrangement for Water & Electrical power for construction and other purposes at his own cost and pay requisite electricity and water charges. The Contractor shall also make standby arrangement for water & electricity to ensure un-interrupted supply.

45.0 MATERIALS TO BE PROVIDED BY THE CONTRACTOR

The Contractor shall, at his own expense, provide all materials, required including Cement & Steel for the works.

The Contractor shall at his own expense and without delay, supply to the Engineer-in-Charge samples of materials to be used on the work and shall get the same approved in advance. All such materials to be provided by the Contractor shall be in conformity with the specifications laid down or referred to in the contract. The Contractor shall, if requested by the Engineer-in-Charge furnish proof, to the satisfaction of the Engineer-In-Charge that the materials so comply.

The Contractor shall at his risk and cost submit the samples of materials to be tested or analyzed and bear all charges and cost of testing unless specifically provided for otherwise elsewhere in the contract or specifications. The Engineer-In-Charge or his authorized representative 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 and every assistance and cost in obtaining the right and visit to such access.

The Engineer-In-Charge shall have full powers to require the removal from the premises of all materials which in his opinion are not in accordance with the specifications and in case of default, the Engineer-In-Charge shall be at liberty to employ at the expense of the Contractor, other persons to remove the same without being answerable or accountable for any loss or damage that may happen or arise to such materials. The Engineer-In-Charge shall also have full power to require other proper materials to be substituted thereof and in case of default, the Engineer-In-Charge may cause the same to the supplies and all
costs which may require such removal and substitution shall be borne by the Contractor.

45.1 CEMENT AND CEMENT GODOWN

Cement shall be procured by Contractor of 43 Grade conforming to BIS : 8112 Specification latest edition or higher Grade as directed by the Engineer-In-Charge. The cement shall be procured directly from the reputed manufacturers/stockist, which will have to be got approved from EPI in advance. Relevant vouchers and test certificates will be produced as and when required. The cement shall be stored by the Contractor in such suitable covered and lockable stores, well protected from climate and atmospheric effect. The cement godown shall be constructed by the Contractor as per CPWD specifications at his own cost. The cement will remain under double lock, one from EPI and other from Contractor. The cement in bags shall be stored in godowns in easy countable position. Cement bags shall be used on first in first out basis. Cement stored for beyond 90 days will be required to be tested at Contractors cost, before use in works.

45.2 STEEL & STEEL STOCKYARD

Steel conforming to BIS specifications (latest edition) shall be procured by the Contractor directly from reputed manufacturers/producers as approved by EPI. The manufacturer has to give a certificate that the material supplied is not a re-rolled product. Relevant vouchers & test certificates will be produced by the Contractor. Re-rolled sections will not be allowed.

Reinforcement steel, structural steel shall be stored and stacked in such manner so as to facilitate easy identification, removal etc. The Contractor shall take proper care to prevent direct contact between the steel and the ground/water for which he shall provide necessary arrangement at his own cost including ensuring proper drainage of area to prevent water logging as per directions of the Engineer-In-Charge. If required, the reinforcement steel shall also be protected, by applying a coat of neat cement slurry over the bars for which no extra payment shall be made.

Test certificates for each consignment of steel shall be furnished and tests to be got carried out by the Contractor at his own cost from the authorized laboratory as per the directions of Engineer-In-Charge, before incorporating the materials in the work.

46.0 SCHEDULE OF QUANTITIES / BILL OF QUANTITIES

46.1 The quantities shown against the various items of work are only approximate quantities, which may vary as per the actual requirement at Site.

46.2 All items of work in the Bill of Quantities/schedule of quantities shall be carried out as per the CPWD/ MORTH (as the case may be) specifications, drawings and instructions of the ENGINEER-IN-CHARGE of EPI and the rates shall include for supply of required materials including proper storage, consumables, skilled & unskilled labour, supervision, tools, tackles, plant & machinery complete
as called for in the detailed specifications and conditions of the contract. No item, which is not covered in the Bill of Quantities, shall be executed by the Contractor without the approval of EPI. In case any Extra/Substituted item is carried out without specific-approval, the same will not be paid.

47.0 ANTI-TERMITE TREATMENT & WATER PROOF TREATMENT

47.1 Pre-construction treatment shall be carried out in co-ordination with the building work and shall be executed in such a manner that the civil works are not hampered or delayed by the anti-termite treatment. The treatment shall be carried out as detailed in BIS: 6313 (Part-II) latest revision. The waterproof treatment shall be of type and specifications as given in the schedule of quantities.

47.2 The treatment against water-proofing of basement, roofs, water retaining areas and termite infestation shall be and remain fully effective for a period of not less than 10(Ten) years to be reckoned from the date of expiry of the Defect Liability period, prescribed in the contract. At any time during the said guarantee period if EPI finds any defects in the said treatment or any evidence of re-infestation, dampness, leakage in any part of buildings or structure and notifies the Contractor of the same, the Contractor shall be liable to rectify the defect or give re-treatment at his own cost and shall commence the work or such rectification or re-treatment within seven days from the date of issue of such letter to him. If the Contractor fails to commence such work within the stipulated period, EPI may get the same done by another agency at the Contractor’s cost and risk and the decision of the Engineer-In-Charge of EPI for the cost payable by the Contractor shall be final and binding upon him.

47.3 Re-treatment if required shall be attended to and carried out by the Contractor within seven days of the notice from Engineer-In-Charge of EPI.

47.4 EPI reserves the right to get the quality of treatment checked in accordance with recognized test methods and in case it is found that the chemicals with the required concentration and rate of application have not been applied, or the water proof treatment is not done as per specifications, the Contractor will be required to do the re-treatment in accordance with the required concentration & specifications at no extra cost failing which no payment for such work will be made. The extent of work thus rejected shall be determined by EPI.

47.5 Water proofing and anti-termite treatment shall be got done through approved / specialized agencies only with prior approval of Engineer-In-Charge.

47.6 The Contractor shall make such arrangement as may be necessary to safeguard the workers and residents of the building against any poisonous effect of the chemicals used during the execution of the work.

47.7 During the execution of work, if any damage shall occur to the treatment already done, either due to rain or any other circumstances, the same shall be rectified and made good to the entire satisfaction of Engineer-In-Charge by the Contractor at his cost.
47.8 The Contractor shall make his own arrangement for all equipments required for the execution of the job.

47.9 The Contractor shall execute Guarantee Bond in the prescribed form as appended for guaranteeing the anti-termite treatment and waterproof treatment.

48.0 INDIAN STANDARDS

Wherever any reference is made to any IS in any particular specifications, Drawings or Bill of Quantities, it means the Indian Standards editions with the amendments current at the last date of receipt of Tender Documents.

49.0 CENTERING & SHUTTERING

Marine plywood only or steel plates of minimum thickness as approved by Engineer-In-Charge shall be used for formwork. The shuttering plates shall be cleaned and oiled after every repetition and shall be used only after obtaining approval of EPI’s Engineers at Site. The number of repetitions allowed for plywood and steel shuttering shall be at the discretion of Engineer-In-Charge of EPI depending upon the condition of shuttering surface after each use and the decision of ENGINEER-IN-CHARGE in this regard shall be final and binding on the Contractor. No claim whatsoever on this account shall be admissible.

50.0 CONTROLLED MATERIALS

50.1 The following Controlled materials shall be brought to Site after the approval of EPI.
   a) Water proofing compound.
   b) Cement
   c) Steel
   d) Primer/ Paints/ Varnish etc.
   e) Bitumen
   f) Chemical for anti termite treatment
   g) Any other materials as per discretion of EPI.

50.2 The quantity of Controlled materials shall be measured and recorded in the Measurement books and signed by the Contractor and the Engineer-In-Charge as a check to ensure that the required quantities as required for execution of works as per specifications have been brought to Site for incorporation in the work.

50.3 Controlled materials brought at Site shall be stored as directed by EPI and those already recorded in Measurement book, shall be suitably marked for identification.

50.4 The Contractor shall ensure that the Controlled materials are brought to Site in original sealed containers or packing bearing manufacturer’s markings and
brands (except where the quantity required is a fraction of the smallest packing). Materials not complying with this requirement shall be rejected. The empty containers of such Controlled materials shall not be destroyed/ disposed-off without the written permission of EPI.

50.5 The Contractor shall produce receipted vouchers showing quantities of the materials to satisfy Engineer-In-Charge that the materials comply with the specifications. These vouchers shall be endorsed, dated and initialed by Engineer-In-Charge giving the contract number and name of work and a certified copy of each such voucher signed both by EPI and the Contractor shall be kept on record.

50.6 When the cost of each category of materials is less than Rs.5000/- production of vouchers may not be insisted upon if EPI is otherwise satisfied with the quality and quantity of materials.

51.0 RECORDS OF CONSUMPTION OF CEMENT & STEEL

51.1 For the purpose of keeping a record of cement and steel received at Site and consumption in works, the Contractor shall maintain a properly bound register in the form approved by EPI, showing columns like quantity received and used in work and balance in hand etc. This register shall be signed daily by the Contractor’s representative and EPI’s representative.

51.2 The register of cement & steel shall be kept at Site in the safe custody of EPI’s Engineer during progress of the work. This provision will not, however, absolve the Contractor from the quality of the final product.

51.3 In case cement or steel quantity consumed is lesser as compared to the theoretical requirement of the same as per CPWD/MORTH (as the case may be) specifications/ norms, the work will be devalued and/ or a penal rate (i.e. double the rate at which cement/ steel purchased last) recovery for lesser consumption of cement/ steel shall be made in the item rates of the work done subject to the condition that the tests results fall within the acceptable criteria as per CPWD/MORTH (as the case may be) specifications otherwise the work shall have to be dismantled and redone by the Contractor at no extra cost. In case of cement, if actual consumption is less than 98% of the theoretical consumption, a recovery shall be effected from the Contractor’s dues at the penal rate for the actual quantity that is lower than 98% of theoretical consumption.

52.0 MATERIALS AND SAMPLES

52.1 The materials/ products used on the works shall be one of the approved make/ brands out of list of manufacturers/ brands/ makes given in the Tender Documents. The Contractor shall submit samples/ specimens out of approved makes of materials/ products to the Engineer-In-Charge for prior approval. In
exceptional circumstances Engineer-In-Charge may allow alternate equivalent makes/brands of products/materials at his sole discretion. The final choice of brand/make shall remain with the Engineer-In-Charge, whose decision in this matter shall be final and binding and nothing extra on this account shall be payable to the Contractor.

In case single brand/make is mentioned, other equivalent makes/brands may be considered by the Engineer-In-Charge with prior approval. In case of variance in CPWD/IS/BIS Specifications from approved products/makes specification, the specification of approved product/make shall prevail for which nothing shall be paid extra to the Contractor.

In case no make or brand of any materials, articles, fittings and accessories etc. is specified, the same shall comply with the relevant Indian Standard Specifications and shall bear the ISI/BIS mark. The Engineer of EPI and the Owner shall have the discretion to check quality of materials and equipments to be incorporated in the work, at source of supply or site of work and even after incorporation in the work. They shall also have the discretion to check the workmanship of various items of work to be executed in this work. The Contractor shall provide the necessary facilities and assistance for this purpose.

52.2 The above provisions shall not absolve the Contractor from the quality of final product and in getting the material and workmanship quality checked and approved from the Engineer-In-Charge of EPI.

52.3 The Contractor shall well in advance, produce samples of all materials, articles, fittings, accessories etc. that he proposes to use and get them approved in writing by EPI. The materials articles etc. as approved shall be labelled as such and shall be signed by EPI and the Contractor's representative.

52.4 The approved samples shall be kept in the custody of the Engineer-in-Charge of EPI till completion of the work. Thereafter the samples except those destroyed during testing shall be returned to the Contractor. No payment will be made to the Contractor for the samples or samples destroyed in testing.

52.5 The brands of all materials, articles fittings etc. approved together with the names of the manufacturers and firms from which supplies have been arranged shall be recorded in the Site Order Book.

52.6 The Contractor shall set up and maintain at his cost, a field testing laboratory for all day-to-day tests at his own cost to the satisfaction of the Engineer-In-Charge. This field testing laboratory shall be provided with equipment and facilities to carry out all mandatory field tests as per CPWD/MORTH (as the case may be) specifications. The laboratory building shall be constructed and installed with the appropriate facilities; Temperature and humidity controls shall be available wherever necessary during testing of samples.

All equipments shall be provided by the Contractor so as to be compatible with the testing requirements specified. The Contractor shall maintain all the equipments in good working condition for the duration of the contract.
The Contractor shall provide approved qualified personnel to run the laboratory for the duration of the Contract. The number of staff and equipment available must at all times be sufficient to keep pace with the sampling and testing programme as required by the Engineer-In-Charge.

The Contractor shall fully service the site laboratory and shall supply everything necessary for its proper functioning, including all transport needed to move equipment and samples to and from sampling points on the Site, etc.

The Contractor shall re-calibrate all measuring devices whenever so required by the Engineer-In-Charge and shall submit the results of such measurements without delay.

All field tests shall be carried out in the presence of EPI’s representative. All costs towards samples, materials, collection, transport, manpower, testing, including concrete mix-design etc. shall be borne by the Contractor and are deemed to be included in the rates quoted by him in the Bill of Quantities.

53.0 TESTS AND INSPECTION

53.1 The Contractor shall carry out the various mandatory tests as per specifications and the technical documents that will be furnished to him during the performance of the work. All the tests on materials, as recommended by CPWD, MORTH (as the case may be) and relevant Indian Standard Codes or other standard specifications (including all amendments current at the last date of submission of Tender Documents) shall be got carried out by the Contractor at the field testing laboratory or any other recognized institution/laboratory, at the direction of EPI. All testing charges, expenses etc. shall be borne by the Contractor. All the tests, either on the field or outside laboratories concerning the execution of the work and supply of materials shall be got carried out by the Contractor or EPI at the cost of the Contractor.

53.2 WORKS TO BE OPEN TO INSPECTION

All works executed or under the course of execution in pursuance of this contract shall at all times be open to inspection and supervision of EPI. The work during its progress or after its completion may also be inspected, by Chief Technical Examiner of Government of India (CTE) and/or an inspecting authority of State Government of State in which work is executed and/or by third party checks by Owner/ Clients. The compliance of observations/improvements as suggested by the inspecting officers of EPI/CTE/ State authorities/ Owners shall be obligatory on the part of the Contractor at the cost of Contractor.

54.0 BORROW AREAS

The Contractor shall make his own arrangements for borrow pits and borrow disposal areas including their approaches and space for movement of men, machinery, other equipments as required for carrying out the works. The Contractor shall be responsible for taking all safety measures, getting approval,
making payment of royalties, charges etc. and nothing extra shall be paid to the Contractor on this account and unit rates quoted by the Contractor for various items of Bill of Quantities shall be deemed to include the same.

55.0 BITUMEN WORK

The Contractor shall be responsible for arranging Bitumen/Tar of required grade from source to be approved by the Engineer-In-Charge. No Bitumen work shall be carried out on wet surface or in rainy conditions.

56.0 CARE OF WORKS

From the commencement to the completion of works and handing over, the Contractor shall take full responsibility for care of all the works and in case of any damage/loss to the works or to any part thereof or to any temporary works due to lack of precautions or due to negligence on part of Contractor, the same shall be made good by the Contractor at his own cost.

57.0 WORK IN MONSOON AND DEWATERING

The execution of the work may entail working in the monsoon also. The Contractor must maintain labour force as may be required for the job and plan and execute the construction and erection according to the prescribed schedule. No special/extra rate will be considered for such work in monsoon. The Contractor’s rate shall be considered inclusive of cost of dewatering required, if any and no extra rate shall be payable on this account.

58.0 NO COMPENSATION FOR FORECLOSURE/CANCELLATION/REDUCTION OF WORKS

If at any time after the commencement of the work EPI shall for any reason whatsoever is required to abandon the work or does not require the whole work thereof as specified in the Tender to be carried out, the Engineer-In-Charge shall give notice in writing of the fact to the Contractor, who shall have no claim to any payment of compensation whatsoever on account of any profit or advantage which he might have derived from the execution of the work in full, but which he did not derive in consequence of the full amount of the work not having been carried out or on foreclosure, neither shall he have any claim for compensation by reason of any alterations having been made in the original Specifications, Drawings, Designs and Instructions which shall involve any curtailment of the work as originally contemplated.

Provided that the Contractor shall be paid the charges on the cartage only of materials actually and bonafide brought to the Site of the work by the Contractor and rendered surplus as a result of the abandonment or curtailment of the work or any portion thereof and then taken back by the Contractor, provided however, that the Engineer-In-Charge shall have in all such cases the option of taking over all or any such materials at their purchase price or at local current rates whichever may be less. In the case of such stores having been issued by EPI
and returned by the Contractor to EPI, credit will be given to him by the Engineer-In-Charge at rates not exceeding those at which they were originally issued to him after taking into consideration any deduction for claims on account of any deterioration or damage while in the custody of the Contractor and in this respect the decision of the Engineer-In-Charge shall be final.

59.0  RESTRICTION ON SUBLETTING

59.1  The Contractor shall not sublet or assign the whole or part of the works except where otherwise provided, by the contract and even then only with the prior written consent of EPI and 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 or neglects of any sub-Contractor, his agents, servants or workmen as full as if they were the acts, defaults or neglects of the Contractor, his agent, servants or workmen provided always that the provision of labour on piece work basis shall not be deemed to be a subletting under this clause.

59.2  The Contractor may entrust specialist items of works to the agencies specialized in the specific trade. The Contractor shall give the names and details of such firm whom he is going to employ for approval of EPI. These details shall include the expertise, financial status, technical manpower, equipment, resources and list of works executed and on hand of the specialist agency. Specialist agency shall be engaged only after obtaining written approval of the Engineer-In-Charge.

60.0  PROHIBITION OF UNAUTHORISED CONSTRUCTION & OCCUPATION

No unauthorized buildings, structures should be put up by the Contractor anywhere on the project Site, neither any building built by him shall be unauthorisedly occupied by him or his staff.

61.0  CO-ORDINATION WITH OTHER AGENCIES

Work shall be carried out in such a manner that the work of other Agencies operating at the Site is not hampered due to any action of the Contractor. Proper Co-ordination with other Agencies will be Contractor’s responsibility. In case of any dispute the decision of EPI shall be final and binding on the Contractor. No claim whatsoever shall be admissible on this account.

62.0  SETTING OUT OF THE WORKS

62.1  The Contractor shall be responsible for the true and proper setting out of the works and for the correctness of the position, levels, dimensions and alignment of all parts of the works. If at any time during the progress of works, shall any error appear or arise in the position, levels, dimensions or alignment of any part of the works, the Contractor shall at his own expenses rectify such error to the satisfaction of Engineer-in-charge. The checking of any setting out or of any line or level by the engineers of EPI shall not in any way relieve the Contractor of his responsibility for the correctness.
62.2 Contractor shall provide permanent bench marks, flag tops and other reference points for the proper execution of work and these shall be preserved till the end of work. All such reference points shall be in relation to the levels and locations, given in the Architectural, Plumbing and other services Drawings.

63.0 NOTICE BEFORE COVERING UP THE WORK

The Contractor shall give not less than seven days notice before covering up or otherwise placing beyond the reach of measurement any work, to the Engineer-In-Charge in order that the same may be inspected and measured. If any work is covered up or placed beyond the reach of Inspection/ measurement without such notice to the Engineer-In-Charge or his consent being obtained, the same shall be uncovered at the Contractors expenses and he shall have to make it good at his own expenses.

64.0 SITE CLEARANCE

64.1 The Contractor shall ensure that the working Site is kept clean and free of obstructions for easy access to job Site and also from safety point of view. Before handing over the work to EPI the Contractor shall remove all temporary structures like the site offices, cement godown, stores, labour hutments etc., scaffolding rubbish, left over materials tools and plants, equipments etc., clean and grade the Site to the entire satisfaction of the Engineer-In-Charge. If this is not done the same will be got done by EPI at his risk and cost.

64.2 The Contractor shall clean all floors, remove cement/ lime/ paint drops and deposits, clean joinery, glass panes etc., touching all painter’s works and carry out all other necessary items of works to make the premises clean and tidy before handing over the building, and the rates quoted by the Contractor shall be deemed to have included the same.

65.0 VALUABLE ARTICLES FOUND AT SITE

All gold, silver and other minerals of any description and all precious stones, coins, treasure, relics, antiques and all other similar things which shall be found in, under or upon the Site, shall be the property of the Owner/ Government and the Contractor shall duly preserve the same to the satisfaction of Engineer-In-Charge and shall from time to time deliver the same to such person or persons indicated by EPI.

66.0 MATERIALS OBTAINED FROM DISMANTLEMENT TO BE OWNER’S PROPERTY

All materials like stone, boulders and other materials obtained in the work of dismantling, excavation etc. will be considered Owner/ government property and may be issued to the Contractor by the Owner/ EPI, if required for use in this work at rates approved by EPI or the Contractor may be asked to dispose off these items at his cost.

67.0 SET-OFF OF CONTRACTOR’S LIABILITIES

EPI shall have the right to deduct or set off the expenses incurred or likely to be incurred by it in rectifying the defects and/or any claim under this agreement
against the Contractor from any or against any amount payable to the Contractor under this agreement including Retention Money and proceeds of Security Deposit cum Performance Guarantee and from any other contract being executed by the Contractor for EPI.

68.0 MATERIALS PROCURED WITH THE ASSISTANCE OF EPI

If any material for the execution of this contract is procured with the assistance of EPI either by issue from its stores or purchase made under orders or permits or licences obtained by EPI, the Contractor shall hold and use the said materials economically and solely for the purpose of this contract and shall not dispose them without the written permission of Engineer-In-Charge. The Contractor, if required by EPI, shall return all such surplus or unserviceable materials that may be left with him after the completion of the contract or at its termination on whatsoever reason, on being paid or credited such price as EPI shall determine having due regard to the conditions of materials.

69.0 ALTERATION IN SPECIFICATION, DESIGN & DRAWING

69.1 The Engineer-In-Charge shall have power to make any alterations in, omissions from, additions to or substitutions for, the original Specifications, Drawings, Designs and Instructions that may appear to him to be necessary during the progress of the work, and the Contractor shall carry out the work in accordance with any instructions which may be given to him in writing signed by the Engineer-In-Charge and such alterations, omissions, additions, or substitutions shall not invalidate the contract and any altered, additional or substituted work which the Contractor may be directed to do in the manner above specified as part of the work shall be carried out by the Contractor on the same conditions in all respects on which he agreed to do the main work.

The time for the completion of the work shall be extended in the proportion that the altered, additional or substituted work price bears to the original contract work price, and the certificate of the Engineer-In-Charge shall be conclusive as to such proportion. Over and above this, a further period to the extent of 25 percent of such extension shall be allowed to the Contractor.

The rates for such additional, altered or substituted work under this clause shall be worked out in accordance with the following provisions in their respective order:

i) If the rates for the additional, altered or substituted work are specified in the contract for the work, the Contractor is bound to carry out the additional, altered or substituted work at the same rates as are specified in the contract for the work.

ii) If the rates for the additional, altered or substituted work are not specifically provided in the contract for the work, the rates will be derived from the rates for a nearest similar item of work as are specified in the contract for the work. In case of composite tenders where two or more
schedule of quantities/ Bill of Quantities form part of the contract, the rates shall be derived from the nearest similar item in the schedule of quantities/Bill of Quantities of the particular part of work in which the deviation is involved failing that from the lowest of the nearest similar item in other schedule of quantity. The opinion of the Engineer-In-Charge as to whether or not the rate can be reasonably so derived from the item in this contract will be final and binding on the Contractor.

iii) If the altered, additional or substituted work includes any work for which no rate is specified in the contract for the work and which cannot be derived in the manner specified in sub para (i) and (ii) above from the similar class of work in the contract then such work shall be carried out at the rates entered in the Schedule of Rates (as mentioned in “Memorandum” to the “Form of Tender” for Civil/ Sanitary Works) minus/plus the percentage which the tendered amount of scheduled items bears with the estimated amount of schedule items based on the Schedule of Rates ( as mentioned in “Memorandum” to the “Form of Tender” for Civil/ Sanitary Works ). The scheduled items mean the items appearing in the Schedule of Rates (as mentioned in “Memorandum” to the “Form of Tender” for Civil/ Sanitary Works), which shall be applicable in this clause. This clause will apply mutatis mutandis to electrical work except that Electrical Schedule of Rates as mentioned in “Memorandum” to the “Form of Tender” will be considered in place of Civil/ Sanitary works Schedule of rates as mentioned in “Memorandum” to the “Form of Tender”.

iv) If the rates for the altered, additional or substituted work cannot be determined in the manner specified in sub-clauses (i) to (iii) above, then the Contractor shall, within 7 days of the date of receipt of order to carry out the work, inform the Engineer-In-Charge the rates which he intends to charge for such class of work, supported by analysis of the rate or rates claimed, and the Engineer-In-Charge shall determine the rate or rates on the basis of prevailing market rates of the material, Labour, T&P etc. plus 10% (Ten percent) to cover the Contractors supervision, overheads and profit and pay the Contractor accordingly. The opinion of the Engineer-In-Charge as to the current market rates of materials and quantum of labour involved per unit of measurements will be final and binding on the Contractor.

However, the Engineer-In-Charge, by notice in writing, will be at liberty to cancel his order to carry out such class of work and arrange to carry it out in such manner, as he may consider advisable. But under no circumstances, the Contractor shall suspend the work on the plea of non-settlement of rates of items falling under the clause.

v) Except in case of items relating to foundations, provisions contained in sub clauses (i) to (iv) above shall not apply to contract, altered or substituted items as individually exceed the ‘deviation limit’ of plus/minus 25% (Twenty Five Percent) subject to the following:-

(a) Deviation limit shall apply to individual items.
(b) The value of additions of items, of any individual trade not already included in the contract, shall not exceed 20% of the Tendered value of work, subject to overall deviation limit as given above.

Provided further that in case where the original item is substituted, the Substituted Item shall be deemed to have replaced the original item in the contract itself to that extent and above provisions pertaining to the deviations shall apply with respect to such Substituted Item and not the original item.

NOTE: Individual trade means the trade section to which Bill of Quantities annexed to the agreement has been divided or in the absence of any such division the individual section of the MORTH/C.P.W.D. (as the case may be) Scheduled of rates specified above, such as excavation and earthwork, Concrete, wood work and joinery, etc.

The rate of any such work except the items relating to foundations which is in excess of the deviation limit and deviation in quantities of AHR items on plus side as contained in Clause 9.2(i) shall be determined in accordance with the provisions contained in Clause 69.2.

69.2 In the case of contract items, substituted items, Contract cum substituted items or additional items which exceed the limits laid down in sub para (v) of condition 69.1 above (except the items relating to foundation work, which the Contractor is required to do under Clause 69.1 above and deviation in quantities of AHR items on plus side as contained in clause 9.2 (i) ), the Contractor may within fifteen days of receipt of order or occurrence of the excess, claim revision of the rates, supported by proper analysis, for the work in excess of the above mentioned limits, provided that if the rates so claimed are in excess of the rates specified in the schedule of quantities or those derived in accordance with the provisions of sub para (i) to (iii) of conditions 69.1 by more than five percent, the Engineer-In-Charge shall within three months of receipt of the claims supported by analysis, after giving consideration to the analysis of the rates submitted by the Contractor, determine the rates on the basis of the market rates and if the rates so determined exceed the rates specified in the schedule of quantities or those derived in accordance with the provisions of sub paras (i) to (iii) of condition 69.1 by more than five percent, the contract shall be paid in accordance with the rates determined. In the event of the Contractor failing to claim revision of rates within the stipulated period, or if the rates determined by the Engineer-In-Charge within the period of three months of receipt of the claims supported by analysis are within five percent of the rates specified in the schedule of quantities or of those determined in accordance with the provisions of sub-para (i) to (iii) of condition 69.1, the Engineer-In-Charge shall make payment at the rates as specified in the schedule of quantities or those already determined under sub para (i) to (iii) of condition 69.1 for the quantities in excess of the limits laid down in sub para (v) of condition 69.1.

69.3 The provisions of the proceeding paragraph shall apply to the decrease in the rates of items for the work in excess of the limits laid down in sub para (v) of
condition 69.1 provided that such decrease is more than five percent of rates specified in the schedule of quantities or those derived in accordance with the provisions of sub para (i) to (iii) of condition 69.1 and the Engineer-In-Charge may after giving notice to the Contractor within two months of receipt of order by the Contractor or occurrence of the excess and after taking into consideration any reply received from him within fifteen days of receipt of the notice revise the rates for the work in question within two months of expiry of the said period of fifteen days having regard to the market rates.

69.4 The Contractor shall send to the Engineer-In-Charge once every three months an up to date account giving complete details of all claims for additional payments to which the Contractor may consider himself entitled and of all additional work ordered by the Engineer-In-Charge which he has executed during the preceding quarter failing which the Contractor shall be deemed to have waived his right.

69.5 For the purpose of operation of clause 69.1 (v) the following works shall be treated as works relating to foundation:-

i) For buildings, compound walls plinth level or 1.2 meters (4 feet) above ground level whichever is lower excluding items of flooring and D.P.C. but including base concrete below the floors.

ii) For abutments, piers, retaining walls of culverts and bridges, walls of water reservoirs the bed of floor level.

iii) For retaining walls where floor level is not determinate 1.2 meters above the average ground level or bed level.

iv) For Roads all items of excavation and filling including treatment of sub base and soiling work.

v) For water supply lines, sewer lines, under-ground storm water drains and similar works. All items of work below ground level except items of pipe work, masonry work.

vi) For open storm water drains, all items of work except lining of drains.

70.0 ACTION AND COMPENSATION PAYABLE IN CASE OF BAD WORK

If it shall appear to the Engineer-In-Charge or his authorized subordinate in charge of the work or to the Chief Technical Examiner or to any other inspecting agency of Government/ State Government/ Owner where the work is being executed, that any work has been executed with unsound, imperfect, or unskillful workmanship or with materials of any inferior description, or that any materials or articles provided by him for the execution of the work are unsound or of a quality inferior to that contracted for or otherwise not in accordance with the contract, the Contractor shall on demand in writing which shall be made within six months of the completion of the work from the ENGINEER-IN-CHARGE specifying the work, materials or articles complained of notwithstanding that the same may have been passed, Certified and paid for forthwith rectify, or remove and
reconstruct the work so specified in whole or in part as the case may require or as the case may be, remove the materials or articles so specified and provide other proper and suitable materials or articles at his own proper charge and cost, and in the event of his failing to do so within a period to be specified by the Engineer-In-Charge in his demand aforesaid, then the Contractor shall be liable to pay compensation at the rate of one percent of the estimated amount put to tender for every day not exceeding ten days, while his failure to do so shall continue and in the case of any such failure, the Engineer-In-Charge may rectify or remove and re-execute the work or remove and replace with others, the material or articles complained of as the case may be at the risk and expense in all respects of the Contractor.

71.0 POSSESSION PRIOR TO COMPLETION

71.1 EPI shall have the right to take possession of or use any completed or partially completed work or part of the work. Such possession or use shall not be deemed to be any acceptance of any work not completed in accordance with the contract agreement. If such prior possession or use by EPI delays the progress of work an equitable adjustment in the time of completion will be made and the contract agreement shall be deemed to be modified accordingly. The decision of EPI in this case shall be final binding and conclusive.

71.2 When the whole of the works or the items or the groups of items of work for which separate periods of completion have been specified have been completed the Contractor will give a notice to that effect to the Engineer in writing. The Engineer shall within 15 days of the date of receipt of such notice inspect the works and either the Engineer-In-Charge issues to the Contractor a completion certificate stating the date on which in his opinion the works were completed in accordance with the contract or gives instructions in writing to the Contractor specifying the balance items of work which are required to be done by the Contractor before completion certificate could be issued. The Engineer-In-Charge shall also notify the Contractor of any defect in the works affecting completion.

71.3 The Contractor shall during the course of execution prepare and keep updated a complete set of ‘as built’ drawings to show each and every change from the Contract Drawings, changes recorded shall be countersigned by the Engineer-In-Charge and the Contractor. Four copies of ‘as built’ drawings shall be supplied to EPI by the Contractor within 30 days of the completion. All costs incurred in this respect shall be borne by the Contractor only.

72.0 COMPENSATION FOR DELAY AND REMEDIES

72.1 If the Contractor fails to maintain the required progress in terms of clause 72.4 or relevant clause of Additional Conditions of Contract, to complete the work and clear the Site on or before the completion date or extended date of completion, he shall, without prejudice to any other right or remedy available under the law to EPI on account of such breach, pay as agreed compensation the amount calculated at the rates stipulated below or such smaller amount as the Engineer in charge (whose decision in writing shall be final and binding) may decide on the amount of tendered value of the work for every completed day / week (as
applicable) that the progress remains below that specified in Clause 72.4.1 or the relevant clause in Additional Conditions of Contract or that the work remains incomplete. This will also apply to items or group of items for which a separate period of completion has been specified.

i) For works with completion period not exceeding 3 month (as originally stipulated) @ 1% per day

ii) For works with completion period exceeding 3 months (as originally stipulated) @ 1% per week or part thereof

Provided always that the total amount of compensation for delay to be paid under this Condition shall not exceed 10% of the Tendered Value of work or of the Tendered Value of the item or group of items of work for which a separate period of completion is originally given.

The amount of compensation may be adjusted or set-off against any sum payable to the Contractor under this or any other contract with EPI even after completion of the work.

72.2 CANCELLATION / DETERMINATION OF CONTRACT IN FULL OR PART

Subject to other provisions contained in this clause, the Engineer-In-Charge may, without prejudice to his any other rights or remedy against the Contract in respect of any delay, inferior workmanship, any claims for damages and / or any other provisions of this contract or otherwise, and whether the date of completion has or has not elapsed, by notice in writing absolutely determine the contract in full or in part in any of the following cases:

i) If the Contractor having been given by the Engineer-In-Charge a notice in writing to rectify, reconstruct or replace any defective work or that the work is being performed in an inefficient or otherwise improper or un-workmanlike manner shall omit to comply with the requirement of such notice for a period of seven days thereafter; or

ii) If the Contractor has, without reasonable cause, suspended the progress of the work or has failed to proceed with the work with due diligence so that in the opinion of the ENGINEER-IN-CHARGE (which shall be final and binding) he will be unable to secure completion of the work by the date for completion and continues to do so after a notice in writing of seven days from the Engineer-In-Charge; or

iii) If the Contractor fails to complete the work within the stipulated date or items of work with individual date of completion, if any stipulated, on or before such date(s) of completion and does not complete them within the period specified in a notice given in writing in that respect by the Engineer-In-Charge; or

iv) If the Contractor persistently neglects to carry out his obligations under the contract and / or commits default in complying with any of the terms
and conditions of the contract and does not remedy it or take effective steps to remedy it within 7 days after a notice in writing is given to him in that respect by the Engineer-In-Charge; or

v) If the Contractor shall offer or give or agree to give to any person in EPI service or to any other person on his behalf any gift or consideration of any kind as an inducement or reward for doing or forbearing to do or for having done or forborne to do any action in relation to the obtaining or execution of this or any other contract for EPI; or

vi) If the Contractor shall enter into a contract with EPI in connection with which commission has been paid or agreed to be paid by him or to his knowledge, unless the particulars of any such commission and the terms of payment thereof have been previously disclosed in writing to the Engineer-In-Charge; or

vii) If the Contractor shall obtain a contract with EPI as a result of wrong tendering or other non-bona-fide methods of competitive tendering; or

viii) If the Contractor being an individual, or if a firm, any partner thereof shall at any time be adjudged insolvent or have a receiving order or order for administration of his estate made against him or shall take any proceedings for liquidation or composition (other than a voluntary liquidation for the purpose of amalgamation or reconstruction) under any Insolvency Act for the time being in force or make any conveyance or assignment of his effects or composition or arrangement for the benefit of his creditors or purport so to do, or if any application be made under any Insolvency Act for the time being in force for the sequestration of his estate or if a trust deed be executed by him for benefit of his creditors; or

ix) If the Contractor being a company, shall pass a resolution or the Court shall make an order for the winding up of the company, or a receiver or manager on behalf of the debenture holders or otherwise shall be appointed or circumstances shall arise which entitle the Court or debenture holders to appoint a receiver or manager; or

x) If the Contractor shall suffer an execution being levied on his goods and allow it to be continued for a period of 21 days; or

xi) If the Contractor assigns, transfers, sublets (engagement of labour on a piece-work basis or of the labour with materials not to be incorporated in the work, shall not be deemed to be subletting) or otherwise parts with or attempts to assign, transfer sublet or otherwise parts with the entire works or any portion thereof without and prior written approval of the Engineer-In-Charge.

When the Contractor has made himself liable for action under any of the clauses aforesaid, the Engineer-In-Charge may without prejudice to any other right or remedy which shall have accrued or shall accrue hereafter to EPI, by a notice in
writing to cancel the contract as a whole or only such items of work in default from the Contract.

The Engineer-In-Charge shall on such cancellation by EPI have powers to:

a) Take possession of Site and any materials, Construction Plant & machinery, implements, stores, etc. thereon; and/or

b) Carry out the incomplete work by any means at the risk and cost of the Contractor; and/or

c) To determine or rescind the contract as aforesaid (of which termination or rescission notice in writing to the Contractor under the hand of the Engineer-In-Charge shall be conclusive evidence). Upon such determination or rescission the full Retention Money recovered by EPI under the contract and Security Deposit cum Performance Guarantee shall be liable to be forfeited and un-used materials, construction plant & machinery, implements, temporary buildings, etc. shall be taken over and shall be absolutely at the disposal of EPI. If any portion of the Retention Money has not been received or recovered by EPI from RA Bills, it would be called for and forfeited; and/or

d) To employ labour and to supply materials, equipment to carry out the work or any part of the work debiting the Contractor with the cost of the labour and the price of the materials, equipment rentals (of the amount of which cost and price certified by the Engineer-In-Charge shall be final and conclusive) against the Contractor and crediting him with the value of the work done in all respects in the same manner and at the same rates as if it had been carried out by the Contractor under the terms of his contract. The certificate of the Engineer-In-Charge as to the value of the work done shall be final and conclusive against the Contractor provided always that action under the sub-clause shall only be taken after giving notice in writing to the Contractor. Provided also that if the expenses incurred by the EPI are less than the amount payable to the Contractor at his agreement rates, the difference shall not be paid to the Contractor; and/or

e) After giving notice to the Contractor to measure up the work of the Contractor and to take such whole, or the balance or part thereof as shall be un-executed or delayed with reference to the General Conditions of Contract clause no. 72.4.1 and/or relevant clause of Additional Conditions of Contract, out of his hands and to give it to another Contractor to complete in which case any expenses which may be incurred in excess of the sum which would have been paid to the original Contractor if the whole work had been executed by him (of the amount of which excess the certificate in writing of the Engineer-In-Charge shall be final and conclusive) shall be borne and paid by the original Contractor and may be deducted from any money due to him by EPI under his contract or on any other account whatsoever or from his Retention Money, Security Deposit cum Performance Guarantee or the proceeds of sales of unused materials, construction plants & machinery, implements temporary buildings etc. thereof or a sufficient part thereof as
the case may be. If the expenses incurred by EPI are less than the amount payable to the Contractor at his agreement rates, the difference shall not be paid to the Contractor; and/or

f) By a notice in writing to withdraw from the Contractor any items or items of work as the Engineer-In-Charge may determine in his absolute discretion and get the same executed at the risk and cost of the Contractor.

Any excess expenditure incurred or to be incurred by EPI in completing the works or part of the works or the excess loss or damages suffered or may be suffered by EPI as aforesaid after allowing such credit shall without prejudice to any other right or remedy available to EPI in law be recovered from any moneys due to the Contractor on any account, and if such moneys are not sufficient the Contractor shall be called upon in writing and shall be liable to pay the same within 30 days.

If the Contractor shall fail to pay the required sum within the aforesaid period of 30 days, the Engineer-In-Charge shall have the right to sell any or all of the Contractors unused materials, Construction Plant, machinery, implements, temporary buildings, etc. and apply the proceeds of sale thereof towards the satisfaction of any sums due from the Contractor under the contract and if thereafter there be any balance outstanding from the Contractor, it shall be recovered in accordance with the provisions of the contract and law.

Any sums in excess of the amounts due to EPI and unsold materials, Construction Plant etc. shall be returned to the Contractor, provided always that if cost or anticipated cost of completion by EPI of the works or part of the works is less than the amount which the Contractor would have been paid had he completed the works or part of the works, such benefit shall not accrue to the Contractor.

In the event of anyone or more of the above courses being adopted by the Engineer-In-Charge the Contractor shall have no claim to compensation whatsoever for any loss sustained by him by reasons of his having purchased or procured any materials or entered into any engagements or made any advances on account or with a view to the execution of the work or the performance of the contract. And in case action is taken under any of the provision aforesaid the Contractor shall not be entitled to recover or be paid any sum for any work thereof or actually performed under this contract unless and until the Engineer-In-Charge has certified in writing the performance of such work and the value payable in respect thereof and he shall only be entitled to be paid the value so certified. Provided further that if any of the recoveries to be made, while taking action as per (d) and/or (e) above, are in excess of the Retention Money & Security Deposit cum Performance Guarantee forfeited, these shall be limited to the amount by which the excess cost incurred by the EPI exceeds the Retention Money & Security Deposit cum Performance Guarantee so forfeited.
72.3 CONTRACTOR LIABLE TO PAY COMPENSATION EVEN IF ACTION NOT TAKEN

In any case in which any of the powers conferred upon the Engineer-In-Charge by relevant clause thereof, shall have become exercisable and the same are not exercised, the non-exercise thereof shall not constitute a waiver of any of the conditions hereof and such powers shall notwithstanding be exercisable in the event of any future case of default by the Contractor and the liability of the Contractor for compensation shall remain unaffected. In the event of the Engineer-In-Charge putting in force all or any of the powers vested in him under the preceding clause he may, if he so desires after giving a notice in writing to the Contractor, take possession of (or at the sole discretion of the Engineer-In-Charge which shall be final and binding on the Contractor) use as on hire (the amount of the hire money being also in the final determination of the Engineer-In-Charge) all or any tools, plant, machinery, materials and stores, in or upon the works, or the site thereof belonging to the Contractor, or procured by the Contractor and intended to be used for the execution of the work / or any part thereof, paying or allowing for the same in account at the contract rates, or in the case of these not being applicable, at current market rates to be certified by the Engineer-In-Charge, whose certificate thereof shall be final, and binding on the Contractor and/or direct the Contractor, clerk of the works, foreman or other authorized agent to remove such tools, machinery, plant, materials, or stores from the premises (within a time to be specified in such notice) in the event of the Contractor failing to comply with any such requisition, the Engineer-In-Charge may remove them at the Contractor's expense or sell them by auction or private sale on account of the Contractor and his risk in all respects and the certificate of the Engineer-In-Charge as to the expenses of any such removal and the amount of the proceeds and expenses of any such sale shall be final and conclusive against the Contractor.

72.4 TIME ESSENCE OF CONTRACT & EXTENSION FOR DELAY

The time allowed for execution of the Works as specified in the terms of contract or the extended time in accordance with these conditions shall be the essence of the contract. The execution of the works shall commence from the 10th Day or such time period as mentioned in letter of Intent after the date on which the Engineer-In-Charge issues written orders to commence the work. If the Contractor commits default in commencing the execution of the work as aforesaid, the Executing Agency shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the earnest money absolutely.

72.4.1 Within 10 (Ten) days of Letter of Intent, the Contractor shall submit a Time and Progress Chart (CPM/ PERT/ Quantified Bar Chart) and get it approved by the Engineer-In-Charge. The Chart shall be prepared in direct relation to the time stated in the contract documents for completion of items of the works. It shall indicate the forecast (mile-stones) of the dates of commencement and completion of various items, trades, sections of the work and may be amended as necessary by agreement between the Engineer-In-Charge and the Contractor within the limitations of time stipulated in the Contract documents, and further to ensure good progress during the execution of the work, the Contractor shall in all cases in which the time allowed for any work exceeds one month (save for
special jobs for which a separate program has been agreed upon) complete 1/8th of the whole of work before 1/4th of the whole time allowed in the contract has elapsed, 3/8th of the work before one half of such time has elapsed and 3/4th of the work before 3/4th of such time has elapsed. The physical report including photographs shall be submitted by the Contractor on the prescribed format & the intervals (not exceeding a month) as decided by the Engineer in Charge. The compensation for delay as per clause 72.1 shall be leviable at intermediate stages also, in case the required progress is not achieved to meet the above time deadlines of the completion period and/ or milestones of time and progress chart, provided always that the total amount of Compensation for delay to be paid under this condition shall not exceed 10% (Ten Percent) of the tendered value of work”.

72.4.2 If the work(s) be delayed by:

i) force-majeure or
ii) abnormally bad weather, or
iii) serious loss or damage by fire, or
iv) civil commotion of workmen, strike or lockout, affecting any or the trades employed on the work, or
v) delay on the part of other Contractors or tradesmen engaged by Engineer-In-Charge in executing work not forming part of the Contract, or
vi) non-availability of stores, which are responsibility of EPI or,
vii) non-availability or break down of tools and plant to be supplied or supplied by EPI or,
viii) any other cause which, in the absolute discretion of EPI, is beyond the Contractor’s control,
then, upon the happening of any such event causing delay, the Contractor shall immediately give notice thereof in writing to the Engineer-In-Charge but shall nevertheless use constantly his best endeavors to prevent or make good the delay and shall do all that may be reasonably required to the satisfaction of the Engineer-In-Charge to proceed with the works.

72.4.3 Request for extension of time, to be eligible for consideration, shall be made by the Contractor in writing within fourteen days of the happening of the event causing delay on the prescribed form. The Contractor may also, if practicable, indicate in such a request the period for which extension is desired. In any such case EPI may give a fair and reasonable extension of time for completion of work. Such extension shall be communicated to the Contractor by the Engineer-In-Charge in writing, within 3 months of the date of receipt of such request. Non-application by the Contractor for extension of time shall not be a bar for giving a fair and reasonable extension by the Engineer-In-Charge and the extension of time so given by the Engineer-In-Charge shall be binding on the Contractor.

73.0 WITHHOLDING AND LIEN IN RESPECT OF SUMS DUE FROM CONTRACTOR

73.1 Whenever any claim or claims for payment of a sum of money arises out of or under the contract or against the Contractor, EPI shall be entitled to withhold and also have a lien to retain such sum or sums in whole or in part from the security,
if any, deposited by the Contractor and for the purpose aforesaid, EPI shall be entitled to withhold the Retention Money, if any, furnished as the case may be and also have a lien over the same pending finalization or adjudication of any such claim. In the event of the security being insufficient to cover the claimed amount or amounts or if no security has been taken from the Contractor, EPI shall be entitled to withhold and have a lien to retain to the extent of such claimed amount or amounts referred to above, from any sum or sums found payable or which may at any time thereafter become payable to the Contractor under the same contract or any other contracts pending finalization or adjudication of any such claim.

73.2 It is an agreed term of the contract that the sum of money or moneys so withheld or retained under the lien referred to above by the Engineer-In-Charge or EPI will be kept withheld or retained as such by the Engineer-In-Charge or EPI till the claim arising out of or under the contract is determined by the Arbitrator / Competent Court and that the Contractor will have no claim for interest or damages whatsoever on any account in respect of such withholding or retention under the lien referred to above and duly notified as such to the Contractor. For the purpose of this clause, where the Contractor is a sole proprietor or a partnership firm or a limited company, etc. the Engineer-In-Charge or EPI shall be entitled to withhold and also have a lien to retain towards such claimed amount or amounts in whole or in part from any sum found payable to proprietor /partnership firm/limited company, as the case may be whether in his individual capacity or otherwise.

EPI shall have the right to cause an audit and technical examination of the works and the final bills of the Contractor including all supporting vouchers, abstract, etc, to be made after payment of the final bill and if as a result of such audit and technical examination any sum is found to have been overpaid in respect of any work done by the Contractor under the contract or any work claimed to have been done by him under the contract and found not to have been executed, the Contractor shall be liable to refund the amount of over-payment and it shall be lawful for EPI to recover the same from him in the manner prescribed in sub-clause (I) of this clause or in any other manner legally permissible; and if it is found that the Contractor was paid less than what was due to him under the contract in respect of any work executed by him under it, the amount of such under payment shall be duly paid by EPI to the Contractor, without any interest thereon whatsoever.

73.3 LIEN IN RESPECT OF CLAIMS IN OTHER CONTRACTS

Any sum of money due and payable to the Contractor (including the Retention Money & Security deposit returnable to him) under the contract may be withheld or retained by way of lien by the Engineer-In-Charge or by EPI against any claim of the Engineer-In-Charge or EPI in respect of payment of a sum of money arising out of or under any other contract made by the Contractor with the Engineer-In-Charge or EPI.

It is an agreed term of the contract that the sum of money so withheld or retained under this clause by the Engineer-In-Charge or EPI will be kept withheld or retained as such by the Engineer-In-Charge or EPI or till his claim arising out of the same contract or any other contract is either mutually settled or determined by the Arbitrator or Competent court as the case may be, and that the Contractor shall have no claim for interest or damages whatsoever on this account or on any
other ground in respect of any sum of money withheld or retained under this clause and duly notified as such to the Contractor.

74.0 DEFECTS LIABILITY PERIOD

The Contractor shall be responsible for the rectification of defects in the works for a period of twelve months from the date of taking over of the works by the Owner/Client. Any defects discovered and brought to the notice of the Contractor forthwith shall be attended to and rectified by him at his own cost and expense. In case the Contractor fails to carry out these rectifications, the same may without prejudice to any other right or remedy available, be got rectified by EPI at the cost and expense of the Contractor.

75.0 FORCE MAJEURE

Any delay or failure of the performance of either party hereto shall not constitute default hereunder to give rise to any claims for damages, if any to the Extent such delay or failure of performance is caused by occurrences such as Acts of God or the public enemy, expropriation, compliance with any order or request of Government authorities/ Courts, acts of war, rebellions, sabotage fire, floods, illegal strikes, or riots (other than Contractor's employees). Only extension of time shall be considered for Force Majeure conditions as accepted by EPI. No adjustment in contract price shall be allowed for reasons of force majeure.

76.0 ARBITRATION

76.1 Before resorting to arbitration as per the clause given below, the parties if they so agree may explore the possibility of conciliation as per the provisions of Part-III of the Arbitration and Conciliation Act. 1996. When such conciliation has failed, the parties shall adopt the following procedure for arbitration:

i) Except where otherwise provided for in the contract, any disputes and differences relating to the meaning of the Specifications, Design, Drawings and Instructions herein before mentioned and as to the quality of workmanship or materials used in the work or as to any other question, claim, right, matter or thing whatsoever in any way arising out of or relating to the Contract, Designs, Drawings, Specifications, Estimates, Instructions, or these conditions, or otherwise concerning the works or the execution or failure to execute the same whether arising during the progress of the work or after the completion or abandonment thereof shall be referred to the Sole Arbitration of the Chairman and Managing Director (CMD) of Engineering Projects (India) Limited (EPI), or any other person discharging the functions of CMD of EPI and if CMD or such person discharging the functions of CMD of EPI is unable to act, to the sole Arbitration of some other person appointed by CMD of EPI or such other person discharging the functions of CMD of EPI. There will be no objection if the arbitrator so appointed is an employee of Engineering Projects (I) Ltd. However, such an employee shall not have directly dealt with the said Contract or the works there under on behalf of EPI. Such Arbitrator shall be appointed within 30 days of the receipt of letter of invocation of arbitration duly satisfying the requirements of this clause.
ii) If the arbitrator so appointed resigns or is unable or unwilling to act due to any reason whatsoever, or dies, the Chairman & Managing Director aforesaid or in his absence the person discharging the duties of the CMD of EPI may appoint a new arbitrator in accordance with these terms and conditions of the contract, to act in his place and the new arbitrator so appointed may proceed from the stage at which it was left by his predecessor.

iii) It is a term of the contract that the party invoking the arbitration shall specify the dispute / differences or questions to be referred to the Arbitrator under this clause together with the amounts claimed in respect of each dispute.

iv) The Arbitrator may proceed with the arbitration ex-parte, if either party, in spite of a notice from the arbitrator, fails to take part in the proceedings.

v) The work under the contract shall continue as directed by the Engineer-In-Charge, during the arbitration proceedings.

vi) Unless otherwise agreed, the venue of arbitration proceedings shall be at the venue given in the ‘Memorandum' to the ‘Form of Tender'.

vii) The award of the Arbitrator shall be final, conclusive and binding on both the parties.

viii) Subject to the aforesaid, the provisions of the Arbitration and Conciliation Act, 1996 or any statutory modifications or re-enactment thereof and the Rules made there under and for the time being in force shall apply to the arbitration proceedings and Arbitrator shall publish his Award accordingly.

NOTE

NOTWITHSTANDING ANYTHING CONTAINED HEREIN ABOVE, THIS CLAUSE SHALL NOT BE APPLICABLE WHERE THE DISPUTE IS BETWEEN EPI AND ANOTHER CENTRAL PUBLIC SECTOR ENTERPRISE OR GOVT. OF INDIA DEPARTMENT, FOR WHICH A SEPARATE ARBITRATION CLAUSE IS PROVIDED VIDE CLAUSE NO. 76.2 GIVEN BELOW :

76.2 ARBITRATION BETWEEN CENTRAL PUBLIC SECTOR ENTERPRISES INTER SE / GOVERNMENT OF INDIA DEPARTMENTS/ MINISTRIES

i) In the event of any dispute or difference relating to the interpretation and application of the provisions of the contract, such dispute or difference shall be referred by either party to the arbitration as per the instructions (Office Memorandums / Circulars) issued by Govt. of India from time to time with regard to arbitration between one Government Department and another, one Government Department and a Public Sector Enterprise and Public Sector Enterprise inter se.

ii) Subject to any amendment that may be carried out by the Government of India from to time, the procedure to be followed in the arbitration shall be as is
contained in D.O. No. DPE/4(10)/2001-PMA-GL-I dated 22.01.2004 of Department of Public Enterprises, Ministry of Heavy Industries and Public Enterprises, Government of India or any modification issued in this regard.

76.3 JURISDICTION

The courts mentioned in the ‘Memorandum’ to the ‘Form of Tender’ alone will have jurisdiction to deal with matters arising from the contract, to the exclusion of all other courts.

77.0 SUSPENSION OF WORKS

(a) The Contractor shall, on receipt of the order in writing of the Engineer-In-Charge, suspend the progress of the works or any part thereof for such time and in such manner, as the Engineer-In-Charge may consider necessary for any of the following reasons:

i) On account of any default on part of the Contractor, or

ii) For proper execution of the works or part thereof for reason other than the default of the Contractor, or

iii) For safety of the works or part thereof.

The Contractor shall, during such suspension, properly protect and secure the works to the extent necessary and carry out the instructions given in that behalf by the Engineer-In-Charge.

(b) If the suspension is ordered for reasons (ii) and (iii) in sub-para (a) above, the Contractor shall be entitled to an extension of the time equal to the period of every such suspension plus 25%. No adjustment of contract price will be allowed for reasons of such suspension.

(c) In the event of the Contractor treating the suspension as an abandonment of the contract by EPI, he shall have no claim to payment of any compensation on account of any profit or advantage which he may have derived from the execution of the work in full but which he could not derive in consequence of the abandonment.

(d) The Contractor shall resume work in all earnestness after suspension has been lifted by EPI.

78.0 TERMINATION OF CONTRACT ON DEATH OF CONTRACTOR

If the Contractor is an individual or a proprietorship concern and the individual or the proprietor dies then unless the Engineer-In-Charge is satisfied that the legal representatives of the individual Contractor or of the proprietor of the proprietary concern and in the case of partnership firm, the surviving partners, are capable of carrying out and completing the contract, the Engineer-In-Charge shall be entitled to cancel the contract as to its incompleted part without EPI being in any
way liable to payment of any compensation to the estate of the deceased Contractor and/or to surviving partners of the Contractor’s firm on account of cancellation of the contract. Such cancellation of Contract shall be with out prejudice to any of the rights & remedies available to the Engineer-In-Charge under the contract. The decision of the Engineer-In-Charge that the legal representatives of the deceased Contractor or the surviving partners of the Contractor’s firm cannot carry out and complete the contract shall be final and binding on the parties.

79.0 CLARIFICATION AFTER TENDER SUBMISSION

Tenderer’s attention is drawn to the fact that during the period, the bids are under consideration, the bidders are advised to refrain from contacting by any means, EPI and/or his employees/ representatives on matters related to the bid under consideration and that if necessary, EPI will obtain clarifications in writing or as may be necessary. The Tender evaluation and process of award of works is done by duly authorized Tender Scrutiny Committee and this committee is authorized to discuss and get clarification from the tenderers.

80.0 ADDENDA/ CORRIGENDA

Addenda/Corrigenda to the Tender Documents may be issued prior to the date of opening of the Tender to clarify or effect modification in specification and/or contract terms included in various Tender Documents. The tenderer shall suitably take into consideration such Addenda/Corrigenda while submitting his tender. The tenderer shall return such Addenda/ Corrigenda duly signed and stamped as confirmation of its receipt and submit along with the Tender Document. All Addenda/ Corrigenda shall be signed and stamped on each page by the tenderer and shall become part of the Tender and contract documents.

81.0 QUALITY ASSURANCE PROGRAMME

To ensure that the works/services under the scope of this contract are in accordance with the specifications, the Contractor shall adopt Quality Assurance Programme to control such activities at the necessary points. The Contractor shall prepare and finalize such Quality Assurance Programme within 15 days from letter of intent. EPI shall also carry out quality audit and quality surveillance of systems and procedures of Contractor’s quality control activities. A Quality Assurance Programme of Contractor shall generally cover the following:

a) His organization structure for the management and implementation of the proposed Quality Assurance Program.
b) Documentation control system.
c) The procedure for procurement of materials and source inspection.
d) System for site controls including process controls.
e) Control of non-conforming items and systems for corrective actions.
f) Inspection and test procedure for site activities.
g) System for indication and appraisal of inspection status.
h) System for maintenance of records.
i) System for handling, storage and delivery.
j) A quality plan detailing out quality practices and procedures, relevant standards and acceptance levels for all types of work under the scope of this contract.

All the quality reports shall be submitted by the Contractors in the formats appended hereto. Checklist enclosed here in this document shall be followed while carrying out Construction activities (items). If any item is not covered by the Checklist/ Formats appended hereto, the Format for the same may be developed and submitted to Engineer-In-Charge for approval and the same shall be adopted. These filled in formats shall be prepared in two copies and duly signed by representatives of Contractor and EPI. All the costs associated with printing of Formats and testing of materials required as per technical specifications or by Engineer-In-Charge shall deemed to be included in the Contractor’s quoted rates of various items of work in the Schedule/ Bill of Quantities.

82.0 APPROVAL OF TEMPORARY / ENABLING WORKS

The setting and nature of all offices, huts, access road to the work areas, and all other temporary works as may be required for the proper execution of the works shall be subject to the approval of the Engineer-In-Charge.

All the equipments, labour, material including cement, reinforcement and the structural steel required for the enabling/ temporary works associated with the entire Contract shall have to be arranged by the Contractor only. Nothing extra shall be paid to the Contractor on this account and the unit rates quoted by the Contractor for various items in the Bill of Quantities shall be deemed to include the cost of enabling works.

83.0 CONTRACT COORDINATION PROCEDURES, COORDINATION MEETINGS AND PROGRESS REPORTING

The Contractor shall prepare and finalize in consultation with EPI, a detailed contract coordination procedure within 15 days from the date of issue of Letter of Intent for the purpose of execution of the Contract.

The Contractor shall have to attend all the meetings at any place in India at his own cost with EPI, Owners/ Clients or Consultants of EPI/ Owner/ Client during the currency of the Contract, as and when required and fully cooperate with such persons and agencies involved during these discussions. The Contractor shall not deal in any way directly with the Clients/ Owners or Consultants of EPI/ Owner/ Clients and any dealings/ correspondence if required at any time with Clients/ Owners/ Consultants shall be through EPI only.

During the execution of the work, Contractor shall submit at his own cost detailed Monthly progress report to the Engineer-In-Charge of EPI by 5th of every month. The format of monthly progress report shall be as approved by Engineer-In-Charge of EPI.

84.0 CONTRACT AGREEMENT
The Contractor shall enter into a Contract Agreement with EPI within 10 days of the date of Letter of Intent or within such extended time, as may be granted by EPI. The cost of stamp papers, stamp duty, registration, if applicable on the contract, shall be borne by the Contractor. In case, the Contractor does not sign the agreement as above or does not start the work within 10 days of the issue of letter/telegram of intent, his earnest money is liable to be forfeited and letter of intent consequently will stand withdrawn.

85.0 MANNER OF EXECUTION OF AGREEMENT

i. The agreement as per prescribed Performa as enclosed to the Additional Conditions of Contract shall be signed at the office of EPI within 10 days from the date of issue of Letter of Intent. The Contractor shall provide for signing of the Contract, appropriate Power of Attorney in favour of the authorised representative duly attested by notary Public and the requisite documents/materials. Till a formal contract is prepared and executed, the Letter of Intent read in conjunction with the Bidding Documents will constitute a binding contract.

ii. The agreement will be signed in two originals and three more copies, EPI shall retain the ‘Original’, the Contractor shall be provided with the other signed original and the remaining three copies will be retained by EPI. In case of a dispute of any kind whatsoever, the ‘Original’ retained by EPI alone shall be treated as the ‘Original Agreement’.

iii. The Contractor shall provide free of cost to EPI all the Engineering data, drawings and descriptive materials submitted along with the bid, in at least five (5) copies to form an integral part of the Agreement within seven 7 days after issuing of Letter of Intent.

iv. Subsequent to signing of the Agreement, the Contractor at his own cost shall provide to EPI with at least five (5) true hard bound copies of Agreement alongwith all the enclosures viz. letter of intent, Tender Documents etc. within thirty (30) days of its signing.

86.0 PURCHASE PREFERENCE TO PUBLIC SECTOR ENTERPRISES

EPI reserves its right to extend Purchase Preference to Central Public Sector Enterprises (CPSEs) as per policy of Government of India, if any, as applicable on this work. The tenderers are requested to go through latest instructions of Government of India on its Purchase Preference Policy for CPSEs before quoting for the Tender.

87.0 CHANGE IN FIRM’S CONSTITUTION TO BE INTIMATED

Where the Contractor is a partnership firm, prior approval in writing of EPI shall be obtained before any change is made in the constitution of the firm. Where the Contractor is an individual or a Hindu undivided family business concern such approval as aforesaid shall likewise be obtained before the Contractor enters into any partnership agreement whereunder the partnership firm would have the right to carry out the works hereby undertaken by the Contractor. If prior approval as aforesaid is not obtained, the contract shall be deemed to have been assigned in
contravention of Clause 59.1 hereof and EPI shall be entitled to take action under Clause 72.2 (xi).

88.0 COMPLIANCE WITH ISO PROCEDURES

EPI is an ISO-9001 and ISO-14001 Company. The conditions of the ISO as applicable shall be followed by the Contractor for implementation & maintaining the established procedures of EPI.
LABOUR SAFETY PROVISIONS

1.0 Suitable scaffolds should be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except such short period work as can be done safely from ladders. When a ladder is used an extra mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well, suitable footholds and handholds shall be provided on the ladder and the ladder shall be given an inclination not steeper than 1/4 to 1 (1/4 horizontal and 1 vertical).

2.0 Scaffolding or staging more than 3.6m (12 feet) above the ground or floor, swung or suspended from an overhead support or erected with stationery support shall have a guard rail properly attached or bolted, braced and otherwise secured at least 90 cm. (3 feet) high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such opening as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.

3.0 Working platforms, gangways, and stairways should be so constructed that they should not sag unduly or unequally, and if the height of the platform or the gangway or the stairway is more than 3.6m (12 feet) above ground level or floor level, they should be closely boarded, should have adequate width & should be suitable fastened as described in (2.0) above.

4.0 Every opening in the floor of a building or in a working platform shall be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 90 cm (3 feet).

5.0 Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9m. (30 feet) in length while the width between side rails in rung ladder shall in no case be less than 29 cm. for ladder up to and including 3m (10 feet) in length. For longer ladders this width should be increased at least 1/4" for each additional 30 cm (1 ft.) of length. Uniform step spacing shall not exceed 30 cm (12"). Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites of the work shall be so stacked or placed as to cause danger or inconvenience to any person or the public. The Contractor shall provide all necessary fencing and lights to protect the public from accident, and shall be bound to bear the expenses of defence of every suit, action or other proceeding at law that may be brought by an person for injury sustained owing to neglect of the above precautions and to pay any damages and cost which may be awarded in any such suit, action or proceedings to any such person or which may, with the consent of the Contractor, be paid to compensate any claim by any such person.

6.0 EXCAVATION AND TRENCHING

All trenches, 1.2mts.(four feet) or more in depth, shall at all times be supplied with at least one ladder for each 30m. (100 feet) in length or fraction thereof, Ladder shall be extended from bottom of the trench to at least 90 cm (3feet) above the surface of the ground. The sides of the trenches, which are 1.5m. (5feet) or more in depth shall be stepped back to give suitable slope or securely held by timber bracing, so as to avoid the danger or sides to collapsing. The excavated materials shall not be placed within 1.5m (5 feet) of the edges of the
trench or half of the depth of the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or undercutting shall be done.

7.0 Demolition - Before any demolition work is commenced and also during the progress of the work:

7.1 All roads and open areas adjacent to the work Site shall either be closed or suitably protected.

7.2 No electric cable or apparatus which is likely to be a source of danger or a cable or apparatus used by the operator shall remain electrically charged.

7.3 All practical steps shall be taken to prevent danger to persons employed from risk or fire or explosion or flooding. No floor, roof or other part of the building shall be overloaded with debris or materials as to render it unsafe.

8.0 All necessary personal safety equipments as considered adequate by the Engineer-In-Charge should be kept available for the use of persons employed on the Site and maintained in a condition suitable for immediate use, and the Contractor should take adequate step to ensure proper use of equipment by those concerned- The following safety equipment shall be invariably provided.

8.1 Workers employed on mixing asphaltic materials, cement and lime mortars shall be provided with protective footwear and protective goggles.

8.2 Those engaged in white washing and mixing or stacking of cement bags or any materials which are injurious to the eye shall be provided with protective goggles.

8.3 Those engaged in welding works shall be provided with welder’s protective eye shields.

8.4 Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe interval.

8.5 When workers are employed in sewers and manholes, which are in active use, the Contractors shall ensure that the manhole covers are opened and ventilated at-least for an hour before the workers are allowed to get into the manholes, and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident the public. In addition, the Contractor shall ensure that the following safety measures are adhered to:

a. Entry for workers into the line shall not be allowed except under supervision of the JE or any other higher officer.

b. At least 5 to 6 manholes upstream and down stream should be kept open for at least 2 to 3 hours before any man is allowed to enter into the manholes for working inside.

c. Before entry, presence of Toxic gases should be tested by inserting wet lead acetate paper which changes colour in the presence of such gases and gives indication of their presence.

d. Presence of Oxygen should be verified by lowering a detector lamp into the manhole. In case, no Oxygen is found inside the sewer line, workers should be sent only with Oxygen kit.
e. Safety belt with rope should be provided to the workers. While working inside the manholes such rope should be handled by two men standing outside to enable him to be pulled out during emergency.

f. The area should be barricaded or cordoned of by suitable means to avoid mishaps of any kind. Proper warning signs should be displayed for the safety of the public whenever cleaning works are undertaken during night or day.

g. No smoking or open flames shall be allowed near the blocked manhole being cleaned.

h. The malba obtained on account of cleaning of blocked manholes and sewer lines should be immediately removed to avoid accidents on account of slippery nature of the malba.

i. Workers should not be allowed to work inside the manhole continuously. He should be given rest intermittently. The Engineer In-charge may decide the time up to which a worker may be allowed to work continuously inside the manhole.

j. Gas masks with Oxygen Cylinder should be kept at Site for use in emergency.

k. Air-blowers should be used for flow of fresh air through the manholes. Whenever called for, portable air-blowers are recommended for ventilating the manholes. The Motors for these shall be vapour proof and of totally enclosed type. Non-sparking gas engines also could be used but they should be placed at-least 2 meters away from the opening and on the leeward side protected from wind so that they will not be a source of friction on any inflammable gas that might be present.

l. The workers engaged for cleaning the manholes/ sewers should be properly trained before allowing them to work in the manhole. m. The workers shall be provided with Gumboots or non-sparking shoes, bump helmets and gloves non-sparking tools, safety lights and gas masks and portable air blowers (when necessary). They must be supplied with barrier cream for anointing the limbs before working inside the sewer lines.

n. Workmen descending a manhole shall try each ladder step or rung carefully before putting his full weight on it to guard against insecure fastening due to corrosion of the rung fixed to manhole well.

o. If a man has received a physical injury, he should be brought out of the sewer immediately and adequate medical aid should be provided to him.

p. The extent to which these precautions are to be taken depend on individual situation but the decision of the Engineer-In-Charge regarding the steps to be taken in this regard in an individual case will be final.

8.6 The Contractor shall not employ men and women below the age of 18 years on the work of painting with products containing lead in any form Wherever men above the age of 18 are employed on the work of lead painting the following precautions should be taken.

8.6.1 No paint containing lead or lead products shall be used except in the form of paste or readymade paint.

8.6.2 Suitable facemasks should be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint is dry rubbed and scrapped.
8.6.3 Overalls shall be supplied by the Contractor to the workmen and adequate facilities shall be provided to enable the working painters to wash during the cessation of work.

8.6.4.1 a. White lead, sulphate or lead work products containing those pigments shall not be used in painting operation except in the form of paste or of paints ready for use.

b. Measures shall be taken whenever required in order to prevent danger arising from the application of paint in the form of spray.

c. Measures shall be taken, whenever practicable to prevent danger arising out of dust caused by dry rubbing down and scrapping.

8.6.4.2 a. Adequate facilities shall be provided to enable working painter to wash during and on cessation of work.

b. Suitable arrangements shall be made to prevent clothing put off during working hours being spoiled by painting materials.

8.6.4.3 a) Cases of lead poisoning and of suspected lead poisoning shall be notified and shall be subsequently verified by a medical man appointed by the competent authorities of the Consultant.

b) EPI may require when necessary a medical examination of workers.

c) Instructions with regard to the special hygienic precautions to be taken in the painting trade shall be distributed to working painters.

9.0 When the work is done near any place where there is risk of drowning, all necessary equipments should be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provisions should be made for prompt first aid treatment of all injuries likely to be obtained during the course of the work.

10.0 Use of hoisting machines and tackle including their attachment encourage and supports shall conform to the following standard of conditions.

10.1 a. These shall be of good mechanical construction, sound material and adequate strength and free from patent, defects and shall be kept required in good working order.

b) Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and adequate strength, and free from patent defects.

10.2 Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years should be in-charge of any hoisting machine including any scaffolding, winch or giving signals to operator.
10.3 In case of every hoisting machine and of every chain ring hook, shackle swivel and pulley block used in hoisting or as means of suspension the safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with the safe working load. In case of a hoisting machine having a variable safe working load, each safe working load and the conditions under which it is applicable shall be clearly indicated. No part of any machine or any gear referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing.

10.4 In case of EPI machines, the safe working load shall be notified by the Engineer-In-Charge. As regards Contractor’s machines the Contractor shall notify the safe working load of the machine to the Engineer-In-Charge whenever he brings any machinery to Site of work and get verified by the Engineer-In-Charge.

11.0 Motors gearing, transmission electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safeguard, hosting appliances should be provided with such means as will reduce to the minimum the risk of accidental descent of the load. Adequate precautions should be taken to reduce the minimum the risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations, which are already energized, insulating mats, wearing apparel, such as gloves sleeves and boots as may be necessary, be provided. The worker should not wear any rings, watches and carry keys or other materials, which are good conductors of electricity.

12.0 All scaffold, ladders, and other safety devices mentioned or described herein shall be maintained in safe condition and no scaffold ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities should be provided at or near places of work.

13.0 These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent place of work spot. The person responsible for compliance of the safety codes shall be named therein by the Contractor.

14.0 To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangements made by the Contractor shall be open to inspection by the or their representatives.

15.0 Notwithstanding the above Clauses from (i) to (xiv) there is nothing in these to exempt the Contractor from the operations of any other Act or Rule in force in the Republic of India.
MODEL RULES FOR THE PROTECTION OF HEALTH AND SANITARY ARRANGEMENTS FOR WORKERS

1.0 APPLICATION

These rules shall apply to all building and construction works in which 20 (twenty) or more workers are ordinarily employed or are proposed to be employed in any day during the period during which the Contractor work is in progress.

2.0 DEFINITION

Work place means a place where twenty or more workers are ordinarily employed or are proposed to be employed in connection with construction work on any day during the period during which the Contractor work is in progress.

3.0 FIRST-AID FACILITIES

3.1 At every work place first aid facilities shall be provided and maintained, so as to be easily accessible during working hours, First-Aid boxes at the rate of not less than one box per 150 contract labour or part thereof ordinarily employed.

3.2 The First-Aid box shall be distinctly marked with a red cross on white ground and shall contain the following equipments:-

3.2.1 a) For work places in which number of contract labour employed does not exceed 50, Each First-Aid box shall contain the following equipments:

i) 6 small sterilized dressings.
ii) 3 medium size sterilized dressings.
iii) large size sterilized dressings.
iv) 3 large sterilized burn dressings.
v) 1 (30 ml) bottle containing a two percent alcoholic solution of iodine.
vi) 1(30 ml) bottle containing salvolatile having the dose and mode of administration indicated on the label.
vii) 1 snake-bite lancet.
viii) 1 (30 gms) bottle of potassium permanganate crystals.
ix) 1 pair of scissors.
x) 1 copy of the First-Aid leaf-let issued by the Director General, Factory Advise Service & Labour Institutes, Government of India.
xi) 1 bottle containing 100 tablets (each of 5 grams) of aspirin.
xii) Ointment for burns.
xiii) A bottle of suitable surgical antiseptic solution.
3.2.2 For work places in which the number of contract labour exceed 50. Each First-Aid box shall contain the following equipments:

i) 12 small sterilized dressings.
ii) 6 medium size sterilized dressings.
iii) 6 large size sterilized dressings.
iv) 6 large size sterilized burn dressings.
v) 6 (15 gms) packet sterilized cotton wool.
v) 1 (60 ml.) bottle containing a two percent iodine alcoholic solution.
vii) 1 (60 ml.) bottle containing salvolatile having the dose and mode of administration indicated on the label.
viii) 1 roll of adhesive plaster.
ix) 1 snake – bite lancet.
x) 1 (30 gms.) bottle of potassium permanganate crystals.
x) 1 pair of scissors.
xii) 1 copy of the First-Aid leaf-let issued by the Director General, Factory Advice Service and Labour Institutes, Government of India.
xiii) A bottle containing 100 tablets (each of 5 grams) of aspirin.
xiv) Ointment for burns.
xv) A bottle of suitable surgical antiseptic solution.

3.3 Adequate arrangements shall be made for immediate recoupment of the equipment when necessary.

3.4 Nothing except the prescribed contents shall be kept in the First Aid box.

3.5 The First Aid box shall be kept in charge of a responsible person who shall always be readily available during the working hours of the work place.

3.6 A person in charge of the First-Aid box shall be a person trained in First-Aid treatment, in work places where the number of labour employed is 150 or more.

3.7 In work places where the number of labour employed is 500 or more and hospital facilities are not available within easy distance of the works, first-Aid Posts shall be established and run by a trained Compounder. The Compounder shall be on duty and shall be available at all hours when the workers are at work.

3.8 Where work places are situated in places, which are not towns of cities, a suitable motor transport shall be kept readily available to carry injured person or persons suddenly taken ill to the nearest hospital.

4.0 DRINKING WATER

4.1 In every work place, there shall be provided and maintained at suitable places, easily accessible to labour, a sufficient supply of cold water fit for drinking.

4.2 Where drinking water is obtained from an intermittent public water supply, each work place shall be provided with storage where such drinking water shall be stored.

4.3 Every water supply of storage shall be at a distance of not less than 50 feet from any latrines drain or other source of pollution, Where water has to be drawn from
an existing well which is within such proximity of latrine, drain or any other source of pollution, the well shall be properly chlorinated before water is drawn from it for drinking. All such wells shall be entirely closed in and be provided with a trap-door which shall be dust and waterproof.

4.4 A reliable pump shall be fitted to each covered well, trap-door shall be kept locked and opened only for cleaning or inspection which shall be done at least once a month.

5.0 WASHING FACILITIES

5.1 In every work place adequate and suitable facilities for washing shall be provided and maintained for the use of labour employed herein.

5.2 Separate and adequate screening facilities shall be provided for the use of male and female workers.

5.3 Such facilities shall be conveniently accessible and shall be kept clean and hygienic condition.

6.0 LATRINES AND URINALS

6.1 Latrines shall be provided in every work place on the following scale, namely:

a) Where females are employed there shall be at least one latrine for every 25 females.

b) Where males are employed, there shall be at least one latrine for every 25 males.

Provided that where the number of males or females exceeds 100, it shall be sufficient if there is one latrine for 25 males or females, as the case may be, up to the first 100, and one for every 50 thereafter.

6.2 Every latrine shall be under cover and so partitioned off as to secure privacy, and shall has a proper door and fastenings.

6.3 Construction of Latrines: The inside walls shall be constructed of masonry or some suitable heat resisting non-absorbent materials and shall be cement washed inside and outside at least once a year. Latrine shall not be a standard lower than borehole system.

6.4 (a) Where workers of both sexes are employed, there shall be displayed outside each block of latrine and urinal, a notice in the language understood by the majority of the workers “For Men only” or “For Women only” as the case may be.

(b) The notice shall also bear the figure of man or of a women, as the case may be.
6.5 There shall be at least one urinal for male workers up to 50 and one for female workers up to 50 employed at a time. Provided that where the number of male or female workmen, as the case may be, exceeds 500, it shall be sufficient if there is one urinal for every 50 males or females up to the first 500 and one for every 100 or part thereof, thereafter.

6.6 a) The latrines and urinals shall be adequately lighted and shall be maintained in a clean and sanitary condition at all times.

b) Latrines and urinals other than those connected with a flush sewerage system shall comply with the requirements of the Public Health Authorities.

6.7 Water shall be provided by means of a tap or otherwise so as to be conveniently accessible in or near the latrines and urinals.

6.8 DISPOSAL OF EXCRETA

Unless otherwise arranged for by the local sanitary authority arrangements for proper disposal of excreta by incineration at the work place shall be made by means of a suitable incinerator. Alternatively excreta may be disposed off by putting a layer of night soil at the bottom of a pucca tank prepared for the purpose and covering it with a 15 cm layer of waste or for refuse and then covering it with a layer of earth for fortnight (when it will turn into manure).

6.9 The Contractor shall, at his own expense, carry out all instruction issued to him by the Engineer-In-Charge to effect proper disposal of night soil and other conservancy work in respect of the Contractor's workmen or employees on the Site. The Contractor shall be responsible for payment of any charges, which may be levied by Municipal or Cantonment Authority for execution of such work on his behalf.

7.0 PROVISION OF SHELTER DURING REST

At every place there shall be provided, free of cost four suitable sheds, two for males and the other two for rest separately for the use of man and women labour. The height of each shelter shall not be less than 3 meters from the floor level to the lowest part of the roof. These shall be kept clean and the space provided shall be on the basis of 0.6 sqm. Per head.

Provided that the Engineer-In-Charges may permit, subject to his satisfaction, a portion of the building under construction or other alternative accommodation to be used for the purpose.

8.0 CRECHES

8.1 A every work place, at which 20 or more women workers are ordinarily employed, there shall be provided two rooms of reasonable dimensions for the use of their children under the age of six years. One room shall be used as a playroom for the children and the other as their bedrooms.

The rooms shall be constructed on standard not lower than the following:
i) thatched roof  
ii) mud floor and walls.  
iii) planks spread over the mud floor and covered with matting

8.2 The rooms shall be provided with suitable and sufficient openings for light and ventilation. There shall be adequate provision of sweepers to keep the places clean.

8.3 The Contractor shall supply adequate number of toys and games in the playroom and sufficient number of cots and beddings in the bedroom.

8.4 The Contractor shall provide one Ayaa to look after the children in the creche when the number of women workers does not exceed 50 and two when the number of women workers exceed 50.

8.5 The use of the rooms/earmarked as ealize shall be restricted to children, their attendant and mother of the children.

9.0 CANTEENS

9.1 In every work place where the work regarding the employment of contract labour is likely to continue for six months and wherein contract labour numbering one hundred or more are ordinarily employed, an adequate canteen shall be provided by the Contractor for the use of such labour.

9.2 The canteen shall be maintained by the Contractor in an efficient manner.

9.3 The canteen shall consist of at least a dining hall, kitchen, storeroom, pantry and washing places separately for workers and utensils.

9.4 The canteen shall be sufficiently lighted at all times when any person has access to it.

9.5 The floor shall be made of smooth and impervious material and inside walls shall be lime washed or colour washed at least once in each year.

Provided that the inside walls of the kitchen shall be lime-washed every four months.

9.6 The premises of the canteen shall be maintained in a clean and sanitary condition.

9.7 Waste Water shall be carried away in suitable covered drains and shall not be allowed to accumulate so as to cause a nuisance.

9.8 Suitable arrangements shall be made for the collection and disposal of garbage.

9.9 The dinning hall shall accommodate at a time 30 persons of the labour working at time.
9.10 The floor area of the dining hall, excluding the area occupied by the service counter and any furniture except tables and chair shall not be less than one square meter per dinner to be accommodated.

9.11 a) A portion of the dining hall, and service counter shall be partitioned off and reserved for women workers in proportion to their number.

b) Washing places for women shall be separate and screened to secure privacy.

9.12 Sufficient tables, stool, chairs or benches shall be available for the number of dinners to be accommodated.

9.13.1 a) There shall be provided and maintained sufficient utensils, crockery, furniture and any other equipment necessary for the efficient running of the canteen.

b) The furniture, utensils and other equipment shall be maintained in a clean and hygienic condition.

9.13.2 a) Suitable clean clothes for the employees serving in the canteen shall be provided and maintained.

b) A service counter, if provided, shall have top of smooth and impervious material.

c) Suitable facilities including an adequate supply of hot water shall be provided for the cleaning of utensils and equipment.

9.14 The foodstuffs and other items to be served in the canteen shall be in conformity with the normal habits of the labour.

9.15 The charge for foodstuffs, beverages and any other items served in the canteen shall be based on 'No profit No loss' and shall be conspicuously displayed in the canteen.

9.16 In arriving at price of foodstuffs, and other articles served in the canteen, the following items shall not be taken into consideration as expenditure, namely:

a) The rent of land building.

b) The depreciation and maintenance charges for the building and equipment provided for the canteen.

c) The cost of purchase, repair and replacement of equipment including furniture, crockery, cutlery and utensils:

d) The water charges and other charges incurred for lighting and ventilation:

e) The interest and amounts spent on the provision and maintenance and equipment provided for in the canteen.
9.17 The accounts pertaining to the canteen shall be audited once every 12 months by registered accountants and auditors.

10.0 ANTI MALARIAL PRECAUTIONS

The Contractor shall at his own expense, conform to all anti-malarial instructions given to him by the Engineer-In-Charge including the filling up of any borrow pits which may have been dug by him.

11.0 AMENDMENTS

EPI may from time to time, add to or amend these rules and issue such directions as it may consider necessary for the purpose of removing any difficulty which may arise in the administration hereof.
CONTRACTOR’S LABOUR REGULATIONS

1.0 SHORT TITLE

These regulations may be called the Contractor “Labour Regulations”.

2.0 DEFINITIONS

2.1 “Workman” means any person employed by EPI or its Contractor directly or indirectly through a sub-Contractor, with or without the knowledge, of EPI to do any skilled, semi-skilled, unskilled, manual, supervisory, technical or clerical work for hire or reward, whether, the terms of employment are expressed or implied but does not include any person-

a) Who is employed mainly in a managerial or administrative capacity; or

b) Who being employed in a supervisory capacity draws wages exceeding Rupees Two thousand Five hundred per person or exercises either by the nature of the duties attached to the office or by reason of powers vested to him, functions mainly of managerial nature.

c) Who is an out worker, that is to say, a person to whom any articles or materials are given out by or on behalf of the principal Employer to be made up clean, washed, altered, ornamental finished, repaired, adopted or otherwise processed for sale for the purpose of the trade or business of the principal Employer and the process is to be carried out either in the home of the out worker or in some other premises, not being premises under the control and management of the principal Employer.

2.2 “Fair Wages” means wages whether for time or piecework fixed and notified under the provisions of the minimum Wages Act from time to time.

2.3 “Contractor” shall include every person who undertake to produce a given result other than a mere supply of goods or articles of manufacture through labour or who supplies labour for any work and includes a sub-Contractor.

2.4 “Wages” shall have the same meaning as defined in the Payment of Wages Act.

2.4.1 Normally working hours of an adult employee should not exceed 9 hours a day. The working day shall be so arranged that inclusive of interval for rest, if any, it shall not spread over more than 12 hours on any day.

2.4.2 When an adult worker is made to work for more than 9 hours on any day or for more than 48 hours in any week he shall be paid overtime for the extra hours put in by him at double the ordinary rate of wages.
2.4.3.1 Every worker shall be given a weekly holiday on a Sunday, in accordance with the provisions of the Minimum Wages (Central) Rules 1960 as amended from time to time, irrespective of whether such worker is governed by the Minimum Wages Act or not.

2.4.3.2 Whether the Minimum Wages prescribed by the Government under the Minimum Wages Act are not inclusive of the wages for the weekly day of rest, the worker shall be entitled to rest day wages at the rate applicable to the next preceding day, provided he has worked under the same Contractor for a continuous period of not less than 6 days.

2.4.3.3 Where a Contractor is permitted by the Engineer-In-Charge to allow a worker to work on a normal weekly holiday, he shall grant a substitute holiday to him for the whole day on one of the five days immediately before or after the normal weekly holidays and pay wages to such worker for the work performed on the normal weekly holiday at overtime rate.

3.0 DISPLAY OF NOTICE REGARDING-WAGES, ETC.

The Contractor shall before he commences his work on contract, display and correctly maintain and continue to display and correctly maintain in a clean and legible condition in conspicuous places on the work, notices in English and in the local Indian languages spoken by the majority of the workers, giving the minimum rates of wages fixed under the Minimum Wages Act, the actual wages being paid, the hours of work for which such wages are earned, wage period, dates of payment of wages and other relevant information as per Appendix ‘A’.

4.0 PAYMENT OF WAGES

4.1 The Contractor shall fix wage periods in respect of which wages shall be payable.

4.2 No wage period shall exceed one month.

4.3 The wages of every person employed as labour in an establishment or by a Contractor where less than one thousand, such persons are employed shall be paid before the expiry of the seventh day and in other cases before the expiry of tenth day after the last day of the wage period in respect of which the wages are payable.

4.4 Where the employment of any worker is terminated by or on behalf of the Contractor the wages earned by him shall be paid before the expiry of the second working day from the date on which his employment is terminated.

4.5 All payments of wages shall be made on a working day at the work premises and during the working time and on a date notified in advance and in case the work is completed before the expiry of the wage period, final payment shall be made within 48 hours of the last working day.
4.6 Wages due to every worker shall be paid to him direct or to other person authorized by him in this behalf.

4.7 All wages shall be paid in current coin or currency or in both.

4.8 Wages shall be paid without any deductions of any kind except those specified by the Central Government by general or special order in this behalf or permissible under the Payment of Wages Act 1956.

4.9 A notice showing the wage period and the place and time of disbursement of wages shall be displayed at the place of work and a copy sent by the Contractor to the Engineer-In-Charge under acknowledgment.

4.10 It shall be the duty of the Contractor to ensure the disbursement of wages in the presence of the Engineer or any other authorized representatives of the Engineer-In-Charge who will be required to be present at the place and time of disbursement of wages by the Contractor to workmen.

4.11 The Contractor shall obtain from the Engineer or any other authorized representative of the Engineer-In-Charge as the case may be, a certificate under his signature at the end of the entries in the “Register of Wages” or the “Wage-cum-Muster Roll” as the case may be in the following form:

“Certified that the amount shown in column No............. has been paid to the workmen concerned in my presence on............. at ............”

5.0 FINES AND DEDUCTIONS, WHICH MAY BE MADE FROM WAGES

5.1 The wages of a worker shall be paid to him without any deduction of any kind except the following:

a) Fines

b) Deductions for absence from duty i.e. from the place or the places where by the terms of his employment he is required to work. The amount of deduction shall be in proportion to the period for which he was absent.

c) Deduction for damage to or loss of goods expressly entrusted to the employed persons for custody, or from loss of money or any other deduction which he is required to account where such damage or loss is directly attributable to his neglect or default.

d) Deduction for recovery of advances or for adjustment of over payment of wages, advances granted shall be entered in a register.

e) Any other deduction, which the Central Government may from time to time allow.

5.2 No fines should be imposed on any worker save in respect of such acts and omissions on his part as have been approved by the Chief Labour Commissioner.
NOTE: An approved list of Acts and Omissions for which fines can be imposed is enclosed at Appendix-I.

5.3 No fine shall be imposed on a worker and no deduction for damage or loss shall be made from his wages until the worker has been given an opportunity of showing cause against such fines or deductions.

5.4 The total amount of fine which may be imposed in any one-wage period on a worker shall not exceed an amount equal to three paise in a Rupee of the total wages, payable to him in respect of that wage period.

5.5 No fine imposed on any worker shall be recovered from him in installment, or after the expiry of sixty days from the date on which it was imposed.

5.6 Every fine shall be deemed to have been imposed on the day of the act or omission in respect of which it was imposed.

6.0 LABOUR RECORDS

6.1 The Contractor shall maintain a “Register of persons employed” on work on contract in form XIII of the CL (R&A) Central Rules 1971 (Appendix-B).

6.2 The Contractor shall maintain a “Muster Roll” register in respect of all workmen employed by him on the work under contract in from XVI of the CL (R&A) Rules 1971 (Appendix-C).

6.3 The Contractor shall maintain a “Wage Register” in respect of all workmen employed by him on the work in form (Appendix-D).

6.4 Register of accidents – The Contractor shall maintain a register of accidents in such form as may be convenient at the work place but the same shall include the following particulars:

   a) Full particulars of the labourers who met with accident.
   b) Rate of wages
   c) Sex
   d) Age
   e) Nature of accident and cause of accident.
   f) Time and date of accident.
   g) Date and time when he/she admitted in Hospital
   h) Date of discharge from the Hospital
   i) Period of treatment and result of treatment
   j) Percentage of loss of earning capacity and disability as assessed by Medical Officer.
   k) Claim required to be paid under Workmen’s Compensation Act.
   l) Date of payment of compensation.
   m) Amount paid with details of the person to whom the same was paid.
   n) Authority by whom the compensation was assessed.
   o) Remarks.
6.5 Register of Fines – The Contractor shall maintain a “Register of Fines” in the form (Appendix-H).

The Contractor shall display in a good condition and in a conspicuous place of work the approved list of Acts and Omission for which fines can be imposed (Appendix-I).

6.6 Register of Deductions-The Contractor shall maintain a “Register of Deductions” for damage or loss in form (Appendix-J).

6.7 Register of Advances-The Contractor shall maintain a “Register of Advances” in form (Appendix-K).

6.8 Register of Overtime-The Contractor shall maintain a “Register of Overtime” in form (Appendix-L).

7.0 ATTENDANCE CARD-CUM WAGE SLIP:

7.1 The Contractor shall issue an attendance card-cum-wage slip to each workman employed by him in the specimen form at (Appendix-E).

7.2 The card shall be valid for each wage period.

7.3 The Contractor shall mark the attendance of each workman on the card twice each day, once at the commencement of the day and again after the rest interval, before he actually starts work.

7.4 The card shall remain in possession of the worker during the wage period under reference.

7.5 The Contractor shall complete the wage slip portion on the reverse of the card at least a day prior to the disbursement of wages in respect of the wage period under reference.

7.6 The Contractor shall obtain the signature or thump impression of the worker on the wage slip at the time of disbursement of wages and retain the card with himself.

8.0 EMPLOYMENT CARD

The Contractor shall issue an Employment Card in form to each worker within three days of the employment of the worker (Appendix-F).

9.0 SERVICE CERTIFICATE

On termination of employment for any reason whatsoever the Contractor shall issue to the workman whose services have been terminated, a service certificate in from Appendix-G.
10.0 **PRESERVATION OF LABOUR RECORDS**

All records required to be maintained under Regulations Nos. 6 and 7 shall be preserved in original for a period of three years from the date of last entries made in them and shall be made available for inspection by the Engineer-In-Charge, Labour Officer.

11.0 **POWER OF LABOUR OFFICERS TO MAKE INVESTIGATIONS INQUIRY**

The Labour Officer or any other person authorized by EPI on its behalf shall have power to make inquiries with a view to ascertaining and enforcing due and proper observance of the Fair Wage Clauses and the Provisions of Regulations. He shall investigate into any complaint regarding the default made by the Contractor or sub-Contractor in regard to such provision.

12.0 **INSPECTION OF BOOK AND SLIPS**

The Contractor shall allow inspection of all the prescribed labour records to any of his workers or to his agent at a convenient time and place after due notice is received or to the Labour officer or any other person, authorized by the Central Government on his behalf.

13.0 **SUBMISSION OF RETURNS**

The Contractor shall submit periodical returns as may be specified from time to time.

14.0 **AMENDMENTS**

EPI may from to time, add or amend the regulations and on any question as to the application, interpretation or effect of these regulations the decision of the Zonal Chief concerned shall be final.
Appendix – ‘A’

LABOUR BOARD

Name of work
Name of Contractor
Address of Contractor
Name and Address of Unit
Name of Labour Enforcement Officer
Address of Labour Enforcement Officer
Date:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Category</th>
<th>Minimum wage fixed</th>
<th>Actual wages paid</th>
<th>Number present</th>
<th>Remarks</th>
</tr>
</thead>
</table>

Weekly Holiday
Wage Period
Date of Payment of wages
Working hours
Rest interval
FORM 13

SEE RULE 75

REGISTER OF WORKMEN EMPLOYED BY CONTRACTOR

Name and Address of Contractor

Name and Address of Establishment in/under which contract is carried on

Nature and location of work

Name & Address of Principal Employer

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name and surname of workman</th>
<th>Age &amp; sex</th>
<th>Father's Husbands Name</th>
<th>Nature of employment / designation</th>
<th>Permanent home address of the workman (village and Tehsil Taluk and District)</th>
<th>Local address</th>
<th>Date of commencement of employment</th>
<th>Signature or thumb impression of the workman</th>
<th>Date of termination of employment</th>
<th>Reasons for termination</th>
<th>Remarks</th>
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Signature of Contractor
Appendix – ‘C’

FORM XVI

(See Rule 78(2) (193)

MUSTER ROLL

Name and address of Contractor

Name and address of establishment in/under which contract is carried on

Nature and location of work

Name and Address of Principal Employer

For the month / fortnight

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of the workman</th>
<th>Sex</th>
<th>Father’s / Husband’s Name</th>
<th>Dates</th>
<th>Remarks</th>
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1 2 3 4 5
FORM XVII

[SEE RULE 78(2) (03)]

REGISTER OF WAGES

Name and address of Contractor

Name and address of establishment in/under which contract is carried on

Nature and location of work

Name and Address of Principal Employer

Wage period: per month/ fortnightly

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of Workman</th>
<th>Serial No. in the register of workman</th>
<th>Designation nature of work done</th>
<th>Nos. of days worked</th>
<th>Units of work done</th>
<th>Daily rate of wages/ piece rate</th>
<th>Basic Wages</th>
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</table>

Dearness allowance

Overtime

Other cash payments (Nature of payments to be indicated)

Total

Duration if any (indicate)

Net Amt paid

Signature thumb impression of the workman

Initial Contractor or his representative

<table>
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<tr>
<th>9</th>
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</table>
FORM XIX

[SEE RULE 78 (2) (B)]

WAGESLIP

Name and address of Contractor

Name and Father’s/Husband’s Name of workman

Nature and location of work

For the Week/Fortnight/Month ending

1. No. of days worked

2. No. of Units worked in case of piece rate workers

3. Rate of daily wages/piece rate

4. Amount of overtime wages

5. Gross wages payable

6. Deductions if any

7. Net amount of wages paid

Sign of the Contractor
## WAGE CARD

**WAGE CARD NO.**

<table>
<thead>
<tr>
<th>NAME AND ADDRESS OF CONTRACTOR</th>
<th>DATE OF ISSUE</th>
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<tbody>
<tr>
<td>NATURE OF WORK WITH LOCATION</td>
<td>DESIGNATION</td>
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<tr>
<td>NAME OF WORKMAN</td>
<td>MONTH/FORTNIGHT</td>
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</tbody>
</table>

**RATE OF WAGES**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
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**MORNING**

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|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
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**INITIAL**

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**RECEIVED FROM**

THE SUM OF RS.

**ON ACCOUNT**

OF MY WAGON.

**SIGNATURE**

THE WAGE CARD IS VALID FOR ONE MONTH FROM THE DATE OF ISSUE.
FORM XIV

(SEE RULE 76)

EMPLOYMENT CARD

Name and address of Contractor

Name and address of establishment under which
The contract is carried out

Nature and location of work

Name and address of Principal Employer

1. Name of the workman

2. S. Name in the register of workman employed

3. Nature of Employment/Designation

4. Wage rate (with particulars of unit in
case of piece work)

5. Wage Period

6. Tenure of employment

7. Remarks

Signature of Contractor
FORM XV

(SEE RULE 77)

SERVICE CERTIFICATE

Name and address of Contractor

Nature and location of work

Name and address of workman

Age or date of birth

Identification Marks

Father’s/Husband’s Name

Name and address of establishment in under which contract is carried on

Name and address of Principal Employer

Total period of which employed

<table>
<thead>
<tr>
<th>S.No.</th>
<th>From</th>
<th>To</th>
<th>Nature of work</th>
<th>Rate of wages (with particular s of unit In case of piece work)</th>
<th>Remarks</th>
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Signature

Signature of Contractor
## FORM XII

[SEE RULE 78 (2) (D)]

### REGISTER OF FINES

Name and address of Contractor

Name and address of establishment in/ under which contract is carried on

Nature and location of work

Name and address of workman

Name and address of Principal Employer

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of workman</th>
<th>Father’s/Husband Name</th>
<th>Designation/nature of employment</th>
<th>Act/Omission for which fine imposed</th>
<th>Date of offence</th>
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Whether workman showed causes against fine

Name of person in whose presence employees explanation was heard

Wage period and wages payable

Amount of fine Imposed

Date on which fine realized

Remarks

<table>
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<tr>
<th>7</th>
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Appendix – ‘I’

LIST OF ACTS AND OMISSIONS FOR WHICH FINES CAN BE IMPOSED

In accordance with rule of Labour Regulations, to be displayed prominently at the Site of work both in English and local language.

1. Willful insubordination or disobedience, whether alone or in combination with other.
2. Theft, fraud or dishonestly in connection with Contractors beside a business or property of EPI.
3. Taking or giving bribes or any illegal gratifications.
4. Habitual late attendance.
5. Drunk-ness fighting riotous or disorderly or indifferent behaviour.
6. Habitual negligence.
7. Smoking near or around the area where combustible or other materials are locked.
8. Habitual indiscipline.
9. Causing damage to work in the progress or to property of EPI or of the Contractor.
10. Sleeping on duty.
11. Malingering or slowing down work.
12. Giving the false information regarding name, age, fathers name etc.
13. Habitual loss of wage cards supplied by the Employer.
14. Unauthorized use of Employers property or manufacturing or making of unauthorized articles at the work place.
15. Bad workmanship in construction and maintenance by skilled workers, which is not approved by EPI for which the Contractors are compelled to undertake rectifications.
16. Making false complaints and/or misleading statements.
17. Engaging on trade within the premises of the establishment.
18. Any unauthorized divulgence of business affairs of the employees.
19. Collection or canvassing for the collection of any money within the premises of an establishment unless authorized by the Employer.
20. Holding meeting inside the premises without previous sanction of the Employers.
21. Threatening or intimidating any workman or employee during the working hours within the premises.
FORM XX

[SEE RULE 78 (2) (D)]

REGISTER OF DEDUCTION FOR DAMAGES OR LOSS

Name and address of Contractor

Name and address of establishment in/ under which contract is carried on

Nature and location of work

Name and address of Principal Employer

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of workman</th>
<th>Father’s/Husband Name</th>
<th>Designation/nature of employment</th>
<th>Particulars of damage or loss</th>
<th>Date of damage/loss</th>
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<tr>
<th>Whether workman showed cause against deductions</th>
<th>Name of person in whose presence employees explanation was heard</th>
<th>Amount of deduction Imposed</th>
<th>No. of installment</th>
<th>First Installment</th>
<th>Last Installment</th>
<th>Remarks</th>
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FORM XXII

[SEE RULE 78(2)]

REGISTER OF ADVANCES

Name and address of Contractor

Name and address of establishment in/ under which contract is carried on

Nature and location of work

Name and address of Principal Employer

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of workman</th>
<th>Father’s/Husband Name</th>
<th>Designation/nature of employment</th>
<th>Wages period and wages payable</th>
<th>Date and amount of advance given</th>
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Purpose / for which advance made

No. of installments by which advance is to be paid

Date and amount of each installment repaid

Date on which last installment was repaid

Remarks

<table>
<thead>
<tr>
<th>Purpose / for which advance made</th>
<th>No. of installments by which advance is to be paid</th>
<th>Date and amount of each installment repaid</th>
<th>Date on which last installment was repaid</th>
<th>Remarks</th>
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### FORM XXIII

[See Rule 78(2) (E)]

**REGISTER OF OVERTIME**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of workman</th>
<th>Father’s/Husband Name</th>
<th>Sex</th>
<th>Designation/ nature of employment</th>
<th>Date on which overtime worked</th>
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<tr>
<th>Total overtime worked or production in case of piece rated</th>
<th>Normal rate of wages</th>
<th>Overtime rate of wages</th>
<th>Overtime earning</th>
<th>Rate on which overtime wages paid</th>
<th>Remarks</th>
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APLICATION FOR EXTENSION OF TIME

(To be completed by the Contractor)

PART –I

1. Name of Contractor

2. Name of the work as given in the Agreement

3. Agreement No.

4. Estimated amount put to Tender

5. Date of commencement work as per agreement

6. Period allowed for completion of work as per agreement

7. Date of completion stipulated as per agreement

8. Period for which extension of time has been given previously
   Extension granted
   a) First extension vide Engineer-in-charge letter No… ……date     Months     Days
   b) 2nd extension vide Engineer-in-charge letter No………. date          Months     Days
   c) 3rd extension vide Engineer-in-charge letter No………. date          Months     Days
   d) 4th extension vide engineer-in-charge letter No………. date          Months     Days

   Total extension previously given

9. Reasons for which extension have been previously given (copies of the previous application should be attached)

10. Period for which extension is applied for:

11. Hindrances on account of which extension is applied for with dates on which hindrances occurred, and the period for which these are likely to last.
   a) Serial No.
   b) Nature of hindrance
c) Date of Occurrence

d) Period for which it is likely to last

e) Period for which extension required for this particular hindrance.

f) Overlapping period, if any, with reference to item

g) Net extension applied for

h) Remarks, if any

Total period for which extension is now applied for on account of hindrances mentioned above .......... Month/ days.

12. Extension of time required for extra work.

13. Details of extra work and on the amount involved:

   a) Total value of extra work

   b) Proportionate period of extension of time based on estimated amount put to tender on account of extra work.

14. Total extension of time required for 11 & 12

Submitted to the Engineer-In-Charges office.

SIGNATURE OF CONTRACTOR

DATE
APPLICATION FOR EXTENSION OF TIME

(PART – II)

1. Date of receipt of application from Contractor for the work in the Engineer-In-Charge office.

2. Acknowledgement issued by Engineer-In-Charge vide his letter No dated

3. Engineer-In-Charge remarks regarding hindrances mentioned by the Contractor.
   i) Serial No.
   ii) Nature of hindrance
   iii) Date of occurrence of hindrance
   iv) Period for which hindrance, is likely to last
   v) Extension of time period applied for by the Contractor
   vi) Over lapping period, if any, giving reference to items which over lap
   vii) Net period for which extension is recommended.
   viii) Remarks as to why the hindrance occurred and justification for extension recommended.

4. Engineer-In-Charge recommendations.

   (The present progress of the work should be stated and whether the work is likely to be completed by the date upto which extension has been applied for. If extension of time is not recommended, what compensation is proposed to be levied under the agreement.)

SIGNATURE OF ENGINEER-IN-CHARGE

APPROVAL OF ZONAL HEAD
PROFORMA FOR EXTENSION OF TIME

PART –III

To

NAME

ADDRESS OF THE CONTRACTOR

SUBJECT:

Dear Sir(s)

Reference your letter No __________ dated __________, in connection with the grant of extension of time for completion of the work.....

The date of completion for the above mentioned work, is __________ as stipulated in the agreement, dated __________.

Extension of time for completion of the above mentioned work is granted upto __________, without prejudice to the right of EPI to recover compensation for delay in accordance with the provision made in the relevant Clause (s) of the said agreement dated the ___/___/____. It is also clearly understood that EPI shall not consider any revision in contract price or any other compensation whatsoever due to grant of this extension.

Provided that notwithstanding the extension hereby granted, time is and shall still continue to be the essence of the said agreement.

Yours faithfully,

FOR EPI LTD.
PROFORMA FOR BANK GUARANTEE IN LIEU OF EARNEST MONEY DEPOSIT

In consideration of Chairman & managing Director, Engineering Projects (India) Limited, (A Govt. of India Enterprise), Core-3, Scope Complex, Lodhi Road, New Delhi Pin- 110003. (hereinafter called the EPI) having agreed to accept bank Guarantee of Rs ................. in lieu of EARNEST MONEY DEPOSIT from ................................................................. (hereinafter called the Supplier/ Contractor/ Sub-Contractor, which expression shall include its heirs, successors and assignees) in respect of the Tender for .................................................................

We, ........................................ bank having its registered/head office at ................................... (hereinafter referred to as the Bank) do hereby agree and undertake to pay to EPI without demur or protest an amount not exceeding Rs........................... on demand by EPI.

We the above said Bank further agree and undertake to pay the said amount of Rs........................ without any demur on demand within 48 hours. Any demand made on the Bank by EPI shall be conclusive as regards the amount due and payable by the Bank under this guarantee.

We the above said Bank further agree that the guarantee herein contained shall be in full force and in effect until ................................................................. date .........................

Unless a demand or claim under this guarantee is made on us in writing on or before ........................................ date ......................... , we shall be discharged from all liabilities under this guarantee thereafter.

We, the above said Bank, further agree that EPI shall have full liberty, without our consent and without affecting in any manner our obligation to verify, modify or delete any of the conditions.

We, the above said Bank, lastly undertake not to revoke this guarantee during its currency except with the prior consent of EPI in writing.

Dated.........................this day of..............200.

For and on behalf of the Bank

NOTE: on a Non-Judicial stamp paper of Rs. 100/- (Rupees One hundred only)
SECURITY DEPOSIT CUM PERFORMANCE BANK GUARANTEE

The Chairman & Managing Director
(A Govt. of India Enterprise),
Engineering Projects (India) Ltd.
Core-3, SCOPE Complex
7, Institutional Area, Lodhi road
New Delhi – 110 003

Dear Sir,

In consideration of the Chairman & Managing Director, Engineering Projects (India) Ltd. (A Govt. of India Enterprise), Core-3, Scope Complex, 7 Institutional Area, Lodhi Road, New Delhi – 110 003 (hereinafter called ‘EPI’ which expression shall unless repugnant to the subject or context includes its successors and assigns) having agreed under the terms and conditions of Supply Contract/Contract/Sub-Contract no.__________________ Dated__________________ made between M/s _________________________ (hereinafter referred to as the said Supplier/Contractor/Sub-Contractor) which expression shall unless repugnant to the subject or context includes its successors and assigns) and EPI in connection with ________________ (hereinafter called ‘The said Supply Contract/Contract/Sub-Contract) to accept a Deed Security Deposit-cum-Performance Bank Guarantee as herein provided for ______________________ in lieu of:

a) The Security Deposit to be made by the said Supplier/Contractor/Sub-Contractor for the due fulfillment by the said Supplier/Contractor/Sub-Contractor of the terms and conditions contained in the said Supply Contract/Contract/Sub-contract, and

b) Fulfillment of the conditions of the said Supply Contract/Contract/Sub-Contract by furnishing a security for the performance of the works and/or equipment/materials supplied in accordance with conditions of the said Supply Contract/Contract/Sub-Contract.

1. We ______________________ (hereinafter referred to as “the said bank which expression shall unless repugnant to the subject or context includes its successors and assigns) and having our registered office at ______________________ do hereby unconditionally and irrevocably undertake and agree to indemnify and keep indemnified EPI from time to time to the extent of ______________________ Only against any loss, damages, costs, charges and expenses caused to or suffered by or that may be caused or suffered by EPI by reason of any breach or breaches by the said Supplier/Contractor/Sub-Contractor of any of the terms and conditions contained in the said Supply Contract/Contract/Sub-Contract and or any amount becoming due for non-
performance and/or penalty as assessed by EPI and top unconditionally pay the amount claimed by EPI on demand and without demur and protest.

2. We the said Bank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Supply Contract/Contract/Sub-Contract and till all the dues of EPI under the said Supply Contract/Contract/Sub-Contract or by virtue of any of the terms and conditions governing the said Supply Contract/Contract/Sub-Contract have been fully paid and its claims satisfied or discharged and till EPI certifies that the terms and conditions of the said Supply Contract/Contract/Sub-Contract have been fully and properly carried out by the said Supplier/Contractor/Sub-Contractor and accordingly discharge this guarantee subject, however, that EPI shall have no claim under this guarantee after 6 months from the date of expiry of the guarantee unless a notice of the claim under this guarantee has been served on the Bank before the expiry of the said period of 6 months.

3. EPI shall have the fullest liberty without affecting in any way the liability of the said Bank under this Guarantee or indemnity from time to time to vary any of the terms and conditions of the said Supply Contract/Contract/Sub-Contract to extend time of performance of the said Supply Contract/Contract/Sub-Contract or to postpone for any time and from time to time any power’s exercisable by it against the said Supplier/Contractor/Sub-Contractor and either to enforce or forbear from enforcing any of the terms and conditions governing the said Supply Contract/Contract/Sub-Contract or securities available to EPI and the said Bank shall not be released from its liability under these presents by any exercise by EPI of the liberty with reference to the matters aforesaid or by reason of time being given to the said Supplier/Contractor/Sub-Contractor or of any other matter or thing whatsoever which under the law relating to sureties would but for this provision have the effect of so releasing the said Bank from its such liability.

4. We, the said Bank, further agree that EPI shall be the sole judge of and as to whether the said Supplier/Contractor/Sub-Contractor has committed any breach or breaches of any of the terms and conditions of the said Supply Contract/Contract/Sub-Contract and the extent of loss, damage, cost, charges and expenses caused to or suffered by or that may be caused to or suffered by EPI on account thereof and the decision of EPI that the said Supplier/Contractor/Sub-Contractor has committed such breach or breaches and as to the amount or amounts of loss, damages, costs, charges and expenses caused to or suffered by EPI from time to time shall be final and binding on the Bank.

5. This guarantee shall be a continuing guarantee and shall remain valid and irrevocable for all claims of EPI and liabilities of the said Supplier/Contractor/Sub-Contractor arising up to and until mid night of ____________________________, subject the claim period as mentioned in para ______________.

6. This guarantee shall be in addition to any other guarantee or security whatsoever that EPI may now or at any time anywise may have in relation to the said Supplier/Contractor/Sub-Contractor obligation/ liabilities under and/or in connection with the said Supply Contract/Contract/Sub-Contract and EPI shall have full authority to take recourse to or enforce this guarantee in preference to any other guarantee or
security which EPI may have or obtain and there shall be no forbearance on the part of EPI IN ENFORCING OR REQUIRING ENFORCEMENT OF ANY OTHER SECURITY AND shall not have the effect of releasing the said Bank from its full liability hereunder:

7. EPI shall be at liberty without reference to the said Bank and without effecting the full liability of the said Bank hereunder to take any other security in respect of the said supplier's/Contractor's/sub-Contractor’s obligations and/or liabilities under or in connection with the said Supply Contract/ Contract/ Sub-Contract.

8. This guarantee shall not be determined or affected by the liquidation or winding up, dissolution, or change of constitution or insolvency of the said Supplier/Contractor/Sub-Contractor, but shall in all respects and for all purposes be binding and operative until payment of all moneys paid to EPI in terms thereof.

9. The said Bank hereby waives all rights at any time inconsistent with the terms of this guarantee and the obligations of the said Bank in terms hereof shall not be anywise affected or suspended by reasons of any dispute or disputes having been raised by the said Supplier/Contractor/Sub-Contractor (whether or not pending before any arbitrator, tribunal or court) of any denial or liability by the said Supplier/ Contractor/Sub-Contractor stopping or preventing or purporting to stop or prevent any payment by the said Bank to EPI in terms hereof. The amount stated in any notice of demand addressed by EPI to the Guarantor Bank as liable to be paid to EPI by the Supplier/ Contractor/Sub-Contractor on account of any losses or damages or costs, charges and/or expenses shall as between the said bank and EPI be conclusive evidence of the amount so liable to be paid to EPI or suffered or incurred by EPI as the case may be and payable by the said Bank to EPI in terms hereof. We, the said Bank further undertake that we shall pay forthwith the amount stated in the notice of demand to EPI without demur and protest.

10. We, the said bank undertake not to revoke this guarantee during its currency except with the consent of EPI in writing and agree that any change in the constitution of the said Supplier/Contractor/Sub-Contractor or the said Bank shall not discharge our liabilities hereunder.

11. It shall not be necessary for EPI to proceed against the said Supplier/Contractor/Sub-Contractor before proceeding against the Bank and the guarantee herein contained shall be enforceable against the Bank notwithstanding any security which EPI may have obtained or obtain from the Supplier/Contractor/Sub-Contractor shall at the time when proceedings are taken against the said Bank hereunder be outstanding or unrealized.

12. Our liability under this guarantee shall be restricted to ________________ and this guarantee shall remain in force until midnight of ________________ unless a claim to enforce this guarantee is filed with us within six months from ________________. (which is date of expiry of this guarantee), we shall be discharged from all liabilities under this guarantee thereafter.

DATED ---------------------------- THIS day of -----------------------200…

FOR AND ON BEHALF OF BANK
PROFORMA FOR ADVANCE BANK GUARANTEE

To

The Chairman & Managing Director,
Engineering Projects (India) Ltd.,
(A Govt. of India Enterprise),
Core-3, Scope Complex,
7, Institutional Area,
Lodhi Road,
New Delhi—110 003.

Dear Sir,

1. In consideration of the Chairman & Managing Director, Engineering Projects (India) Limited, (A Govt. of India Enterprise), Core-3, Scope Complex, 7, Institutional Area, Lodhi Road, New Delhi – 110 003 (hereinafter called 'EPI' which expression shall includes its successors and assigns) having agreed under the terms and conditions of Supply Contract/ Contract/ Sub-Contract No……………………………dated…(hereinafter referred to as the said Supply Contract/ Contract/ Sub-Contract) made between EPI and……………………….hereinafter called the Supplier/ Contractor/ Sub-Contractor) which expression shall include its successors and assigns to make at the request of the Supplier/ Contractor/ Sub-Contractor a lump sum advance of Rs…………..for utilising it only for the purposes of the said Supply Contract/ Contract/ Sub-Contract on his furnishing a guarantee acceptable to EPI.

2. We, the...... Bank (hereinafter referred to as 'the said Bank) a Company under the Companies Act 1956 and having our registered office at…………. ......................do hereby guarantee the recovery of the said advance and interest thereon as provided according to the terms and conditions of the said Supply Contract/ Contract/ Sub-Contract. If the Supplier/ Contractor/ Sub-Contractor fails to utilise the said advance for the purposes of the said Supply Contract/ Contract/ Sub-Contract and/or the said advance together with interest thereon as aforesaid is not fully recovered by EPI, we. ............Bank hereby unconditionally and irrevocably undertake to pay the EPI on demand and without demur or protest to the extent of the said sum of Rs……………any claim made by EPI on us against non-utilisation / misutilisation of the said advance and/or by reason of EPI not being able to recover in full the sum of Rs……………….. with interest as aforesaid.

3. We...............Bank further agree that EPI shall be the sole judge of and as to whether the said Supplier/ Contractor/ Sub-Contractor has utilised or not utilised the said advance or any part thereof for the purposes of the said Supply Contract/ Contract/ Sub-Contract and/or as to whether the advance or any part thereof with
interest has been recovered or not and the finding of the EPI in this regard shall be final and binding on us.

4. We, the said Bank further agree that the Guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Supply Contract/Contract/Sub-Contract and till the said advance with interest has been fully recovered and its claims satisfied or discharged and till EPI certificates that the said advance with interest has been fully recovered from the Supplier/Contractor/Sub-Contractor.

5. EPI shall have the fullest liberty without affecting in any way the liability to the said Bank under this guarantee or indemnity from time to time to vary any of the terms and conditions of the said Supply Contract/Contract/Sub-Contract, or the advance or to extend time of performance by the said Supplier/Contractor/Sub-Contractor or to postpone for any time and from time to time any powers exercisable by it against the said Supplier/Contractor/Sub-Contractor and either to enforce or forbear from enforcing any of the terms and conditions governing the said Supply Contract/Contract/Sub-Contract or securities available to EPI and the said Bank shall not be released from its liability under these presents by any exercise by EPI of the liberty with reference to the matters aforesaid or by reason of time being given to the said Supplier/Contractor/Sub-Contractor or any other forbearance, act or omission on the part of the EPI or any indulgence by EPI to the said Supplier/Contractor/Sub-Contractor or of any other matter or thing whatsoever which under the law relating to sureties would but for this provision have the effect of so releasing the said Bank from its such liability.

6. The Bank hereby waives all rights at any time inconsistent with the terms of this guarantee/Undertaking and the obligations of the Bank in terms hereof shall not be anywise affected or suspended by reasons of any dispute or disputes having been raised by the Supplier/Contractor/Sub-Contractor (whether or not pending before any arbitrator, Tribunal or court) or any denial or liability by the Supplier/Contractor/Sub-Contractor stopping or preventing or purporting to stop or prevent any payment by the Bank to EPI in terms hereof.

7. The amount stated in any notice of demand addressed by EPI to Bank as liable to be paid to EPI by the Supplier/Contractor/Sub-Contractor, shall be conclusive evidence of the amount so liable to be paid to EPI by the Bank.

8. This guarantee/undertaking shall be in addition to any other guarantee or security whatsoever that EPI may now or any time anywise may have in relation to the Supplier’s/Contractor’s/Sub-Contractor’s obligations of liabilities under and/or in connection with the said Supply Contract/Contract/Sub-Contract, and EPI shall have full authority to take recourse to or enforce this security in preference to any other guarantee or security which EPI may have or obtain and there shall be no forbearance on the part of EPI in enforcing or requiring enforcement of any other security and shall not have the effect of releasing the Bank from its full liability hereunder.

9. It shall not be necessary for EPI to proceed against the said Supplier/Contractor/Sub-Contractor before proceeding against the Bank and the guarantee herein contained shall be enforceable against the Bank notwithstanding any security which EPI may have obtained or obtain from the Supplier/Contractor/Sub-Contractor, shall at the time
when proceedings are taken against the said Bank hereunder be outstanding or unrealised.

10. We, ..................................... the said Bank further undertake that we shall pay forthwith the amount stated in the notice of demand without demur and protest notwithstanding any dispute/difference pending between the parties before the arbitrator Tribunal or Court and/or dispute is being referred to arbitrator.

11. We, the said Bank undertake not to revoke this Guarantee during its currency except with the consent of EPI in writing and agree that any change in the Constitution of the said Supplier/ Contractor/ Sub-Contractor or the said Bank shall not discharge our liability hereunder.

12. This guarantee/undertaking shall be a continuing guarantee/undertaking and shall remain valid and irrevocable for all claims of EPI and liabilities of the Supplier/ Contractor/ Sub-Contractor arising up to and until midnight of………

13. Notwithstanding anything contained herein above, our liability under this guarantee shall be restricted to Rs………………. (Rs……………………………….) and this guarantee shall remain in full force till……………. unless a claim is made on us within 3 months from the date of expiry of this guarantee i.e. before all the claims under this guarantee shall be forfeited and we shall be relieved of and discharged from our liabilities hereunder.

Dated………………………………………………day of……………………………………..200

For and on behalf of Bank
PROFORMA FOR PERFORMANCE BANK GUARANTEE

To

The Chairman & Managing Director,
Engineering Projects (India) Ltd.,
(A Govt. of India Enterprise),
Core-3, Scope Complex,
7, Institutional Area,
Lodhi Road,
New Delhi—110 003.

Dear Sir,

In consideration of the Chairman & Managing Director, Engineering Projects (India) Limited, (A Govt. of India Enterprise), Core-3, Scope Complex, 7, Institutional Area, Lodhi Road, New Delhi – 110 003 (hereinafter called ‘EPI’ which expression shall include its successors and assigns) having awarded to ……………… (hereinafter referred to as ‘the Supplier/ Contractor/ Sub-Contractor’ which expression shall wherever the subject or context so permits include its successors and assigns) a Supply Contract/Contract / Sub-Contract No. ……………… in terms inter alia, of EPI Letter No. ………………dated… and the General Conditions of Contract/ General Purchase Conditions of EPI and upon the condition of the Supplier’s/ Contractor’s/ Sub-Contractor’s furnishing security for the performance of the Supplier’s/ Contractor’s/ Sub-Contractor’s obligations and/or discharge of the Supplier’s/ Contractor’s/ Sub-Contractor’s liability under and/or in connection with the said Supply Contract/ Contract/ Sub-Contract up to a sum of Rs………………(Rupees……………………………..only).

1. We………………………………………………………………………………………….(hereinafter called ‘the Bank’ which expression shall include its successors and assigns) hereby jointly and severally undertake the guarantee to payment to EPI in rupees forthwith on demand in writing and without protest or demur or any and all monies anywise payable by the Supplier/ Contractor/ Sub-Contractor to EPI under in respect of or in connection with the said Supply Contract/ Contract/ Sub-Contract inclusive of all EPI’s losses and damages and costs, charges and expenses and other moneys anywise payable in respect to the above as specified in any notice of demand made by the EPI to the Bank with reference to this guarantee up to and aggregate limit of Rs……………………………..(Rupees……………………………………………………only).
2. We……………….. Bank further agree that EPI shall be sole judge of and as to whether the said Supplier/ Contractor/ Sub-Contractor has committed any breach or breaches of any of the terms and conditions of the said Supply Contract/ Contract/ Sub-Contract and the extent of loss, damage, cost, charges and expenses caused to or suffered by or that may be caused to or suffered by EPI on account thereof and the decision of EPI that the said Supplier/ Contractor/ Sub-Contractor has committed such breach or breaches and as to the amount or amounts of loss, damage, costs, charges and expenses caused to or suffered by EPI from time to time shall be final and binding on us.

3. EPI shall be at liberty without reference to the Bank and without effecting the full liability of the Bank hereunder to take any other security in respect of the Supplier’s/ Contractor’s/ Sub-Contractor’s obligations and/or liabilities under or in connection with the said Supply Contract/ Contract/ Sub-Contract and to vary the forms vis-à-vis the Supplier/ Contractor/ Sub-Contractor of the said Supply Contract/ Contract/ Sub-Contract or to grant time and/or indulgence to the Supplier/ Contractor/ Sub-Contractor or to reduce or to increase or otherwise vary the prices of the total Supply Contract/ Contract/ Sub-Contract Value or to release or to forbear from enforcement of all or any of the security and/or any other security(ies) now or hereafter held by the EPI and no such dealing(s) reduction(s) increase(s) or other indulgence(s) or arrangements with the Supplier/ Contractor/ Sub-Contractor or release or forbearance whatsoever shall absolve the bank of the full liability to EPI hereunder or prejudice rights of EPI against the bank.

4. The guarantee/undertaking shall not be determined or affected by the liquidation or winding up, dissolution, or change of constitution or insolvency of the Supplier/ Contractor/ Sub-Contractor but shall in all respects and for all purposes be binding and operative until payment of all moneys made to EPI in terms thereof.

5. The Bank hereby waives all rights at any time inconsistent with the terms of this guarantee/undertaking and the obligations of the Bank in terms hereof shall not be anywise affected or suspended by reasons of any dispute or disputes having been raised by the Supplier/ Contractor/ Sub-Contractor (whether or not pending before any arbitrator, Tribunal or Court) of any denial or liability by the Supplier/ Contractor/ Sub-Contractor stopping or preventing or purporting to stop or prevent any payment by the Bank to the EPI in terms hereof.

6. The amount stated in any notice of demand addressed by EPI to Bank as liable to be paid to EPI by the Supplier/ Contractor/ Sub-Contractor or as suffered or incurred by the EPI on account of any losses or damages or costs, charges and/or expenses shall be conclusive evidence of the amount so liable to be paid to EPI or suffered or incurred by EPI as the case may be and shall be payable by the Bank to EPI in terms hereof.
7. This guarantee/undertaking shall be a continuing guarantee/undertaking and shall remain valid and irrevocable for all claims of EPI and liabilities of the Supplier/Contractor/Sub-Contractor arising up to and until midnight of……………….

8. This guarantee/undertaking shall be in addition to any other guarantee or security whatsoever that EPI may now or any time anywise may have in relation to the Supplier’s/Contractor’s/Sub-Contractor’s obligations of liabilities under and/or in connection with the said Supply Contract/Contract/Sub-Contract, and EPI shall have full authority to take recourse to or enforce this security in preference to any other guarantee of security which EPI may have or obtain and here shall be no forbearance on the part of EPI in enforcing or requiring enforcement of any other security and shall not have the effect of releasing the Bank from its full liability hereunder.

9. It shall not be necessary for EPI to proceed against the said Supplier/Contractor/Sub-Contractor before proceeding against the Bank and the guarantee herein contained shall be enforceable against the Bank notwithstanding any security which the EPI may have obtained or obtain from the Supplier/Contractor/Sub-Contractor, shall at the time when proceedings are taken against the said Bank hereunder be outstanding or unrealised.

10. We the said Bank undertake not to revoke this guarantee during its currency except with the consent of EPI in writing and agree that any change in the constitution of the said Supplier/Contractor/Sub-Contractor or the said bank shall not discharge our liability hereunder.

11. We ………….the said Bank further undertake that we shall pay forthwith the amount stated in the notice of demand without demur and protest notwithstanding any dispute/difference pending between the parties before the arbitrator Tribunal or Court and/or any dispute is being referred to arbitrator.

12. Notwithstanding anything contained herein above, our liability under this guarantee shall be restricted to Rs…………………………… (Rupees……………………………….) and this guarantee shall remain in force till………………… unless a claim is made on us within 3 months from that date, that is before all the claims under this guarantee shall be forfeited and we shall be relieved of and discharged from our liabilities thereunder.

Dated………………………………………. day of………………………………………. 200

For and on behalf of Bank
INDEMNITY BOND

THIS INDEMNITY BOND is made this ........................................ day of................. 20.......... by........................................ (Contractor's Name) a Company registered under the Companies Act, 1956/Partnership firm/Proprietary concern having its Registered Office at ............... (hereinafter called as ‘Contractor’ which expression shall include its successors and permitted assigns) in favour of Engineering Projects (India) Limited, a Company incorporated under the Companies Act, 1956 having its Registered Office at Core-3, Scope Complex, 7, Institutional Area, Lodhi Road, New Delhi - 110 003 (hereinafter called “EPI” which expression shall include its successors and assigns)

WHEREAS EPI has awarded to the Contractor a Contract for the work of............... vide its letter of Intent/Work Order No............. dated...................(hereinafter called the “Contract”) in terms of which EPI is required to give “Secured Advance” to the Contractor as per Clause no. 35 of the General Conditions of Contract against supply of materials by the Contractor for the project on the security of materials, the quantities, rates and other particulars of which are detailed in the Bill of Quantities for the said Contract.

And WHEREAS by virtue of Clause no. 35 of the General Conditions of Contract of the said Contract, the Contractor is required to execute an Indemnity Bond in favour of EPI for the amount of “Secured Advance” towards the materials actually supplied by the Contractor for the Contract Work from time to time to EPI for the purpose of performance of the Contract. (hereinafter called the “Materials”).

“AND WHEREAS the Contractor has applied to EPI that they may be allowed “Secured Advance” on the security of materials absolutely belonging to them and brought by them to the site of the works for use in construction of the work”.

NOW THEREFORE, This Indemnity Bond witnesseth as follows:

1. That in consideration of the “Secured Advance” being given to the Contractor as mentioned in the Contract, for the purpose of performance of the Contract, the Contractor hereby undertakes to indemnify and shall keep EPI indemnified, for the Actual Cumulative Amount of the “Secured Advance” given to the Contractor from time to time against the said Contract. The Contractor hereby acknowledges actual receipt of the materials etc. as per despatch title documents being /to be handed over to EPI from time to time. The Contractor shall hold such materials in trust as a “Trustee” for and on behalf of EPI.
2. That the Contractor is obliged and shall remain absolutely responsible for the safe transit/protection and custody of the materials at EPI’s project site against all risks whatsoever till the materials are duly used/erected in accordance with the terms of the Contract and the plant/package duly erected and commissioned in accordance with the terms of the Contract is taken over by EPI and the Secured Advance is fully adjusted/recovered as per terms of the Contract. The Contractor undertakes to keep EPI harmless against all losses, damages, deterioration and shortages that may be caused to the materials.

3. The Contractor undertakes that the materials shall be used exclusively for the performance/execution of the Contract strictly in accordance with its terms and conditions and no part of the materials shall be utilized for any other work or purpose whatsoever. It is clearly understood by the Contractor that non-observance of the obligations under this Indemnity Bond by the Contractor shall inter-alia constitute a criminal breach of trust on the part of the Contractor for all intents and purposes including legal/penal consequences.

4. That EPI is and shall remain the exclusive owner of the materials free from all encumbrances, charges or liens of any kind, whatsoever. The materials shall at all times be open to inspection and checking by the Engineer – In-Charge or other employees/agents authorized by him in this regard. Further, EPI shall always be free at all times to take possession of the materials in whatever form the materials may be, if in its opinion, the materials are likely to be endangered, misutilised or converted to uses other than those specified in the Contract, by any acts of omission or commission on the part of the Contractor or any other person or on account of any reason whatsoever and the Contractor binds himself and undertakes to comply with the directions of demand of EPI to handover the materials without any demur or reservation.

5. That this Indemnity Bond is irrevocable. If at any time any loss or damage occurs to the materials or the same or any part thereof is mis-utilised in any manner whatsoever, then the Contractor hereby agrees that the decision of the Engineer-In-Charge of EPI as to assessment of loss or damage to the materials shall be final and binding on the Contractor. The Contractor binds itself and undertakes to replace the lost and/or damaged materials at its own cost and/or shall pay the amount of ‘Secured Advance’ to EPI without any demur, reservation or protest. This is without prejudice to any other right or remedy that may be available to EPI against the Contractor to recover any amount or all the amounts of this Bond from any dues of the Contractor under the Contract or as per the law.

6. This Bond shall remain in force and effect till the completion of the work as per the aforesaid Contract and till all the amount recoverable under this Bond from the Contractor is fully recovered by EPI. The Bond can not be revoked by the Contractor without the written consent of EPI.

7. That Contractor also agrees that any change in the constitution of the Contractor shall not discharge them from their obligation and liability.

8. This Bond shall be treated as an additional addage to the Contract and nothing herein contained shall be construed to adversely affect the rights of EPI in the Contract.
IN WITNESS WHEREOF, the Contractor has signed this Indemnity Bond through its duly authorized representative on the date and place first above written.

For and on behalf of Contractor

(Contractor’s Name)

WITNESS:

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FORM FOR GUARANTEE BOND
FOR ANTI-TERMITE TREATMENT

THIS AGREEMENT made this ____ day of Two thousand _____ between M/s________ (hereinafter called the guarantor of the one part and M/s Engineering Projects (India) Limited, hereinafter called EPI hereinafter called the OWNER of the other part.

Whereas this agreement is supplementary to the contract hereinafter called the contract dated_______ made between the guarantor of the one part and Engineering Projects (India) Ltd., of the other part whereby the Contractor inter-alia, understood to render the buildings and structures in the said contract recited, completed, termite proof. And whereas the guarantor agreed to give a guarantee to the effect that the said structure will remain termite proof for TEN YEARS to be so reckoned from the date after the maintenance period prescribed in the contract expires.

During this period of guarantee the guarantor shall make good all defects and for that matter shall replace at his risk and cost such wooden member as may be damaged by termite and in case of any other defect being found, he shall render the building termite proof at his cost to the satisfaction of the Engineer-In-Charge and shall commence the works of such rectification within seven days from date of issuing notice from the Engineer-In-Charge calling upon him to rectify the defects falling which the work shall be got done by EPI/ OWNER by some other Contractor at the guarantor’s cost and risk and in the later case the decision of the Engineer-In-Charge as to the cost recoverable from the guarantor shall be final and binding.

That if the Guarantor fails to execute the Anti-Termite treatment or commits breaches hereunder then the Guarantor will indemnify EPI against all losses damages, cost expenses or otherwise which may be incurred by him by reasons of any default on the part of the guarantor in performance and observance of this supplemental Agreement. As to the amount of loss and or damage and/or cost incurred by EPI/ OWNER, the decision of the Engineer-In-Charge will be final and binding on the parties.

In witness where of these presents have been executed by the Guarantor_________ and by________________ for and on behalf of EPI on the day of month and year first above written.

Signed sealed and delivered by (Guarantor)

IN THE PRESENCE OF:
1.
2.

Signed for and on behalf of EPI by/ in presence of:
1.
2.
GUARANTEE TO BE EXECUTED BY CONTRACTOR FOR REMOVAL OF DEFECTS AFTER COMPLETION IN RESPECT OF WATER PROOFING WORKS

The agreement made this …………….. day of …………….. Two thousand …………….. between …………………………… (hereinafter called Guarantor of the one part) and EPI (hereinafter called the Execution Agency of the other part).

WHEREAS this agreement is supplementary to a contract (hereinafter called the Contract), dated ……………. and made between the GUARANTOR OF THE ONE part and EPI of the other part, whereby the Contractor, inter-alia, undertook to render the buildings and structures in the said contract recited completely water and leak proof.

AND WHEREAS the Guarantor agreed to give a guarantee to the effect that the said structures will remain water and leak proof for ten years from the date of handing over of the structure of water proofing treatment.

NOW THE GUARANTOR hereby guarantees that water proofing treatment given by him will render the structures completely leak proof and the minimum life of such water proofing treatment shall be ten years to be reckoned from the date after the maintenance period prescribed in the contract.

Provided that the Guarantor will not be responsible for leakage caused by earthquake or structural defects or misuse of roof or alteration and for such purpose.

a) Misuse of roof shall mean any operation, which will damage proofing treatment, like chopping of firewood and things of the same nature, which might cause damage to the roof.

b) Alternation shall mean construction of an additional storey or a part of the roof or construction adjoining to existing roof whereby proofing treatment is removed in parts

c) The decision of the Engineer-In-Charge with regard to cause of leakage shall be final

During this period of guarantee, the Guarantor shall make good all defects and in case of any defect being found render the building water proof to the satisfaction of the Engineer-In-Charge at his cost and shall commence the work for such rectification within seven days from the date of issue of notice from the Engineer-In-Charge calling upon him to rectify the defects failing which the work shall be got done by EPI by some other Contractor at the guarantor's cost and risk. The decision of Engineer-In-Charge as to the cost, payable by the Guarantor shall be final and binding.

That if the Guarantor fails to execute the waterproofing or commits breach thereunder, then the Guarantor will indemnify the principal and his successors against all laws
damage, cost, expense or otherwise which may be incurred by him by reason of any default on the part of the GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and / or damage and/ or cost incurred by EPI, the decision of the Engineer-In-Charge will final and binding on the parties.

IN WITNESS WHEREOF these presents have been executed by the Obligor,,,,,,,, and by ............ And for and on behalf of EPI on the day, month and year first above written.

Signed, sealed and delivered by Obligor in the presence of-

1. 

2. 

Signed for and on behalf of EPI by ________________

In presence of:

1. 

2. 
AGREEMENT FORM

This agreement made this day of (Month) (Year), between THE ENGINEERING PROJECTS (INDIA) LIMITED (EPI), (A Govt. of India enterprise) a company incorporated under the Companies Act, 1956 having its Registered and Corporate Office at Core-3, Scope Complex, 7, Institutional area, Lodhi Road, New Delhi – 110003 (hereinafter referred to as the “EPI” which expression shall include its administrators, successors, executors and assigns) of the one part and M/s (NAME OF CONTRACTOR) (hereinafter referred to as the ‘Contractor’ which expression shall unless the context requires otherwise include its administrators, successors, executors and permitted assigns) of the other part.

WHEREAS, EPI, is desirous of construction of (NAME OF WORK) (hereinafter referred to as the “PROJECT”) on behalf of the (NAME OF OWNER/MINISTRY) (hereinafter referred to as “OWNER”), and had invited Tenders as per Tender Documents vide NIT No. _____.

AND WHEREAS (NAME OF CONTRACTOR) had participated in the above referred Tender vide their tender dated _____ and EPI has accepted their aforesaid Tender and award the contract for (NAME OF PROJECT) on the terms and conditions contained in its Letter of Intent No. __________ dated ______ and the documents referred to therein, which have been unequivocally and unconditionally accepted by (NAME OF CONTRACTOR) vide their Letter of Undertaking dated _______ resulting into a contract.

NOW THEREFORE THIS DEED WITNESSETH AS UNDER:

ARTICLE 1.0 – AWARD OF CONTRACT

1.1 SCOPE OF WORK

EPI has awarded the contract to (NAME OF CONTRACTOR) for the work of (NAME OF WORK) on the terms and conditions in its Letter of intent No. __________ dated _______ and the documents referred to therein. The award of work has taken effect from (DATE) i.e. the date of issue of aforesaid letter of intent. The terms and expressions used in this agreement shall have the same meanings as are assigned to them in the “Contract Documents” referred to in the succeeding Article.

ARTICLE 2.0 – CONTRACT DOCUMENTS

2.1 The contract shall be performed strictly as per the terms and conditions stipulated herein and in the following documents attached herewith (hereinafter referred to as “Contract Documents”).

a) EPI Notice Inviting Tender vide No. ______ date _____ and EPI’s Tender Documents consisting of:

i) Instructions to Tenderers and General Conditions of Contract (GCC) alongwith amendments/errata to GCC (if any) issued (Volume-I).
ii) Additional Conditions of Contract including Appendices & Annexures, Volume-II.

iii) Bill of Quantities along with amendments/corrigendum of schedule items, if any (Volume-III).

iv) Technical Specifications

v) Drawings

vi) ______________________________________________

b) (NAME OF CONTRACTOR) letter/proposal no._________________
dated ________ and their subsequent communication:

i) Letter of Undertaking of Tender Conditions dated ______________

ii) _____________________________________________________

iii) _____________________________________________________

2.2 EPI’s detailed Letter of Intent No. __________ dated _____ including Bill of Quantities. Agreed time schedule, Contractor’s Organisation Chart and list of Plant and Equipments submitted by Contractor.

2.3 All the aforesaid contract documents referred to in Para 2.1 and 2.2 above shall form an integral part of this Agreement, in so far as the same or any part thereof conform, to the Tender Documents and what has been specifically agreed to by EPI in its Letter of Intent. Any matter inconsistent therewith, contrary or repugnant thereto or deviations taken by the Contractor in its “TENDER” but not agreed to specifically by EPI in its Letter of Intent, shall be deemed to have been withdrawn by the Contractor without any cost implication to EPI. For the sake of brevity, this Agreement along with its aforesaid contract documents and Letter of Intent shall be referred to as the “Contract”.

ARTICLE 3.0 – CONDITIONS & CONVENANTS

3.1 The scope of Contract, Consideration, Terms of Payments, Advance, Retention Moneys, Taxes wherever applicable, Insurance, Agreed Time Schedule, Compensation for delay and all other terms and conditions contained in EPI’s Letter of Intent No. __________ dated _____ are to be read in conjunction with other aforesaid Contract Documents. The contract shall be duly performed by the Contractor strictly and faithfully in accordance with the terms of this contract.

3.2 The scope of work shall also include all such items which are not specifically mentioned in the Contract Documents but which are reasonably implied for the satisfactory completion of the entire scope of work envisaged under this contract unless otherwise specifically excluded from the scope of work in the Letter of Intent.

3.3 Contractor shall adhere to all requirements stipulated in the Contract documents.

3.4 Time is the essence of the Contract and it shall be strictly adhered to. The progress of work shall conform to agreed works schedule/contract documents and Letter of Intent.

3.5 This agreement constitutes full and complete understanding between the parties and terms of the presents. It shall supersede all prior correspondence to the extent of inconsistency or repugnancy to the terms and conditions contained in
Agreement. Any modification of the Agreement shall be effected only by a written instrument signed by the authorized representative of both the parties.

3.6 The total contract price for the entire scope of this contract as detailed in Letter of Intent is Rs. _________________ (Rupees _____________________________ only), which shall be governed by the stipulations of the contract documents.

ARTICLE 4.0 – NO WAIVER OF RIGHTS

4.1 Neither the inspection by EPI or the Engineer-In-Charge or Owner or any of their officials, employees or agents nor order by EPI or the Engineer-In-Charge for payment of money or any payment for or acceptance of, the whole or any part of the work by EPI or the Engineer-In-Charge nor any extension of time nor any possession taken by the Engineer-In-Charge shall operate as waiver of any provisions of the contract, or of any power herein reserved to EPI, or any right to damage herein provided, nor shall any waiver of any breach in the contract be held to be a waiver of any other or subsequent breach.

ARTICLE 5.0 – GOVERNING LAWS AND JURISDICTION

5.1 The Laws applicable to this contract shall be the laws in force in India and as amended from time to time.

Jurisdiction shall be of the Court (s) stated in the 'Memorandum' to the ‘Form of Tender’ only.

5.2 Notice of Default

Notice of default given by either party to the other party under the Agreement shall be in writing and shall be deemed to have been duly and properly served upon the parties hereto, if delivered against acknowledgment due or by FAX or by registered mail duly addressed to the signatories at the address mentioned herein above.

IN WITNESS WHEREOF, the parties through their duly authorized representatives have executed these presents (execution whereof has been approved by the Competent Authorities of both the parties) on the day, month and year first above mentioned at New Delhi.

For and on behalf of:      For and on behalf of:

(NAME OF CONTRACTOR)     M/s. Engineering Projects (I) Ltd.

WITNESS:       WITNESS:

1.         1.

2.         2.
ENGINEERING PROJECTS (INDIA) LIMITED
(A Govt. of India Enterprise)

QUALITY CONTROL FORMATS AND CHECKLISTS
# NAME OF PROJECT

## CONTRACT

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<tr>
<td></td>
<td>LOCATION BLOCK LOCATION</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## LAYOUT
- Alignment
  - Checked
- Level of base
  - Checked
- Dimensional Check (edges & diagonals)
- Staircase
- Location of cutout & services

## STAGING / SCAFFOLDING
- Adequacy & rigidity of Props, stays, bracings, conformity to scheme orgs.

## FORMWORK
- Qty. of forms and support
  - Props adequate
- Vertical form surface in alignment & plumb
- Even Surface
  - Oil sprayed
- Gaps between shuttering are properly closed
- No space for sagging of Formwork
- Rebars
  - Adequate laps
  - Welds
  - Chair / cover blocks
  - Placed as per scheme
  - Binding wire not Touching shuttering
  - Fixtures, inserts
  - Conduits in position
- Dowels & positioning
  - Provided as per org.
- Walkway
  - Provided
  - Labour provided

## REINFORCEMENT

## CLEARANCE from Elect. In-charge

## PRE-CONCRETING
- Concrete
  - Arrangements
- Approval of Construction joint
- Condition & mixing
  - Mixer / Vibrator
  - Top level of Concrete marked
  - Transporting & Placing arrangement

## POST-CONCRETING
- Compaction
  - Checked
- Removal of Laitance
- Post Concreting Level / Dimensions
  - No. of Cubes Cast

## DESHUTTERING & CLEARING
- Curing days
  - Water / compound
  - Surface finish
  - Concrete Test
    - Results OK

## SIGNATURE

<table>
<thead>
<tr>
<th>CONTRACTOR</th>
<th>DATE</th>
<th>SITE ENGR</th>
<th>DATE</th>
<th>SITE INCHARGE</th>
<th>DATE</th>
<th>CONSULTANT</th>
<th>DATE</th>
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<table>
<thead>
<tr>
<th>LAYOUT</th>
<th>SCAFFOLDING</th>
<th>PRE-LAYING</th>
<th>LAYING</th>
<th>CURING AND CLEARING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment &amp; wall</td>
<td>Adequacy of props,</td>
<td>Working arrangements</td>
<td>Joint thickness &amp; course</td>
<td>Proper curing of const.</td>
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<tr>
<td>Thickness Checked</td>
<td>Stays, platform</td>
<td>&amp; service provisions checked</td>
<td>Ht. As specified</td>
<td>Joint</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td>Checked</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Raking of joints</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>Done (if applicable)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Bearing plaster for</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td>Concrete</td>
</tr>
<tr>
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<tr>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Brick on edge (top course)</td>
<td>Rigidity of base</td>
<td>Bricks as per specification</td>
<td>Joint alignment</td>
<td>Scaffolding removed</td>
</tr>
<tr>
<td></td>
<td>Movement Space</td>
<td>Mortar grade &amp; mix</td>
<td>Checked</td>
<td>(if required)</td>
</tr>
<tr>
<td></td>
<td>Approach to height</td>
<td>As specified</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bricks moistened</td>
<td></td>
<td></td>
</tr>
<tr>
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**NAME OF PROJECT** ____________________________

**CONTRACT** ________________

**CHECK LIST FOR MASONRY WORK**

**REF DRAWING No.** ____________________________

**CONTRACT No.** ____________________________

**LOCATION BLOCK** ____________________________ **FLOOR** ____________________________ **AREA** ____________________________

**SIGNATURE** ____________________________

**DATE** ____________________________

**SITE ENGR** ____________________________ **DATE** ____________________________

**SITE INCHARGE** ____________________________ **DATE** ____________________________

**W.O. ITEM** ____________________________ **UNIT** ____________________________ **QTY** ____________________________

**CONTRACTOR** ____________________________ **DATE** ____________________________

**CONSULTANT** ____________________________ **DATE** ____________________________

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<table>
<thead>
<tr>
<th>CONTRACT</th>
<th>CHECK LIST FOR PLASTERING WORK</th>
<th>REF. DRAWING No.</th>
<th>LOCATION BLOCK</th>
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<th>AREA</th>
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<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SCAFFOLDING**
- Platform
  - Stability
  - Approach to Height

**SERVICE**
- All chasing work
  - Complete
  - Fixing in position
  - Using clamps etc.
  - Patching
  - Work complete
  - All door/window frames
    - Fixed in position
    - Skirting to floors marked

**SURFACE PREPARATION**
- Clearing & raking of surface
  - Roughening
  - Fixing metal/lathe
    - Chicken mesh
  - Mortar level
  - Guides made
  - Surface moistened
  - Cement slurry

**PLASTERING**
- Mix & W/P compound
  - Checked as per specification
  - Coating/thickness
    - As specified
  - Groove at Joints
    - Provided
  - Corners & edges sharp
    & at right Angles lines & levels maintained
  - Surface leveled with
    - At straight edge

**FINISHING**
- Texture
  - Curing Days
  - Site cleared

**SIGNATURE**

**CONTRACTOR** | **DATE** | **SITE ENGR** | **DATE** | **SITE INCHARGE** | **DATE** | **CONSULTANT** | **DATE**

**W.O. ITEM** | **UNIT** | **QTY**

---

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NAME OF PROJECT ____________________________

<table>
<thead>
<tr>
<th>CONTRACT</th>
<th>CHECK LIST FOR LAYING OF EXTERNAL SEWER</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTRACT No.</td>
<td>REF DRAWING No.</td>
<td>LOCATION BLOCK _______ FLOOR _______ AREA _______</td>
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</table>

<table>
<thead>
<tr>
<th>EXCAVATION</th>
<th>LAYOUT</th>
<th>Slope/cutting as per Specifications</th>
<th>Level</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LAYING/RCC</td>
<td>Bed concrete as per Specifications</td>
<td>RCC pipes as per Requirement</td>
<td>Jointing of Pipes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Boxing</td>
<td>Strata bore Dewatering (wherever required)</td>
<td>Mortar as per specifications</td>
<td>Plastering</td>
</tr>
<tr>
<td>Manholes</td>
<td>Bricks as per specifications</td>
<td>End of pipes plugged</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Back fillings</td>
<td>In layers</td>
<td></td>
<td></td>
<td></td>
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<table>
<thead>
<tr>
<th>SIGNATURE</th>
<th>V.O. ITEM</th>
<th>UNIT</th>
<th>QTY.</th>
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</thead>
<tbody>
<tr>
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<td>SITE ENGR</td>
<td>DATE</td>
</tr>
</tbody>
</table>

123
<table>
<thead>
<tr>
<th>SCAFFOLDING</th>
<th>Platform</th>
<th>Stability</th>
<th>Movement space</th>
<th>Approach to Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>SERVICE PROVISIONS</td>
<td>All chasimg work Complete</td>
<td>All door/window frames Fixed in position</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SURFACE PREPARATION</td>
<td>Roughening/hocking of surface done</td>
<td>Fixing metal/lath Chicken mesh</td>
<td>Mortar level Guides made</td>
<td>Surface moistened/Cement slurry</td>
</tr>
<tr>
<td>BASE PLASTER</td>
<td>Mix &amp; W/P compound Checked against spec</td>
<td>Coating/thickness As specified</td>
<td>Corners &amp; edges sharp &amp; at right angles lines &amp; levels maintained</td>
<td></td>
</tr>
<tr>
<td>TOP LAYER</td>
<td>Fixing of beading for grooves as per drawing</td>
<td>Lines &amp; levels of grooves maintained</td>
<td>Mix as per specification</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Washing of top layer</td>
<td>Washing with acid (light)</td>
<td>Curing day</td>
<td>Texture of final surface</td>
</tr>
<tr>
<td>SIGNATURE</td>
<td>W.O. ITEM</td>
<td>UNIT</td>
<td>QTY</td>
<td></td>
</tr>
<tr>
<td>CONTRACTOR</td>
<td>DATE</td>
<td>SITE ENGR DATE</td>
<td>SITE INCHARGE DATE</td>
<td>CONSULTANT DATE</td>
</tr>
<tr>
<td>MATERIAL</td>
<td>Make as specified</td>
<td>Thickness / class as specified</td>
<td>Length &amp; dia as specified</td>
<td>No cracks or holes visible</td>
</tr>
<tr>
<td>----------------</td>
<td>------------------</td>
<td>-------------------------------</td>
<td>--------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>LAYOUT</td>
<td>Space distribution &amp; Alignment as specf.</td>
<td>Plumb of vertical line checked</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIXING PIPE &amp; FITTINGS</td>
<td>Qty available for pipes fittings &amp; jointing material as per size &amp; fixing</td>
<td>Cutting &amp; Jointing as specified</td>
<td>Fixing of fittings &amp; specials as specified</td>
<td>Connection with corr. internal networks</td>
</tr>
<tr>
<td>SMOKE TEST</td>
<td>Open ends plugged</td>
<td>Injection of smoke Pressure</td>
<td>No leakage of Smoke</td>
<td>Section is Ok</td>
</tr>
</tbody>
</table>

**NAME OF PROJECT**

**CONTRACT**

**REFERENCE DRAWING NO.**

**CONTRACT NO.**

**LOCATION BLOCK**

**FLOOR**

**AREA**

---

**SIGNATURE**

**CONTRACTOR**

**DATE**

**SITE ENGR**

**DATE**

**SITE INCHARGE**

**DATE**

**CONSULTANT**

**DATE**

---

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**NAME OF PROJECT**

**CONTRACT**

**REF DRAWING No.**

**LOCATION BLOCK**

**FLOOR**

**AREA**

<table>
<thead>
<tr>
<th>LAYOUT</th>
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</thead>
<tbody>
<tr>
<td>Sub base</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Provided</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Services</td>
<td></td>
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</tr>
<tr>
<td>Checked</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slope</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provision</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Checked</td>
<td></td>
<td></td>
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</tbody>
</table>

| BASE LAYER   |         |         |         |         |
| Mix          |         |         |         |         |
| As specified |         |         |         |         |
| Water        |         |         |         |         |
| Cement       |         |         |         |         |
| Slurry       |         |         |         |         |
| Applied      |         |         |         |         |
| Cement      |         |         |         |         |
| Concrete     |         |         |         |         |
| Thickness    |         |         |         |         |
| Checked      |         |         |         |         |
| Joints       |         |         |         |         |
| Treatment    |         |         |         |         |
| If any,      |         |         |         |         |
| Provided     |         |         |         |         |

| TOP LAYER    |         |         |         |         |
| Mix          |         |         |         |         |
| As specified |         |         |         |         |
| Proper       |         |         |         |         |
| Leveling     |         |         |         |         |
| Done         |         |         |         |         |
| Trowelling   |         |         |         |         |
| Finish       |         |         |         |         |
| Proper       |         |         |         |         |
| Curing       |         |         |         |         |
| Done         |         |         |         |         |

| FINISHING    |         |         |         |         |
| Grinding    |         |         |         |         |
| Final        |         |         |         |         |
| Grinding     |         |         |         |         |
| Stages       |         |         |         |         |
| Repair       |         |         |         |         |
| Applied      |         |         |         |         |
| Grinding     |         |         |         |         |
| Polishing    |         |         |         |         |

<table>
<thead>
<tr>
<th>W.O. ITEM</th>
<th>UNIT</th>
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**SIGNATURE**

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</table>

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**NAME OF PROJECT**

**CONTRACT**

**CHECK LIST FOR GLAZED TILE FLOORING**

**CONTRACT No.**

**REF DRAWING No.**

**LOCATION BLOCK**

**FLOOR**

**AREA**

<table>
<thead>
<tr>
<th>LAYOUT</th>
<th>Fixing pattern</th>
<th>Level of base &amp; dark</th>
<th>Finish level Guide</th>
<th>Door &amp; window frames in position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service provisions Sanitary, electrica</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BASE</td>
<td>Mix</td>
<td>Thickness</td>
<td>Watering / Cement slurry</td>
<td>Evenness</td>
</tr>
<tr>
<td>LAYING</td>
<td>Moistening of tiles</td>
<td>Plan position of cut pieces at corner</td>
<td>Cut to size Smooth edge</td>
<td>Chamfering of edges &amp; edge matching proper</td>
</tr>
<tr>
<td>Cement slurry adhesive</td>
<td>Level &amp; plumb checked</td>
<td>No hollow sound on tapping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FINISHING</td>
<td>Grouting of joints</td>
<td>Curing of joints</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>W.O. ITEM</th>
<th>UNIT</th>
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<table>
<thead>
<tr>
<th>CONTRACT No.</th>
<th>CHECK LIST FOR WATER BOUND MACADAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATION</td>
<td></td>
</tr>
</tbody>
</table>

**MATERIAL AGGREGATE**
- Gradation as specified
- Crushing strength as specified
- No of layers
- Thickness of layers starting from subgrade

**SCREENINGS**
- Gradation as specified
- Crushing strength
- As specified
- Waiting & rolling as specified

**MOORUM**
- Gradation as specified
- Silt content as specified
- Fill material

**LAYOUT**
- Alignment of central line as per drawings and reference points
- Marking of Carriage way edges as per drawings
- Cross section levels of precedent layer recorded

**WATER BOUND MACADAM**
- Templates placed of specified thickness
- Placing, leveling of stone aggregate
- Stone Screening spread as specified
- Dry rolling as specified
- Top cross section lands layer recorded
- Application of moorum as specified
- Wet rolling / compaction as specified

<table>
<thead>
<tr>
<th>W.O. ITEM</th>
<th>UNIT</th>
<th>QTY.</th>
</tr>
</thead>
</table>

**SIGNATURE**

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<th>DATE</th>
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</tr>
</thead>
</table>
ENGINEERING PROJECTS (INDIA) LTD.  
(A GOVT OF INDIA ENTERPRISE)  

MATERIALS MANAGEMENT DIVISION  

GENERAL PURCHASE CONDITIONS  

1. DEFINITION  

1.1 The Buyer means Engineering Projects (India) Limited, a Company incorporated in India and having its registered office and Corporate Office at Core 3, Scope Complex, Lodi Road, New Delhi-110003.  

1.2 Supplier' means the tenderer whose tender has been accepted and shall include his its/their heirs, executors, administrators or successors and permitted agents as the case may be.  

1.3 'Purchase Order' means the letter of memorandum, communicating to the supplier, the acceptance of his tender and includes an advance acceptance of his tender.  

1.4 'Consignee' means where the stores are required by the purchase order to be despatched by rail, road, air or steamer, the person specified in the Purchase Order to whom they are to be delivered at the destination, where the stores are required by the Purchase Order to be delivered to a person as an interim consignee for the purpose of dispatch to another person, such other person and in any other case the person to whom the stores are required by the Purchase Order to be delivered in the manner specified therein.  

1.5 'Inspectors': Inspectors deputed by BUYER.  

2. TERMS & EXPRESSIONS  

Terms & expressions not herein defined shall have the same meanings as assigned to them in the Indian Sales of Goods Act, 1930, Indian Contract Act, 1872 and General Clause Act, 1897.  

3. PRICES  

Prices accepted by the BUYER shall be considered as firm and not subject to escalation due to any variations in the prices of materials, labour and/or any other reasons whosoever which may occur while the order is being carried out.  

4. Payment Terms  

Unless otherwise agreed upon between the parties, payment for delivery of
the stores will be made on submission of bills in accordance with instruction given in the purchase order by a cheque or demand draft in accordance with the following procedure. 90% of the price of the equipment/material shall be paid on proof of despatch to the consignee through bank or delivery to an interim consignee, if any, and on production of Inspection Note issued by the Inspector, Maker's Test Certificate, the number- and date of the Railway receipt, postal receipt, bill of lading or consignment note under which the goods charged for in the bill are despatched by rail, post, sea or air respectively and the number and date of the letter with which such railway receipt, post receipt, bill of lading shall also be attached to the bill and in the case of stores despatched by post, the postal receipt shall be attached in original to the bill. The bank charges shall be borne by the supplier.

4.1 Balance 10% of price of equipment/material shall be released within 30 days after expiry of the warranty period as per Clause No. 17.

5. Insurance to be arranged by BUYER.

6. Inspection, Checking, Testing

The stores covered by the Purchase Order shall be subject to preliminary inspection and testing at any time prior to shipment and/or despatch and final inspection within a reasonable time after arrival at the place of delivery. The Inspector shall have the right to carry out the inspection and testing which include raw materials at manufacturer's work and at the time of actual despatch before and after completion of packing.

The supplier shall inform the BUYER at least 21 days in advance of the exact place, date and time of rendering the stores for required inspection, provide free access to Inspectors during normal working hours at supplier's or his/its sub-supplier's works and places at their disposal, internal test reports, material/component test certificates, approved drawings and all useful means of performing, checking, marking, testing, inspection and final stamping at his own expenses. Stores offered without internal testing shall be treated as a lapse on the part of supplier.

If, after receiving inspection call from the supplier/manufacturer the inspector on reaching the works finds that the equipment/materials offered for inspection is not fully ready or fails to meet vital requirements, it will be deemed to be a fake inspection call. Issue of a fake inspection call shall be treated as a serious lapse on the part of the supplier.

In the event of rejection of stores due to defective workmanship/material/design or fake inspection call, the stores would be offered for re-inspection at the earliest. The BUYER shall have the right to deduct the cost of re-inspection from the supplier's invoices.

Even if inspections and tests are fully carried out, supplier shall not be absolved to any degree from their responsibilities to ensure that stores supplied, comply strictly with requirements, of the purchase order at the time of delivery, inspection on arrival at site, after its erection or start-up and guarantee period.
In any case, the stores must be strictly in accordance with the Purchase order failing which the BUYER shall have the right to reject goods and hold the supplier liable for non-performance of contract.

7. **Maker's Test Certificate:**

Maker's Test Certificate shall be supplied by the supplier at the time of inspection. Failure to comply may cause delay in the issue of certificate of inspection and consequent delay in delivery and payment.

8. **Packing, Marking and Painting :**

A. The stores shall be despatched by the supplier adequately packed in appropriate packing which should be suitable for sea and inland carriage and ensure complete safety of goods from any kind of damage in transport both on sea and land and all equipment should be properly lubricated.

B. Each package shall contain packing list in English. Each packing shall bear the following marking in English, in indelible paint:

(i) Address of the Ultimate Consignee (ii) Address of the Interim Consignee, if any (iii) Name of Railway Station for ultimate and interim consignee, (iv) Supplier's name (v) Name of Equipment (vi) Railway Station from where despatched (vii) Purchase Order No. & Date (viii) Package Number (ix) Gross Weight in Kg (x) Net Weight in Kg. (xi) Outer Dimension in Cms. (xii) TOP 'Do NOT TURN OVER' 'HANDLE WITH CARE' etc.

The package shall indicate the centre of gravity with a red vertical line, wherever required, together with marking for slings.

The package which cannot be so marked shall have metal tags with the above marking on them.

As far as possible, size of packings shall remain within the permissible limit allowed by the Indian Railways. If this is not possible, timely information will be given and necessary over dimension sanction obtained.

9. **Security Deposit :**

The successful tenderer shall be required to furnish security deposit equal to 5% of the value of the contract within 7 days from the date of intimation of the acceptance of Purchase Order for due and proper fulfilment of the contract. The security deposit is to be deposited in the form of unconditional irrevocable bank guarantee from a Nationalised Bank (if from any other bank the bank guarantee should be duly countersigned by State Bank/Reserve Bank). The bank guarantee should remain valid till completion of supplies.

10. **Despatch Instructions :**

Despatches of stores will be arranged by Public Tariff rates. In case of FOR Station of Despatch stores shall be booked at full wagon rates whenever available and by the most economical route or by most economical tariff available. Failure to do so will render the supplier liable for any avoidable expenditure caused to the BUYER.
11. **Assembly, after sales service and training:**

If required by the BUYER the supplier shall be fully responsible for the assembly of the equipment at destination site and completeness of the machinery from the angle of its end use. The supplier shall provide necessary "After Sales Service" and also impart training to the Consignee's staff in the operation and maintenance of the equipment free of cost to the satisfaction of the consignee. Furthermore, all tools and plants particularly heavy cranes, which are generally used as well as semi-skilled and unskilled labour for the assembly of such machinery will be provided by the BUYER free of cost to the supplier with consumable stores, like fuel, oil, lubricants, battery acids, cotton waste, grease etc., free of cost for the purpose of starting the machines, testing and putting them into good working order.

12. **Respect of Delivery Date:**

The time and delivery date as agreed to between the BUYER and Supplier shall be the essence of the contract. No variation shall be permitted, except with prior authorisation in writing from the Buyer. Goods should be delivered securely packed and in good order and conditions at the place and within the time specified for their delivery.

13. **Penalty for late deliveries:**

The time and date of delivery of stores, materials, equipment as agreed to shall be deemed to be the essence of the contract. In case of delay in execution of the order beyond the date of delivery as agreed to for any reason, the BUYER shall recover from the supplier as penalty a sum equivalent to 0.5% of the value of the entire contract for every week of delay or part thereof limited to an aggregate of 5%.

14. **Risk Purchase on Default**

In case of default on the part of the supplier to supply all the stores or part thereof covered by the contract upto the standard/specifications within the contractual delivery period stipulated in the contract, the BUYER shall have the right to purchase such stores or other of similar description at the risk and cost of the supplier. However, supplier shall be liable to pay penalty under clause 13 above for resultant delay.

15. **Delay due to force majeure**

If any time during the continuance of the contract the performance in whole or part by either party on any obligation under the contract shall be prevented or delayed by reason of any war, hostility, explosions, epidemics, quarantine restrictions, or other acts of God, then provided, notice of the happening of any such event is given by either party to the other within twenty one days from the date of occurrence thereof, neither party shall be reason of such event be entitled to terminate this contract nor shall either party have any claim for damages against the other in respect of such non-performance and delay in performance and deliveries under the contract shall be resumed as soon as practicable after such event has come to an end or ceased to exist and the decision of the Chairman and Managing Director, EPI, New Delhi as to whether the deliveries so
resumed shall be final and binding on both the parties. In case Force Majeure Condition persists for a period exceeding sixty (60) days, either party may at its option terminate the contract.

BUYER shall be at liberty to take over from the supplier at a price to be fixed by the Chairman and Managing Director, EPI, New Delhi which shall be the final, all unused, undamaged and acceptable material, bought out components and stores in course of manufacture in the possession of the supplier at the time of such termination or portion thereof as the BUYER may deem fit. Rejection, Removal of Rejected Goods and Replacement

In case the testing and inspection at any stage by inspectors reveal that the equipment, material and workmanship do not comply with the specifications and requirements, the same shall be removed by the Supplier at his/its own expenses and risk within the time allowed by the BUYER. The BUYER shall be at liberty to dispose of such rejected goods in such manner as he may think appropriate, in the event the supplier fails to remove the rejected goods within the period as aforesaid.

All expenses incurred by the BUYER for such disposal shall be to the account of the supplier. The freight paid by the BUYER, if any, on the inward journey of the rejected material shall be reimbursed by the supplier to the BUYER before the rejected materials are removed by the Supplier. The supplier will have to proceed with the replacement of that equipment or part of equipment without claiming any extra payment if so required by the BUYER. The time taken for replacement in such event will not be added to the contractual delivery period.

16. Warranty

The supplier shall warrant that every material/plant, machinery and equipment to be supplied be new and free from all defects and faults in design, material, workmanship and manufacture and shall be of the highest quality.

The items should be consistent with the established, recognised or stipulated standards for material of the type usually used for the purpose and in full conformity with the specifications and drawings or samples, if any. Equipment offered must be capable, during operation, of withstanding extreme dusty, wet, humid and sultry conditions. The warranty shall continue not withstanding inspection, payment, acceptance of tendered equipment and shall expire except in respect of complaints notified to supplier prior to such date within 12 months from the date of commissioning or 18 months from the date of despatch whichever is earlier.

17. Performance Guarantee

The supplier shall guarantee that any/all material used in execution of the Purchase Order shall be in strict compliance with characteristics requirements and specifications agreed upon and that same shall be free from any defects.

The supplier shall guarantee that all material and equipment shall be repaired or replaced as the case may be at his own expense in case the same have been found to be defective in respect of material, workmanship or smooth and rated operation within a period of 12 months after the same has been put in service or 18 months from the date of despatch of last consignment, whichever is earlier. The guarantee period for the replacement parts shall be 12 months starting from
the date on which the replacement parts are commissioned. Acceptance by the BUYER or his inspectors of any equipment and materials or their replacement will not relieve the supplier of his/its responsibility concerning the above guarantee.

18. **Indemnity**

The supplier shall at all times indemnify the BUYER against all claims which may be made in respect of stores for infringement of any right protected by patent, registration of design or trade mark. Provided always that in the event of any claim in respect of alleged breach of patent, registered designs or trade mark being made against the BUYER, the BUYER shall notify the supplier of the same and the supplier shall at his own expense either settle any such dispute or conduct any litigation that may arise therefrom. The supplier shall not be liable for payment of any royalty, licence fee or other expenses in respect of or for making of patents or designs with respect to which he is, according to the terms of the contract, to be treated as an agent of the Government for the purpose of making use of the patent or trade mark of fulfilment of the contract.

20. **Spare Parts**

The supplier shall furnish itemised and priced list of spare parts required for two years normal operation of the equipment alongwith the quotation

21. **Drawings**

The supplier shall furnish the general arrangements and dimensional drawings in three sets within four weeks from date of placement of order.

22. **Literature of Equipment**

Following literature and documents for the equipment shall be supplied in five copies each free of cost alongwith the equipment,

(a) Operator’s instructions  
(b) Service Manual  
(c) Illustrated and detailed parts catalogues  
(d) Specifications  
(e) A list of service tools required for routine servicing of the equipment.

23. **Arbitration**

Except where otherwise provided for in the contract all questions and disputes relating to the meaning of the specifications, designs, drawings and instructions herein before mentioned and as to the quality of workmanship or materials used on the work or as to any other questions, claim, right matter or thing whatsoever if any, arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or any contradictions or otherwise concerning the purchase order or the execution or failure to execute the same whether arising during the progress of the work or after the completion or abandonment thereof shall be referred to the sole arbitration of the Chairman and Managing Director/General Manager (accepting authority) of Engineering Projects (India) Ltd. and if the Chairman and Managing Director/General Manager is unable or unwilling to act to the sole arbitration some other person shall be appointed by the Chairman and Managing Director/General Manager willing to act as such arbitrator. There will be no objection if the arbitrator so appointed is an employee of Engineering Projects (India) Ltd., and that he had to deal with matters to
which the contract relates and that in the course of his duties as such he had expressed views on all or any of the matters in disputes or difference. The arbitrator to whom the matter is originally referred being transferred or vacating his office or being unable to act for any reason, such Chairman and Managing Director/General Manager as aforesaid at the time of such transfer, vacation of office or inability to act, shall appoint another person to act as an arbitrator in accordance with the terms of the contract. Such person shall be entitled to proceed with the reference from the stage at which it was left by his predecessor. It is also a term of this contract that no person other than a person appointed by such Chairman and Managing Director/General Manager as aforesaid should act as arbitrator and if for any reason, that is not possible, the matter is not to be referred to arbitration at all. Cases where the amount of award in claim is Rs. 50,000/- (Rupees fifty thousand only) and above, the arbitrator shall give reasons for the award.

Subject as aforesaid the provisions of the arbitration act 1940 or any statutory modification or re-enactment thereof and the rules made thereunder and for time being in force shall apply to the arbitration proceedings under this clause.

It is a term of the contract that the party invoking arbitration shall specify the disputes or dispute to be referred to arbitration under this clause together with the amount or amounts claimed in respect of each such dispute.

The arbitrator may from time to time with consent of the parties enlarge the time, for making and publishing the award.

The work under the contract shall, if reasonably possible continue during the arbitration proceedings.

The arbitrator shall be deemed to have entered on the reference on the date he issues notice to both the parties fixing the date of the first hearing.

The arbitrator shall give a separate award in respect of each disputes or difference referred to him.

The avenue of arbitration shall be such place as maybe fixed by the Arbitrator in his sole discretion.

The award of the arbitrator shall be final, conclusive and binding on all parties to the contract.

24. **Court Jurisdiction**

Disputes of any nature that may arise in connection with the execution of the contract shall be subjected to the jurisdiction of courts situated in Delhi/New Delhi only.
Check List for Evaluation & Selection of Suppliers / Vendors

1. Name

2. Address

3. Contact Person

4. Proprietor

5. a) Phone Nos.
   b) Fax Nos.

6. Items / Products

7. Manufacturer
   Distributor
   Dealer
   Stockist

8. Facilities Available
   In House Through External Agency
   a) Testing Facilities
      i) For Incoming materials
      ii) For In process
      iii) For Final Product
   b) Can Issue Test Certificate Yes No
   c) Details of Manufacturing Facilities
   d) Products being manufactured
      (Product Catalogues)

9. Annual Turn Over

10. Whether ISO 9000 certified or not

11. Whether IS certified or not

12. Reference list of important customers during last five years

13. Ability to give after sales service

14. Sample sent or not
    To Incharge MMD
    EPI
    Signature of Vendor / Supplier
    Name
    Designation
    Date
For use in EPI

Data has been collected over phone verbally.

Signature of person collecting data

**Evaluation & Review**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td>Reviewed the details of vendor Product is suitable</td>
<td></td>
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</table>

If Yes basis

- Sample checked
- Specification checked
- Suppliers details reviewed
- Enjoys goodwill / Reputation

Testing facilities adequate

Enquiries from customers of sub suppliers

Past performance with EPI

—

Approved Reviewed

Signature Signature
TENDER DOCUMENTS

5.00 LLPD DAIRY PLANT &

30 MTPD POWDER PLANT AT

Dehri-On-Sone
Notice Inviting Tender

1. **NAME OF WORK**
   : Design, Construction, Supply, Erection & Commissioning of 5.00 LLPD Dairy Plant & 30 MTPD Powder Plant at Dehri-On-Sone (Bihar)

2. **PERIOD OF CONSTRUCTION**
   : 20 Months

3. **TIME, DATE AND PLACE OF PRE-BID CONFERENCE**
   : 19/08/2013 at 11.00 AM
   COMFED, P.O. - B.V. College, Patna-800014

4. **LAST DATE, TIME AND PLACE FOR RECEIPT OF BIDS**
   : 30/08/2013 at 01.30 PM
   Office either by Courier or by speed post
   COMFED, P.O. – B.V. College, Patna-800014

5. **TIME AND DATE OF OPENING TECHNICAL BIDS**
   : DATE 30/08/2013 TIME 15.00 HOURS

6. **TIME AND DATE OF OPENING FINANCIAL BIDS**
   : TO BE ANNOUNCED LATER

7. **PLACE OF OPENING OF BIDS**
   : COMFED, P.O. – B.V. College, Patna-800014

8. **LAST DATE OF BID VALIDITY**
   : 120 days after 30/8/2013

9. **OFFICER INVITING BIDS**
   : Manager (Engg) on behalf of MD, COMFED

10. **CONTACT PERSON**
    : Manager (Engg)
     COMFED, P.O. - B.V. College
     Patna- 800014
     Email- engineeringcomfed@gmail.com
     Mobile No- 9473199911
SECTION 1
INSTRUCTION TO BIDDERS
(ITB)

A. GENERAL

1.0 Scope of Bid

1.1 The Employer (named in Appendix to ITB) invites bids for the design, construction & execution of 5.00 LLPD Dairy Plant & 30 MTPD Powder Plant at Dehri-On-Son (Bihar) (as defined in these documents and referred to as "the works") detailed in the table given in IFB.

1.2 The successful bidder will be expected to complete the works by the intended completion date specified in the General Conditions of Contract.

1.3 Throughout these bidding documents, the terms 'bid' and 'tender' and their derivatives (bidder/tenderer, bid/tender, bidding/tendering, etc.) are synonymous.

2.0 Source of Funds

2.1 The expenditure on this project will be met from the budget of COMFED.

3.0 Eligible Bidders

3.1 This Invitation for Bids is open to all bidders.

3.2 All bidders shall provide in Section 2, Forms of Bid and Qualification Information, a statement that the Bidder is neither associated, nor has been associated, directly or indirectly, with the COMFED personals any other entity that has prepared the design, specifications, and other documents for the Project or being proposed as Project Manager for the Contract, involve in supervision of the contract. A firm that has been engaged by the Employer to provide the services for the preparation or supervision of the works, and any of its affiliates, shall not be eligible to bid.

3.3 Bidders shall not be under a declaration of ineligibility for corrupt and fraudulent practices by the State Govt. or Central Govt. or Public Undertaking, Autonomous Body.

4.0 Qualification of the Bidder

4.1 All bidders shall provide in Section 2, Forms of Bid and Qualification Information, a preliminary description of the proposed work method and schedule, including drawings and charts, as necessary.

4.2 All bidders shall also furnish the following information in Section 2:

(i) Evidence of access to or availability of credit facilities (minimum 10% of estimated cost) certified by the bankers.

(ii) Undertaking that bidder would be able to invest a minimum of cost upto 25% of the contract value of work, during implementation of contract.

(iii) Proposals, if any, for sub contracting of elements of work, costing more that 10% of the bid amount.

(iv) Power of attorney.

(v) Latest income tax clearance certificate from concerned department.

4.3 If the Employer has not undertaken prequalification of potential bidders, all bidders shall include the following information and documents with their bids in Section 2:

(a) copies of original documents defining the constitution or legal status, place of registration, and principal place of business; written power of attorney of the signatory of the Bid to commit the Bidder;

(b) total monetary value of construction work performed for each of the last five years;
(c) experience in works of a similar nature and size for the last five years, and details of works underway or contractually committed; and clients who may be contacted for further information on those contracts.

(d) major items of construction equipment proposed to carry out the Contract or evidence of arrangement of possessing them on hire/lease/buying as defined therein;

(e) qualifications and experience of key site management and technical personnel proposed for contract;

(f) reports on the financial standing of the Bidder, such as profit and loss statements and auditor's reports for the past five years;

(g) evidence of access to line(s) of credit and availability of other financial resources facilities (10% of contract value), certified by the Bankers (Not more than 3 months old)

(h) undertaking that the bidder will be able to invest a minimum cash up to 25% of contract value of work, during implementation of work.

(i) authority to seek references from the Bidder's bankers.

(j) information regarding any litigation, current or during the last five years, in which the Bidder is involved, the parties concerned and dispute amount.

(k) proposals for subcontracting components of the Works amounting to more that 10% of the Bid Price (for each, the qualifications and experience of the identified sub-contractor in the relevant field should be annexed); (for all contracts over Rs. 2.00 Crore)

(l) the proposed methodology and programme of construction, backed with equipment planning and deployment, duly supported with broad calculations and quality control procedures proposed to be adopted, justifying their capability of execution and completion of the work as per technical specifications within the stipulated period of completion as per milestones (for all contracts over Rs. 2.00 Crore)

4.4A) To qualify for award of the contract, each bidder in its name should have in the last five years as referred to in Appendix.

(a) achieved a minimum annual financial turnover (in all classes of Civil/ Mechanical/Electrical engineering construction works only) volume of work of at least the amount equal to the estimated cost of works for which bid has been invited. The turnover will be indexed at the rate of 8% for a year.

(b) satisfactorily completed as a prime contractor (or as a nominated subcontractor, where the subcontract involved execution of all main items of work described in the bid document, provided further that all other qualification criteria are satisfied) at least one similar work of value not less than amount indicated in Appendix (usually not less than 50% of estimated value of contract);

(c) executed in any one year, the minimum quantities of the following items of work as indicated in Appendix.

- cement concrete (including RCC and PCC) ..........cum
- earthwork in both excavation and embankment (combined quantities) ..........cum
- .................................................. ..........cum
- .................................................. ..........cum

(d) The contractor or his identified sub-contractor should possess required valid electrical license for executing the building electrification works and should have executed similar electrical works for a minimum amount as indicated in Appendix in any one year.

(e) The contractor or his identified sub-contractor should possess required valid license for executing the water supply/sanitary engineering works and should have executed similar water supply/sanitary engineering works for a minimum amount as indicated in Appendix in any one year.
B. Each bidder should further demonstrate:

(a) availability (either owned or leased or by procurement against mobilization advances) of the following key and critical equipment for this work:

Based on the studies, carried out by the Engineer the minimum suggested major equipment to attain the completion of works in accordance with the prescribed construction schedule are shown in the Annexure-I.

The bidders should, however, undertake their own studies and furnish with their bid, a detailed construction planning and methodology supported with layout and necessary drawings and calculations (detailed) as stated in clause 4.3(1) above to allow the employer to review their proposals. The numbers, types and capacities of each plant/equipment shall be shown in the proposals along with the cycle time for each operation for the given production capacity to match the requirements.

(b) Availability for this work of personnel with adequate experience as required; as per Annexure-II.

(c) Liquid assets and/or availability of credit facilities of no less than amount indicated in Appendix (Credit lines/letter of credit/certificates from Banks for meeting the funds requirement etc.- usually the equivalent of the estimated cash flow for 3 months in peak construction period.)

C. To qualify for a contract made up of this and other contract for which bids are invited in the IFB, the bidder must demonstrate having experience and resources sufficient to meet the aggregate of the qualifying criteria for the individual contracts.

4.5 Sub-contractors' experience and resources shall not be taken into account in determining the bidder's compliance with the qualifying criteria except to the extent stated in 4.5(A) above.

4.6 Bidders who meet the minimum qualification criteria will be qualified only if their available bid capacity is more than the total bid value. The available bid capacity will be calculated as under:

Assessed Available Bid capacity = (A*N*3 – B)

Where

A = Maximum value of civil/mechanical/electrical engineering works executed in any one year during the last five years (updated to the price level of the year indicated in Appendix) taking into account the completed as well as works in progress.

N = Number of years prescribed for completion of the works for which bids are invited.

B = Value (updated to the price level of the year indicated in Appendix) of existing commitments and on-going works to be completed during the next one year.

Note: The statements showing the value of existing commitments and on-going works as well as the stipulated period of completion remaining for each of the works listed should be countersigned by the Engineer in charge, not below the rank of an Executive Engineer or equivalent.

4.7 Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have:

- made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements; and/or

- record of poor performance such as abandoning the works, not properly completing the contract, inordinate delays in completion, litigation history, or financial failures etc; and/or

- participated in the previous bidding for the same work and had quoted unrealistically high bid prices and could not furnish rational justification to the employer.

5.0 One Bid per Bidder

5.1 Each bidder shall submit only one bid for any work package or group. A bidder who submits or participates in more than one bid (other than as a sub-contractor or in cases of alternatives that have been permitted or requested) will cause all the proposals with the bidder’s participation to be disqualified.
6.0 Cost of Bidding

6.1 The bidder shall bear all costs associated with the preparation and submission of his Bid, and the Employer will in no case be responsible and liable for those costs.

7.0 Site Visit

7.1 The Bidder, at the Bidder's own responsibility and risk, is encouraged to visit and examine the Site of Works and its surroundings and obtain all information that may be necessary for preparing the Bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the Bidder's own expense.

B. BIDDING DOCUMENTS

8.0 Content of Bidding Documents

8.1 The set of bidding documents comprises the documents listed below and addenda issued in accordance with Clause 10;

<table>
<thead>
<tr>
<th>Section</th>
<th>Particulars</th>
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<tbody>
<tr>
<td>1</td>
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<td>3</td>
<td>Qualifications of Bidders</td>
</tr>
<tr>
<td>4</td>
<td>Conditions of Contracts</td>
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<tr>
<td>5</td>
<td>Contract Data</td>
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<tr>
<td>6</td>
<td>Technical Specifications</td>
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<tr>
<td>7</td>
<td>Form of bid</td>
</tr>
<tr>
<td>8</td>
<td>Bill of Quantities</td>
</tr>
<tr>
<td>9</td>
<td>Securities and other forms</td>
</tr>
<tr>
<td>10</td>
<td>Drawings</td>
</tr>
<tr>
<td></td>
<td>Documents to be furnished by bidder</td>
</tr>
</tbody>
</table>

8.2 The bidder is expected to examine carefully all instructions, conditions of contract, contract data, forms, terms, technical specifications, bill of quantities, forms, Annexes and drawings in the Bid Document. Failure to comply with the requirements of Bid Documents shall be at the bidder's own risk. Pursuant to clause 26 hereof, bids which are not substantially responsive to the requirements of the Bid Documents shall be rejected.

9.0 Clarification of Bidding Documents

9.1 Pre-bid meeting

9.1.1 The bidder or his official representative is invited to attend a pre-bid meeting which will take place at the address, venue, time and date as indicated in appendix.

9.1.2 The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.

9.1.3 The bidder is requested to submit any questions in writing or by Email to reach the Employer not later than one week before the meeting.

9.1.4 Minutes of the meeting, including the text of the questions raised (without identifying the source of enquiry) and the responses given will be transmitted without delay to all purchasers of the bidding documents. Any modification of the bidding documents listed in Sub-Clause 8.1 which may become necessary as a result of the pre-bid meeting shall be made the Employer exclusively through the issue of an Addendum pursuant to Clause 10 and not through the minutes of the pre-bid meeting.

9.1.5 Non-attendance at the pre-bid meeting will not be a cause for disqualification of a bidder.
10.0 Amendment of Bidding Documents

10.1 Before the deadline for submission of bids, the Employer may modify the bidding documents by issuing addenda.

10.2 Any addendum thus issued shall be part of the bidding documents and shall be communicated in writing or by cable to all the purchasers of the bidding documents. Prospective bidders shall acknowledge receipt of each addendum in writing or by cable to the Employer. The Employer will assume no responsibility for postal delays.

10.3 To give prospective bidders reasonable time in which to take an addendum into account in preparing their bids, the Employer may, at his discretion, extend as necessary the deadline for submission of bids, in accordance with Sub-Clause 20.2 below.

C. PREPARATION OF BIDS

11.0 Language of the Bid

11.1 All documents relating to the bid shall be in the English language.

12.0 Documents Comprising the Bid

12.1 The bid to be submitted by the bidder as per the bidding document (refer Clause 8.1) shall be in two separate parts;

Part I shall be named “Technical Bid” and shall comprise
(i) Earnest money in the form specified in Section 8
(ii) Qualification Information and supporting documents as specified in Section- 2
(iii) Certificates, undertakings, affidavits as specified in Section 2
(iv) Any other information pursuant to Clause 4.2 of these instructions
(v) Undertaking that the bid shall remain valid for the period specified in Clause 15.1
(vi) An affidavit affirming the information be has furnished in the bidding document is correct to the best of his knowledge and belief.

Part II shall be named “Financial Bid” and shall comprise
(i) Form of Bid as specified in Section 6
(ii) Priced Bill of Quantities as specified in Section 7

12.2 Each part will be separately sealed and marked in accordance with the Sealing and Marketing Instructions in Clause 19.

12.3 Following documents, which are not submitted with the bid, will be deemed to be part of the bid.

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<td>4</td>
<td>Contract Data</td>
</tr>
<tr>
<td>5</td>
<td>Specifications</td>
</tr>
</tbody>
</table>

13.0 Bid Prices

13.1 The contract shall be for the whole works as described in Sub-Clause 1.1 based on the priced Bill of Quantities submitted by the Bidder.

13.2 All duties, taxes, and other levies payable by the contractor under the contract or for any other cause shall be included in the rates, prices and total Bid Price submitted by the Bidder.

13.3 The rate and prices quoted by the bidder shall be fixed for the duration of the Contract and shall not be subject to adjustment on any account (For contracts up to 18 months period).
14.0 Currencies of Bid and Payment

14.1 The units rates and the prices shall be quoted by the bidder entirely in Indian Rupees. All payments shall be made in Indian Rupees.

15.0 Bid Validity

15.1 Bids shall remain valid for a period not less than 120 days after the deadline date for bid submission specified in Clause 20. A bid valid for a shorter period shall be rejected by the Employer as non-responsive. In case of discrepancy in bid validity period between that given in the undertaking pursuant to Clause 12.1 (v) and the Form of Bid submitted by the bidder, the latter shall be deemed to stand corrected in accordance with the former and the bidder has to provide for any additional security that is required.

15.2 In exceptional circumstances, prior to expiry of the original time limit, the Employer may request that the bidders may extend the period of validity for a specified additional period. The request and the bidders' responses shall be made in writing or by cable. A bidder may refuse the request without forfeiting his bid security. A bidder agreeing to the request will not be required or permitted to modify his bid except as provided in 15.3 hereinafter, but will be required to extend the validity of his bid security for a period of the extension, and in compliance with Clause 16 in all respects.

16.0 Earnest Money

16.1 The Bidder shall furnish, as part of his Bid, a Bid security in the amount as shown in column 4 of the table of IFB for this particular work. This bid security shall be in favour of Employer as named in Appendix and may be in one of the following forms:

a. Indian Post Office Term deposit 3 years/ 5 years/ National Savings Certificate endorsed by the competent postal authority in Bihar issued in the same year.

b. Fixed deposit receipt of a schedule Bank, Fixed deposit receipt should be valid for six months after the last date of receipt of tender and shall be pledged in favour of Bihar State Milk Co-Operative Federation Ltd

c. 5 year National development Bond / State development loan certificate

d. Unconditional Bank guarantees from any schedule Indian Bank issued within the state in the format given in Vol.III (If issued from any bank outside the state will be converted to any bank within the state before executing the agreement)

e. Bank Draft issued by a schedule bank in favour of Bihar State Milk Co-Operative Federation Limited payable at patna.

16.2 Bank guarantees (and other instruments having fixed validity) issued as surety for the bid shall be valid for 45 days beyond the validity of the bid.

16.3 Any bid not accompanied by an acceptable Bid Security and not secured as indicated in Sub-Clauses 16.1 and 16.2 above shall be rejected by the Employer as non-responsive.

16.4 The Earnest money of unsuccessful bidders will be returned within 28 days of the end of the bid validity period specified in Sub-Clause 15.1.

16.5 The Earnest money of the successful bidder will be discharged when the bidder has signed the Agreement and furnished the required Performance Security. The Earnest money may be forfeited

(a) if the Bidder withdraws the Bid after Bid opening during the period of Bid validity;
(b) if the Bidder does not accept the correction of the Bid Price, pursuant to Clause 27; or
(c) in the case of a successful Bidder, if the Bidder fails within the specified time limit to
   (i) sign the Agreement; or
   (ii) furnish the required Performance Security.

17. Alternative Proposals by Bidder
17.1 Bidders shall submit offers that fully comply with the requirements of the bidding documents, including the conditions of contract (including mobilization advance or time for completion), basic technical design as indicated in the drawings and specifications.

17.2 Conditional offer or alternative offers will not be considered further in the process of tender evaluation.

18.0 Format and Signing of Bid

18.1 The Bidder shall submit one set of the bid comprising of the documents as described in clause 12 of ITB.

18.2 The original and copy of the Bid shall be typed or written in indelible ink and shall be signed by a person or persons duly authorized to sign on behalf of the Bidder, pursuant to Sub-Clause 4.3. All pages of the bid where entries or amendments have been made shall be initialed by the person or persons signing the bid.

18.3 The Bid shall contain no alterations or additions, except those to comply with instructions issued by the Employer, or as necessary to correct errors made by the bidder, in which case such corrections shall be initialed by the person or persons signing the bid.

D. SUBMISSION OF BIDS

19.0 Sealing and Marking of Bids

19.1 The Bidder shall place the two separate envelopes. The two envelopes (called as inner envelopes) shall be marked Technical Bid and Financial Bid and the be pur inside one outer envelope. The marked “Technical Bid” and “Financial Bid” will have additional markings as follows.

- Technical Bid: To be opened on 30/08/2013 at 15.00 Hrs. (date of Technical Bid opening) in the presence of Evaluation Committee.

- Financial Bid: Not to be opened except with the approval of Evaluation Committee.

The contents of Technical and Financial Bids will be as specified in clause 12.1

19.2 The inner, outer and separate envelopes containing Technical and Financial Bids shall

(a) be addressed to the Employer at the address given in Appendix

(b) bear the identification no of contract as indicated in Appendix.

(c) provide a warning not to open before the specified time and date for bid opening as specified in ITB.

19.3 In addition to the identification required in Sub-Clause 19.1 and 19.2, each of the envelopes shall indicate the name and address of the bidder to enable the bid to be returned unopened in case it is declared late, pursuant to Clause 21, or the Evaluation Committee declares the bid as non responsive pursuant to Clause 23.

19.4 If the outer envelope is not sealed and marked as above, the Employer will assume no responsibility for the misplacement or premature opening of the bid.

20.0 Deadline for Submission of the Bids

20.1 Complete Bids (including Technical and Financial) must be received by the Employer at the address specified above not later than the date indicated in appendix. In the event of the specified date for the submission of bids declared a holiday for the Employer, the Bids will be received up to the appointed time on the next working day.

20.2 The Employer may extend the deadline for submission of bids by issuing an amendment in accordance with Clause 10, in which case all rights and obligations of the Employer and the bidders previously subject to the original deadline will then be subject to the new deadline.

21.0 Late Bids

21.1 Any Bid received by the Employer after the deadline prescribed in Clause 20 will be returned unopened to the bidder.
E. **BID OPENING AND EVALUATION**

**22.0 Bid Opening**

22.1 The Employer will open all the Bids received (except those received late), including modifications made pursuant to Clause 22, in the presence of the Bidders or their representatives who choose to attend at time, date and the place specified in Appendix in the manner specified in Clause 20 and 23.3. In the event of the specified date of Bid opening being declared a holiday for the Employer, the Bids will be opened at the appointed time and location on the next working day.

22.2 If any of the tenderers or their agents are not present at the time of opening, the employer will open the tender in their absence and prepare a statement and that will be binding on the absent tenderers.

22.3 The envelope containing "Technical Bid" shall be opened. The amount, form and validity of the Earnest money furnished with each bid will be announced. If the bid security furnished does not conform to the amount and validity period as specified in the Invitation for Bid (ref. Column 4 and paragraph 3), and has not been furnished in the form specified in Clause 16, the remaining technical bid and the sealed financial bid will be returned to the bidder.

22.4 (i) Subject to confirmation of the bid security by the issuing Bank, the bids accompanied with valid security will be taken up for evaluation with respect to the Qualification Information and other information furnished in Part I of the bid pursuant to Clause 12.1.

(ii) After receipt of confirmation of the bid security, the bidder will be asked in writing (usually within 10 days of opening of the Technical Bid) to clarify or modify his technical bid, if necessary, with respect to any rectifiable defects.

(iii) The bidders will respond in not more than 7 days of issue of the clarification letter, which will also indicate the date, time and venue of opening of the Financial Bid (usually on the 21st day of opening of the Technical Bid)

(iv) Immediately (usually within 3 or 4 days), on receipt of these clarifications the Evaluation Committee will finalize the list of responsive bidders whose financial bids are eligible for consideration.

22.5 At the time of opening of "Financial Bid", the names of the bidders were found responsive in accordance with Clause 23.4 (iv) will be announced. The bids of only these bidders will be opened. The remaining bids will be returned to the bidders unopened. The responsive Bidders' names, the Bid prices, the total amount of each bid, any discounts, Bid Modifications and withdrawals, and such other details as the Employer may consider appropriate, will be announced by the Employer at the opening. Any Bid price or discount, which is not read out and recorded, will not be taken into account in Bid Evaluation.

22.6 In case bids are invited in more than one package, the order for opening of the "Financial Bid" shall be that in which they appear in the "Invitation For Bid".

22.7 The Employer shall prepare minutes of the Bid opening, including the information disclosed.

**23.0 Process to be Confidential**

23.1 Information relating to the examination, clarification, evaluation and comparison of Bids and recommendations for the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process until the award to the successful Bidder has been announced. Any effort by a Bidder to influence the Employer's processing of Bids or award decisions may result in the rejection of his Bid.

24.0 **Clarification of Financial Bids**

24.1 To assist in the examination, evaluation and comparison of Bids, the employer may, at his discretion, ask any bidder for clarification of his bid, including breakdown of unit rates. The request for clarification and the response shall be sought, offered or permitted except as required to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the bids in accordance with clause 26.
24.2 Subject to sub-clause 24.1, no Bidder shall contact the Employer on any matter relating to his bid from the time of the bid opening to the time of contract awarded. If bidder wishes to bring additional information to the notice of the Employer, it should do so in writing.

24.3 Any effort by the bidder to influence the Employer in the Employer’s bid evaluation, bid comparison or contract award, decision may result in the rejection of the Bidders bid.

25.0 Examination of Bids and Determination of Responsiveness

25.1 During detailed evaluation of "Technical Bids", the Employer will determine whether each Bid (a) meets the eligibility criteria defined in Clause 3 and 4; (b) has been properly signed; (c) is accompanied by the required securities and; (d) is substantially responsive to the requirements of the Bidding documents. During the detailed evaluation of the "Financial Bid", the responsiveness of the bids will be further determined with respect to the remaining bid conditions, i.e., priced bill of quantities, technical specifications, and drawings.

25.2 A substantially responsive "Financial Bid" is one which conforms to all the terms, conditions, and specifications of the Bidding documents, without material deviation or reservation. A material deviation or reservation is one (a) which affects in any substantial way the scope, quality or performance of the Works; (b) which limits in any substantial way, inconsistent with the Bidding documents, the Employer's rights or the Bidder's obligations under the Contract; or (c) whose rectification would affect unfairly the competitive position of other Bidders presenting substantially responsive Bids.

25.3 If a "Financial Bid" is not substantially responsive, it will be rejected by the Employer, and may not subsequently be made responsive by correction or withdrawal of the non-conforming deviation or reservation.

26.0 Correction of Errors

26.1 "Financial Bids" determined to be substantially responsive will be checked by the Employer for any arithmetic errors. Errors will be corrected by the Employer as follows:

(a) where there is a discrepancy between the rates in figures and in words, the rate in words will govern; and

(b) where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by the quality, the unit rate as quoted will govern.

26.2 The amount stated in the "Financial Bid" will be corrected by the Employer in accordance with the above procedure and the bid amount adjusted with the concurrence of the Bidder in the following manner:

(a) If the Bid price increases as a result of these corrections, the amount as stated in the bid will be the ‘bid price’ and the increase will be treated as rebate;

(b) If the bid price decreases as a result of the corrections, the decreased amount will be treated as the ‘bid price’

Such adjusted bid price shall be considered as binding upon the Bidder. If the Bidder does not accept the corrected amount the Bid will be rejected, and the Earnest money may be forfeited in accordance with Sub-Clause 16.6(b).

27.0 Evaluation and Comparison of Financial Bids

27.1 The Employer will evaluate and compare only the Bids determined to be substantially responsive in accordance with Sub-Clause 25.2.

27.2 In evaluating the Bids, the Employer will determine for each Bid the evaluated Bid Price by adjusting the Bid Price as follows:

(a) making any correction for errors pursuant to Clause 26; or

(b) making an appropriate adjustments for any other acceptable variations, deviations.

27.3 The Employer reserves the right to accept or reject any variation or deviation. Variations and deviations and other factors, which are in excess of the requirements of the Bidding documents.
or otherwise result in unsolicited benefits for the Employer, shall not be taken into account in Bid evaluation.

27.4 If the Bid of the successful Bidder is seriously unbalanced in relation to the Engineer's estimate of the cost of work to be performed under the contract, the Employer may require the Bidder to produce detailed price analyses for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, the Employer may require that the amount of the performance security set forth in Clause 31 be increased at the expense of the successful Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract.

27.5 A bid which contains several items in the Bill of Quantities which are unrealistically priced low and which cannot be substantiated satisfactorily by the bidder may be rejected as non-responsive.

F. AWARD OF CONTRACT

28.0 Award Criteria

28.1 Subject to Clause 29, the Employer will award the Contract to the Bidder whose Bid has been determined

(i) to be substantially responsive to the Bidding documents and who has offered the lowest evaluated Bid Price; and

(ii) to be within the available bid capacity adjusted to account for his bid price which is evaluated the lowest any of the packages opened earlier than the one under consideration.

In no case, the contract shall be awarded to any bidder whose available bid capacity is less than the evaluated bid price, even if the said bid is the lowest evaluated bid. The contract will in such cases be awarded to the next lowest bidder at his evaluated bid price.

29.0 Employer's Right to accept any Bid and to reject any or all Bids

Notwithstanding Clause 28, the Employer reserves the right to accept or reject any Bid, and to cancel the Bidding process and reject all Bids, at any time prior to the award of Contract, without thereby in incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders of the ground for the Employer's action.

30.0 Notification of Award and Signing of Agreement

30.1 The Bidder whose Bid has been accepted will be notified of the award by the Employer prior to expiration of the Bid validity period by cable, telex or facsimile confirmed by registered letter. This letter (hereinafter and in the General Conditions of Contract called the "Letter of Acceptance") will state the sum that the Employer will pay the Contractor in consideration of the execution, completion and maintenance of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Contract called the "Contract Price").

30.2 The notification of award will constitute the formation of the Contract, subject only to the furnishing of the performance security in accordance with the provisions of Clause 31.

30.3 The Agreement will incorporate all agreements between the Employer and the successful Bidder. It will be signed by the Employer and the successful Bidder, after the performance security is furnished.

31. Performance Security

31.1 Within 15 (Fifteen) days of receipt of the Letter of Acceptance, the successful Bidder shall deliver to the Employer a Performance Security in any of the forms given below for an amount equivalent 2% of the Contract price including earnest money plus additional security for unbalanced not more than 0.25 % of the Contract Price.

31.2 If the performance security is provided by the successful Bidder in the form of an Bank Guarantee or fixed deposit receipts in the name of Employer, it shall be issued either (a) at the Bidder's option, by a Nationalized / Scheduled Indian bank within state or (b) acceptable to the Employer.
31.3 Failure of the successful Bidder to comply with the requirements of Sub-Clause 34.1 shall constitute sufficient grounds for cancellation of the award and forfeiture of the Bid Security.

32.0 Advance Payment and Security

32.1 The Employer will provide an Advance Payment on the Contract Price as stipulated in the General Conditions of Contract, subject to maximum amount, as stated in the Contract Data.

33.0 Corrupt or Fraudulent Practices

33.1 The Employer will reject a proposal for award if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question and will declare the firm ineligible, either indefinitely or for a stated period of time, to be awarded a contract with PWD and any other agencies, if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for the contractor, or in execution.

33.2 Furthermore, Bidders shall be aware of the provision stated in Sub-Clause 14 of the General Condition of contract.

34.0 Bids from Joint Ventures are also allowed (Criteria for Joint Venture)

34.1 Bids from joint venture are only allowed for the works having estimated cost more than 10.00 cr. Bids submitted by a joint venture (JV) of not more than a total of three firms as partners shall comply with the following requirements:-

34.1.1 There shall be a joint venture Agreement (Refer Annexure specific for the contract package between the constituent firms indicating clearly, amongst other things, the proposed distribution of responsibilities both financial as well as technical for execution of the work amongst them. For the purpose of this clause, the most experience lead partner will be the one defined. A copy of the joint Venture agreement in accordance with requirements mentioned in Annexure -I shall be necessarily submitted with the bid.

34.1.2 Alternatively, a letter of intent to execute a JV in the event of successful bid shall be signed by all partner of JV and submitted with the bid together with a copy of the proposed agreement. Pursuant to the foregoing, the JV shall include amount other things, the joint venture's objectives, the proposed management structure, the contribution of each partner to joint venture operation, the commitment of the partners to joint and several liability for due performance recourse/sanction within the joint venture in the event of default or with drawl of any partner and arrangements for providing the required indemnities.

34.1.3 The JV so formed shall also have to be registered with the concerned department after issue of LOA but before the agreement.

34.2 The bid, and in the case of the successful bidder, the form of agreement etc, shall be signed and/or executed in such a manner as may be required for making it legally binding on all partners (including operative parts of the ensuing contract in respect of Agreement of Arbitration, etc.). On award of work, the form of Agreement and contract Documents shall be signed by all partners of the joint venture to conclude contract Agreement.

34.3 Lead partner shall be nominated as being partner-in-charge: and this authorization shall be evidenced by submitting a power of attorney signed by the legally authorized signatories of all the partners.

34.4 The partner -in- charge shall be authorized to incur liabilities and to receive instruction for and on behalf of the partners of the joint venture, whether jointly or severally and entire execution of the contract (including payment) shall be carried out exclusively through the partner-in-charge. A copy of the said authorization shall be furnished with the bid.

34.5 All partners of the joint venture shall be liable jointly and severally for the execution of the contract in accordance with contract terms, and a relevant statement to this effect shall be included in the authorization mentioned under sub clause (1.3) above as well as in the Form of tender and the Form of Agreement (in case of a successful bidder).

34.6 In the event of default, all the partners of the joint venture will retain the full and undivided responsibility for the performance of their obligations under the contract and/or for satisfactory completion of the works.
34.7 The bid submitted shall include all the event information as required under the provisions of sub clause 4.5 of ITB and furnished separately for each partner. The requirement of key plants & equipments construction equipments as per Annexure 1 of SBD testing equipment for establishing field laboratory key personnel to be employed on contract work as per Annexure II of SBD shall be counted altogether for the partners it shall be less than the requirement.

34.8 The bank guarantee/other suitable instrument in shape of bid security shall be issued in the name of JV and pledged in-favor of employer.

34.9 Each partner of this JV must produce:

34.9.1 The permanent account number (PAN) of Income tax.

34.9.2 An affidavit though 1st class Executive Magistrate that the information furnished with the bid documents is correct in all respect: and.

34.9.3 Such other certificates as defined in the Appendix to ITB. Failure to produce the certificates shall make the bid non-responsive.

34.10 Each bidder must demonstrate:-

34.10.1 Availability for construction work, either owned, or on lease or on hire, of the key equipment stated in the Appendix to ITB including equipments required for establishing field library to perform mandatory test and those stated in the Appendix to ITB. The requirement of key plants & equipments construction equipments as per Annexure 1 of SBD testing equipment for establishing field laboratory key personal to be employed on contract work as per Annexure II of SBD shall be counted altogether for the partners it shall be less than the requirement.

34.10.2 Availability for construction work of technical personnel as stated in the Appendix to ITB. The requirement of key plants & equipments construction equipments as per Annexure 1 of SBD testing equipment for establishing field laboratory key personnel to be employed on contract work as per Annexure II of SBD shall be counted altogether for the partners it shall be less than the requirement.

34.10.3 The joint venture must satisfy collectively the criteria laid down in para 34.1 & 34.2 above.

34.10.4 Liquid assets and/ or credit facilities, net of other contractual commitments and exclusive of any advance payments which any be made under the contract, of not less than the amount specified in the Appendix to ITB.

34.11 The bidder must not have in his employment.

34.11.1 The near relations (defined as first blood relations, and their spouses, of the bidder or the bidders spouse) of persons, The bidder must produce an affidavit stating that the near relations of the following departmental officers are not in his employment:

34.12 To qualify for a package of contracts made up of this and other contracts for which bids are invited in the Notice inviting Tender, the bidder must demonstrate having experience and resources sufficient to meet the aggregate of the qualifying criteria for the individual contract.

34.13 If bidder is joint venture, the partners would be limited to three (including lead partner). Joint venture firm shall jointly and severally responsible for completion of the project. Joint venture must fulfill the following minimum qualification requirement.

34.13.1 The lead partner shall meet not less than 50% (fifty percent) of qualification criteria.

34.13.2 Each of the remaining partners shall meet not less than 25% (Twenty five percent) of qualification criteria.

34.13.3 The joint venture must also collectively satisfy the subject of the criteria of clause 4.2 4.5 A, 4.5 B, 4.7 & 4.8 of ITB for this purpose the relevant figures for each of the partners shall be 100% or more.

34.13.4 In the event that the employer has caused to disqualify under clause 4.8 of ITB and the constitutions stated below of all the joint Venture partners will be disqualified.
34.13.5 Joint venture applicants shall provide certified copy of the Joint Venture Agreement in demonstration of the partners undertaking joint and several liabilities for the performance of any contract entered into with the bid.

34.13.6 The available bid capacity of the JV as required under clause 4.7 of ITB below will be applied for each partner to the extent of his proposed participation in the execution of the work. The total bid capacity available shall be more than estimated contract value.

**The available bid capacity will be calculated as under**

Assessed Available Bid capacity = \((A^N \times M - B)\)

Where

- **A** = Maximum value of civil engineering works executed in any one year during the last five years (updated to the price level of the last year at the rate of 8 percent a year) taking into account the completed as well as works in progress.
- **N** = Number of years prescribed for completion of the works for which bids are invited.
- **M** = 3
- **B** = Value, at the current price level, of existing commitments and on-going works to be completed during the period of completion of the works for which bids are invited.

Note: - The statements showing the value of existing commitments and ongoing works as well as the stipulated period of completion remaining for each of the works listed should be countersigned by the Engineer-In-Charge, not below the rank of an executive Engineer or equivalent.

34.14 Sub-Contractors (duly authorized) experience and resources shall be taken into account in determining the bidders compliance with the qualifying criteria. The sub contractors role may be verified by the employer.

34.15 Qualification of a joint venture does not necessarily qualify any or its partners individually or as a partner to any other joint venture. In case of dissolution of a joint venture, each one of the constituent firms may qualify if they meet all the qualification, requirements subject to the written approval of the Employer.

34.16 The rescinding of contract of a joint venture on account of reasons other than non-performance, such as most experienced partner of joint venture pulling out, court direction leading to breaking up of a joint venture before the start of work, which are not attributable to the poor performance of the contractor will, however, not affect the qualification of the individual partners.

35.0 Submission of Project Report

35.1 The successful bidder must submit the Detailed Project Report containing detailed design/drawing/specification/estimation of Dairy/Cattle/Powder/Ice-Cream Plant along with the Layout Plan duly vetted by NIT/IIT and the cost will be born by them.
G. APPENDIX to ITB

1. Name of the Employer- Bihar State Milk Co-Operative Federation Limited, P.O.- B.V. College Patna- 800014

2. The last five years
   - 2008-2009
   - 2009-2010
   - 2009-2010
   - 2011-2012
   - 2012-2013

3. This annual financial turn over amount is Rs. 100.00 Crores (Rupees Hundred Crores only)

4. Value of work is Rs. 100.00 Crores (Rupees Hundred Crores only)
   (in words)

5. Quantities of work are:
   Quantity of the different items alongwith standard specification of
   PWD (Bihar) will have to be submitted by the bidder as per the drawing
   Submitted by the Bidder. However for Mechanical/Electrical works
   List/Quantities is enclosed for quoting the rate.

6. Price level of the financial year 2012-2013

7. The pre-bid meeting will take place at 19/08/2013 at 11.00 Hrs.
   (address of the venue) on COMFED office, Patna (time and date)

8. The technical bid will be opened at 30/08/2013 at 3.00 PM
   (address of the venue) on COMFED Office, Patna (time and date)

9. Address of the Employer COMFED, , Patna

10. Identification:
    - Bid for construction of 5.00 LLPD Dairy Plant & 30 MTPD
        Powder Plant Dehri-On-Sone (Name of contract)
    - Do not open before at 3:00 PM (time and date)
11. Bids may be submitted only in any one of the following Plinth Area
   Basis for building works, per sqm basis for road & hard park, per Litre
   On capacity of RCC over head water tank.

12. The bid should be submitted latest by 30/08/2013 till 1.30 PM (date
    and time) [Cl. 20.1(a)]

13. The bid will be opened at COMFED Office Patna (place) on 30/08/2013 at 3.00 PM (time and date) [Cl. 23.1]

14. The Bank Draft in favour of Bihar State Milk Co-Operative
    Federation Limited, payable at Patna

15. Escalation factors (for the cost of works executed and financial figure to
    common base value for works completed)

<table>
<thead>
<tr>
<th>Year before</th>
<th>Multiply factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>1.1</td>
</tr>
<tr>
<td>Two</td>
<td>1.21</td>
</tr>
<tr>
<td>Three</td>
<td>1.33</td>
</tr>
<tr>
<td>Four</td>
<td>1.46</td>
</tr>
<tr>
<td>Five</td>
<td>1.61</td>
</tr>
</tbody>
</table>
FORMAT FOR JOINT VENTURE AGREEMENT

If the application is made by a Joint Venture of two or more firms (limited to three firms), the evidence of clear mandate (i.e. in the form of respective Board Resolution duly authenticated by the competent authority) by such two or more firms willing to form Joint Venture among themselves for the specified projects should accompany duly recognizing their respective authorized signatories singing for and on behalf of the respective firms for the purpose of forming the joint venture. A legally authorized signatories of all the firms of the joint venture shall accompany the application. The JV agreement shall be signed by the authorized representative of the Joint Venture. The JV Agreement shall need be submitted consisting but not limited to the following provision:-

a. Name, Style and project(s) specified JV with head office address.
b. Extent (or Equality) of participation of each party in the JV.
c. Commitment of each party to furnish the Bond Money (i.e. Bid Security, Performance Security and security for the Mobilizations Advance) in proportion to his participation in the JV.
d. Responsibility of each partner of JV (in terms of Physical and Financial involvement)
e. Working capital arrangement of JV.
f. Operation of separate bank account in the name of JV to be operated by at least one foreign partner and local partner. In case of JV among local partners, all the partner are required to operate.

g. Provision for cure in case of non-performance of responsibility by the party of the JV.
h. Provision that NEITHER party of the JV shall be allowed to sign, pledge, sell or otherwise dispose all or part of its respective interest in the JV to any party including existing partner(s) of the JV. The Employer derives right for any consequent action (including blacklisting) against any JV partners in case of any breach in this regard.

Management structure of JV with details.

Lead partner to be identified who shall empowered by the JV to incur liabilities on behalf of JV.

Parties/Firms committing themselves to the Employer for jointly and severally responsible for the intended works.

The Power of Attorney shall be duly notarized.

Any relevant details.
### List of Key Personnel to be deployed on Contract Work

[Reference Cl. 4.5(B) (b)]

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Personnel</th>
<th>Qualification</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Project Manager</td>
<td>B.E. Civil + 15 Years Exp. (5 years as Manager)</td>
<td>1 No.</td>
</tr>
<tr>
<td>2.</td>
<td>Site Engineer</td>
<td>B.E. Civil + 10 Years Exp. (5 years in Building Construction)</td>
<td>1 No.</td>
</tr>
<tr>
<td>3.</td>
<td>Plant Engineer</td>
<td>B.E. Civil + 10 Years Exp. or B.E. Mech + 15 Years Exp.</td>
<td>1 No. Each</td>
</tr>
<tr>
<td>4.</td>
<td>Plant Engineer</td>
<td>B.E. Mech. + 7 Years Exp. / B.E. Elect. + 07 Years Exp.</td>
<td>2 No. Each</td>
</tr>
<tr>
<td>5.</td>
<td>Soil &amp; Material Engineer</td>
<td>B.E. Civil + 10 Years Exp.</td>
<td>1 No. Each</td>
</tr>
<tr>
<td>6.</td>
<td>Survey Engineer</td>
<td>B.E. Civil + 5 Years Exp. or Dip. Civil + 8 Years Exp.</td>
<td>1 No.</td>
</tr>
</tbody>
</table>
SECTION 2

QUALIFICATION INFORMATION

(To be filled in by Bidder)
QUALIFICATION INFORMATION

1.0 For Individual Bidders/Consortium of Firms

1.1 Constitution or legal status of Bidder
   *(Attach copy)*

   - Place of registration:
   - Principal place of business:
   - Power of attorney of signatory of Bid
     *(Attach)*

1.2 Total value of Civil/Mechanical/ Electrical works in Dairy Industry construction

2.0 Qualification Criteria

   The firms should meet the following minimum qualifying criteria for getting pre-qualified

**Past Similar Experience in last 5 Years (To fulfill either of three options)**

- Single project - ₹ 100.00 Crores at least
- Two projects each- ₹ 50.00 Crores at least
- Three projects each- ₹ 25.00 Crores at least

**The definition of similar works is as under:**

   Should have successfully completed any of the following works:-

1. Should have experience for setting up of Dairy & Powder Plant on Turnkey Basis.
2. Should have experience in setting of large Infrastructural Projects in agriculture sectors.
3. Should have experience in setting up of Powder/ Milk Product Plant, Beverages and other agriculture bi-product.

3.0 Average annual Turnover during last 3 years - ₹ 100.00 Crores at least

4.0 Latest Bank Solvency- ₹ 10.00 Crores at least

5.0 Work performed in the last five years**

   *(in Rs. Million)*
   2008-2009
   2009-2010
   2010-2011
   2011-2012
   2012-2013

Work performed as prime contractor, work performed in the past as a nominated sub-contractor will also be considered provided the sub-contract involved execution of all main items of work described in the bid document, provided further that all other qualification criteria are satisfied (in the same name) on works of a similar nature over the last five years.**
<table>
<thead>
<tr>
<th>Project Name</th>
<th>Name of the Employer*</th>
<th>Description of work</th>
<th>Contract No.</th>
<th>Value Contract (Rs. Crore)</th>
<th>Date issue work order</th>
<th>Stipulated period completion</th>
<th>Actual date of completion*</th>
<th>Remarks explaining reasons for delay &amp; work completed</th>
</tr>
</thead>
<tbody>
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</table>

* Attach certificate(s) from the Engineer(s)-in-Charge

** Immediately preceding the financial year in which bids are received.

β Attach certificate from Chartered Accountant.

6.0 Quantities of work executed as prime contractor, work performed in the past as a nominated sub-contractor will also be considered provided the sub-contract involved execution of all main items of work described in the bid document, provided further that all other qualification criteria are satisfied (in the same name and style) in the last five years :** (Civil Work)

<table>
<thead>
<tr>
<th>Year</th>
<th>Name of the work</th>
<th>Name of the</th>
<th>Quantity of work performed (cum)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Quantity of work performed (cum)</td>
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<tr>
<td></td>
<td></td>
<td>Cement Concrete (including RCC &amp; PCC)</td>
<td>Masonry</td>
<td>Earth</td>
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</tbody>
</table>
7.0 Information on Bid Capacity (works for which bids have been submitted and works which are yet to be completed) as on the date of this bid.

(a) Existing commitments and on-going works:

<table>
<thead>
<tr>
<th>Description of works</th>
<th>Place &amp; State</th>
<th>Contract No.</th>
<th>Name &amp; Address of Employer</th>
<th>Value of Contract (Rs Cr)</th>
<th>Stipulated Period of Completion</th>
<th>Value of works* remaining to be completed (Rs Cr)</th>
<th>Anticipated date of completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
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</table>

* Attach certificate(s) from the Engineer(s)-in-Charge

@ The item of work for which data is requested should tally with that specified in ITB clause 4.5A (c)

** Immediately preceding the financial year in which bids are received.

# Delete, if prequalification has been carried out.

(b) Works for which bids already submitted:

<table>
<thead>
<tr>
<th>Description of works</th>
<th>Place &amp; State</th>
<th>Name &amp; Address of Employer</th>
<th>Estimated value of works (Rs Cr)</th>
<th>Stipulated period of completion</th>
<th>Date when decision is expected</th>
<th>Remarks, if any</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
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</tbody>
</table>
8.0 Availability of key items of Contractor’s Equipment essential for carrying out the Works [Ref. Clause 4.5(B)(a)]. The Bidder should list all the information requested below. Refer also to Sub Clause 4.3 (d) of the Instruction to Bidders.

<table>
<thead>
<tr>
<th>Description works</th>
<th>Requirement</th>
<th>Availability proposals</th>
<th>Remarks (from whom to be purchased)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Capacity</td>
<td>Owned/Leased to be procured</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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</tbody>
</table>

9.0 Qualifications and experience of key personnel required for administration and execution of the Contract [Ref. Clause 4.5(B)(b)]. Attach biographical data. Refer also to Sub Clause 4.3 (e) of instructions to Bidders and Sub Clause 9.1 of the Condition of Contract.

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
<th>Qualification</th>
<th>Year of Experience (General)</th>
<th>Years of experience in the proposed position</th>
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</tbody>
</table>
10.0 Proposed sub-contracts and firms involved. [Refer ITB Clause 4.3(k)]

<table>
<thead>
<tr>
<th>Sanction of the works</th>
<th>Value of Sub-contract</th>
<th>Sub-contractor (Name &amp; Address)</th>
<th>Experience in similar work</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
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</table>

Attach copies of certificates on possession of valid license for executing water supply/sanitary work/building electrification works [Reference Clause 4.5(d) & Clause 4.5(e)]

11.0 Financial reports for the last five years: balance sheets, profit and loss statements, auditors' reports (in case of companies/corporation), etc. List them below and attach copies.

12.0 Evidence of access to financial resources to meet the qualification requirements: cash in hand, lines of credit, etc. List them below and attach copies of support documents.

13.0 Name, address and telephone, telex and fax numbers of the Bidders' bankers who may provide references if contacted by the Employer.

14.0 Information on litigation history in which the Bidder is involved.

<table>
<thead>
<tr>
<th>Other Party(ies)</th>
<th>Employer</th>
<th>Cause of Dispute</th>
<th>Amount involved</th>
<th>Remarks showing Present Status</th>
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</table>
15.0 Proposed work method and schedule. The Bidder should attach descriptions, drawings and charts as necessary to comply with the requirements of the Bidding documents. [Refer ITB Clause 4.1 & 4.3(1)]

16.0 Programme

17.0 Quality Assurance Programme

18.0 Additional Requirements

18.1 Bidders should provide any additional information required to fulfill the requirements of Clause 4 of the Instructions to the Bidders, if applicable.

(i) Affidavit

(ii) Undertaking

*** (iii) Update of original prequalification application

*** (iv) Copy of original prequalification application

*** (v) Copy of prequalification letter

* Delete, if prequalification has been carried out.

** Fill the Name of Consultant.

*** Delete, if prequalification has not been carried out.
SAMPLE FORMAT FOR EVIDENCE OF ACCESS TO OR
AVAILABILITY OF CREDIT FACILITIES

(CLAUSE 4.2 (i) OF ITB)

BANK CERTIFICATE

This is to certify that M/s. ______________________ is reputed company with a good financial standing.

If the contract for the work, namely ______________________________ is awarded to the above firm, we shall be able to provide overdraft/credit facilities to the extent of Rs. __________________ to meet their working capital requirements for executing to the above contract during the contract period.

______________________
(Signature)

Name of Bank
Senior Bank Manager
Address of the Bank
AFFIDAVIT

1. I, the undersigned, do hereby certify that all the statements made in the required attachments are true and correct.

2. The undersigned also hereby certifies that neither our firm M/s____________________________________________________ has abandoned any work on National Highways in India nor any contract awarded to us for such works have been rescinded, during last five years prior to the date of this bid.

3. The undersigned hereby author use(s) and request(s) any bank, person, firm or corporation to furnish pertinent information deemed necessary and requested by the Department to verify this statement or regarding my (our) competence and general reputation.

4. The undersigned understand and agrees that further qualifying information may be requested, and agrees to furnish any such information at the request of the Department Project implementing agency.

____________________________________
(Signed by an Authorised Officer of the Firm)

_______________________
Title of Officer

_______________________
Name of Firm

_______________________
DATE
UNDERTAKING

I, the undersigned do hereby undertake that our firm M/s ____________________________
________________________________ would invest a minimum cash up to 25% of the value of the work
during implementation of the Contract.

________________________________________
(Signed by an Authorised Officer of the Firm)

________________________________
Title of Officer

________________________________
Name of Firm

________________________________
DATE
SECTION 3

GENERAL CONDITIONS OF CONTRACT
GENERAL GUIDELINES

1. This book of "General Conditions of Contract" is applicable to both types of tenders i.e. "Percentage rate tenders" and "Item rate tenders". Accordingly alternative provisions for conditions Nos. 4, The appropriate alternatives will be applicable in specific cases depending on whether this is used for percentage rate tender (P.W.D.-2) or item rate tender (P.W.D.-3).

2. P.W.D.-1, Schedules A to F, special conditions/ specifications and drawing only will be issued to intending bidders. The standard form shall form part of the agreement to be drawn and signed by both parties after acceptance of tender.

3. All blanks are confined to Notice Inviting Tender (P.W.D.-1) and Schedules A to F.

4. Authority approving the Notice Inviting Tender (NIT) shall fill up all the blanks in P.W.D. and in Schedules B to F before issue of Tender Papers.

5. The intending bidders will quote their rates in Schedule A.

6. The proforma for registers and Schedules A to F are only for information and guidance. These are not to be filled in the Standard Form. The Schedules with all blanks, duly filled shall be separately issued to all intending tenderers.
I/We have read and examined the notice inviting tender, schedule, A,B,C,D,E & F. Specifications applicable, General Rules and Directions, Conditions of Contract, clauses of contract, Special conditions & other documents and Rules referred to in the conditions of contract and all other contents in the tender document for the work.

I/We hereby tender for the execution of the work specified for the COMFED within the time specified in Schedule ‘F’, viz., schedule of quantities and in accordance in all in respects with the specifications, designs, drawings and instructions in writing referred to in Rule-1 of General Rules and Directions and in Clause 11 of the Conditions of contract and with such materials as are provided for, by, and in respect in accordance with, such conditions so far as applicable.

We agree to keep the tender open for one hundred twenty (120) days from the due date of submission thereof and not to make any modifications in its terms and conditions.

A sum of Rs. ......................... has been deposited as/receipt treasury challan/deposit at call receipt of a scheduled bank/NSC/Postal Certificates/ fixed deposit receipt of scheduled bank/demand draft of a scheduled bank as earnest money. If I/We, fail to furnish the prescribed performance guarantee within prescribed period, I/we agree that the said COMFED or his successors in office shall without prejudice to any other right or remedy, be at liberty to forfeit the said earnest money absolutely. Further, if/we fail to commence work as specified, I/we agree that COMFED or his successors in office shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the said earnest money and the performance guarantee absolutely, otherwise the said earnest money shall be retained by him towards security deposit to execute all the works referred to in the tender documents upon the terms and conditions contained or referred to therein and to carry out such deviations as may be ordered, up to maximum of the percentage mentioned in Schedule ‘F’ and those in excess of that limit at the rates to be determined in accordance with the provision contained in Clause 12.2 and 12.3 of the tender form.

I/We hereby declare that I/We shall treat the tender documents drawings and other records connected with the work as secret/confidential documents and shall not communicate information/derived there from to any person other than a person to whom I/We am/are authorized to communicate the same or use the information in any manner prejudicial to the safety of the State.

Dated............................... Signature of Contractor
Postal Address
Witness :
Address :
Occupation :

Bihar State Milk Co-Operative Federation Ltd.
The above tender (as modified by you as provided in the letters mentioned hereunder) is
accepted by me for and on behalf of the COMFED for a sum of
Rs........................................(Rupees................................................... ............................................
................................................... ................................................... ........................................)
The letters referred to below shall form part of this contract Agreement :-
a) b) c)
For & on behalf of the COMFED
Signature..............................................................
Dated........................................

GENERAL CONDITIONS OF CONTRACT

CIVIL, ELECTRICAL & PHE WORKS
GENERAL CONDITIONS OF CONTRACT FOR CIVIL, ELECTRICAL & PHE

1. The contract means the document forming the tender and acceptances thereof and the formal agreement executed between the competent authority on behalf of the Bihar State Milk Co-Operative Federation Limited, Patna (referred hereinafter as ‘COMFED’) and the Contractor, together with the documents referred to therein including these conditions, the specifications, designs, drawings and instructions issued from time to time form one contract and shall be complementary to one another.

2. In the contract, the following expressions shall, unless the context otherwise requires have the meanings, hereby respectively assigned to them:-

i) The expression works or work shall, unless there be something either in the subject or context repugnant to such construction, be construed and taken to mean the works by or by virtue of the contract contracted to be executed whether temporary or permanent, and whether original, altered, substituted or additional.

ii) The site shall mean the land/or other places on. into or through which work is to be executed under the contract or any adjacent land, path or street through which work is to be executed under the contract or any adjacent land, path or street which may be allotted or used for the purpose of carrying out the contract.

iii) The Contractor shall mean the individual, firm or company, whether incorporate or not, undertaking the works and shall include the legal personal representative of such individual or the persons composing such firm or company, or the successors of such firm or company and the permitted assignees of such individual, firm or company.

iv) The COMFED means the Bihar State Milk Co-Operative Federation Limited as defined under Bihar Infrastructure Development Enabling Act, 2006 and its successors, assigns if any.

v) The Engineer -In-Charge means the Engineer/ officer who shall supervise and be in-charge of the work and who shall sign the contract on behalf of the COMFED as mentioned in Schedule ‘F’ hereunder.

vi) COMFED shall mean the Bihar State Milk Co-Operative Federation Limited.

Competent Person to sign agreement: - Managing Director or the person authorized by Managing Director shall be competent authority to sign

ix) Excepted Risk are risks due to riots (other than those on account of contractor employees), war (whether declared or not) invasion, act of foreign enemies, hostilities, civil war, rebellion revolution, insurrection, military or usurped power, any acts of COMFED, damages from aircraft, acts of God, such as earthquake, lightening and unprecedented floods, and other causes over which the contractor has no control and accepted as such by the Accepting Authority or causes solely due to use or occupation by COMFED of the part of the works in respect of which a certificate of completion has been issued or a cause solely due to COMFED’s faulty design of works.

Provided that the Contractor is to take all necessary measures to prevent such adverse impact and damage and he would also show that he has taken all due precaution to prevent /minimize any adverse effect/ damage from the above.

x) The Defect liability certificate is the certificate issued by Manager (Engg) after defect liability period has ended and upon correction of defects by the contractor.

The defect liability period is will be decided by COMFED for different nature of works from date of completion of the work and must be mentioned in the Agreement.

It would be decided by the COMFED for different nature of work from time to time as mentioned in Contract data.

xi) The intended completion is the time intended to complete the work by the contractor.

xii) The start date is given in the contract data. It is the date when the contractor shall commence execution of the works. It does not necessarily coincide with any of the site possession date.
xiii) A sub contractor is a person or corporate body who has a contract with the contractor to carry out a part of the construction work in the contract, which includes work on the site.

xiv) Temporary works are works designed, constructed, installed and removed by the contractor that are needed for construction or installation of the works.

xv) Market Rate shall be the rate as decided by the Competent Authority 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 Schedule ‘F’ to cover all overheads and profits.

xvi) Schedule(s) referred to in these conditions shall mean the relevant schedule(s) annexed to the tender papers or the standard Schedule of COMFED mentioned in Schedule ‘F’ hereunder, with the amendments thereto issued up to date of receipt of the tender.

xvii) Authority means Bihar State Milk Co-operative Federation Limited, Bihar which invites tenders on behalf of COMFED as specified in schedule ‘F’.

xviii) Specifications mean the specifications followed by relevant Authority of the Government of India or State Government in the area where the work is to be executed and/or as specified by COMFED.

xx) Tender value/Agreement value means the value of the entire work as stipulated in the letter award;

3. Where the context so requires, words imparting the singular only also include the plural and vice versa. Any reference to masculine gender shall whenever required include feminine gender and vice versa.

4. Heading and Marginal notes to these General Conditions of Contract shall not be deemed to form part thereof or be taken into consideration in the interpretation or construction thereof or of the contract.

5. The contractor must furnish, free of cost one certified copy of the contract documents with standard specifications and such other printed and published documents, together with all drawings in three sets & in CD as may be forming part of the tender papers. None of these documents shall be used for any purpose other that that of this contract.

6. The work to be carried out under the Contract shall, except as otherwise provided these conditions, include all labour, materials, tools, plants, equipment and transport which may be required in preparation of and for and in the full and entire execution and completion of the works.

7. The contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his tender for the works and of the rates and prices quoted in the Schedule of Quantities, which rates and prices shall, except as otherwise provided cover all his obligations under the Contract and all matters and things necessary for the proper completion and maintenance of the works.

8. The several documents forming the contract are to be taken as mutually explanatory of one another, detailed drawings being followed in preference to small scale drawing and figured dimensions in preference to scale and special conditions in preference to General Conditions.

8.1 In the case of discrepancy between the schedule of Quantities, the Specifications and/or the Drawings, the following order of preference shall be observed:-

i) Description of Schedule of Quantities.

ii) Particular Specification and Special Condition, if any

iii) Drawings.

iv) Indian Standard Specifications of B.I.S.

8.2 If there are varying or conflicting provisions made in any one document forming part of the contract, Managing Director shall be the deciding authority with regard to the intention of the document and his decision shall be final and binding on the contractor.

8.3 Any error in description, quantity or rate in Schedule of Quantities or any omission there from shall not vitiate the Contract or release the Contractor from the execution of the whole or any part of the works comprised therein according to drawings and specifications or from any of his obligations under the contract.

9. The successful tenderer/contractor, after submitting the performance guarantee i.e. within 7 days of receipt of letter of acceptance shall attend COMFED for authentication, signing and completion of the contractor document and execute the agreement consisting of :-

i) The notice inviting tender, all the documents including drawings, if any, forming the tender as issued at the time of invitation of tender and acceptance thereof together with any correspondence leading thereto.

ii) Standard Form as mentioned in Schedule ‘F’ consisting of:
Various standard clauses with corrections up to the date stipulated in Schedule ‘F’ along with annexure thereto.

CLAUSE OF CONTRACT

CLAUSE 1

(i) The contractor shall submit an irrevocable PERFORMANCE GUARANTEE of 2% (Two percent) of the tendered amount including earnest money in the shape as

- Fixed deposit receipt of a scheduled Bank should be valid for 28 days after defect liability paid and pledged in favour of Bihar State Milk Co-Operative Federation Limited, Bihar, Patna
- Demand Draft of a scheduled Bank issued in favour of the above
- One year or two year or three year post office time deposit in the favor of the above National Saving Certificate issued within the state pledged in favour of above
- 5 year National Development Bond State Development Loan Certificate
- Or Bank Guarantee for work costing more than one or any other deposits mentioned elsewhere in the contract for his proper performance of the contract agreement, (notwithstanding and/or without prejudice to any other provisions in the contract) within period specified in scheduled ‘F’ from the date of issue of letter of acceptance. This period can be further extended by the Manager (Engg) up to a maximum period as specified in schedule ‘F’ on written request of the contractor stating the reason for delays in procuring the Bank Guarantee, to the satisfaction of COMFED.

(ii) The performance Guarantee shall be initially valid up 60 days beyond the defect liability period. In case the time for completion of work gets enlarged, the contractor shall get the validity of performance Guarantee extended to cover such enlarged time for completion of work. After recording of the completion certificate for the work by the competent authority, the performance guarantee shall be returned to the contractor without any interest.

(iii) The Manager (Engg) shall not make a claim under the Performance guarantee except for amounts to which the COMFED is entitled under the contract (notwithstanding and/or without prejudice to any other provisions in the contract agreement) in the event of:

(a) Failure by the contractor to extend the validity of the Performance Guarantee as described herein above, in which event the Manager (Engg) may claim the full amount of the Performance guarantee.

(b) Failure by the contractor to pay COMFED any amount due, either as agreed by the contractor or determined under any of the Clauses/Conditions of the agreement, within 30 days of the service of notice to this effect by Consultant-In-Charge.

(c) Failure by the Agency to rectify any defects as defined in the defect liability clause in the schedule- F of contract data to the satisfaction of the Engineer in charge the contractor has to pay COMFED, any amount due, either as agreed by the Contractor or determined under any of the Clauses/ Conditions of the Agreement, within 30 days of the service of notice to this effect by Engineer in Charge.

(iv) In the event of the contract being determined or rescinded under provisions of any of the clause/condition of the agreement, the performance guarantee shall stand forfeited in full and shall be absolutely at the disposal of the COMFED.

CLAUSE 1 A

The person/persons whose tender(s) may be accepted (hereinafter called the contractor) shall permit COMFED at the time of making any payment to him for work done under the contract to deduct a sum at the rate of 8 % (eight percent) of the gross amount of each running bill till full amount of security deposit (10%) of agreement value or value of work (whichever is higher) is reached. If value of work exceeds the agreement value, security deposit (10%) will be recovered from the running bills.
All compensations or the other sums of money payable by the contractor under the terms of this contract may be deducted from, or paid by the sale of a sufficient part of his security deposit or from the interest arising there from, or from any sums which may be due to or may become due to the contractor by the COMFED on any account whatsoever and in the event of his Security Deposit being reduced by reason of any such deductions or sale as aforesaid, the contractor shall within 10 days make good in cash or fixed deposit receipt tendered by the State Bank of India or by Scheduled Banks or Government Securities (if deposited for more than 12 months) endorsed in favour of the COMFED, Bihar any sum or sums which may have been deducted from, or raised by sale of his security deposit or any part thereof. The security deposit shall be collected from the running bills of the contractor at the rates mentioned above and the Earnest money if deposited in cash at the time of tenders will be treated a part of the Security Deposit.

CLAUSE 2

If the contractor fails to maintain the required progress in terms of clause 5 or to complete the work and clear the site on or before the contract or extended date of completion, he shall, without prejudice to any other right or remedy available under the law to the COMFED on account of such breach, pay as agreed compensation the amount calculated at the rates stipulated below as the Manager (Engg) (whose decision in writing shall be final and binding) may decide on the amount of tendered value of the work for every completed day/month (as applicable) that the progress remains below that specified in Clause 5 or that the work remains incomplete.

This will also apply to items or group of items for which a separate period of completion has been specified.

i) Compensation @ 1.5 % per month of delay to for delay of work be computed on per Day basis

Provided always that the total amount of compensation for delay to be paid under this condition shall not exceed 10% of the Tendered Value of work or to the Tendered Value of the item or group of items of work for which a separate period of completion is originally given.

The amount of compensation may be adjusted or set-off against any sum payable to the Contractor under this or any other contract with the COMFED. In case, the contractor does not achieve a particular milestone mentioned in schedule- F, or the rescheduled milestone(s) in terms of Clause 5.4, the amount shown against that milestone shall be withheld, to be adjusted against the compensation levied at the final grant of extension of time. Withholding of this amount on failure to achieve a milestone, shall be automatic without any notice to the contractor. However, if the contractor catches up with the progress of work on the subsequent milestone(s), the withheld amount shall be released. In case the contractor fails to make up for the delay in subsequent milestone(s), amount mentioned against each milestone missed subsequently also shall be withheld. However, no interest, whatsoever, shall be payable on such withheld amount.

CLAUSE 2A

In case, the contractor completes the work ahead of scheduled completion time, a bonus @ 1% (one percent) of the tendered value per month computed on per day basis, shall be payable to the contractor, subject to a maximum limit of 5% (five percent) of the tendered value. The amount of bonus, if payable, shall be paid along with final bill after completion of work. Provided always that provision of the Clause 2A shall be applicable only when so provided in 'Schedule F'.

CLAUSE 3

Subject to the other provisions contained in this clause, the Manager (Engg) may, without prejudice to his any other rights or remedy against the contractor in respect of any delay, inferior workmanship, any claims for damages and/or any other provisions of this contract or otherwise, and whether the date of completion has or has not elapsed, by notice in writing absolutely determine the contract in any of the following cases:

i) If the contractor having been given by the Manager (Engg) a notice in writing to rectify, reconstruct or replace any defective work or that the work is being performed in an inefficient or
otherwise improper or unworkman like manner shall omit to comply with the requirement of such notice for a period of seven days thereafter.

ii) If the contractor being a company shall pass a resolution or the court shall make an order that the company shall be wound up or if a receiver or a manager on behalf of a creditor shall be appointed or if circumstances shall arise which entitle the court or the creditor to appoint a receiver or a manager or which entitle the court to make a winding up order.

iii) if the contractor has, without reasonable cause, suspended progress of the work or has failed to proceed with the work with due diligence so that in the opinion of the Manager (Engg) (which shall be final and binding) he will be unable to secure completion of the work by the date for completion and continues to do so after a notice in writing of seven days from the Consultant-In-Charge.

iv) If the contractor fails to complete the work within the stipulated date or items of work with individual date of completion, if any stipulated, on or before such date(s) of completion and does not complete them within the period specified in a notice given in writing in that behalf by the Manager (Engg).

v) If the contractor persistently neglects to carry out his obligations under the contract and/or commits default in complying with any of the terms and conditions of the contract and does not remedy it or take effective steps to remedy it within 7 days after a notice in writing is given to him in that behalf by the Consultant-In-Charge.

vi) If the contractor commits any acts mentioned in Clause 21 hereof:

vii) If the work not started by the contractor within 1/8th of the stipulated time subject to maximum of 45 days.

When the contractor has made himself liable for action under any of the cases aforesaid, the Manager (Engg) on behalf of COMFED shall have powers:

a) To determine or rescind the contract as aforesaid (of which termination or rescission notice in writing to the contractor under the hand of Manager (Engg) shall be conclusive evidence). Upon such determination or rescission the Earnest Money Deposit, Security Deposit already recovered and Performance Guarantee under the contract shall be liable to be forfeited and shall be absolutely at the disposal of the COMFED.

b) After giving notice to the contractor to measure up the work of the contractor and to take such whole, or the balance or part thereof as shall be un-executed out of his hands and to give it to another contractor to complete the work. The contractor, whose contract is determined or rescinded as above, shall not be allowed to participate in the tendering process for the balance work.

In the event of above course(s) being adopted by the Manager (Engg), the contractor shall have no claim to compensation for any loss sustained by him by reasons of his having purchased or procured any materials or entered into any engagements or made any advances on account or with a view to the execution of the work or the performance of the contract. And in case action is taken under any of the provision aforesaid, the contractor shall not be entitled to recover or be paid any sum for any work thereof or actually performed under this contract unless and until the Manager (Engg) has certified in writing the performance of such work and the value payable in respect thereof and he shall only be entitled to be paid the value so certified.

CLAUSE 3A

In case, the work cannot be started due to reasons not within the control of the contractor within 1/8th of the stipulated time for completion of work, either party may close the contract. In such eventuality, the Earnest Money deposit and the Performance Guarantee of the contractor shall be refunded, but no payment on account of interest, loss of profit or damages etc. shall be payable at all.

CLAUSE 3

Subject to the other provisions contained in this clause, the Manager (Engg) may, without prejudice to his any other rights or remedy against the contractor in respect of any delay, inferior workmanship, any claims for damages and/or any other provisions of this contract or otherwise, and whether the date of completion has or has not elapsed, by notice in writing absolutely determine the contract in any of the following cases:
i) If the contractor having been given by the Manager (Engg) a notice in writing to rectify, reconstruct or replace any defective work or that the work is being performed in an inefficient or otherwise improper or unworkman like manner shall omit to comply with the requirement of such notice for a period of seven days thereafter.

ii) If the contractor being a company shall pass a resolution or the court shall make an order that the company shall be wound up or if a receiver or a manager on behalf of a creditor shall be appointed or if circumstances shall arise which entitle the court or the creditor to appoint a receiver or a manager or which entitle the court to make a winding up order.

iii) if the contractor has, without reasonable cause, suspended progress of the work or has failed to proceed with the work with due diligence so that in the opinion of the Manager (Engg) (which shall be final and binding) he will be unable to secure completion of the work by the date for completion and continues to do so after a notice in writing of seven days from the Consultant-In-Charge.

iv) If the contractor fails to complete the work within the stipulated date or items of work with individual date of completion, if any stipulated, on or before such date(s) of completion and does not complete them within the period specified in a notice given in writing in that behalf by the Manager (Engg).

v) If the contractor persistently neglects to carry out his obligations under the contract and/or commits default in complying with any of the terms and conditions of the contract and does not remedy it or take effective steps to remedy it within 7 days after a notice in writing is given to him in that behalf by the Consultant-In-Charge.

vi) If the contractor commits any acts mentioned in Clause 21 hereof:

vii) If the work not started by the contractor within 1/8th of the stipulated time subject to maximum of 45 days.

When the contractor has made himself liable for action under any of the cases aforesaid, the Manager (Engg) on behalf of COMFED shall have powers:

a) To determine or rescind the contract as aforesaid (of which termination or rescission notice in writing to the contractor under the hand of Manager (Engg) shall be conclusive evidence). Upon such determination or rescission the Earnest Money Deposit, Security Deposit already recovered and Performance Guarantee under the contract shall be liable to be forfeited and shall be absolutely at the disposal of the COMFED.

b) After giving notice to the contractor to measure up the work of the contractor and to take such whole, or the balance or part thereof as shall be un-executed out of his hands and to give it to another contractor to complete the work. The contractor, whose contract is determined or rescinded as above, shall not be allowed to participate in the tendering process for the balance work.

In the event of above course(s) being adopted by the Manager (Engg), the contractor shall have no claim to compensation for any loss sustained by him by reasons of his having purchased or procured any materials or entered into any engagements or made any advances on account or with a view to the execution of the work or the performance of the contract. And in case action is taken under any of the provision aforesaid, the contractor shall not be entitled to recover or be paid any sum for any work thereof or actually performed under this contract unless and until the Manager (Engg) has certified in writing the performance of such work and the value payable in respect thereof and he shall only be entitled to be paid the value so certified.

CLAUSE 3A

In case, the work cannot be started due to reasons not within the control of the contractor within 1/8th of the stipulated time for completion of work, either party may close the contract. In such eventuality, the Earnest Money deposit and the Performance Guarantee of the contractor shall be
refunded, but no payment on account of interest, loss of profit or damages etc. shall be payable at all.

CLAUSE 4

In any case in which any of the powers conferred upon the Manager (Engg) by Clause-3 thereof, shall have become exercisable and the same are not exercised the non-exercise thereof shall not constitute a waiver of any of the conditions hereof and such powers shall notwithstanding be exercisable in the event of any future case of default by the contractor and the liability of the contractor for compensation shall remain unaffected. In the event of the Manager (Engg) putting in force all or any of the powers vested in him under the preceding clause he may, if he so desires after giving a notice in writing to the contractor, take possession of (or at the sole discretion of the Manager (Engg) which shall be final and binding on the contractor) use as on hire (the amount of the hire money being also in the final determination of the Manager) all or any tools, plant, materials and stores, in or upon the works, or the site thereof belonging to the contractor, or procured by the contractor and intended to be used for the execution of the work, or any part thereof, paying or allowing for the same in account at the contract rates or, in the case of these not being applicable, at current market rates to be certified by the Consultant-In-Charge, whose certificate thereof shall be final, and binding on the contractor, clerk of the works, foreman or other authorized agent to remove such tools, plant, materials, or stores from the premises (within a time to be specified in such notice) in the event of the contractor failing to comply with any such requisition, the Manager (Engg) may remove them at the contractor's expense or sell them by auction or private sale on account of the contractor and his risk in all respects and the certificate of the Manager (Engg) as to the expenses of any such removal and the amount of the proceeds and expenses of any such sale shall be final and conclusive against the contractor.

CLAUSE 5

The time allowed for execution of the Works as specified in the Schedule 'F' or the extended time in accordance with these conditions shall be the essence of the Contract. The execution of the works shall commence from such time period as mentioned in letter of acceptance or from the date of handing over of the site whichever is later. If the Contractor commits default in commencing the execution of the work as aforesaid, COMFED shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the earnest money and performance guarantee absolutely.

5.1 As soon as possible, after the contract is concluded, the Contractor shall submit a Time & Progress Chart for each milestone and get it approved by COMFED. The Chart shall be prepared in direct relation to the time stated in the Contract documents for completion of items of the work. It shall indicate the forecast of the dates of commencement and completion of various trades of sections of the work and may be amended as necessary by agreement between the Manager (Engg) and Contractor within the limitations of time imposed in the contract documents, and further to ensure good progress during the execution of the work, the contractor shall in all cases in which the time allowed for any work, exceeds one month (save for special jobs for which a separate Programme has been agreed upon) complete the work as per milestone given in schedule 'F'.

5.2 If the work(s) be delayed by.

   i) Force majeure, or
   ii) Abnormally bad weather, or
   iii) Serious loss or damage by fire, of
   iv) Civil commotion, local/commotion of workmen, strike or lockout] affecting any of the trades employed on the work, or
   v) Delay on the part of other contractors or tradesmen engaged by Manager (Engg) in executing work not forming part of the Contract, or

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vi) Non-availability of stores, which are the responsibility of Government to supply or

vii) Non-availability or break down of tools and Plant to be supplied or supplied by Government or

vii) Any other cause which, in the absolute discretion of the authority mentioned in Schedule 'F' is beyond the Contractor’s control, then upon the happening of any such event causing delay, the Contractor shall immediately give notice thereof in writing to the Manager (Engg) but shall nevertheless use constantly his best endeavors to prevent or make good the delay and shall do all that may be reasonably required to the satisfaction of the Manager (Engg) to proceed with the works.

5.3 Request for the rescheduling of Milestones and extension of time, to be eligible for consideration, shall be made by the contractor in writing within fourteen days of the happening of the event causing delay on the prescribed form. The Contractor may also, if practicable, indicate in such a request, the period for which extension is desired.

5.4 In any such case the authority mentioned in Schedule 'F' may give a fair and reasonable extension of time and reschedule the milestones for completion of work. Such extension shall be communicated to the Contractor by the Manager (Engg) in writing, within 3 months of the date of receipt of such request. Non application by the contractor for extension of time shall not be a bar for giving a fair and reasonable extension by the Manager (Engg) and this shall be binding on the contractor.

CLAUSE 6 (Ref Special Condition of Contract)

Manager (Engg) shall, except as otherwise provided, ascertain and determine measurement and the value in accordance with the contract of work done.

All measurement of all items having financial value shall be entered in Measurement Book and/or level field book; so that a complete record is obtained of all works performed under the contract. All measurements and levels shall be taken jointly by the Manager (Engg) or his authorized representative and by the contractor or his authorized representative from time to time during the progress of the work and such measurements shall be signed and dated by the Manager (Engg) and the contractor or their representatives in token of their acceptance. If the contractor objects to any of the measurements recorded, a note shall be made to that effect with reason and signed by both the parties.

If for any reason, the contractor or his authorized representative is not available and the work of recording measurements is suspended by the Manager (Engg) or his representative, the Manager (Engg) and the COMFED shall not entertain any claim from contractor for any loss or damages on this account. If the contractor or his authorized representative does not remain present at the time of such measurements after the contractor or his authorized representative has been given a notice in writing three (3) days in advance or fails to countersign or to record objection within a week from the date of the measurement, then such measurements recorded in his absence by the Manager (Engg) or his representative shall be deemed to be accepted by the Contractor.

The contractor shall, without extra charge, provide all assistance with every appliance, labor and other things necessary for measurements and recording levels.

Except where any general or detailed description of the work expressly shows to the contrary, measurements shall be taken in accordance with the procedure set forth in the specifications notwithstanding any provision in the relevant Standard Method of measurement or any general or local custom. In the case of items which are not covered by specifications, measurements shall be taken in accordance with the relevant standard method of measurement issued by the Bureau of India Standards and if for any item no such standard is available then a mutually agreed method shall be followed.

The contractor shall give not less than seven days notice to the Manager (Engg) or his authorized representative in charge of the work before covering up or otherwise placing beyond the reach of measurement any work in order that the same may be measured and correct dimension thereof be taken before the same is covered up or placed beyond the reach of measurement and shall
not cover up and place beyond reach of measurement any work without consent in writing of the Engineer-In-Charge or his authorized representative in charge of the work who shall within the aforesaid period of seven days inspect the work, and if any work shall be covered up or placed beyond the reach of measurements without such notice having been given or the Consultant-In-Charge's consent being obtained in writing, the same shall be uncovered at the contractor's expense, or in default thereof, no payment or allowance shall be made for such work or the materials with which the same was executed.

Manager (Engg) or his authorized representative may cause either themselves or through another officer of the COMFED to check the measurements recorded jointly or otherwise as aforesaid and all provisions stipulated herein above shall be applicable to such checking of measurements or levels.

It is also a term of this contract that recording of measurements of any item of work in the measurement book and/or its payment in the interim, on account or final bill shall not be considered as conclusive evidence as to the sufficiency of any work or material to which it relates nor shall it relieve the contractor from liabilities from any over measurement defects noticed till completion of the defects liability period.

CLAUSE 7

All such interim payments shall be regarded as payment by way of advances against final payment only and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be rejected, removed, taken away and reconstructed or re-erected. Any certificate given by the Manager (Engg) relating to the work done or materials delivered forming part of such payment may be modified or corrected by any subsequent such certificate(s) or by the final certificate and shall not by itself be conclusive evidence that any work or materials to which it relates is/are in accordance with the contract and specifications. Any such interim payment, or any part thereof shall not in any respect conclude, determine or affect in any way powers of the Manager (Engg) under the contract or any of such payments be treated as final settlement and adjustment of accounts or in any way vary or affect the contract.

Pending consideration of extension of date of completion interim payments shall continue to be made as herein provided, without prejudice to the right of the COMFED to take action under the terms of this contract for delay in the completion of work, if the extension of date of completion is not granted by the competent authority.

CLAUSE 8

Within ten days of the completion of the work, the contractor shall give notice of such completion to the Manager (Engg) and within thirty days of the receipt of such notice, the Manager (Engg)shall inspect the work and if there is no defect in the work shall furnish the contractor with a final certificate of completion, otherwise a provisional certificate of physical completion indicating defects (a) to be rectified by the contractor and/or (b) for which payment will be made at reduced rates, shall be issued. But no final certificate of completion shall be issued, nor shall the work be considered to be complete until the contractor shall have removed from the premises on which the work shall be executed all scaffolding, surplus materials, rubbish and all huts and sanitary arrangements required for his/their work people on the site in connection with the execution of the works as shall have been erected or constructed by the contractor(s) and cleaned off the dirt from all wood work, doors, windows, walls, floor or other parts of the building, in, upon, or about which the work is to be executed or of which he may have had possession for the purpose of execution thereof, and not until the work shall have been measured by the Consultant-In-Charge. If the contractor shall fail to comply with the requirements of this clause as to removal of scaffolding, surplus materials and rubbish and all huts and sanitary arrangements as aforesaid and cleaning off dirt on or before the date fixed for the completion of work, the Manager (Engg) may at the expense of the contractor remove such scaffolding surplus materials and rubbish etc. and dispose of the same as he thinks fit and clean off such dirt as aforesaid, and the contractor shall have no claim in respect of scaffolding or surplus materials as aforesaid except for any sum actually realized by the sale thereof.
CLAUSE 8 A

When the annual repairs and maintenance of works are carried out, the splashes and droppings from white washing, color washing, painting etc. on walls, floor, windows etc. shall be removed and the surface cleaned simultaneously with the completion of these items of work in the individual rooms, quarters or premises etc. where the work is done without waiting for the actual completion of all the other items of work in the contract. In case the contractor fails to comply with the requirements of this clause, the Manager (Engg) shall have the right to get this work done at the cost of the contractor either ideally or through any other agency. Before taking such action, the Manager (Engg) shall give ten days notice in writing to the contractor.

CLAUSE 8 B

The contractor shall submit completion plan as required vide General Specifications within thirty days of the completion of the work.

In case, the contractor fails to submit the completion plan as aforesaid, he shall be liable to pay a sum equivalent to 2.5% of the value of the work subject to a ceiling of Rs. 15,000 (Rs. Fifteen thousand only) as may be fixed by the Engineer In Charge concerned and in this respect the decision of the Engineer In Charge shall be final and binding on the contractor.

CLAUSE 9

The final bill shall be submitted by the contractor in the same manner as specified in interim bills within three months of physical completion of the work or within one month of the date of the final certificate of completion furnished by the Manager (Engg) whichever is earlier. No further claims shall be made by the contractor after submission of the final bill and these shall be deemed to have been waived and extinguished. Payments of those items of the bill in respect of which there is no dispute and of items in dispute, for quantities and rates as approved by Consultant-In-Charge, will, as far as possible be made within the period specified herein under, the period being reckoned from the date of receipt of the bill by the Manager (Engg), complete with account of materials issued by the COMFED and dismantled materials.

CLAUSE 10 (Deleted)

Materials which COMFED will supply are shown in rare case as shown in schedule 'B' which also stipulates quantum, place of issue and rate(s) to be charged in respect thereof. The contractor shall be bound to procure them from the Manager (Engg).

As soon as the work is awarded, the contractor shall finalize the programme for the completion of work as per clause 5 of this contract and shall give his estimates of materials required on the basis of drawings/or schedule of quantities of the work. The Contractor shall give in writing his requirement to the Manager (Engg) which shall be issued to him keeping in view the progress of work as assessed by the Manager (Engg), in accordance with the agreed phased programme of work indicating monthly requirements of various materials. The contractor shall place his indent in writing for issue of such materials at least 7 days in advance of his requirement.

Such materials shall be supplied for the purpose of the contract only and the value of the materials so supplied at the rates specified in the aforesaid schedule shall be set off or deducted, as and when materials are consumed in items of work (including normal wastage) for which payment is being made to the contractor, from any sum then due or which may therefore become due to the contractor under the contract or otherwise from the security deposit. At the time of submission of bills the contractor shall certify that balance of materials supplied is available at site in original good condition.

The contractor shall submit along with every running bill (on account or interim bill) material wise reconciliation statements supported by complete calculations reconciling total issue, total consumption and certified balance (diameter/section-wise in the case of steel) and resulting variations and reasons therefore. Manager (Engg) shall (whose decision shall be final and
binding on the contractor) be within his rights to follow the procedure of recovery in clause 42 at any stage of the work if reconciliation is not found to be satisfactory.

The contractor shall bear the cost of getting the material issued, loading, transporting to site, unloading, storing under cover as required, cutting assembling and joining the several parts together as necessary. Notwithstanding anything to the contrary contained in any other clause of the contract and (or the PWD Code) all stores/materials so supplied to the contractor or procured with the assistance of the Government shall remain the absolute property of Government and the contractor shall be the trustee of the stores/materials, and the said stores/materials shall not be removed/disposed off from the site of the work on any account and shall be at all times open to inspection by the Manager (Engg) or his authorized agent. Any such stores/materials remaining unused shall be returned to the Manager (Engg) in as good a condition in which they were originally supplied at a require, but in case it is decided not to take back the stores/materials the contractor shall have no claim for compensation on any account of such stores/materials so supplied to him as aforesaid and not used by him or for any wastage in or damage to in such stores/materials.

On being required to return the stores/materials, the contractor shall hand over the stores/materials on being paid or credited such price as the Manager (Engg) shall determine, having due regard to the condition of the stores/materials. The price allowed for credit to the contractor, however, shall be at the prevailing market rate not exceeding the amount charged to him, excluding the storage charge, if any. The decision of the Manager (Engg) shall be final and conclusive. In the event of breach of the aforesaid condition, the contractor shall in addition to the throwing himself open to account for contravention of the terms of the licenses or permit and/or for criminal breach of trust, be liable to Government for all advantages or profits resulting or which in the usual course would have resulted to him by reason or such breach. Provided that the contractor shall in no case be entitled to any compensation or damages on account of any delay in supply or non-supply thereof all or any such materials and stores provided further that the contractor shall be bound to execute the entire work if the materials are supplied by the Government within the original scheduled time for completion of the work plus 50% thereof or schedule time plus 6 months whichever is more if the time of completion of work exceeds 12 months but if a part of the materials only has been supplied within the aforesaid period then the contractor shall be bound to do so much of the work as may be possible with the materials and stores supplied in the aforesaid period. For the completion of the rest of the work, the contractor shall be entitled to such extension of time as may be determined by the Manager (Engg) whose decision in this regard shall be final and binding on the contractor.

The contractor shall see that only the required quantities of materials got issued. Any such material remaining unused and in perfectly good/original condition at the time of completion or determination of the contract shall be returned to the Manager (Engg) at the stores from which it was issued or at a place directed by him by a notice in writing. The contractor shall not be entitled for loading, transporting, unloading and stacking of such unused material except for the extra lead, if any involved, beyond the original place of issue.

CLAUSE 10 A

The contractor shall, at his own expense, provide all materials, required for the works other than those which are stipulated to be supplied by the COMFED.

The contractor shall, at his own expense and without delay; supply to the Manager (Engg) samples of materials to be used on the work and shall get these approved in advance. All such materials to be provided by the Contractor shall be in conformity with the specifications laid down or referred to in the contract. The contractor shall, if requested by the Manager (Engg) furnish proof, to the satisfaction of the Manager (Engg) that the materials so comply. The Manager (Engg) shall within thirty days of supply of samples or within such further period as he may require intimate to the Contractor in writing whether sample are approved by him or not. If samples are not approved, the Contractor shall forthwith arrange to supply to the Manager (Engg)for his approval fresh samples complying with the specifications laid down in the contract. When materials are required to be tested in accordance with specifications, approval of the Manager (Engg) shall be issued after the test results are received.
The Contractor shall at his risk and cost submit the samples of materials to be tested or analyzed and shall not make use of or incorporate in the work any materials represented by the samples until the required tests or analysis have been made and materials finally accepted by the Manager (Engg). The Contractor shall not be eligible for any claim or compensation either arising out of any delay in the work or due to any corrective measures required to be taken on account of and as a result of testing of materials.

The contractor shall, at his risk and cost, make all arrangements and shall provide all facilities as the Manager (Engg) may require for collecting, and preparing the required number of samples for such tests at such time and to such place or places as may be directed by the Manager (Engg) and bear all charges and cost of testing unless specifically provided for otherwise elsewhere in the contract or specifications. The Manager (Engg) or his authorized representative shall at all time 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 and every assistance in obtaining the right to such access.

The Manager (Engg) shall have full powers to require the removal from the premises of all materials which in his opinion are not in accordance with the specifications and in case of default the Manager (Engg) shall be at liberty to employ at the expense of the contractor, other persons to remove the same without being answerable or accountable for any loss for damage that may happen or arise to such materials. The Manager (Engg) shall also have full powers to require other proper materials to be substituted thereof and in case of default the Manager (Engg) may cause the same to be supplied and all costs which may attend such removal and substitution shall borne by the Contractor.

CLAUSE 10 B

i) The contractor, on signing an indenture in the form to be specified by the Manager (Engg), shall be entitled to be paid during the progress of the execution of the work up to 75% of the assessed value of any materials which are in the opinion of the Engineer In Charge nonperishable, non-fragile and noncombustible and are in accordance with the contract and which have been brought on the site in connection therewith and are adequately stored and/or protected against damage by weather or other causes but which have not at the time of advance been incorporated in the works. When materials on account of which ad advance has been made under this sub-clause are incorporated in the work the amount of such advance shall be recovered/deducted from the next payment made under any or the clause or clauses of this contract.

ii) Mobilization advance not exceeding 10% of the tendered value may be given, if requested by the contractor in writing within one month of the order to commence the work. In such a case the contractor shall execute a Bank Guarantee Bond from a Scheduled Nationalized Bank as specified by the Manager (Engg) for the full amount of such advance is released. Such advance shall be in two or more installments to be determined by the Consultant-In-Chief at his absolute discretion. The first installment of such advance shall be released by the Manager (Engg) to the contractor on a request made by the contractor to the Manager (Engg) in this behalf. The second and subsequent installment shall be released by the Manager (Engg) only after the contractor furnished a proof of the satisfactory utilization of the earlier installment to the entire satisfaction of the Manager (Engg).

An advance for plant machinery required for the work and brought to site by the Contractor may be given if requested by the contractor in writing within one month of bringing such plant and machinery to site. Such advance shall be given on such plant and machinery which in the opinion of the Manager (Engg) will add to the expeditious
execution of work and improve the quality of work. The amount of advance shall be restricted to 5% of tender value. In the case of new plant and equipment to be purchased for the work the advance shall be restricted to 90% of the price of such new plant and equipment paid by the contractor for which the contractor shall produce evidence satisfactory to the Manager (Engg) and approval from Managing Director. In the case of second hand and used plants and equipment, the amount of such advance shall be limited to 50% of the depreciated value of plant and equipment as may be decided by the Manager (Engg). The contractor shall, if so required by the Manager (Engg), submit the statement value of such old plant and equipment duly approved by a Registered Valuer recognized by the Central Board of Direct Taxes under the Income-Tax Act, 1961. No such advance shall be paid on any plant and equipment of perishable nature and on the plant and equipment of a value less than Rs. 50,000/- Seventy five percent of such amount of advance shall be paid after the plant & equipment is brought to site and balance twenty five percent on successfully commissioning the same only after approval from Managing Director.

Leasing of equipment shall be considered at par with purchase of equipment and shall be covered by tripartite agreement with the following:

1. Leasing company which gives certificate of agreeing to lease equipment to the contractor.
2. Manager (Engg), and
3. The contractor.

This advance shall further be subject to the condition that such plant and equipment (a) are considered by the Manager (Engg) to be necessary for the works; (b) and are in and are maintained in working order; (c) hypothecated to the Government as specified by the Manager (Engg) before the payment of advance is released. The contractor shall not be permitted to remove from the site such hypothecated plant and equipment without the prior written permission of the Manager (Engg). The contractor shall be responsible for maintaining such plant and equipment in good working order during the entire period of hypothecation falling which such advance shall be entirely recovered in lump sum. For this purpose steel scaffolding and from work shall be treated as plant and equipment.

The contractor shall insure the Plant and Machinery for which mobilization advance is sought and given, for a sum sufficient to provide for their replacement at site. Any amounts not recovered from the insurer will be borne by the contractor.

iii) The mobilization advance and plant and machinery advance in (ii)&(iii) above bear simple interest at the rate of 10 per cent per annum or rate of inflation (whichever higher) and shall be calculated from the date of payment to the date of recovery, both days inclusive, on the outstanding amount of advance. Recovery of such sums advanced shall be made by the deduction from the contractor's bills commencing after first ten per cent of the gross value of the work is executed and paid, on pro-rata percentage basis to the gross value of the work billed beyond 10% in such a way that the entire advance is recovered by the time eighty per cent of the gross value of the contract is executed and paid, together with interest due on the entire outstanding amount up to the date of the installment.

iv) If the circumstances are considered reasonable by the Manager (Engg), the period mentioned in (ii) and (iii) for request by the contractor in writing for grant of mobilization advance and plant and equipment advance may be extended in the discretion of the Managing Director.

v) The said bank guarantee for advances shall initially be made for the full amount and valid for the contract period, and be kept renewed from time to time to cover the balance amount and likely period of complete recovery together with interest.

The contractor shall undertake to execute the work in such a manner that the work is completed on time and to the satisfaction of the Manager (Engg) along with the Manager (Finance), and the Manager (Engg), and the Manager (Finance) shall determine the quality of the work. The contractor shall also undertake to comply with all the terms and conditions of the contract and to perform all the work in the manner and to the standard as specified in the contract. The contractor shall also undertake to comply with all the terms and conditions of the contract and to perform all the work in the manner and to the standard as specified in the contract.
vi) Any materials including tools, plants, equipments etc. brought to the site shall not be removed from the sites without the written permission of the Engineer In Charge.

CLAUSE 10 C

If after submission of the Rate Offer the price of any material incorporated in the works (not being a material supplied form the Manager (Engg) stores in accordance with clause 10 thereof) and/or wages of labour increases as a direct result of the coming into force of any fresh law, or statutory rule or order (but not due to any changes in sales tax) and such increase in the price and/or wages prevailing at the time of the last stipulated date for receipt of the Rate Offers including extensions if any for the work, and the Agency thereupon necessarily and properly pays in respect of that material (incorporated in the works) such increased price and/or in respect of labour engaged on the execution, of the work such increased wages. Then the amount of the contract shall accordingly be varied and provided further that any such increase shall not be payable if such increase has become operative after the stipulated date of completion of the work in question.

If after submission of the Rate Offer, the price of any material incorporated in the works (not being a material supplied from the Manager (Engg) stores in accordance with clause 10 thereof) and/or wages of labour is decreased as a direct result of the coming not force of any law or statutory rules or order (but not due to any change s in sales tax) and such decrease in the prices and/or wages prevailing at the time of receipt of the Rate Offer for the work. COMFED shall in respect of materials incorporated in the works (not being materials supplied from the Manager’s (Engg) stores in accordance with Clause-10 thereof) and/or labour engaged on the execution of the work after the date of coming into force of such law statutory rule or order be entitled to deduct form the dues of the Agency such amount as shall be equivalent to the difference between the prices of the materials and/or wages as prevailed at the time of last stipulated date for receipt of Rate Offers including extensions if any for the work and the price of materials and/or wages of labour on the coming into force of such law, statutory rule or order. The Agency shall, for purpose of this condition, keep such books of account and other documents as are necessary to show the amount of any increase claimed or reduction available and shall allow inspection of the same by a duly authorized representative of COMFED, and further shall, at the request of the Manager (Engg) may require any documents so kept and such other information as the Manager (Engg) may require.

The Agency shall, within a reasonable time of his becoming aware of any alteration in the price of any such material and/or wages of labour, give notice thereof to the Manager (Engg)stating that the same is given pursuant to this condition together with all information relating thereto which he may be in position to supply.

CLAUSE 10 CA

If after submission of the tender/Rate offer, the price of cement or steel reinforcement bars/bitumen incorporated in the works (not being a material supplied form the Consultant-In-Charge’s stores) increase(s) beyond the price(s) prevailing at the time of the last stipulated date for receipt of tenders rate imitation (including extensions, if any) for the work, then the amount of the contract shall accordingly be varied and provided further that any such increase shall not be payable if such increase has become operative after the stipulated date of completion of work in question.

If after submission of the tender/Rate offer the price of cement and/or steel reinforcement bars/bitumen incorporated in the works (not being a material supplied form the Consultant-In-Charge’s stores) is decreased. COMFED shall in respect of these materials incorporated in the works (not being materials supplied from the Consultant-In-Charge's stores) be entitled to deduct from the dues of the contractor such amount as shall be equivalent to the difference between the prices of Cement and/or Steel reinforcement bars/bitumen as prevailed at the time of last stipulated date for receipt of tenders including extensions if any for the work and the prices of these materials on the coming into force of such base price of cement and/or steel reinforcement bars/bitumen issued under authority of Schedule of Rate Committee.
The amount increase/decrease in prices shall be determined by the All India Wholesale Price Indices for Cement and Steel (bars and rods) as published by Economic Advisor to Government of India, Ministry of Commerce and Industry and base price for cement and/or steel reinforcement bars/bitumen as issued under authority of Schedule of Rate Committee as valid on the last stipulated date of receipt of tender, including extension if any and for the period under consideration.

The amount of the contract shall accordingly be varied for cement or steel reinforcement bars/bitumen and will be worked out as per the formula given below:-

Adjustment for Cement component

(i) Price adjustment for increase or decrease in the cost of cement procured by the contractor shall be paid in accordance with the following formula:

\[ V_c = P_c \times Q_c \times \left( \frac{C - C_0}{C_0} \right) \]

- \( V_c \) = Variation in cement cost i.e. increase or decrease in the amount in rupees to be paid or recovered.
- \( P_c \) = Base Price of cement as issued under Prevalent Schedule of Rate at the time of the last stipulated date of receipt of tender including extensions, if any.
- \( Q_c \) = Quantity of cement used in the works since previous bill.
- \( C_0 \) = The all India wholesale price index for cement on 28 days preceding the date of opening of Bids as published by the Ministry of Industrial Development, Government of India, New Delhi.
- \( C_1 \) = The all India average wholesale price index for cement for the month under consideration as published by Ministry of Industrial Development, Government of India, New Delhi.

(As per the time of extension granted by the COMFED, the index prevailing at the time of the stipulated date of completion or the prevailing index of the period under consideration, whichever is less, shall be considered.)

Adjustment for Steel component

(ii) Price adjustment for increase or decrease in the cost of steel procured by the contractor shall be paid in accordance with the following formula:

\[ V_s = P_s \times Q_s \times \left( \frac{S_1 - S_0}{S_0} \right) \]

- \( V_s \) = Variation in cost of steel reinforcement bars i.e. increase or decrease in the amount in rupees to be paid or recovered.
- \( P_s \) = Base Price of steel as issued under Prevalent Schedule of Rate at the time of the last stipulated date of receipt of tender including extensions, if any.
- \( Q_s \) = Quantity of steel used in the works since previous bill.
- \( S_0 \) = The all India wholesale price index for steel (Bars and Rods) on 25 days preceding the date of opening of Bids as published by the Ministry of Industrial Development, Government of India, New Delhi.
- \( S_1 \) = The all India average wholesale price index for steel (Bars and Rods) for the month under consideration as published by Ministry of Industrial Development, Government of India, New Delhi.

(As per the time of extension granted by the COMFED, the index prevailing at the time of the stipulated date of completion or the prevailing index of the period under consideration, whichever is less, shall be considered.)

Note: For the application of this clause, index of Bars and Rods has been chosen to represent steel group.

Adjustment for bitumen component

Payment due to Increase/Decrease in Prices/Wages after Receipt of Tender for Works (Time Period more than 18 months)
(iii) Price adjustment for increase or decrease in the cost of bitumen shall be paid in accordance with the following formula:

\[ V_b = P_b \times Q_b \times \frac{(B_1 - B_0)}{B_0} \]

- \( V_b \) = Variation in cost of bitumen reinforcement bars i.e. increase or decrease in the amount in rupees to be paid or recovered.
- \( P_b \) = Base Price of bitumen as issued under Prevalent Schedule of Rate at the time of the last stipulated date of receipt of tender including extensions, if any.
- \( Q_b \) = Quantity of bitumen used in the works since previous bill.
- \( B_0 \) = The office retail price of bitumen at the IOC depot at nearest center on the day 28 days prior to date of opening of Bids.
- \( B_1 \) = The official retail price of bitumen of IOC depot at nearest center for the 15th day of the month under consideration.

(In respect of the period, time of extension is granted by the COMFED, the index prevailing at the time of stipulated date of completion or the prevailing index of the period under consideration, whichever is less, shall be considered.)

CLAUSE 10 CC

If the price of materials (not being materials supplied or services rendered at fixed prices by the COMFED in accordance with clause 10 & 34 thereof) and/or wages of labour required for execution of the work increase, the contractor shall be compensated for such increase as per provision detailed below and the amount of the contract shall accordingly be varied, subject to the condition that such compensation for escalation in prices shall be available only for the work done during the stipulated period of the contract. No escalation shall be paid for work executed in extended contract period even of extension of time is granted without any action under Clause 2 and also no such compensation shall be payable for a work for which the stipulated period of completion is equal to or less than the time as specified in Schedule ‘F’. Such compensation for escalation in the prices of material and labour, when due, shall be worked out based on the following provisions:

i) The base date for working out such escalation shall be the last stipulated date of receipt of tender including extension, if any.

ii) The cost of work on which escalation will be payable shall be reckoned as below:

a) Gross value of work done up to this quarter: (A)
b) Gross value of work done up to the last quarter: (B)
c) Gross value of work done since previous quarter (A-B): (C)
d) Full assessed value of Secured Advance fresh paid in this quarter : (D)
e) Full assessed value of Secured Advance recovered in this quarter : (E)
f) Full assessed value of Secured Advance for which Escalation in payable in this quarter (D-E): (F)
g) Advance payment made during this quarter: (G)
h) Advance payment recovered during this quarter: (H)
i) Advance payment for which escalation is payable in this quarter (G-H) : (I)
j) Extra items paid as per Clause 12 based on prevailing market rates during this quarter : (J)

Then, 
\[ M = C \pm F \pm I - J \]
\[ N = 0.85 \times M \]

k) Less cost of material supplied by the COMFED as per Clause 10 and recovered during the quarter : (K)
l) Less cost of services rendered at fixed charges as per Clause 34 and recovered during the quarter : (L)

Cost of work for which escalation is applicable:
\[ W = N - (K+L) \]

iii) Components of cement, steel, materials, labour, P.O.L., etc. shall be pre-determined for every work and incorporated in the conditions of contract attached to the tender papers.
The decision of the Manager (Engg) in working out such percentage shall be binding on the contractor.

iv) The compensation for escalation for cement, steel, materials and P.O.L. shall be worked out as per the formula given below:

**a) Adjustment for component of 'Cement'**

\[
V_c = \frac{W \times X_c \times (C_I - C_{I_o})}{100}
\]

- \(V_c\) = Variation in cement cost i.e. increase or decrease in the amount in rupees to be paid or recovered.
- \(W\) = Cost of work done worked out as indicated in sub-para (ii) of Clause 10CC.
- \(X_c\) = Component of cement expressed as percent of the total value of work.
- \(C_I\) = All India Whole Sale Price Index for cement for the period under consideration as published by the Economic Advisor to Government of India, Ministry of Industry & Commerce.
- \(C_{I_o}\) : All India Whole Sale Price Index for cement as published by the Economic Advisor to Government of India, Ministry of Industry & Commerce as valid on the last stipulated date of receipt of tenders including extensions, if any.

**b) Adjustment for component of 'Steel'**

\[
V_s = \frac{W \times X_s \times (S_I - S_{I_o})}{100}
\]

- \(V_s\) = Variation in steel cost i.e. increase or decrease in the amount in rupees to be paid or recovered.
- \(W\) = Cost of work done worked out as indicated in sub-para (ii) of Clause 10CC.
- \(X_s\) = Component of steel expressed as percent of the total value of work.
- \(S_I\) = All India Whole Sale Price Index for steel (bars & rods) for the period under consideration as published by the Economic Advisor to Government of India, Ministry of Industry & Commerce. However the price index shall be limited to for the month when the last consignment of steel reinforcement for the work is procured or for the month in which half of the stipulated contract period is over which ever of these two is earlier.
- \(S_{I_o}\) = All India Whole Sale Price Index for steel (bars & rods) as published by the Economic Advisor to Government of India, Ministry of Industry & Commerce as valid on the last stipulated date of receipt of tenders including extensions, if any.

**c) Adjustment for civil component (except cement and steel)/ electrical component of construction 'Materials'**

\[
V_m = \frac{W \times X_m \times (M_I - M_{I_o})}{100}
\]

- \(V_m\) = Variation in material cost i.e. increase or decrease in the amount in rupees to be paid or recovered.
- \(W\) = Cost of work done worked out as indicated in sub-para (ii) of Clause 10CC.
- \(X_m\) = Component of 'materials' expressed as percent of the total value of work.
- \(M_I\) = All India Whole Sale Price Index for civil component/electrical component of construction materials as worked out on the basis of All India Wholesale Price Index for Individual Commodities/Group Items for the period under consideration as published by the Economic Advisor to Government of India, Ministry of Industry & Commerce and applying weightage to the Individual Commodities/Grout Items.
- \(M_{I_o}\) = All India Whole Sale Price Index for civil component/electrical component of construction materials as worked out on the basis of All India Wholesale Price Index for Individual Commodities/Group Items valid on the last stipulated date of receipt of tender including extension, if any, as published by the Economic Advisor to Government of India, Ministry of Industry & Commerce and applying weightages to the Individual Commodities/Grout Items.

**d) Adjustment for component of 'POL'**

\[
V_F = \frac{W \times Z \times (F_I - F_{I_o})}{100}
\]

- \(V_F\) = Variation in POL cost i.e. increase or decrease in the amount in rupees to be paid or recovered.
- \(W\) = Cost of work done worked out as indicated in sub-para (ii) of Clause 10CC.
- \(Z\) = All India Wholesale Price Index for POL as worked out on the basis of All India Wholesale Price Index for Individual Commodities as published by the Economic Advisor to Government of India, Ministry of Industry & Commerce and applying weightage to the Individual Commodities/Grout Items.
- \(F_{I_o}\) = All India Wholesale Price Index for POL as published by the Economic Advisor to Government of India, Ministry of Industry & Commerce as valid on the last stipulated date of receipt of tender including extensions, if any.

*Note* : relevant component only will be applicable.
$V_F = \text{Variation in cost of fuel, oil and lubricant, increase or decrease in the amount in rupees to be paid or recovered.}$

$W = \text{Cost of work done worked out as indicated in sub-para (ii) of Clause 10CC.}$

$Z = \text{Component of P.O.L. expressed as a percent of total value of work as indicated under the special conditions of contract.}$

$\text{FI} = \text{All India Wholesale Price Index for Fuel, Oil & Lubricant for the period under consideration as published by Economic Advisor to Govt. of India, Ministry of Industry & Commerce, New Delhi.}$

$\text{FI}_o = \text{All India Wholesale Price Index for Fuel, Oil & Lubricant valid on the last stipulated date of receipt of tender including extension, if any.}$

v) The following principles shall be followed while working out the indices mentioned in para (iv) above.

(a) The compensation for escalation shall be worked out at quarterly intervals and shall be with respect to the cost of work done as per bills paid during the three calendar months of the said quarter. The first such payment shall be made at the end of three months after the month (excluding) in which the tender was accepted and thereafter at three months interval. At the time of completion of the work, the last period for payment might become less than 3 months, depending on the actual date of completion.

(b) The index (MI/FI etc.) relevant to any quarter/period for which such compensation is paid shall be the arithmetical average of the indices relevant to the three calendar months. If the period up to date of completion after the quarter covered by the last such installment of payment, is less than three months, the index $MI$ and $FI$ shall be the average of the indices for the months falling within that period.

vi) The compensation for escalation for labour shall be worked out as per the formula given below:

$$VL = W \times \frac{Y}{100} \times \frac{(LI - LI_o)}{LI_o}$$

$vl = \text{Variation in labour cost i.e. amount of increase or decrease in rupees to be paid or recovered.}$

$w = \text{Value of work done worked out as indicated in sub-para (ii) above.}$

$y = \text{Component of labour expressed as a percentage of total value of the work.}$

$LI_o = \text{Minimum daily wage in rupees of an unskilled adult male mazdoor, fixed under any law, statutory rule or order as on the last stipulated date of receipt of tender including extension, if any.}$

$LI = \text{Minimum wage in rupees of an unskilled adult male mazdoor, fixed under any law, statutory rule or order as applicable on the last date of the quarter previous to the one under consideration.}$

vii) The following principles will be followed while working out the compensation as per sub-para (vi) above.

(a) The minimum wage of an unskilled male mazdoor mentioned in sub para (vi) above shall be the higher of the wage notified by Government of India, Ministry of Labour and that notified by the local administration both relevant to the place of work and the period of reckoning.

(b) The escalation for labour also shall be paid at the same quarterly intervals when escalation due to increase in cost of materials and/or P.O.L. is paid under this clause. If such revision of minimum wages take place during any such quarterly intervals, the escalation compensation shall be payable at revised rates only for work done in subsequent quarters.

(c) Irrespective of variations in minimum wages of any category of labour, for the purpose of this clause, the variation in the rates for an unskilled adult male mazdoor alone shall from the basis for working out the escalation compensation payable on the labour component.

viii) In the event the price of materials and/or wages of labour required for execution of the work decrease/s, there shall be a downward adjustment of the cost of work so that such price of materials and/or wages of labour shall be deductible from the cost of work under this contract and
in this regard the formula herein before stated under this clause 10(CC) shall mutatis mutandis apply, provided that:

(a) no such adjustment for the decrease in the price of materials and/or wages of labour aforementioned would be made in case of contracts in which the stipulated period of completion of the work is equal to or less than the time as specified in Schedule 'F'.

(b) the Manager (Engg) shall otherwise be entitled to lay down the procedure by which the provision of this sub-clause shall be implemented from time to time and the decision of the Manager (Engg) in this behalf shall be final and binding on the contractor.

i) Provided always that the provision of the preceding clause 10C and 10 CA shall not be applicable for contracts where provisions of this clause are applicable but in cases where provisions of this clause are not applicable, the provisions of Clause 10C and 10 CA will become applicable.

CLAUSE 10 D

The contractor shall treat all materials obtained during dismantling of a structure, excavation of the site for a work, etc. as COMFED's property and such materials shall be disposed off to the best advantage of Government according to the PWD code provision.

CLAUSE 11

The contractor shall execute the whole and every part of the work in the most substantial and workmanlike manner both as regards materials and otherwise in every respect in strict accordance with the specifications. The contractor shall also conform exactly, fully and faithfully to the design, drawings and instructions in writing in respect of the work signed by the Manager (Engg) and the contractor shall be furnished free of charge one copy of the contract documents together with specification, designs, drawings and instruction as are not included in the standard specifications of Public Works Department specified in Schedule 'F' or in any Bureau of Indian Standard or any other, published standard or code or, Schedule of Rates or any other printed publication referred to elsewhere in the contract.

The contractor shall comply with the provisions of the contract and with the care and diligence execute and maintain the works and provide all labour and materials, tools and plants including for measurements and supervision of all works, structural plans and other things of temporary or permanent nature required for such execution and maintenance in so far as the necessity for providing these, is specified or is reasonably inferred from the contract. The Contractor shall take full responsibility for adequacy, suitability and safety of all the works and methods of construction.

CLAUSE 12

The Manager (Engg) shall have power (i) to make alternation in, omissions from, additions to, or substitutions for the original specifications, drawings, designs and instructions that may appear to him to be necessary or advisable during the progress of the work, and (ii) to omit a part of the works in case of non-availability of a portion of the site or for any other reasons and the contractor shall be bound to carry out the works in accordance with any instructions given to him in writing signed by the Manager (Engg) after approval from competent authority and such alterations omissions, additions or substitutions shall form part of the contract as if originally provided therein and any altered, additional or substituted work which the contractor may be directed to do in the manner specified above as part of the works, shall be carried out by the contractor on the same conditions in all respects including price on which he agreed to do the main work except as hereafter provided.

12.1 The time for completion of the works shall, in the event of any deviations resulting in additional cost over the tendered value sum being ordered, be extend, if requested by the contractor, as follows:

i) In the proportion which the additional cost of the altered, additional or substituted work, bears to the original tendered value plus.
ii) 25% of the time calculated in (i) above or such further additional time as may be considered reasonable by the Manager (Engg) after approval from competent authority

12.2 In the case of extra item(s) the contractor may within fifteen days of receipt of order or occurrence of the item(s) claim rates, supported by proper analysis, for the work and the Manager (Engg) after approval from competent authority shall within one month of the receipt of the claims supported by analysis, after giving consideration to the analysis of the rates submitted by the contractor, determine the rates as per power delegated in PWD Code/COMFED regulation and on the basis of the market rates and the contractor shall be paid in accordance with the rates so determined.

In the case of substituted items, the rate for the agreement item (to be substituted) and substituted item shall also be determined in the manner as mentioned in the aforesaid para.

If the market rate for the substituted item so determined is more than the market rate of the agreement item (to be substituted) the rate payable to the contractor for the substituted item shall be the rate for the agreement item (to be substituted) so increased to the extent of the difference between the market rates of substituted item and the agreement item (to be substituted).

If the market rate for the substituted item so determined is less than the market rate of the agreement item (to be substituted) the rate payable to the contractor for the substituted item shall be the rate for the agreement item (to be substituted) so decreased to the extent of the difference between the market rates of substituted item and the agreement item (to be substituted).

In the case of contract items, substituted items, contract cum substituted items, which exceed the limits laid down in Schedule F, the contractor may within fifteen days of receipt of order or occurrence of the excess, claim revision of the rates, supported by proper analysis, for the work in excess of the above mentioned limits, provided that if the rates so claimed are in excess of the rates specified in the schedule of quantities the Manager (Engg) shall within one month of receipt of the claims supported by analysis, after giving consideration to the analysis of the rates submitted by the contractor, determined the rates as per power delegated in PWD Code/COMFED regulation and on the basis of the market rates and the contractor shall be paid in accordance with the rates so determined.

12.4 The contractor shall send to the Manager (Engg) once every three months an up to date account giving complete details of all claims for additional payments to which the contractor may consider himself entitled and of all additional work ordered by the Manager (Engg) after approval from competent authority which he has executed during the preceding quarter failing which the contractor shall be deemed to have waived his right. However, the Managing Director is authorized for consideration of such claims on merits.

12.5 For the purpose of operation of Schedule 'F' the following works shall be treated as works relating to foundation:

i) For buildings, compound walls, plinth level or 1.2 meters (4 feet) above ground level whichever is lower excluding items of flooring and D.P.G. but including base concrete below the floors.

ii) For abutments, piers, retaining walls of culverts and bridges, walls of water reservoirs the bed of floor level.

iii) For retaining walls where floor level is not determinate 1.2 meters above the average ground level or bed level.

iv) For Roads all items of excavation and filling including treatment of sub-base.

Any operation incidental to or necessarily has to be in contemplation of tenderer while filing tender, or necessary for proper execution of the item included in the Schedule of quantities or in the schedule of rates mentioned above, whether or not, specifically indicated in the description of the item and the relevant specifications, shall be deemed to be included in the rates quoted by the tenderer or the rate given in the said schedule of rates, as the case may be. Nothing extra shall be admissible for such operations.
CLAUSE 13

If at any time after acceptance of the tender Government shall decide to abandon or reduce the scope of the works for any reason whatsoever and hence not require the whole or any part of the works to be carried out, the Manager (Engg) shall give notice in writing to that effect to the contractor and the contractor shall act accordingly in the matter. The contractor shall have no 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 in full but which he did not derive in consequence of the foreclosure of the whole or part of the works.

The contractor shall be paid at contract rates full amount for works executed at site and in addition, a reasonable amount as certified by the Manager (Engg) for the items hereunder mentioned which could not be utilized on the work to the full extent in view of the foreclosure.

i) 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.

ii) COMFED 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, COMFED shall be bound to take over the materials or such portions thereof as the contractor does not desire to retain. For materials taken over or to be taken over by COMFED, cost of such materials as detailed by Manager (Engg) shall be paid. The cost shall, however, take into account purchase price, cost of transportation and deterioration of damage which may have been caused to materials whilst in the custody of the contractor.

iii) If any materials supplied by COMFED are rendered surplus, the same except normal wastage shall be returned by the contractor to COMFED 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 Government stores, if so required by COMFED, shall be paid.

iv) Reasonable compensation for transfer of T & P from site to contractor's permanent stores or to his other works, whichever is less. If T & P are not transported to either of the said places, no cost of transportation shall be payable.

v) Reasonable compensation for repatriation of contractor's site staff and imported labour to the extent necessary.

The contractor shall, if required by the Manager (Engg) furnish to him books of account, wage books, time sheets and other relevant documents and evidence as may be necessary to enable him to certify the reasonable amount payable under this condition. The reasonable amount of items on (i), (iv) and (v) above shall not be in excess of 2% of the cost of the work remaining incomplete on the date of closure, i.e. total stipulated cost of the work as per accepted tender less the cost of work actually executed under the contract and less the cost of contractor's materials at site taken over by the Government as per item (ii) above. Provided always that against any payments due to the contractor on this account or otherwise, the Manager (Engg) shall be entitled to recover or be credited with any outstanding balances due from the contractor for advance paid in respect of any tool, plants and materials and any other sums which at the date of termination were recoverable by the Government from the contractor under the terms of the contract.

CLAUSE 14

If contractor:

i) At any time makes default in proceeding with the works or any part of the work with the due diligence and continues to do so after a notice in writing of 7 days from the Consultant-In-Charge; or
ii) commits default to comply with any of the terms and conditions of the contract and does not remedy it or take effective steps to remedy it within 7 days after a notice in writing is given to him in that behalf by the Consultant-In-Charge; or

iii) fails to complete the works or items of work with individual dates of completion, on or before the date(s) of completion, and does not complete then within the period specified in a notice given in writing in that behalf by the Consultant-In-Charge; or

iv) shall offer or give or agree to give to any person working at COMFED on contract/deputation or to any other person on his behalf any gift or consideration of any kind as an inducement or reward for doing or forbearing to do or for having done or forborne to do any action relation to the obtaining or execution of this or any other contract for Government; or

v) shall enter into a contract with COMFED in connection with which commission has been paid or agreed to be paid by him or to his knowledge, unless the particulars of any such commission and the terms of payment thereof have been previously disclosed in writing to the Competent Authority/Consultant-In-Charge; or

vi) shall obtain a contract with Government as a result of wrong tendering or other non-bona fide methods of competitive tendering; or

vii) being an individual, or if a firm, any partner thereof shall at any time be adjudged insolvent or have a receiving order or order for administration of his estate made against him or shall take any proceedings for liquidation or composition (other than a voluntary liquidation for the purpose of amalgamation or reconstruction) under any Insolvency Act for the time being in force or make any conveyance or assignment of his effects or composition or arrangement for the benefit of his creditors or purport so to do, or if any application be made under any Insolvency Act for the time being in force for the sequestration of his estate or if a trust deed be executed by him for benefit of his creditors; or

viii) being a company, shall pass a resolution or the Court shall make an order for the winding up of the company, or a receiver or manager on behalf of the debenture holders or otherwise shall be appointed or circumstances shall arise which entitle the Court or debenture holders to appoint a receiver or manager; or

ix) shall suffer an execution being levied on his goods and allow it to be continued for a period of 21 days; or

x) assigns, transfers, sublets (engagement of labour on a piece-work basis or of labour with materials not to be incorporated in the work, shall not be deemed to be subletting) or otherwise parts with or attempts to assign, transfer sublet or otherwise parts with the entire works or any portion thereof without the prior written approval of the Competent Authority;

The Competent Authority may, without prejudice to any other right or remedy which shall have accrued or shall accrue hereafter to Government, by a notice in writing to cancel the contract as a whole or only such item of work in default from the Contract.

The Manager (Engg) shall on such cancellation by the Competent Authority have powers to:

(a) take possession of the site and any materials, constructional plant, implements stores, etc., thereon; and/or

(b) carry out the incomplete work by any means at the risk and cost of the contractor.

On cancellation of the contract in full or in part, the Manager (Engg) shall determine what amount, if any, is recoverable from the contractor for completion of the works or part of the works or in case the works or part of the works is not to be completed, the loss of damage suffered by Government. In determining the amount, credit shall be given to the contractor for the value of the work executed by him up to the time of cancellation, the value of contractor's materials taken over and incorporated in the work and use of plant and machinery belonging to the contractor. Any excess expenditure incurred or to be incurred by COMFED in completing the works or part of the works or the excess loss or damages suffered or may be suffered by COMFED as aforesaid after allowing such credit shall without prejudice to any other right or remedy available to COMFED in law be recovered from any moneys due to the contractor on any account, and if
such moneys are not sufficient the contractor shall be called upon in writing and shall be liable to pay the same within 31 days.

If the contractor shall fails to pay the required sum within the aforesaid period of 30 days the Manager (Engg) shall have the right to sell any or all of the contractors unused materials, constructional plant, implements, temporary buildings, etc. and apply the proceeds of sale thereof towards the satisfaction of any sums due from the contractor under the contract and if thereafter there be any balance outstanding from the contractor, it shall be recovered in accordance with the provisions of the contract.

Any sums in excess of the amounts due to Government and unsold materials, constructional plant, etc., shall be returned to the contractor, provided always that if cost or anticipated cost of completion by Government of the works or part of the works is less than the amount which the contractor would have been paid had he completed the works or part of the works, such benefit shall not accrue to the contractor.

CLAUSE 15

i) The contractor shall, on receipt of the order in writing of the Manager (Engg) (whose decision shall be final and binding on the contractor) suspend the progress of the works or any part thereof for such time and in such manner as the Manager (Engg) may consider necessary so as not to cause any damage or injury to the work already done or endanger the safety thereof for any of the following reasons:

a) on account of any default on the part of the contractor or;

b) for proper execution of the works or part thereof for reasons other than the default of the contractor; or

c) for safety of the works or part thereof.

The contractor shall, during such suspension, properly protect and secure the works to the extent necessary and carry out the instructions given in that behalf by the Consultant-In-Charge.

ii) If the suspension is ordered for reasons (b) and (c) in sub-para (i) above.

a) the contractor shall be entitled to an extension of time equal to the period of every such suspension PLUS 25%, for completion of the item or group of items of work for which a separate period of completion is specified in the contract and of which the suspended work forms a part, and;

b) If the total period of all such suspensions in respect of an item or group of items or work for which a separate period of completion is specified in the contract exceeds thirty days, the contractor shall, in addition, be entitled to such compensation as the Manager (Engg) may consider reasonable in respect of salaries and/or wages paid by the contractor to his employees and labour at site, remaining idle during the period of suspension, adding thereto 2% to cover indirect expenses of the contractor. Provided the contractor submits his claim supported by details to the Manager (Engg) within fifteen days of the expiry of the period of 30 days.

iii) If the works or part thereof is suspended on the orders of the Manager (Engg) for more than three months at a time, except when suspension is ordered for reason (a) in sub-Para (i) above, the contractor may after receipt of such order serve a written notice on the Manager (Engg) requiring permission within fifteen days from receipt by the Manager (Engg) of the said notice, to proceed with the work or part thereof in regard to which progress has been suspended and if such permission is not granted within that time, the contractor, if he intends to treat the suspension, where it affects only a part of the works as an omission of such part by COMFED or where it affects whole of the works, as an abandonment of the works by COMFED, shall within ten days of expiry of such period of 15 days give notice in writing of his intention to the Consultant-In-Charge. In the event of the contractor treating the suspension as an abandonment of the contract by COMFED,
he shall have no claim to payment of any compensation on account of any profit or advantage which he might have derived from the execution of the work in full but which he could not derive in consequence of the abandonment. He shall, however, be entitled to such compensation, as the Manager (Engg) may consider reasonable, in respect of salaries and/or wages paid by him to his employees and labour at site, remaining idle in consequence adding to the total thereof 2% to cover indirect expenses of the contractor provided the contractor submits his claim supported by details to the Manager (Engg) within 30 days of the expiry of the period of 3 months.

Provided, further, that the contractor shall not be entitled to claim any compensation from COMFED for the loss suffered by him on account of delay by COMFED in the supply of materials in schedule ‘B’ where such delay is covered by difficulties relating to the supply of wagons, force majeure including non-allotment of such materials by controlling authorities, act of God, acts of enemies of the state/country or any reasonable cause beyond the control of the COMFED.

CLAUSE 16

All works under or in course of execution or executed in pursuance of the contract shall at all times be open and accessible to the inspection and supervision of the Consultant-In-Charge/Chief Consultant/ Director (PI)/ managing Director, his authorized subordinates in charge of the work and all the superior officers, officer of the Quality Control Consultants/ Organization of the COMFED and the contractor shall, at all times, during the usual working hours and at all other times at which reasonable notice of the visit of such officers has been given to the contractor, either himself be present to receive orders and instructions of have a responsible agent duly accredited in writing, present for that purpose. Orders given to the Contractor's agent shall be considered to have the same force as if they had been given to the contractor himself.

It shall appear to the Manager (Engg) or his authorized subordinates in charge of the Chief Consultant in charge or Quality Control or his subordinate officers, that any work has been executed with unsound, imperfect, or unskilful workmanship, or with materials or article provides by him for the execution of the work which are unsound or of a quality inferior to that contracted or otherwise not in accordance with the contract the contractor shall, on demand in writing which shall be made within six months of the completion of the work from the Manager (Engg) specifying the work, materials or articles complained of notwithstanding that the same may have been passed, certified and paid for forthwith rectify, or remove and reconstruct the work so specified in whole or in part, as the case may require or as the case may be, remove the materials or articles so specified and provide other proper and suitable materials or articles at his own charge and cost. In the event of the failing do so within a period specified by the Manager (Engg) in his demand aforesaid, then the contractor shall be liable to pay compensation at the same rate as under clause 2 of the contract (for non-completion of the work in time) for this default. In such case the Manager (Engg) may not accept the item of work at the rates applicable under the contract but may accept such items at reduced rates as the competent authority may consider reasonable during the preparation of on account bills or final bill if the item is so acceptable without detriment to the safety and utility of the item and the structure and incidental items rectified, or removed and re-executed at the risk and cost or contractor. Decision of the Manager (Engg) to be conveyed in writing in respect of the same will be final and binding on the contractor.

CLAUSE 17

If the contractor or his working people or servants shall break, deface, injure or destroy any part of building in which they may be working, or any building, road, road curb, fence, enclosure, water pipe, cables, drains, electric or telephone post or wired, trees, grass or grassland, or cultivated ground contiguous to the premises on which the work or any part is being executed, or if any damage shall happen to the work while in progress, from any cause whatever or if any defect, shrinkage or other faults appear in the work within defect liability period after a certificate final or otherwise of its completion shall have been given by the Manager (Engg) as aforesaid arising out of defect or improper materials or workmanship the contractor shall upon receipt of a
notice in writing on that behalf make the same good at his own expense or in default the Manager (Engg) cause the same to be made good by other workmen and deduct the expense from any sums that may be due or at any time thereafter may become due to the contractor, or from his security deposit except for the portion pertaining to asphaltic work which is governed by sub-para (iii) of clause 35 or the proceeds of sale thereof or of a sufficient option thereof. The security deposit of the contractor shall not be refunded before the expiry of defect liability period after the issue of the certificate final or otherwise, of completion of work, or till the final bill has been prepared and passed whichever is later.

In case of Maintenance and Operation works of E & M services, the security deposit deducted from contractors shall be refunded within one month from the date of final payment or within one month from the date of completion of the maintenance contract whichever is earlier.

CLAUSE 18

The contractor shall provide at his own cost all materials (except such special materials, if any, as may in accordance with the contract be supplied from the Consultant-In-Charge’s stores), plant, tools, appliances, implements, ladders, cordage, tackle, scaffolding and temporary works required for the proper execution of the work, whether original, altered or substituted and whether included in the specification or other document forming part of the contract or referred to in these conditions or not, or which may be necessary for the purpose of satisfying or complying with the requirements of the Manager (Engg) as to any matter as to which under these conditions he is entitled to be satisfied, or which he is entitled to require together with carriage therefore to and from the work. The contractor shall also supply without charge the requisite number of persons with the means and materials, necessary for the purpose of setting out works, and counting, weighing and assisting the measurement for examination at any time and from time to time of the work or materials. Failing his so doing the same may be provided by the Manager (Engg) at to the contractor, under this contract or otherwise and/or from his security deposit or the proceeds of sale thereof, or of a sufficient portions thereof.

CLAUSE 18 A

In every case in which by virtue of the provisions sub-section (1) of Section 12, of the Workmen’s Compensation Act, 1923, Government is obliged to pay compensation to a workman employed by the contractor, in execution of the works, Government will recover from the contractor the amount of the compensation so paid; and without prejudice to the right of the Government under sub-section (2) of section 12, of the said Act, Government shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due by Government to the contractor whether under this contract or otherwise. Government shall not be bound to contest any claim made against it under sub-section (1) Section 12, of the said Act, except on the written request of the contractor and upon his giving to Government full security for all costs for which Government might become liable in consequence of contesting such claim.

CLAUSE 18 B

In every case in which by virtue of the provisions of the Contract Labour (Regulation and Abolition) Act, 1970, and of the Contract Labour (Regulation and Abolition) Central Rules, 1971, COMFED is obliged to pay any amounts of wages to a workman employed by the contractor in execution of the works, or to incur any expenditure in providing welfare and health amenities required to be provided under the above said Act and the rules under Clause 19H or under the State Labour Regulations, or under the Rules framed by COMFED from time to time for the protection of health and sanitary arrangements for workers employed by contractors working for COMFED, COMFED will recover from the contractor the amount of wages so paid or the amount of expenditure so incurred; and without prejudice to the rights of the COMFED under sub-section (2) of Section 20, and sub-section (4) of Section 21, of the Contract Labour (Regulation and Abolition) Act, 1970, COMFED shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due by COMFED to the contractor whether under this contract or otherwise COMFED shall not be bound to contest any claim made against it under sub-section (1) of Section 20, sub-section (4) of Section 21, of the said Act, except on the
written request of the contractor and upon his giving to the Government full security for all costs for which Government might become liable in contesting such claim.

CLAUSE 19

The contractor shall obtain a valid license under the State Labour Act, and the Contract Labour (Regulation and Abolition) Central rules 1971, before the commencement of the work, and continue to have a valid license until the completion of the work. The contractor shall also abide by the provisions of the Child Labour (Prohibition and Regulation) Act, 1986.

The contractor shall also comply with the provisions of the building and other Construction Workers (Regulation of Employment & Conditions of Service) Act, 1996 and the building and other Construction Workers Welfare Cess Act, 1996.

Any failure to fulfill these requirements shall attract the penal provisions of the contract arising out of the resultant non-execution of the work.

CLAUSE 19 A

No labour below the age of fourteen years shall be employed on the work.

CLAUSE 19 B

Payment of wages:

i) The contractor shall pay to labour employed by him either directly or through sub-contractors, wages not less than fair wages as defined in State Labour Regulations or as per the provisions of the Contract Labour (Regulation and Abolition) Act 1970 and the contract Labour (Regulation and Abolition) Central Rules, 1971, wherever applicable.

ii) The contractor shall, notwithstanding the provisions of any contract to the contrary, cause to be paid fair wage to labour indirectly engaged on the work including any labour engaged by his sub-contractors in connection with the said work, as if the labour had been immediately employed by him.

iii) In respect of all labour directly or indirectly employed in the works for performance of the contractor's part of this contract, the contractor shall comply with or cause to be complied with the state Labour Regulations made by Government from time to time in regard to payment of wages, wage period, deductions from wages recovery of wages not paid and deductions unauthorized made, maintenance of wage books or wage slips, publication of scale of wages and other terms of employment, inspection and submission of periodical returns and all other matters of the like nature or as per the provisions of the Contract Labour (Regulation and Abolition) Act, 1970, and the Contract Labour (Regulation And Abolition) Central Rules, 1971, wherever applicable.

iv) a) The Manager (Engg) concerned shall have the right to deduct from the moneys 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 nonfulfillment of the conditions of the contract for the benefit of the workers, non-payment of wages or of deductions made from his or their wages which are not justified by their terms of the contract or non-observance of the Regulations.

b) Under the provision of Minimum Wages (Central) Rules 1950, the contractor is bound to allow to the labours directly or indirectly employed in the works one day rest for 6 days continuous work and pay wages at same rate as for duty. In the event of default, the Manager (Engg) shall have the right to deduct the sum or sums not paid on account of wages for weekly holidays to any labours and pay the same to the persons entitled thereto from any money due to the contractor by the Manager (Engg) concerned.
v) The contractor shall comply with the provisions of the Payment of Wages Act, 1936, Minimum Wages Act, 1948, Employees Liability Act, 1938, Workmen's Compensation Act, 1923, Industrial Disputes Act, 1947, Maternity Act, 1970, or the modifications thereof or any other laws relating thereto and the rules made thereunder from time to time.

vi) The contractor shall indemnify and keep indemnified Government again payments to be made under and for the observance of the laws aforesaid and the State Labour Regulations without prejudice to his right to claim indemnity from his sub-contractors.

vii) The laws aforesaid shall be deemed to be a part of this contract and any breach thereof shall be deemed to be a breach of this contract.

viii) Whatever is the minimum wage for the time being, or if the wage payable higher than such wage, such wage shall be paid by the contractor to the workmen directly without the intervention of Jamadar and that Jamadar shall not be entitled to deduct or recover any amount from the minimum wage payable to the workmen as and by way of commission or otherwise.

ix) The contractor shall ensure that no amount by way of commission or otherwise is deducted or recovered by the Jamadar from the wage of workmen.

CLAUSE 19 C

In respect of all labour directly or indirectly employed in the work for the performance of the contractor's part of this contract, the contractor shall at his own expense arrange for the safety provisions as per P.W.D. Safety Code framed from time to time and shall at his own expense provide for all facilities in connection therewith. In case the contractor fails to make arrangement and provide necessary facilities as aforesaid he shall be liable to pay a penalty of Rs. 200/- for each default and in addition the Manager (Engg) shall be at liberty to make arrangement and provide facilities as aforesaid and recover the costs incurred in that behalf from the contractor.

CLAUSE 19 D

The contractor shall submit by the 4th and 19th of every month, to the Manager (Engg) a true statement showing in respect of the second half of the preceding month and the first half of the current month respectively:

(1) the number of labourers employed by him on the work,
(2) their working hours,
(3) the wages paid to them,
(4) the accidents that occurred during the said fortnight showing the circumstance under which they happened and the extent of damage and injury caused by them, and
(5) the number of female workers who have been allowed maternity benefit according to Clause 19F and the amount paid to them.

Failing which the contractor shall be liable to pay to Government a sum not exceeding Rs. 200/- for each default or materially incorrect statement. The decision of the Chief Consultant shall be final in deducting from any bill due to the contractor the amount levied as fine and be binding on the contractor.

CLAUSE 19 E

In respect of all labour directly, or indirectly employed in the works for the performance of the contractor's part of this contract, the contractor shall comply with or cause to be complied with all the rules framed by Government from time to time for the protection of health and sanitary arrangements for workers employed by the COMFED and contractors.
CLAUSE 19 H

The contractor(s) shall at his/their own cost provide his/their labour with a sufficient number of huts (hereinafter referred to as the camp) of the following specifications on a suitable plot of land to be approved by the Consultant-In-Charge.

i) a) The minimum height of each hut at the eaves level shall be 2.10m (7ft.) and the floor area to be provided will be at the rate of 2.7 sq. m. (30 sq. ft.) for each member of the worker's family staying with the labourer.

b) The contractor(s) shall in addition construct suitable cooking places having a minimum area of 1.80m x 1.50m (6' x 5') adjacent to the hut for each family.

c) The contractor(s) shall also construct temporary latrines and urinals for the use of the labourers each on the scale of not less than four per each one hundred of the total strength, separate latrines and urinals being provided for women.

d) The contractor(s) shall construct sufficient number of bathing and washing places, one unit for every 25 persons residing in the camp. These bathing and washing places shall be suitably screened.

ii) a) All the huts shall have walls of sun-dried or burnt-bricks laid in mud mortar or other suitable local materials as may be approved by the Consultant-In-Charge.

b) The contractor(s) shall provide each hut with proper ventilation.

c) All doors, windows, and ventilators shall be provided with suitable leaves for security purposes.

d) There shall be kept an open space of at least 7.2m (8 yards) between the rows of huts which may be reduced to 6m (20 ft.) according to the availability of site with the approval of the Consultant-In-Charge. Back to back construction will be allowed.

iii) Water supply - The contractor(s) shall provide adequate supply of water for the use of labourers. The provisions shall not be less than two gallons of pure and wholesome water per head per day for drinking purposes and three gallons of clean water per head per day for bathing and washing purposes. Where piped water supply is available, supply shall be at stand posts and where the supply is from wells or river, tanks which may be of metal or masonry, shall be provided. The contractor(s) shall also at his/their own cost make arrangements for laying pipe lines of water supply to his/their labour camp from the existing mains wherever available, and shall pay all fees and charges therefore.

iv) The site selected for the camp shall be high ground, removed from jungle.

v) Disposal of Excreta - The contractor(s) shall make necessary arrangements for the disposal of excreta from the latrines by trenching or incineration which shall be according to the requirements laid down by the Local Health Authorities. If trenching or incineration is not allowed the contractor(s) shall make arrangements for the removal of the excreta through the Municipal Committee/authority and inform it about the number of labourers employed so that arrangements may be made by such Committee/authority for the removal of the excreta. All charges on this account shall be borne by the contractor and paid direct by him to the Municipality/authority. The contractor shall provide one sweeper for every eight seats in case of dry system.
vi) **Drainage** - The contractor(s) shall provide efficient arrangements for draining away sullage water so as to keep the camp neat and tidy.

vii) The contractor(s) shall make necessary arrangements for keeping the camp area sufficiently lighted to avoid accidents to the workers.

viii) **Sanitation** - The contractor(s) shall make arrangements for conservancy and sanitation in the labour camps according to the rules of the Local Public Health and Medical Authorities.

**CLAUSE 19 I**

The Manager (Engg) may require the contractor to dismiss or remove from the site of the work any person or persons in the contractor’s employment upon the work who may be incompetent or who misconducts himself and the contractor shall forthwith comply with such requirements.

**CLAUSE 19 J**

It shall be the responsibility of the contractor to see that the building under construction is not occupied by any body unauthorized during construction, and is handed over to the Manager (Engg) with vacant possession of complete building. If such building though completed is occupied illegally, then the Manager (Engg) shall have the option to refuse to accept the said building/buildings in that position. Any delay in acceptance on this account will be treated as the delay in completion and for such delay a levy up to 5% of tendered value of work may be imposed by the Manager (Engg) upon approval of Managing Director whose decision shall be final both with regard to the justification and quantum and be binding on the contractor.

However, the Manager (Engg), through a notice, may require the contractor to remove the illegal occupation any time on or before construction and delivery.

**CLAUSE 20**

The Contractor shall at least pay and comply with all the provisions of the Minimum Wages Acts and Rules framed there under other labour laws related to contract labour.

**CLAUSE 21**

The contract shall not be assigned or sublet without the written approval of the Manager (Engg) with approval of Managing Director. And if the contractor shall assign or sublet his contract, or attempt to do so, or become insolvent or commence any insolvency proceedings or make any composition with his creditors or attempt to do so, or if any bribe, gratuity, gift, loan, perquisite, reward or advantage pecuniary or otherwise, shall either directly or indirectly, be given, promised or offered by the contractor, or any of his servants or agent to any public officer or person in the employ of Government in any way relating to his office or employment, or if any such officer or person shall become in any way directly or indirectly interested in the contract, the Manager (Engg) on behalf of the **COMFED** shall have power to adopt the courses specified in Clause 3 hereof in the interest of Government and in the event of such course being adopted the consequences specified in the said Clause 3 shall ensue.

**CLAUSE 22**

All sums payable by way of compensation under any of these conditions shall be considered as reasonable compensation to be applied to the use of Government without reference to the actual loss or damage sustained and whether or not any damage shall have been sustained.

**CLAUSE 23**

Where the contractor is a partnership firm, the previous approval in writing of the Managing Director shall be obtained before any change is made in the constitution of the firm where the contractor is an individual or a Hindu undivided family business concern such approval as
Settlement of Disputes and Arbitration

CLAUSE 24

All works to be executed under the contract shall be executed under the direction and subject to the approval in all respects of the Manager (Engg) who shall be entitled to direct at what point or points and in what manner they are to be commenced, and from time to time carried on.

CLAUSE 25

Except where otherwise provided in the contract all questions and disputes relating to the meaning of the specifications, design, drawings and instructions here-in-before mentioned and as to the quality of workmanship or materials used on the work or as to any other question, claim right matter or thing whatsoever in any way arising out of or relating to contract, designs, drawings, specifications, estimates, instructions, orders or these conditions or otherwise concerning the works or the execution or failure to execute the same whether arising during the progress of the work or after the cancellation, termination, completion or abandonment thereof shall be dealt with as mentioned hereinafter.

If the contractor considered any work demanded of him to be outside the requirements of the contract, or dispute any drawings, record or decision given in writing by the Engineer-in-Charge on any matter in connection with or arising out of the contract or carrying out of the work, to be unacceptable, he shall promptly within 7 days request the Manager (Engg) in writing for written instruction or decision. Thereupon, the Manager (Engg) shall give his written instructions or decision within a period of fifteen days from the receipt of the Contractor’s letter.

If the Manager (Engg) fails to give his instruction of decision in writing within the aforesaid period or if the contractor is dissatisfied with the instructions or decision of the Manager (Engg), the contractor may, within 15 days of the receipt of Manager (Engg) decision, appeal to the General Manager (COMFED) who shall afford an opportunity to the contractor to be heard, if the latter so desires, and to offer evidence in support of his appeal. The General Manager (COMFED) shall give his decision within 30 days of receipt of contractor’s appeal. If the contractor is dissatisfied with this decision, the contractor shall within a period of 30 days from receipt of the decision, give notice to the General Manager (COMFED) for appointment of arbitrator failing which the said decision shall be final binding and conclusive and not referable to adjudication by the arbitrator.

Expert where the decision has become final, binding and conclusive in terms of sub para (i) above disputes or difference shall be referred for adjudication through arbitrator appointed by Managing Director (COMFED) or the administrative head of the said P.W.D. If the arbitrator so appointed is unable or unwilling to act or resign his appointment or vacates his office due to any reason whatsoever another sole arbitrator shall be appointed in the manner aforesaid. Such person shall be entitled to proceed with the reference from the stage at which it was left by his predecessor.

It is a term of this contract that the party invoking arbitration shall give a list of disputes with amounts claimed in respect of each such dispute along with the notice for appointment of arbitrator and giving reference to the rejection by the General Manager (COMFED) of the appeal.

It is also a term of the contract that the arbitrator shall be deemed to have entered on the reference on the date he issued notice to both the parties calling them to submit their statement of claims and counter statement of claims. The venue of the arbitration shall be such place as may be fixed by the arbitrator in his sole discretion. The decision of arbitrator will be final & binding to the parties.
CLAUSE 26

The contractor shall fully indemnify and deep indemnified the COMFED against any action, claim or proceeding relating to infringement or use of any patent or design or any alleged patent or design rights and shall pay any royalties which may be payable in respect of any article or part thereof included in the contract. In the event of any claims made under the action brought against COMFED in respect of any such matter as aforesaid the contractor shall be immediately notified thereof and the contractor shall be at liberty, at his own expense, to settle any dispute or to conduct any litigation that may arise there from, provided that the contractor shall not be liable to indemnify the COMFED if the infringement of the patent or design or any alleged patent or design right is the direct result of an order passed by the Manager (Engg) in this behalf.

CLAUSE 27

When the estimate on which a tender is made includes lump sum in respect of parts of the work, the contractor shall be entitled to payment in respect of the items of work involved or the part of the work in question at the same rates as are payable under this contract for such items, or if the part of the work in question is not, in the opinion of the Manager (Engg) payable of measurement, The Manager (Engg) may at his discretion pay the lump-sum amount entered in the estimate, and the certificate in writing of the Manager (Engg) shall be final and conclusive against the contractor with regard to any sum or sums payable to him under the provisions of the clause.

CLAUSE 28

In the case of any class of work for which there is no such specifications as referred to in Clause 11, such work shall be carried out in accordance with the Bureau of Indian Standards Specifications, Indian Road Congress for road works and Indian Building Congress for building works or any central government agency. In case there is no such specifications in Bureau of Indian Standards, the work shall be carried out as per manufacturers specifications. If not available then as per District Specifications. In case there are no such specifications as required above, the work shall be carried out in all respects in accordance with the instructions and requirements of the Consultant-In-Charge.

CLAUSE 29

i) Whenever any claim or claims for payment of a sum of money arises out of or under the contract or against the contractor, the Manager (Engg) or the COMFED shall be entitled to without and also have a lien to retain such sum or sums in whole or in part from the security, if any deposited by the contractor and for the purpose aforesaid, the Manager (Engg) or the COMFED shall be entitled to withhold the security deposit, if any, furnished as the case may be and also have a lien over the same pending finalization or adjudication of any such claim. In the event of the security being insufficient to cover the claimed amount or amounts or if no security has been taken from the contractor, the Manager (Engg) or the COMFED shall be entitled to withhold and have a lien to retain to the extent of payable or which may at any time thereafter become payable to the contractor under the same contract or any other contract with the Manager (Engg) or the COMFED or any contracting person through the Manager (Engg) of the COMFED or any person through the Manager (Engg) pending finalization of adjudication of any such claim.

It is an agreed term of the contract that the sum of money or moneys so withheld or retained under the lien referred to above by the Manager (Engg) or COMFED will be kept, withheld or retained as such by the Manager (Engg) or COMFED till the claim arising out of or under the contract is determined by the arbitrator (if the contract is governed by the arbitration clause) by the competent court, as the case may be and that the contractor will have no claim for interest or damages whatsoever on any account in respect of such withholding or retention under the lien referred to above and duly notified as such to the contractor. For the purpose of this clause, where the contractor is a
partnership firm or a limited company, the Manager (Engg) or the COMFED shall be entitled to withhold and also have a lien to retain towards such claimed amount or amounts in whole or in part from any sum found payable to any partner/limited company as the case may be, whether in his individual capacity or otherwise.

ii) COMFED shall have the right to cause an audit and technical examination of the works and the final bills of the contractor including all supporting vouchers, abstract etc., to be made after payment of the final bill and if as a result of such audit and technical examination any sum is found to have been overpaid in respect of any work done by the contractor under the contract or any work claimed to have been done by him under the contract and found not to have been executed, the contractor shall be liable to refund the amount of over-payment and it shall be lawful for COMFED to recover the same from him in the manner prescribed in sub-clause (i) of this clause or in any other manner legally permissible; and if is found that the contractor was paid less than what was due to him under the contract in respect of any work executed by him under it, the amount of such under payment shall be duly paid by Government to the contractor, without any interest thereon whatsoever.

CLAUSE 29 A

Any sum of money due and payable to the contractor (including the security deposit returnable to him) under the contract may be withheld or retained by way of lien by the Manager (Engg) or the COMFED or any other contracting person or persons through Manager (Engg) against any claim of the Manager (Engg) or COMFED or such other person or persons in respect of payment of a sum of money arising out of or under any other contract made by the contractor with the Manager (Engg) or the COMFED or with such other person or persons.

It is an agreed term of the contract that the sum of money so withheld or retained under this clause by the Manager (Engg) or the COMFED will be kept withheld or retained as such by the Manager (Engg) or the COMFED or till his claim arising out of the same contract or any other contract is either mutually settled or determined by the arbitration clause or by the competent court, as the case may be and that the contractor shall have no claim for interest or damages whatsoever on this account or on any other ground in respect of any sum of money withheld or retained under this clause and duly notified as such to the contractor.

CLAUSE 30

The contractor(s) shall make his/their own arrangements for water required for the work and nothing extra will be paid for the same. This will be subject to the following conditions.

i) That the water used by the contractor(s) shall be fit for construction purposes to the satisfaction of the Manager (Engg).

ii) The Manager (Engg) shall make alternative arrangements for supply of water at the risk and cost of contractor(s) if the arrangements made by the contractor(s) for procurement of water are in the opinion of the Manager (Engg), unsatisfactory.

CLAUSE 31

Notwithstanding anything contained to the contrary in this contract where any materials for the execution of the contract are procured with the assistance of COMFED, either by issue form COMFED stocks or purchase made under orders or permits or licenses issued by COMFED the Agency shall hold the said materials economically and solely for the purpose of the contract and not dispose of them without the written permission of the COMFED, and return, if required by the Manager (Engg), all surplus or unserviceable materials that may be left with him after the completion of the contract or at its termination for any reason whatsoever on being paid or credited such price as the Engineer in Charge shall determine having due regard to the condition of the materials. The price allowed to the Agency however shall not exceed the amount charged by him excluding the element of storage charges. The decision of the Engineer in Charge shall be final and conclusive. In the event of breach of the aforesaid condition the Agency shall in addition
to throwing himself open to action for contravention of the term of the license or permit and/or for criminal breach of trust, be liable to COMFED for all moneys, advantages or profits resulting or which in the usual course would have resulted to him by reason of such breach.

CLAUSE 32

i) The contractor shall arrange at his own expense all tools, plant machinery and equipment (hereinafter referred to as T & P) required for execution of the work except for the Plant & Machinery listed in Schedule ‘C’ and stipulated for issue to the contractor. If the contractor requires any item of T & P on hire from the T & P available will, if such item is available, hire it to the contractor at rates to be agreed upon between him and the Consultant-In-Charge. In such a case all the conditions hereunder for issue of T & P shall also be applicable to such T & P as is agreed to be issued.

ii) Plant and Machinery when supplied on hire charges shown in Schedule ‘C’ shall be made over and taken back at the idea equipment yard/shed shown in Schedule ‘C’ and the contractor shall bear the cost of carriage from the place of issue to the site of work and back. The contractor shall be responsible to return the plant and machinery with condition in which it was handed over to him, and he shall be responsible for all damage caused to the said plant and machinery at the site of work or elsewhere in operation and otherwise during transit including damage to or loss of plant and for all losses due to his failure to return the same soon after the completion of the work for which it was issued. The Divisional Engineer shall be the sole judge to determine the liability of the contractor and its extent in this regard and his decision shall be final and binding on the contractor.

iii) The plant and machinery as stipulated above will be issued as and when available and if required by the contractor. The contractor shall arrange his programme of work according to the availability of the plant and machinery and no claim, whatsoever, will be entertained from him for any delay in supply by the COMFED.

iv) The hire charges shall be recovered at the prescribed rates from and inclusive of the date the plant and machinery made over up to and inclusive of the date of the return in good order even though the same may not have been working for any cause except major breakdown due to not fault of the Agency or faulty use requiring more than three working days continuously (excluding intervening holidays and Sundays) for bringing the plant in order. The Agency shall immediately intimate in writing to the Engineer in Charge when any plant or machinery gets out of order. The Engineer in Charge shall record the date and time of receipt of such intimation in the log sheet of the plant or machinery. Based on this if the breakdown before lunch period or major breakdown will be computed considering half a day’s breakdown on the day of complaint. If the breakdown occurs in the post lunch period of major breakdown will be computed starting from the next working day. In case of any dispute under this clause the decision of the Manager (Engg) shall be final and binding on the Agency.

v) The hire charges shown above are for each day of 8 hours (inclusive of the one hour lunch break) or part thereof.

vi) Hire charges will include service of operating staff as required and also supply of lubricating oil and stores for cleaning purposes. Power fuel of approved type, firewood, kerosene oil etc. for running the plant and machinery and also the full time chowkidar for guarding the plant and machinery against any loss or damage shall be arranged by the contractor who shall be fully responsible for the safeguard and security of plant and machinery. The contractor shall on or before the supply of plant and machinery sign an agreement indemnifying the COMFED against any loss or damage caused to the plant and machinery either during transit or at site of work.

Ordinarily, no plant and machinery shall work for more than 8 hours a day inclusive of one hour lunch break. In case of an urgent work however, the Engineer in Charge may, at his discretion, allow the plant and machinery to be worked for more than normal period or 8 hours a day. In that case the hourly hire charges for overtime to charge (1/8)th of the daily charges) subject to a minimum of half day’s normal charges on any particular day. For working out hire charges for
over time a period of half an hour and above will be charged as one hour and a period of less than half an hour will be ignored. The Agency shall release the plant and machinery every seventh day for periodical servicing and/or wash out which may take about three to four hours or more. Hire charges for full day shall be recovered from the Agency for the day of servicing/Wash out irrespective of the period employed in servicing.

The plant and machinery once issued to the Agency shall not be returned by him on account of lack of arrangements of labour and materials, etc. on his part, the same will be returned only when they are required for major repairs or when in the opinion of the Engineer in Charge the work or a portion of work for which the same was issued is completed.

The Agency shall be responsible to return the plant and machinery in the condition in which it was handed over to him and he shall be responsible for all damage caused to the said plant and machinery at the site of work or elsewhere in operation or otherwise or during transit including damage to or loss of parts, and for all losses due to his failure to return the same soon after the completion of the work for which it was issued. The Divisional Engineer shall be the sole judge to determine the liability of the Agency and its extent in this regard and his decision shall be final and binding on the Agency.

In the case of concrete mixers, the Agency shall arrange to get the hopper cleaned and the drum washed at the close of the work each day or each occasion.

In case rollers for consolidation are employed by the Agency himself, log book for such rollers shall be maintained in the same manner as is done in case of Ideal rollers, maximum quantity of any item to be consolidated for each roller day shall also be same as in Annexure to Clause 34 (x). For less use of rollers recovery for the less roller days shall be made at the stipulated issue rate.

The Agency will be exempted for levy of any hire charges for the number of days he is called upon in writing by the Engineer in Charge to suspend execution of the work provided COMFED plant and machinery in question have, in fact remained idle with the Agency because of the suspension.

In the event of the Agency not requiring any item of plant and machinery issued by COMFED though not stipulated for issue in Schedule ‘C’ any time after taking delivery at the placed of issue, he may return it after two days written notice or at any time without notice if he agrees to pay hire charges for two days written notice or at any time without notice if he agrees to pay hire charges for two additional days without in any way affecting the right of the Engineer in Charge to use the said plant and machinery during the said period of two days as he likes including hiring out to a third party.

**CLAUSE 33**

**Contractors Superintendence, Supervision, Technical Staff & Employees**

i) The contractor shall provide all necessary superintendence during execution of the work and as along thereafter as may be necessary for proper fulfillment of the obligations under the contract.
The contractor along with bidding of the tender, intimate in writing to the Manager (Engg) the name, qualifications, experience, age, address and other particulars along with certificates, of the principal technical representative to be in charge of the work. Such qualifications and experience shall not be lower than specified in Schedule ‘F’. The Manager (Engg) shall within 15 days of issue of letter of acceptance intimate in writing his approval or otherwise of such a representative to the contractor, intimate in writing his approval or otherwise of such a representative to the contractor. Any such approval may at any time be withdrawn and in case of such withdrawal the contractor shall appoint another such representative according to the provisions of this clause. Decision of the tender Managing Director shall be final and binding on the contractor in this respect. Such a principal technical representative shall be appointed by the contractor soon after receipt of the approval from Managing Director or any other person so authorized by him. Technical staff shall be available at site within fifteen days of start of work.

If the contractor (or any partner in case of firm/company) who himself has such qualifications, it will not be necessary for the said contractor to appoint such a principal technical representative but the contractor shall designate and appoint a responsible agent to represent him and to be present at the work whenever the contractor is not in a position to be so present. All the provisions applicable to the principal technical representative under the Clause will also be applicable in such a case to contractor or his responsible agent. The principal technical representative and/or the contractor or his responsible authorized agent shall be actually available at site also during recording of measurement of works and whenever so required by the Manager (Engg) or his designated down the instructions and in token of acceptance of measurements.

If the Manager (Engg), whose decision in this respect is final and binding on the contractor, is convinced that no such technical representative or agent is effectively appointed or is effectively attending or fulfilling the provision of this clause, a recovery shall be effected from the contractor as specified in Schedule ‘F’ and the decision of the Manager (Engg) as recorded in the site order book and measurement recorded in Measurement Books shall be final and binding on the contractor. Further if the contractor fails to appoint a suitable technical representative or responsible agent and if such appointed persons are not effectively present or do not discharge their responsibilities satisfactorily, the Manager (Engg) shall have full powers to suspend the execution of the work until such date as a suitable agent is appointed and the contractor shall submit a certificate of employment of the technical representative/responsible agent along with every on account bill/fixed bill and shall produce evidence if at any time so required by the Manager (Engg).

ii) The Contractor shall provide and employ on the site only such technical assistants as are skilled and experienced in their respective fields and such foremen and supervisory staff as are competent to give proper supervision to the work. The contractor shall provide and employ skilled, semi-skilled and unskilled labour as is necessary for proper and timely execution of the work.

The Engineer in Charge shall be at liberty to object to and require the contractor to remove from the works any person who in his opinion misconducts himself, or is incompetent or negligent in the performance of his duties or whose employment is otherwise considered by the Engineer in Charge to be undesirable. Such person shall not be employed again at works site without the written permission of the Engineer in Charge and the persons so removed shall be replaced as soon as possible by competent substitutes.

CLAUSE 34
i) Sales Tax, any other tax on materials or Labour Welfare Tax (if applicable) in respect of this contract shall be payable by the contractor and COMFED shall not entertain any claim whatsoever in this respect.

ii) The contractor shall deposit royalty and obtain necessary permit for supply of the red bajri, earth, moorum, sand, stone chips, kankar, etc. from local authorities.
If pursuant to or under any law, notification or order any royalty, cess or the like becomes payable to the Government of India and does not at any time become payable by the contractor to the Government. Local authorities in respect of any material used by the contractor in the works then in such a case, it shall be lawful to the Government of India and it will have the right and be entitled to recover the amount paid in the circumstances as aforesaid from dues of the contractor.

CLAUSE 35

All tendered rates shall be inclusive of all taxes and levies payable under respective statutes. However, pursuant to the Constitution (46th Amendment) Act, 1982, if any further tax or levy is imposed by Statute, after the last stipulated date for the receipt of Tender offer including extensions if any and the Contractor thereupon necessarily and properly pays such taxes / levies, the Contractor shall be reimbursed the amount so paid, provided such payments, if any, is not, in the opinion of the Engineer in Charge/ Chief Engineer(whose decision shall be final and binding on the Contractor) attributable to delay in execution of work within the control of Contractor.

The Contractor shall keep necessary books of accounts and other documents for the purpose of this condition as may be necessary and shall allow inspection of the same by a duly authorized representative of the COMFED and /or the Engineer In Charge and further shall furnish such other information/ document as the Engineer in Charge may require from time to time.

The contractor shall, within a period of 30 days of the imposition of any such further tax or levy, pursuant to the Constitution (46th Amendment) Act, 1982, give a written notice thereof to the Engineer in Charge that the same is given pursuant to this condition, together with all necessary information relating thereto.

CLAUSE 36

If the contractor is imprisoned, becomes insolvent compound with his creditors, has a receiving order made against him or carries on business under a receiver for the benefit of the creditors or any of them, or being a partnership firm becomes dissolved, or being a company or corporations goes into liquidation or commences to be wound up not being a voluntary winding up for the purpose only of amalgamation or reconstitution the Nigam shall be at liberty.

To give such liquidator, receiver, or other person in whom the contract may become vested, the option of carrying out the contract or a position there of to be determined by the Nigam, subject to his providing an appropriate guarantee for the performance of such contract or.

To terminate the contract, forthwith by notice in writing to the Agency, the liquidator, the receiver or person in whom the contract may become vested and take further action as provided in the relevant clauses of the contract.

CLAUSE 37

Without prejudice to any of the rights or remedies under this contract if the contractor dies, the Managing Director on behalf of the COMFED shall have the option of terminating the contract without compensation to the contractor after the affidavit of his/their legal heir/heirs that they are not going to be in this profession in future.

CLAUSE 38

The Agency shall not be permitted to Rate Offer for works in the concerned division (responsible for award and execution of contracts) in which his near relative is posted as Divisional Accountant or as an officer in any capacity between the grades of the Superintending Engineer and Assistant Engineer (both inclusive). He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any Gazetted Officer in the COMFED. Any breach of this condition by the Agency's of
this Nigam shall lead to blacklisting. If however the Agency’s is registered in any other COMFED, he shall be debarred from tendering in COMFED for any breach of this condition.

NOTE: By the term “near relatives” is meant wife, husband, parents and grand parents, children and grand children, brothers and sisters, uncles, aunts and cousins and their corresponding in law.

CLAUSE 39

No engineer of gazetted rank or other gazetted officer employed in engineering or administrative duties in an engineering COMFED shall work as an Agency or employee of an Agency for a period of two years after his retirement from COMFED service without the previous permission of State Government of India in writing. This contract is liable to be cancelled if either the Agency or any of his employees is found at any time to be such a person who had not obtained said permission prior to engagement in the Agency’s service, as the case may be.

CLAUSE 40

After completion of the work and also at any intermediate stage in the event of non reconciliation of materials issued, consumed and in balance (see Clause 10) theoretical quantity of materials issued by the COMFED for use in the work shall be calculated on the basis and method given hereunder.

Quantity of cement & bitumen shall be calculated on the basis of quantity of cement & bitumen required different items of work as shown in the Schedule of Rates mentioned in Schedule ‘F’. In case any item is executed for which standard constants for the consumption of cement or bitumen are not available in the above mentioned schedule/statement or cannot be derived from the same shall be calculated on the basis of standard formula to be laid down by the Engineer in Charge.

Theoretical quantity of steel reinforcement of structural steel sections shall be taken as the quantity required as per design or as authorized by Engineer in Charge, including authorized lappages, chairs etc., plus 3% wastage due to cutting into pieces, such theoretical quantity being determined and compared with the actual issues each diameter wise, section wise and categories wise separately.

For any other material as per actual requirements.

Over the theoretical quantities of materials so computed a variation shall be allowed as specified in Schedule ‘F’. The difference in the net quantities of material actually issued to the Agency and the theoretical quantities including such authorized variation, if not returned by the Agency or if not fully reconciled to the satisfaction of the Engineer in Charge within fifteen days of the issue of written notice by the Engineer in Charge to this effect shall be recovered at the rates specified in Schedule ‘F’ without prejudice to the provision of the relevant conditions regarding return of materials governing the contract. Decision of Engineer in Charge in regard to theoretical quantities of materials, which should have been actually used as per the Annexure of the standard schedule of rates and recovery at rates specified in Schedule ‘F’, shall be final & binding on the Agency.

For not scheduled items, the decision of the Managing Director regarding theoretical quantities of materials, which should have been actually used, shall be final and binding on the Agency.

The said action under this clause is without prejudice to the right of the COMFED to take action against the Agency under any other conditions of contract for not doing the work according to the prescribed specifications.

CLAUSE 41

Release of Security deposit after labour clearance

No-Gazetted-Engineer to work as Agency within two years of retirement

Return of material and recovery for excess material issued
On completion of the whole of the work, half of the total amount of security shall be repaid to the contractor after six months of completion. However, the balance half of the total amount of security will be returned after completion of defect liability period and after the Engineer has certified that all defects notified by him to the contractor before the end of this period have been corrected and also after recovery of any dues.

Clause 42

Technical officers/staff deployed by the Contractor at any construction site will also be responsible for inferior quality/poor performance of any work; and his name will be circulated to all division of the department, to debar from any other site, if his name is being proposed by other contractor.

CLAUSE 43

All risks of loss of or damage to physical property and of personal injury and death which arise during and in consequence of the performance of the Contract other than the excepted risks are the responsibility of the Contractor.

CLAUSE 44

The Contractor shall provide, in the joint names of the Employer and the Contractor, insurance cover from the Start Date to the end of the Defects Liability Period, in the amounts and deductibles stated in the Contract Data for the following events which are due to the Contractor’s risks: loss of or damage to the Works, Plant and Materials; loss of or damage to Equipment; loss of or damage of property (except the Works, Plant, Materials and Equipment) in connection with the Contract; and Personal injury or death.

Policies and certificates for insurance shall be delivered by the Contractor to the Engineer for the Engineer’s approval before the Start Date. All such insurance shall provide for compensation to be payable in the types and proportions of currencies required to rectify the loss or damage incurred.

Policies and certificates for insurance shall be delivered by the Contractor to the Engineer for the Engineer’s approval before the Start Date. All such insurance shall provide for compensation to be payable in the types and proportions of currencies required to rectify the loss or damage incurred.

If the Contractor does not provide any of the policies and certificates required, the Employer may affect the insurance which the Contractor should have provided and recover the premiums the Employer has paid from payments otherwise due to the Contractor or, if no payment is due, the payment of the premiums shall be a debt due.

Alteration to the terms of insurance shall not be made without the approval of the Managing Director.

Both parties shall comply with any conditions of the insurance policies.

CLAUSE 45

The Contractor shall, within the time stated in special Conditions of contract after the date of the Letter of Acceptance, provide to the Engineer for his information a detailed cash flow estimate, in quarterly periods, of all payments to which the Agency will be entitled under the Contract and the Agency shall subsequently supply revised cash flow estimates at quarterly intervals, if required to do so by the Engineer in charge.

CLAUSE 46
The Contractor shall, throughout the execution and completion of the Works and the remedying of any defects therein:

have full regard for the safety of all persons entitled to be upon the Site and keep the Site (so far as the same is under his control) and the Works (so far as the same are not completed or occupied by the Employer) in an orderly state appropriate to the avoidance of danger to such persons,

Provide and maintain at his own cost all lights, guards, fencing, warning signs and watching, when and where necessary or required by the Engineer or by any duly constituted authority, for the protection of the Works or for the safety and convenience of the public or others, and take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation.

CLAUSE 47

All samples shall be supplied by the Contractor at his own cost if the supply thereof is clearly intended by or provided for in the Contract.

CLAUSE 48

The cost of making any test shall be borne by the Contractor if such test is:

clearly intended by or provided for in the Contract, or particularised in the Contract (in case only of a test under load or of a test to ascertain whether the design of any finished or partially finished work is appropriate for the purposes which it was intended to fulfill) in sufficient detail to enable the Contractor to price or allow for the same in his Tender.

CLAUSE 49

If any test required by the Engineer which is:

not so intended by or provided for,

(in the cases above mentioned) not so particularised, or (though so intended or provided for) required by the Engineer to be carried out at any place other than the Site or the place of manufacture, fabrication or preparation of the materials or Plant tested, shows the materials, Plant or workmanship not to be in accordance with the provisions of the Contract to the satisfaction of the Engineer, then the cost of such test shall be borne by the Contractor, but in any other case Sub-Clause shall apply.

CLAUSE 50

The contract shall commence the Works as soon as is reasonably possible after the receipt by him of a notice to this effect from the Consultant-In-Charge, which notice shall be issued within the time stated in the Appendix to Tender after the date of the Letter of Acceptance. Thereafter, the Contractor shall proceed with the Works with due expedition and without delay.

CLAUSE 51

If any part of the Permanent Works has been substantially completed and has satisfactorily passed any Test on Completion prescribed by the Contract, the Engineer may issue a Taking-Over Certificate in respect of that part of the Permanent Works before completion of the Works and, upon the issue of such Certificate, the Contractor shall be deemed to have undertaken to complete with due expedition any outstanding work in that part of the Permanent Works during the Defects Liability Period.

CLAUSE 52

Neither party shall be liable to the other for any loss or damage occasioned by nor raisin out of acts of GOD such has unprecedented flood, volcanic eruption, Earthquake or other convulsion of
nature and other acts such as the general partial strikes by a section of COMFED employees, invasion, the act of foreign countries hostilities or war like operation before or after declaration of war, rebellion military or usurped power which prevent performance of the contract and which could not have been foreseen or avoided by a prudent person.

CLAUSE 53

Recovery

Any amount found recoverable from the Agency shall be recovered as public demand under the Bihar Public Demand Act without prejudice to any other mode of recovery.
GENERAL CONDITIONS OF CONTRACT

For Plant Work
1.0 Definitions

1.1 In this Contract, the following terms shall be interpreted as indicated.

a. The Contract means the agreement entered into between the Purchaser and the Supplier, as recorded in the Contract Form signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein;

b. "The Contract Price" means the price payable to the Supplier under the Contract for the full and proper performance of its contractual obligations;

c. "The Goods" means all of the equipment, machinery, and/or other materials, which the Supplier is required to supply to the Purchaser under the Contract;

d. "Services" means services ancillary to the supply of the Goods, such as transportation and insurance, and any other incidental services, such as installation, commissioning, provision of technical assistance, training and other such obligations of the Supplier covered under the Contract;

e. "The Purchaser" means the Organisation purchasing the Goods and services and would include the term "Owner";

f. "The Supplier" means the individual or firm supplying the Goods and services under this Contract; and

g. "Engineer-in-charge" means the Engineer designated as such or other Engineer appointed from time to time by the Purchaser and notified in writing to the Supplier to act as Engineer-in-charge for the purposes of contract.

h. "Works" means all goods to be provided and work (Services) to be done by the supplier under the contract.

2.0 Application

2.1 These General Conditions shall apply to the extent that they are not superseded by provisions in other parts of the Contract.

6.0 Country of Origin

For purpose of this Clause "origin" means the place where the Goods were mined, grown or produced, or from which the Services are supplied. Goods are produced when, through manufacturing, processing or substantial and major assembling of components, a commercially recognised new product results that is substantially different in basic characteristics or in purpose or utility from its components.

The origin of Goods and Services is distinct from the nationality of the Supplier.

4.0 Standards
4.1. The Goods supplied under this Contract shall conform to the standards mentioned in the Technical Specifications, and, when No applicable standard is mentioned, to the authoritative standard appropriate to the Goods' country of origin and such standards shall be the latest issued by the concerned institution.

5.0 Use of Contract Documents and Information

5.1 The Supplier shall not, without the Purchaser's prior written consent, disclose the Contract, or any provision thereof, or any specification, plan, drawing, pattern, sample or information furnished by or on behalf of the Purchaser in connection therewith, to any person other than a person employed by the Supplier in the performance of the Contract. Disclosure to any such employed person shall be made in confidence and shall extend only so far as may be necessary for purposes of such performance.

5.2 The Supplier shall not, without the Purchaser's prior written consent, make use of any document or information enumerated in para 5.1 except for purposes of performing the Contract.

5.3 Any document, other than the Contract itself, enumerated in Para 5.1 shall remain the property of the Purchaser and shall be returned (in all copies) to the Purchaser on completion of the Supplier’s performance under the Contract if so required by the Purchaser.

6.0 Patent Rights

6.1 The Supplier shall indemnify the Purchaser against all third-party claims of infringement of patent, trademark or industrial design rights arising from use of the Goods or any part thereof in India.

7.0 Performance Security

7.1 Within 30 days after the Supplier's receipt of notification of award of the Contract, the Supplier shall furnish performance security to the Purchaser in the amount specified in the Special Conditions of Contract.

7.2 The proceeds of the performance security shall be payable to the Purchaser as compensation for any loss resulting from the Supplier's failure to complete its obligations under the Contract.

7.3 The Performance Security shall be denominated in the currency of the Contract or in a freely convertible currency acceptable to the Purchaser, and shall be in the following form:

a. A bank guarantee, issued by a Nationalized Indian Bank/other banks like IDBI Bank treated/approved by RBI to be at par with Nationalized Banks for the limited purpose of acceptance of guarantee or a foreign bank having branch in India.

OR

b. Demand Draft or Banker's Cheque in favour of Bihar State Milk Co-Operative Federation Ltd. payable at Patna.
c. Such bank guarantees shall be valid till the expiry of the warranty period.

7.4 The performance security will be discharged by the Purchaser and returned to the Supplier not later than 30 days following the date of completion of the Supplier’s performance obligations, including any warranty obligations, under the Contract.

8.0 Inspection and Tests

8.1 The Purchaser or its representative shall have the right to inspect and / or test the Goods to confirm their conformity to the Contract. The Special Conditions of Contract and / or the Technical Specifications shall specify what inspections and tests the Purchaser requires and where they are to be conducted. The Purchaser shall notify the Supplier in writing of the identity of any representatives, if retained for these purposes.

8.2 The inspections and tests may be conducted on the premises of the Supplier or its subcontractor(s), at point of delivery and / or at the Good's final destination. Where conducted on the premises of the Supplier or it's subcontractor(s), all reasonable facilities and assistance including access to drawings and production data shall be furnished to the inspectors at no charge to the Purchaser. In case of any defects or deficiency notified by the Purchaser’s inspection authority, the Supplier will rectify and make good the same without delay and not proceed with further processing of such item(s) of Goods without obtaining approval from the inspection authority.

8.3 Should any inspected or tested Goods fail to conform to the Specifications, the Purchaser may reject them and the Supplier shall either replace the rejected Goods or make all alterations necessary to meet specification requirements free of cost to the Purchaser.

8.4 The Purchaser’s right to inspect, test and, where necessary, reject the Goods after the Goods' arrival at the destination shall in no way be limited or waived by reason of the Goods having previously been inspected, tested and passed by the Purchaser or its representative prior to the Goods shipment from the country of origin.

8.5 Tests upon completion (for Supply, installation & commissioning contracts)

8.5.1 The Supplier shall give to the Purchaser, 21 day’s notice of the date after which he will be ready to make the tests of completion (the Test). Unless otherwise agreed, the Tests shall take place within 14 days after the said date on such day or days, as the Purchaser shall notify the Supplier.

8.5.2 If the Purchaser fails to appoint a time after having been asked to do so, or does not attend at the time and place appointed, the Supplier shall be entitled to proceed with the Tests in his absence. The tests shall then be deemed to have been made in the presence of the Purchaser and the results of the Tests shall be accepted as accurate.

8.5.3 If the Tests are being unreasonably delayed by the Supplier the Purchaser may give notice requiring the Supplier to make the tests within 21 days after the receipt of such notice. The supplier shall make the Tests on such days within that period as the Supplier may fix and of which he shall give notice to the Purchaser.

If the Supplier fails to make the Tests within 21 days the Purchaser may himself proceed with the Tests. All tests so made by the Purchaser shall be at the risk and cost of the Supplier and the cost thereof shall be deducted from the Supplier's price. The test shall then be deemed to have been made in the presence of the Supplier and results of the tests shall be accepted as accurate.
8.5.4 If the Goods / services or any section fails to pass the Tests, the Supplier may require such tests to be repeated on the same terms and conditions. All costs to which the Purchaser may be put to by the repetition of the tests under this sub-clause or under sub clause 8.5.14 shall be deducted from the Contract Price.

8.5.5 If the Purchaser and the Supplier disagree on the interpretation of the test results each shall give a statement of his views to the other within 14 days after such disagreement arises. The statement shall be accompanied by all relevant evidence. The Purchaser will review both the statements and render a final decision within a further period of fourteen (14) days, which shall be binding on the Supplier.

8.5.6 If the Goods/Services or any Section fails to pass the Tests on the repetition thereof under sub-clause 8.5.4 the Purchaser after due consultation with the Supplier, shall be entitled to:

a) Order one further repetition of the Tests under the conditions of sub-clause 8.5.4

Or,

b) Reject the Goods or a section thereof in which event the Purchaser shall have the same remedies against the Supplier as are provided under sub-clause 8.5.12.

c) Issue a taking over certificate, if the Purchaser so wishes, notwithstanding that the Goods are not complete. The Supplier’s price shall then be reduced by such amount as may be agreed to by the Purchaser and the Supplier or failing an agreement, as may be determined through arbitration.

8.5.7 In considering the results of tests carried out under sub-clause 8.5.11 and 8.5.14 and the Purchaser shall make allowances for the effect of any use of the Goods by him on the performance or other characteristics of the Goods.

8.5.8 As soon as the Goods / Services or any section thereof has passed the tests, the Purchaser shall issue a certificate to the Supplier to that effect.

8.5.9 The Goods and Services shall be accepted by the Purchaser when they have been completed in accordance with the contract, except in minor respects that do not affect the use of the Goods for their intended purposes and having passed the tests on completion and a taking over certificate has been issued or deemed to have been issued in accordance with sub-clause 8.5.10

8.5.10 The Supplier may apply by notice to the Purchaser for a taking over certificate not earlier than 14 days before the goods will in the Supplier's opinion be complete and ready for taking over under sub-clause 8.5.9.

The Purchaser shall within 28 days after the receipt of the Supplier's application either:

a) Issue the taking over certificate to the Supplier stating the date on which the works were complete and ready for taking over, or

b) Reject the application giving his reasons and specifying the work required to be done by the Supplier to enable the taking over certificate to be issued.

c) If the Purchaser fails either to issue the taking over certificate or to reject the Supplier’s application within the period of 28 days he shall be deemed to have issued the taking over certificate on the last day of that period.
d) If the services are divided by the Contract into sections the Supplier shall be entitled to apply for separate taking over certificate for each such section.

8.5.11 The Purchaser shall not use any part of the Goods unless taking over certificate has been issued in respect thereof.

If nevertheless the Purchaser uses any part of the Goods that part which is used shall be deemed to have been taken over at the date of such use. The Purchaser shall on request of the Supplier issue a taking over certificate accordingly. If the Purchaser uses any part of the Goods before taking over, the Supplier shall be given the earliest opportunity of taking such steps as may be necessary to carry out the tests on completion.

8.5.12 If the Supplier fails to remedy a defect or damage pointed out by the Purchaser within a reasonable time, the Purchaser may fix a final time for remedying the defect or damage.

If the Supplier fails to do so, the Purchaser may:

a) Carry out the work himself or by others at the Supplier’s risk and cost, provided that he does so in a reasonable manner. The costs properly incurred by the Purchaser in remedying the defect or damage shall be deducted from the Contract Price, but the Supplier shall have no responsibility for such work, or

b) Require the Supplier to grant the Purchaser a reasonable reduction in the Contract Price to be agreed or fixed by arbitration or

c) If the defect or damage is such that the Purchaser has been deprived of substantially the whole of the benefits of the Goods or a part thereof, he may terminate the Contract, in respect of such parts of the Goods as can not be put to the intended use. The Purchaser shall, to the exclusion of any remedy be entitled to recover all sums paid in respect of such parts of the Goods together with the cost of dismantling the same, clearing the site and returning plant to the Supplier or otherwise disposing of it in accordance with the Supplier’s instructions.

8.5.13 If the defect or damage is such that repairs cannot be expeditiously carried out on the site, the Supplier may with the consent of the Purchaser remove from the site for the purpose of repair any part of the works which is defective or damaged, after furnishing a suitable guarantee as may be prescribed by the Purchaser.

8.5.14 If the replacement or renewals are such that they may affect the performance of the services, the Purchaser may request that the tests on completion be repeated to the extent necessary. The request shall be made by notice within 28 days after the replacement or renewal. The tests shall be carried out in accordance with clauses 8.5.1 to 8.5.3.

8.5.15 Until the final certificate of commissioning has been issued, the Supplier shall have the right of access to all parts of the Goods and to the records of the working and performance of the Goods and Services.

Such right of access shall be during the Purchaser’s normal working hours at the
Supplier's risk and cost. Access shall also be granted to any duly authorized representative of the Supplier whose name has been communicated in writing to the Supplier.

Subject to the Purchaser's approval, the Supplier may also at his own risk and cost make any tests, which he considers desirable.

8.6 Nothing in the clause 8 shall in any way relieve the Supplier from any warranty or other obligations under this Contract.

9.0 Packing and Marking

9.1 The Supplier shall provide such packing of the Goods as is required to prevent their damage or deterioration during transit to their final destination as indicated in the Contract. The packing shall be sufficient to withstand, without limitation, rough handling during transit and exposure to temperature, salt and precipitation during transit and open storage. Packing case size and weights shall take into consideration, where appropriate, the remoteness of the Goods' final destination and the absence of heavy handling facilities at all points in transit.

9.2 The packing, marking and documents within and outside the packages shall comply strictly with such special requirements as shall be expressly provided for in the Contract and, subject to Clause 17 and any subsequent instructions given by the Purchaser.

9.3 Each package shall be marked to indicate:
   a) Name of the Supplier
   b) Details of items in the package
   c) Name of the Consignee
   d) Purchase Order number
   e) Gross, net and tare weights of the item
   f) Destination

10 Delivery and Documents

10.1 Delivery of the Goods shall be made by the Supplier in accordance with the terms specified by the Purchaser in its Schedule of Requirements and the Special Conditions of Contract.

11. Insurance

11.1 The Goods supplied under the Contract shall be fully insured in Indian Rupees or a freely convertible currency against loss or damage incidental to manufacture or acquisition, transportation, storage at site, delivery, installation, testing & commissioning and up to handing over of the plant and equipment in the manner specified in the Special Conditions of Contract.

11.2 In supply only contracts, where delivery of the Goods is required by the Purchaser on a CIF basis, the Supplier shall arrange and pay for marine insurance naming the Purchaser as the beneficiary.
11.3 The Supplier shall provide a copy of the insurance policy along with invoice to the Purchaser who will make arrangements to extend the validity of the policy, if necessary.

11.4 Should any loss or damage occur, the Supplier should -
   a. Initiate and pursue claim till settlement, and
   b. Promptly make arrangements for repair and/or replacement of any damaged item/s irrespective of settlement of claim by the underwriters.

12. Transportation

12.1 Where the Supplier is required under the Contract to deliver the Goods FOR DESTINATION, as specified in the schedule of requirements, transportation shall be arranged and paid for by the Supplier, and the cost thereof shall be included in the Contract Price.

12.2 Where the Supplier is required to effect delivery under any other terms, for example, by post or to another address in the source country, the Supplier shall be required to meet all transport and storage expenses until delivery.

12.3 In all the cases, transportation of the Goods up to the project site shall be the responsibility of the Bidder and the cost thereof shall be included / indicated in the contract price.

12.4 Where the Supplier is required under the Contract to deliver the Goods CIF, no further restriction shall be placed on the choice of the ocean carrier.

13. Incidental Services

13.1 As specified in the Special Conditions of Contract, the Supplier may be required to provide any or all of the following services:
   a. Performance or supervision of on-site assembly and/or start-up of the supplied Goods;
   b. Furnishing of tools required for assembly and/or maintenance of the supplied goods;
   c. Furnishing of a detailed operations and maintenance manual for each appropriate unit of the supplied Goods; and manuals covering the operation and maintenance of automation software and control systems.
   d. Performance or supervision or maintenance and/or repair of the supplied Goods, for a period of time agreed by the parties, provided that this service shall not relieve the Supplier of any warranty obligations under this Contract; and
   e. Conduct of training of the Purchaser's personnel, at the Supplier's plant and / or on-site, in assembly, start-up operation, maintenance and/or repair of the supplied Goods.

13.2 Prices charged by the Supplier for the preceding incidental services, if not included in the price for the Goods, shall be agreed upon in advance by the
14.0 Spare Parts

14.1 As specified in the Special Conditions of Contract, the Supplier may be required to provide any or all of the following materials and notifications pertaining to spare parts manufactured or distributed by the Supplier:

a. Such spare parts as the Purchaser may decide / select to purchase from the Supplier, provided that this selection shall not relieve the Supplier of any warranty obligations under the Contract; and

b. In the event of termination of production of the spare parts:

   i. Advance notification to the Purchaser of the pending termination, in sufficient time to permit the Purchaser to procure its needed requirements; and

   ii. Following such termination, furnishing at no cost to the Purchaser, the blueprints, drawings and specifications of the spare parts, if and when requested.

15.0 Warranty/Guarantee

15.1 The Supplier warrants that the Goods and equipment, supplied, installed and commissioned under the Contract are new, unused, of the most recent or current models and incorporate all recent improvements in design and materials unless provided otherwise in the Contract. The Supplier further warrants that the Goods supplied under this Contract shall have no defect arising from design, materials or workmanship (except insofar as the design or material is required by the Purchaser's Specifications) or from any act or omission of the Supplier, that may develop under normal use of the supplied Goods in the conditions obtaining in the country of final destination. The Supplier also guarantees that the Goods supplied shall perform satisfactorily as per the Signed / rated /-installed capacity as provided for in the Contract.

15.2 This warranty/guarantee shall remain valid for 12 months after the Goods have been delivered at site, installed and the plant successfully tested, commissioned and accepted by the Purchaser. The automation systems, instruments and controls will be guaranteed against system malfunction for a period of one year from the date of commissioning. The Supplier shall also submit a quotation along with the bid towards warranty for one extra year. This will be used at the option of the Purchaser.

15.3 The Purchaser shall promptly notify the Supplier in writing of any claims arising under this warranty.

15.4 Upon receipt of such notice, the Supplier shall, with all reasonable speed, repair or replace the defective Goods or parts thereof, inland delivery of the repaired or replaced Goods or parts from the port of entry to the final destination.

15.5 If the Supplier, having been notified, fails to remedy the defect(s) within a reasonable period, the Purchaser may proceed to take such remedial action as may be necessary, at the Supplier's risk and expense and without prejudice to any other rights which the Purchaser may have against the Supplier under the Contract.
16.0 Payment

16.1 The method and conditions of payment to be made to the Supplier under the Contract shall be specified in the Special Conditions of Contract.

16.2 The Supplier's request(s) for payment shall be made to the Purchaser in writing, accompanied by an invoice describing, as appropriate, the Goods delivered and Services performed, and by shipping documents, submitted pursuant to Clause 10, and fulfillment of other obligations stipulated in the Contract.

16.3 Payments shall be made promptly by the Purchaser within sixty (60) days of submission of an invoice/claim by the Supplier.

16.4 All payments under this contract shall be made in Indian Rupees only.

17. Prices

17.1 Prices charged by the Supplier for Goods delivered and Services performed under the Contract shall not vary from the prices quoted by the Supplier in its bid.

18.0 Change Orders

18.1 The Purchaser may, at any time, by a written order given to the Supplier pursuant to Clause 30, make changes within the general scope of the Contract in any one or more of the following:

   a. Drawings, designs or specifications, where Goods to be furnished under the Contract are to be specifically manufactured for the Purchaser:

   b. The method of shipment or packing;

   c. The place of delivery; or

   d. The Services to be provided by the Supplier.

18.2 If any such change causes an increase or decrease in the cost of, or the time required for, the Supplier's performance of any part of the work under the Contract, whether changed or not changed by the order, an equitable adjustment shall be made in the Contract Price or delivery schedule, or both, and the Contract shall accordingly be amended. Any claims by the Supplier for adjustment under this clause must be asserted within thirty (30) days from the date of the Purchaser's receipt of the Supplier's change order.

19.0 Contract Amendment

19.1 Subject to Clause 17, no variation in or modification of the terms of the Contract shall be made except by written amendment signed by the parties.

20.0 Assignment

20.1 The Supplier shall not assign, in whole or in part, its obligations to perform under the Contract, except with the Purchaser's prior written consent.
21.0 Subcontracts

21.1 The Supplier shall notify the Purchaser in writing of all subcontracts awarded under the Contract if not already specified in his bid. Such notification, in his original bid or later, shall not relieve the Supplier from any liability or obligation under the Contract.

21.2 Subcontracts must comply with the provisions of clause 3

22.0 Delays in the Supplier's Performance

22.1 Delivery of the Goods and performance of Services shall be made by the Supplier in accordance with the time schedule specified by the Purchaser in its Schedule of Requirements.

22.2 An un-excused delay by the Supplier in the performance of its delivery obligations shall render the Supplier liable to any or all of the following sanctions:

- Forfeiture of its performance security, imposition of liquidated damages, and/or termination of the Contract for default

22.3 If at any time during performance of the Contract, the Supplier or its subcontractor(s) should encounter conditions impeding timely delivery of the Goods & performance of Services, the Supplier shall promptly notify the Purchaser in writing of the fact of the delay, its likely duration and its cause(s). As soon as practicable after receipt of the Supplier's notice, the Purchaser shall evaluate the situation and may at its discretion extend the Supplier's time for performance, in which case the extension shall be ratified by the parties by amendment of the Contract.

23.0 Liquidated Damages

23.1 Subject to Clause 24, if the Supplier fails to deliver any or all the goods or perform the services within the time period(s) specified in the Contract, the Purchaser shall, without prejudice to its other remedies under the Contract, deduct from the contract prices, as liquidated damages, a sum equivalent to:

(1) 0.5% of the full contract value for every completed week (week comprising of 7 days including holidays and any incomplete week shall be ignored for the calculations of liquidated damages) of delay in the supplies/commissioning.

(2) The total amount so deducted shall not exceed 10% of the Contract value. Once the maximum is reached, the Purchaser may consider termination of the contract pursuant to clause 23.

23.2 Any incremental taxes and levies on account of delay in performance of the Contract by the Supplier shall be to the Supplier's account.

24.0 Termination for Default

24.1 Suppliers default:

24.1.1 If the supplier shall assign the Contract, without the consent in writing of the Purchaser first obtained, or if in the opinion of the Purchaser, the Supplier:
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 Purchaser written notice to proceed, or

c. Despite previous warnings by the Purchaser in writing, is not executing the works in accordance with the Contract, or neglecting to carry out his obligations under the contract so as seriously to affect the carrying out of the Works.

Then the Purchaser may, after giving fourteen days notice in writing to the Supplier, enter upon the Site and expel the Supplier there from without thereby voiding the contract, or releasing the Supplier from any of his obligations or liabilities under the contract, or affecting the rights and powers conferred by the Contract on the Purchaser and may himself complete the works or may employ any other Supplier to complete the Works without prejudice to any other remedy of the Purchaser. The Purchaser or such other Supplier shall have free use for such completion of so much of the Supplier's Equipment as may be on the Site in connection with the works without being responsible to the Supplier for fair wear and tear thereof and to the inclusion of any right of the Supplier over the same.

24.1.2 The Purchaser shall, as soon as may be practicable after any such entry and expulsion by the Purchaser, fix and determine by or after reference to the parties, or after such investigation or enquiries 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 Supplier in respect of work then actually done by him under the Contract and the value of any unused or partially used materials on the Site.

24.1.3 If the Purchaser shall enter and expel the Supplier under this Clause, he shall not be liable to pay to the Supplier any money on account of the Contract until the costs of execution and all other expenses incurred by the Purchaser have been ascertained and the amount thereof certified. The Supplier shall then be entitled to receive only such sum or sums, if any, as the PURCHASER 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 Supplier on due completion by him, then the Supplier shall, upon demand, pay to the Purchaser the amount of such excess and it shall be deemed a debt due by the Supplier to the Purchaser and shall be recoverable accordingly.

24.1.4 If the Purchaser pursuant to this Clause takes the Works or part thereof out of the Supplier's hands the Supplier's Liability under Clause for delay in completion shall immediately cease, without prejudice to any such liability that may at that time already be recoverable from the Supplier by the Purchaser.

24.1.5 Consequent to such termination of Contract, the Purchaser shall also be entitled to recover the advance paid, if any, to the Supplier along with interest @ 13% per annum compounded quarterly on the last day of March, June, September and December on the advance paid for the entire period for which the advance was retained by the Supplier.

24.2 Default of the Purchaser

24.2.1 In the event of the Purchaser:

a. Failing to pay to the Supplier the amount due within 60 days after the same shall have become due under the terms of the Contract subject to any deduction that the Purchaser is entitled to make under the Contract, or

b. Becoming bankrupt or (being a company) going into liquidation other than for the purpose of a scheme of reconstruction or amalgamation, or

c. Being unable to continue to meet his contractual obligations for unforeseen
reasons due to economic dislocation The Supplier shall be entitled without prejudice to any other rights or remedies (and in respect of paragraph (a) above as an alternative to the provisions of Clause 16 for Payment to terminate his employment under the Contract by giving 30 days prior notice in writing to the Purchaser.

24.2.2 Upon the giving of such notice the Supplier shall with all reasonable dispatch remove from the Site all suppliers’ equipment brought by him thereon.

24.2.3 In the event of such termination the Purchaser shall be under the same obligations to the Supplier in regard to payment as if the Contract had been terminated under the provisions of Sub-Clause 24.4.2 hereof but in addition payment specified therein, the Purchaser shall pay to the Supplier the amount of any reasonable loss or damage to the Supplier arising out of or in connection with or by consequence of such termination.

24.2.4 Nothing in this clause contained shall prejudice the right of the Supplier to exercise, either in lieu of or in addition to the rights and remedies specified in this Clause, any other rights or remedies to which the Supplier may be entitled.

25.0 Force Majeure

25.1 Notwithstanding the provisions of Clauses 21, 21, 21, the Supplier shall not be liable for forfeiture of its performance security, liquidated damages or termination for default, if and to the extent that, its delay in performance or other failure to perform its obligations under the Contract is the result of an event of Force Majeure.

25.2 For purposes of this clause, “Force Majeure” means an event beyond the control of the Supplier and not involving the Supplier’s fault or negligence and not foreseeable. Such events may include, but are not restricted to, acts of the Purchaser either in its sovereign or contractual capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and freight embargoes.

25.3 If a Force Majeure situation arises, the Supplier shall promptly notify the Purchaser in writing of such condition and the cause thereof. Unless otherwise directed by the Purchaser in writing, the Supplier shall continue to perform its obligations under the Contract as far as is reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the Force Majeure event.

25.4 Termination in Consequence of Force Majeure

25.4.1 If circumstances of Force Majeure have occurred and shall continue for a period of 182 days then, notwithstanding that the Supplier may by reason thereof have been granted an extension of Time for Completion of the Works, either party shall be entitled to serve upon the other 28 days’ notice to terminate the Contract. If at the expiry of the period of 28 days Force Majeure shall still continue the Contract shall terminate.

25.4.2 If the Contract shall be terminated as aforesaid the Supplier shall be paid by the Purchaser for all work executed prior to the date of termination at the rates and prices provided in the Contract and in addition:

a. The amounts payable in respect of any preliminary items, so far as the work or service comprised therein has been carried out or performed, and a proper proportion as certified by the Purchaser of any such items the work or service comprised in which has been partially carried out or performed.

b. The cost of materials or goods reasonably ordered for the Works or for use in
connection with the Works which shall have been delivered to the Supplier or of which the Supplier is legally liable to accept delivery (such materials or goods becoming the property of the Purchaser upon such payment being made by him).

c. A sum, to be certified by the Purchaser, being the amount of any expenditure, which in the circumstances was reasonably incurred by the Supplier in the expectation of completing the whole of the Works, in so far as such expenditure shall not have been covered by the payments in this Sub-Clause before mentioned.

d. The reasonable cost of removal under Sub-Clause b of this Clause and (if enquired by the Supplier) return thereof to the Supplier's works in his country or to any other destination at no greater cost.

e. The reasonable cost of repatriation of all the Supplier's staff and workmen employed on or in connection with the Works at the time of such termination.

Provided always that, against any payments due from the Purchaser under this Sub-Clause, the Purchaser shall be entitled to be credited with any outstanding balances due from the Supplier for advances in respect of Plant and materials, and any sum previously paid by the Purchaser to the Supplier in respect of the execution of the Works.

26.0 Termination for Insolvency

26.1 The Purchaser may at any time terminate the Contract by giving written notice to the Supplier, without compensation to the Supplier, if:

a. The Supplier becomes bankrupt or otherwise insolvent,

b. The Supplier being a Company is wound up voluntarily by the order of a Court receiver, liquidator or Manager appointed on behalf of the debenture holders or circumstances shall have arisen which entitle the court or debenture holders to appoint a receiver, liquidator or a Manager, provided that such termination will not prejudice or affect any right of action or remedy which has accrued or will accrue thereafter to the Purchaser.

27.0 Termination for Convenience

27.1 The Purchaser may, by written communication sent to the `Supplier, terminate the Contract, in whole or in part, at any time for its convenience. The notice of termination shall specify that termination is for the Purchaser’s convenience, the extent to which performance of work under the Contract is terminated, and the date upon which such termination becomes effective.

27.2 The Goods that are complete and ready for shipment within 30 days after the Supplier’s receipt of notice of termination shall be purchased by the Purchaser at the Contract terms and prices. For the remaining Goods, the Purchaser may elect:

a. To have any portion completed and delivered at the Contract terms and prices; and/or

b. To cancel the remainder and pay to the Supplier an agreed amount for partially completed Goods and for materials and parts previously procured by the Supplier.
28.0 Resolution of Disputes
28.1 The Purchaser and the Supplier shall make every effort to resolve amicably by direct informal negotiation any disagreement or dispute arising between them under or in connection with the Contract.

28.2 If, after thirty (30) days from the commencement of such informal negotiations, the Purchaser and the Supplier have been unable to resolve amicably a Contract dispute, either party may require that the dispute be referred for resolution to the formal mechanisms specified in the Special Conditions of Contract. These mechanisms may include, but are not restricted to, conciliation mediated by a third party, adjudication in an agreed national or international forum, and/or international arbitration. The mechanism shall be specified in the Special Conditions of Contract.

29.0 Governing Language
29.1 The Contract shall be written in the language of the bid, as specified by the Purchaser in the Instructions to Bidders. Subject to Clause 29, that language version of the Contract shall govern its interpretation. All correspondence and other documents pertaining to the Contract, which are exchanged by the parties, shall be written in that same language.

30.0 Applicable Law
30.1 The Contract shall be interpreted in accordance with the laws of the Union of India.

31.0 Notices
31.1 Any notice given by one party to the other pursuant to the Contract shall be sent in writing or by telegram or telex/fax and confirmed in writing to the address specified for that purpose in the Special Conditions of Contract.

31.2 A notice shall be effective when delivered or on the notice's effective date, whichever is later.

32.0 Taxes and Duties
32.1 A supplier shall be entirely responsible for payment of all taxes, duties, license fees, etc. until taking over of the works by the 'Purchaser'. However, Octroi, if any shall be reimbursed at actuals on submission of documentary evidence and Entry Tax, wherever applicable shall be paid by the Project Authority.

33.0 Income Tax and Other Taxes:
33.1 The Supplier shall be liable to pay all corporate taxes, income tax, service tax and other taxes that shall be levied according to the laws and regulations applicable from time to time and the price bid by the Supplier shall include all such taxes.

33.2 Wherever the laws and regulations require deduction of such taxes at the source of payment, the Purchaser shall effect such deductions from the payment due to the Supplier. The remittance of amounts so deducted and issuance of certificate for such deductions shall be made by the Purchaser as per the laws and regulations in force. Nothing in the Contract shall relieve the Supplier from his responsibility to pay any tax that may be levied on income and profits made by the Supplier in respect of the Contract.

33.3 The Supplier's staff, personnel and labour will be liable to pay personal income taxes in respect of such of their salaries and wages as are chargeable under the laws and
regulations for the time being in force, and the Supplier shall perform such duties in regard to such deductions thereof as may be imposed on him by such laws and regulations. The Purchaser shall not, in any way, be responsible for such payments by the Supplier/Suppliers' staff.

34.0 Right to use defective Goods

If after delivery, acceptance and installation and within the guarantee and warranty period, the operation or use of the Goods proves to be unsatisfactory, the Purchaser shall have the right to continue to operate or use such Goods until rectifications of defects, errors or omissions by repair or by partial or complete replacement is made without interfering with the Purchasers' operation.

35.0 Construction of the contract

35.1 Notwithstanding anything stated elsewhere in the Bidding Documents, the entire work could be awarded in more than one contracts.

35.2 The award of more than one contracts shall not in any way dilute the responsibility of the supplier for the successful commissioning of the plant/equipment as per the Bid Specifications and all the contracts will contain cross-fall breach clause. Any delay in completion of one contract shall be construed as delay in completion of all the contracts and the liquidated damages shall be imposed accordingly.

36.0 Jurisdiction

This invitation for bids is issued for and on behalf of Bihar State Milk Co-Operative Federation Limited having its head office situated at Patna (Bihar).

For the settlement of any dispute arising out of the contract against this bid, only the Courts at Patna shall have jurisdiction.
SECTION 4

CONTRACT DATA
CONTRACT DATA

(PROFORMA OF SCHEDULES)

PROFORMA OF SCHEDULES

(Operative Schedules to be supplied separately to intending tenderer)

SCHEDULE ‘A’

Schedule of quantities

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description of Item (with brief specification and reference to book of specification)</th>
<th>BILL OF QUANTITY</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Quantity</td>
<td>Unit</td>
</tr>
<tr>
<td>1</td>
<td>As per State PWD Specification</td>
<td>2</td>
<td>3</td>
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SCHEDULE ‘B’

Schedule of materials to be issued to the contractor.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Description of item</th>
<th>Quantity</th>
<th>Rates in figures &amp; words at which the material will be charged to the contractor</th>
<th>Place of Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>2</td>
<td>3</td>
<td>4</td>
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SCHEDULE ‘C’

Tools and plants to be hired to the contractor

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Hire charge per day</th>
<th>Place of Issue</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>6</td>
<td>7</td>
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</tbody>
</table>
SCHEDULE ‘D’
Extra schedule for specific requirements/document for the work, if any.

SCHEDULE ‘E’ (Not Applicable)
Schedule of Components of cement, steel, other materials, labour etc for price escalation.

CLAUSE 10 CC (Not Applicable)
Component of Cement - expressed as percent of total value of work.

Component of Steel - expressed as percent of total value of work.

Component of civil (except cement & steel)/ Electrical construction Materials expressed as percent of total value of work -

Component of Labour - expressed as percent of total value of work.

Component of P.O.L. – expressed as percent of total value of work.

SCHEDULE ‘F’
Reference to General Condition of Contract.

Name of work: Construction of 5.00 LLPD Dairy & 30 MT Powder Plant at Dehri-On-Sone

Estimated cost of work: Rs. 100.00 Crores

i) Earnest money: 2% for the project value upto 10.00 Crores & on balance amount above 10 Crores at the rate of 1%

ii) Performance Guarantee:

iii) Security Deposit: 10% of tendered value to be deducted from the bill including EMD.

GENERAL RULES AND Definitions: Officer inviting tender _______Managing Director (COMFED)/ Union

Definitions:

2(v) Consultant-In-Charge _____________________________
________________________________________

2(vi) Percentage on cost of materials and labour to cover all overheads and profits.

2(vii) Department and Employer Bihar State Milk Co-Operative Federation Limited

2(viii) Standard PWD Contract Form PWD 2/3 as modified & corrected upto
 Clause 1

i) Time allowed for submission of performance Guarantee from the date of issue of letter of acceptance, in days 15 days

ii) Maximum allowable extension beyond the period provided in i) above in days 10 days

Clause 2

Authority for fixing compensation General Manager/ MD of Concerned under clause 2. Milk Union

Clause 2A

Whether Clause 2A shall be applicable No

Clause 5

Number of days from the date of issue of letter of acceptance for reckoning date of start 07 days

Milestone(s) as per table given below:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description of Milestone(Physical)</th>
<th>Time allowed in days (from date of start)</th>
<th>Amount to be with-held in case of non achievement of milestone</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
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</table>

OR

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Financial Progress</th>
<th>Time allowed (from date of start)</th>
<th>Amount to be with-held in case of non achievement of milestone</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>1/8&quot;&quot;(of whole work)</td>
<td>1/4&quot;&quot;(of whole work)</td>
<td>In the event of not achieving the necessary progress as assessed from the running payments, 1% of the tendered value of work will be withheld for failure of each milestone.</td>
</tr>
<tr>
<td>2.</td>
<td>3/8&quot;&quot;(of whole work)</td>
<td>1/2&quot;&quot;(of whole work)</td>
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<td>3.</td>
<td>3/4&quot;&quot;(of whole work)</td>
<td>3/4&quot;&quot;(of whole work)</td>
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<td>4.</td>
<td>Full</td>
<td>Full</td>
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</table>

Time allowed for execution of work 20 Months

Authority to give fair and reasonable extension of time for completion of work. MD of concerned Milk Union

Clause 7

Gross work to be done together with net payment/ adjustment of advances for material collected, if any, since the last such payment for being eligible
Clause 10 CC (Not Applicable)

Clause 10 CC to be applicable in contracts with stipulated period of completion exceeding the period shown in next column

Clause 11

Specifications to be followed for execution of work As per PWD & as mentioned in the Tender Documents

Clause 12

12.1 & 12.3 Deviation, variation, Extent and pricing As per approval of MD of Milk Union

Clause 16

Competent Authority for deciding reduced rates.

• The Following Documents also form the part of the contract

• The law which applied to the contract is- The Law of Union of India

• The Court of jurisdiction- Patna

• The language of the Contract document- English

• The Limit of Sub-contracting- Maximum 10% of the bid Value with the approval of COMFED

• The currency of contract- Indian Rupee
SECTION 5
SPECIAL CONDITION OF CONTRACT

Civil Works
Plant Works
SPECIAL CONDITION OF CONTRACT

For Civil Works

The bidders must furnish the Sale Tax Clearance Certificate from such Commercial Taxes Authority for the previous year. If the contractor is a Sales Tax assesses, he shall produce a valid Sales Tax Clearance Certificate before the payment of the final bill otherwise the final payment of the contract will be withheld. In case of award of work, the bidder must be registered with any Sales Tax Department.

Tenderers registered in out of state may take part in tender but he should be registered under VAT in Bihar State before executing the agreement.

Those bidders whose activities are doubtful or against whom action for black listing has been initiated by the Department shall not be liable for Tender.

In case of lowest tenderers whose rates are equal, the work shall be allotted by draw of lottery in terms of B.P.W.D. clause 163.

Variation in the schedule of quantities for this work as given in the bill of quantities shall not vitiate the contract. The rates quoted for the individual items shall apply for the quantities of work increased or decreased by any extent or by any percent for each of the items of work. If the amount of work actually involved under any item, vary by any extent or by any percent, the rate for that item of work shall not be revised for payment over the increased or decreased quantity. The payment for such item shall continue to be made at the original rate entered into the contract.

The contractor shall at his own expense provide all construction materials required for the works other than those which are available with the department prior to execution of agreement for which recovery rate is mentioned in clause 2.17.

Quality of construction shall be in accordance with ISI specification.

Cement supplied by the Contractor shall be purchased from authorized stockist of cement manufacturers.

MEASUREMENT OF CIVIL/ELECTRICAL/ PHE WORKS

Measurement of work will be accessed as per quantum of work undertaken by the Bidder on different level as follows:

(a) Upto Plinth Level
(b) Upto Linter Level
(c) Upto Roof
(d) Upto flooring & finishing
(e) Measurement of Road & Hard Park will be per sq. mtr of finished work.
(f) For overhead tank & water supply measurement will be per liter capacity of tank after fully completion of work in all respect after completion of work.
(g) For ETP, the payment of civil work will be made on the basis of per cum of the capacity of units completed with required accessories after completion of work.
PAYMENT TERMS & CONDITION FOR CIVIL/ELECTRICAL/PHE WORKS

i) Up to Plinth level - 10% of the allotted rate.

ii) Up to Lintel level - 25%

iii) Up to Roof level - 25%

iv) Finishing work - 40%

Payment of running bill will be made within 15 days after submission of bill.

GUARANTEE/DEFECT LIABILITY PERIOD

Notwithstanding any certificate of acceptance issued by the Engineer-in-charge to the contractor for this work, the contractor shall be bound for a period of 1 year after the date of completion of the entire works under this contract to carry out any repair of damages therein which is attributable to the contractor. The contractor shall be bound also to carry out any improvement or adjustment to remove any defect in the work. This will prevail over clause 16 at page 13 of P.W.D. F2 Form. Such repairs and maintenance shall be carried out by the contractor without any charge to the government as directed by the Engineer-in-Charge. The decision of the Engineer-in-Charge, about the defects or damages to be made good shall be final and binding on the contractor.

In case the contractor fails to make good the defects, the Engineer-in-Charge may employ other person to make good such defects, and all expenses consequent thereof and incidental cost shall be borne by the contractor.

To enable the contractor to attend to the defective part for repair or improvements, creation of the same working conditions, facilities etc. as existed before the start of the work, are necessary. The same shall be done at the cost of the contractor.

All materials arranged by the contractor shall conform to specifications laid and relevant I.S. Code or other standard specifications and subject to the approval by the Manager.

COMPLETION PERIOD

The completion period of the work is 20 (Twenty) months.

11.0 No Escalation shall be allowed in any case.

The contractor shall be responsible for the quality assurance. All necessary arrangements regarding quality control/test like concerned labours, materials, equipments, laboratories etc. will be arranged by contractor on his own cost.

All materials to be used in work, such as cement, sand, coarse and fine aggregates, reinforcement, etc. shall comply with and shall pass test, and analysis required by Manager (Engg) or as specified by the relevant IS case specifications or such recognized specifications acceptable to the Engineer-in-Charge or in the absence of such authorized specifications, such requirements, tests and analysis as may be specified by the Engineer-in-Charge shall have to be carried out by departmental officers while the labour for conduction the same and collection the samples shall be provided by the contractor free of cost at site and field laboratory.

The contractor shall at his own risk and cost make all arrangements and provide for all such facilities as the Manager (Engg) directs for collecting, preparing and forwarding required number of samples for test and analysis at such times and at such places as may be directed by the Manager (Engg). No extra payment will be made on this account to the contractor.
Notwithstanding any certificate of acceptance issued by the Engineer-in-charge to the contractor for this work, the contractor shall be bound up to defect liability period for a period of twelve months after the date of completion of the entire works under this contract to carry out any repair of damages therein which is attributable to the contractor. The contractor shall be bound also to carry out any improvement or adjustment to remove any defect in the work.

Such repairs and maintenance shall be carried out by the contractor without any charge to the government as directed by the Consultant-In-Charge. The decision of the Manager (Engg), about the defects or damages to be made good shall be final and binding on the contractor.

17. All furniture, electrical equipments, cabling etc should be supplied by a standard company and according to the specification made in B.O.Q. Any deviation shall liable to holding of payments and panel action. For the payment of these items, contractor has to submit the certificate from the authorized dealer of the company regarding the purchase of the supplied materials.

18. All works has to be strictly completed according to the technical details in the BOQ and as per the direction of supervision Consultant and Manager (Engg).

19. All Non-SOR item rate is required to be approved by the competent authority. Non-SOR rates may decrease at the time of approval. Any claim for the payment of mentioned rate shall not be entertained. The Non-SOR Item rate shall depend upon the approval of the rates on the basis of the quotations from the authorized dealers.

20. Contractor shall use steel of Vizeg, Sail and Tata make. TMT Fe 500 conforming to Bureau of Indian Standard.
SPECIAL CONDITION OF CONTRACT
For Plant Works

PART - I

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SPECIAL CONDITIONS OF CONTRACT FOR INSTALLATION

PART – III - A

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SPECIAL CONDITIONS OF CONTRACT FOR INSTALLATION

PART – III - B

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<td>9.</td>
<td>Recommended cable sizes for Industrial wiring</td>
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SPECIAL CONDITIONS OF CONTRACT

PART – 1

The following Special Conditions of Contract shall supplement the General Conditions of Contract. Whenever there is a conflict, the provisions herein shall prevail over those in the General Conditions of Contract. The corresponding clause number of the General Conditions is indicated in parentheses.

Definitions (Clause 1)

(a) The Project Authority is Bihar State Milk Co-Operative Federation Limited and would include the term “Owner”.

(b) The Supplier is (Name of Supplier).

2. Country of Origin (Clause 3)

The place where the goods were mined, grown or produced from which the services are supplied.

3. Equivalency of Standards and Codes (Clause 4)

Wherever reference is made in the contract to the respective standards and codes in accordance with which goods and materials are to be furnished, and work is to be performed or tested, the provisions of the latest current edition or revision of the relevant standards and codes in effect shall apply, unless otherwise expressly set forth in the Contract. Where such standards and codes are national in character, or relate to a particular country or region, other authoritative standards which ensure an equal or higher quality than the standards and codes specified will be accepted subject to the Purchaser’s prior review and written approval. Differences between the standards specified and the proposed alternative standards must be fully described in writing by the Supplier and submitted to the Purchaser at least 30 days prior to the date when the Supplier desires the Purchaser's approval. In the event the Purchaser determines that such proposed deviations do not ensure equal or higher quality, the Supplier shall comply with the standards set forth in the documents.

4.0 Performance Security (Clause 7)

4.1 The Performance Security shall be in the amount of 10% of the Contract price.

4.2 Additional Performance Security, if deemed necessary, shall be submitted as mutually agreed by the Purchaser and the successful bidder at the time of acceptance of the contract/Purchase order.

5.0 Inspection and Tests (Clause 8)

5.1 The inspection of the Goods shall be carried out to check whether the Goods are in conformity with the technical specifications attached to the purchase order form and shall be in line with the inspection/test procedures laid down in the Schedule of Specifications and the Contract conditions.

5.2 Manufacturer must have suitable facilities at their works for carrying out various performance tests on the equipment. The bidder should clearly confirm that all the facilities exist for inspection and shall be made available to the inspecting Authority.

5.3 A load and functional tests as indicated in the specifications must be carried out at the manufacturer’s works. Reliability of the equipment shall be demonstrated to the satisfaction of the appointed inspector or inspecting Agency.
5.4 Approved supplier's drawings shall not be departed from except as provided in the Bidding Document.

5.5 The Purchaser shall have the right at all reasonable times to inspect, at the Supplier's premises all Supplier's drawings of any part of the work.

5.6 The supplier shall provide, within the time stated in the contract or in the programme, drawings showing how the plant is to be designed and any other information required for-

a) Preparing suitable foundations or other means of support.

b) Providing suitable access on the site for the plant and any necessary equipment to the place where the plant is to be erected and

c) Making necessary electrical connections from the panel board provided in the individual sections to the machines

5.7 Before the goods and equipment are taken over by the Purchaser, the Supplier shall supply operation and maintenance manuals together with drawings of the goods and equipment as built. These shall be in such details as will enable the Purchaser to operate, maintain, adjust and repair all parts of the works as stated in the specifications.

The manuals and drawings shall be in the ruling language (English) and in such form and numbers as stated in the contract

Unless and otherwise agreed, the goods and equipment shall not be considered to be completed for the purposes of taking over until such manuals and drawings have been supplied to the Purchaser.

5.8 The goods will be accepted after inspection by the Purchaser, his representative or any inspection agency appointed by Purchaser and the costs for such Inspector/Agency shall be borne by the Purchaser.

6. Delivery and Documents (Clause 10)

Upon shipment/dispatch, the supplier shall notify to the Purchaser by cable or email or fax the full details of dispatch including Purchaser order no., description of the goods, quantity, mode of transport, place of loading, date of dispatch etc. The supplier will mail the following documents to the Purchaser with a copy to the Insurance Company:

The Supplier's invoice showing purchase order no. Goods description, quantity, unit price, total amount;

Delivery note/case-wise detailed packing list identifying contents of each package/lorry receipt;

Manufacturer's/Supplier's guarantee certificate;

Inspection Certificate issued by the nominated inspection agency, and the Supplier's factory inspection report;

Certificate of origin;

Insurance policy;

Excise gate pass / octroi receipts wherever applicable, duly sealed indicating payments made; and

Any other document evidencing payment of statutory levies.
The supplier's certificate certifying that the defects pointed out during inspection have been rectified.

Note: The nomenclature used for the item description in the invoice/s, packing list/s and delivery note/s etc. Should be identical to that used in the purchase order. The dispatch particulars including name of transporter, LR no. And date should also be mentioned in the invoice/s.

7. Insurance (clause 11)

The “marine / transit” insurance to be taken by the contractor / supplier shall be in an amount equal to 110% of the FOR Destination value of the goods from "warehouse to warehouse" on "All Risks" basis including Strike, Natural calamities but exclusive of War Risks valid for a period not less than 3 months after the date of arrival of Goods at final destination

"Storage-cum-erection ALL Risks” insurance for an amount equal to 110% of the contract value valid for a period not less than 3 months after installation, including one month for testing and commissioning, shall be taken by the contractor / supplier.

OR

As an alternative to (a) & (b) above, “Marine-cum-erection ALL Risks” insurance policy, covering storage of equipment and other erection materials at site, for an amount equal to 110% of the contract value of supply, installation & commissioning and valid for a period not less than 3 months after installation, including one month for testing and commissioning, shall be taken by the contractor / supplier.

(c) Third Party Insurance : Before commencing the erection work the contractor / supplier without limiting his obligations and responsibilities, shall insure against his liability for any material or physical damage, loss or injury which may occur to any property including that of the Owner / Purchaser, or to any person including any employee of the Owner / Purchaser.

Such insurances shall be for an amount not less than Rs. 10.00 lakhs per occurrence with the number of occurrence limited to five.

8. Incidental services (Clause 12)

8.1 The incidental services for supply, installation and commissioning contract, as follows shall be provided by the Supplier:

(a) Furnishing of tools required for assembly and maintenance of the supplied goods;
(b) Furnishing of a detailed operations and maintenance manual for each appropriate unit of the supplied Goods;
(c) On-site assembly and start-up of the supplied Goods;
(d) Conduct of training of the Purchaser’s personnel (approx. for 4 man-weeks); at the Supplier’s plant and/or on-site, in assembly, start-up operation, maintenance and/or repair of the supplied Goods.
(e) Furnishing of layout drawing etc. as specified in clause 3 of Special Conditions of Contract Part II.

9. Spare Parts (Clause 13)

Supplier shall carry sufficient inventories to assure ex-spares parts and components shall be supplied as promptly as possible but in any case within six months of placement of order.

10. Warranty/Guarantee (Clause 14)

The warranty/guarantee shall be as per provision under Clause 14 of General Conditions.

11.0 Payment (Clause 15)
11.1.1 Payment for design and supply component:

(a) 30% (Thirty Percent) of the total supply may be paid in advance against Bank Guarantee of the equivalent amount valid till completion of the project Work.

(b) **On receipt of goods:** 60% of the contract price of the goods (against detailed break up cost to be furnished by the Supplier in advance and accepted by the Purchaser) on safe receipt of goods at destination/site within 30 days after inspection and approval of the Purchaser.

(c) On final acceptance:

The balance 10% of the contract price of the goods shall be paid on continuous satisfactory running of the complete plant for one month, on completion of other contracted services and accepted by the Purchaser’s representative, within the scope of this contract.

11.1.2 Payment for installation, testing and commissioning component:

(a) **On progress of work:** 80% of the contract price for installation and commissioning shall be paid on prorate basis on actual completion of installation/erection and after due inspection and approval by the Purchaser (against detailed break up cost to be furnished by the Supplier in advance and accepted by the Purchaser).

(b) **On commissioning:** 10% of the contract price for installation and commissioning shall be paid on actual completion of commissioning and after due inspection and approval by the Purchaser (against detailed break up cost to be furnished by the Supplier in advance and accepted by the Purchaser).

(c) On final acceptance:

The balance 10% shall be paid on continuous satisfactory running of the complete plant for one month, on completion of other contracted services and accepted by the Purchaser’s representative, within the scope of this contract.

NOTE:

(i) All bank guarantees should be issued by Nationalised Banks / other banks like IDBI Bank treated/approved by RBI to be at par with Nationalised Banks for the limited purpose of acceptance of guarantee.

(ii) The successful bidder may raise running bills for supply as soon as supply is completed as per the schedule and bills for labour job shall be raised once in a month.

(iii) Retention money shall be deducted @ 10% of the Contract Price (excluding taxes) wherever tax break-up is available separately in the Purchase Order/Contract.

(iv) The Purchaser shall issue Material Transfer Challan (MTC) after safe receipt of equipment.

(v) No cost escalation will be granted towards the supply of Plant equipments & allied accessories.

12. Resolution of Disputes (Clause 27)

In the event of any dispute in the interpretation of the terms of the order/contract or difference of opinion between the parties on any point in the order/contract arising out of or in connection with the agreement accepted order/contract or with regard to performance of any obligation hereunder by either party, the parties hereto shall use their best efforts to settle such disputes or difference of opinion amicably by mutual negotiations. In case no agreement is reached, either party may forthwith give to the other, a notice in writing of the existence of such question, dispute or difference of opinion and the same shall be referred to the adjudication of sole arbitrator to be appointed by Purchaser whose decision in the matter shall be final and binding on the parties.
The Arbitration proceedings shall be governed under the provisions of the Indian Arbitration and Conciliation Act, 1996 and the rules there under or any statutory modifications thereof for the time being in force. In the order/contract, the venue of such Arbitration shall be Patna, Bihar and Courts at Patna alone shall have jurisdiction regarding any matter arising out of order/contract.

Performance under the Contract shall, if reasonably possible, continue during the Arbitration proceedings and payments due to the Supplier by the Purchaser shall not be withheld, unless they are the subjects of the Arbitration proceedings.

All awards for claims equivalent to Rupees thirty thousand or more shall be in writing and state the reasons for the amounts awarded.

13 Notices (Clause 30)

For the purpose of all the notices, the following shall be the address of the Purchaser and Supplier.

Purchaser – Bihar State Milk Co-Operative Federation Limited, Patna-800014

Supplier (To be filled in at the time of Contract signature.)
SPECIAL CONDITIONS OF CONTRACT FOR INSTALLATION

PART II

1.0 SUFFICIENCY OF TENDER

The Supplier by bidding shall be deemed to have satisfied himself as to all the conditions and circumstances affecting the Contract Price, 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, as to the general labour position at site and to have determined the prices accordingly.

2.0 PROGRAMME OF INSTALLATION AND COMMISSIONING

As soon as practicable after the acceptance of the bid, the Supplier shall submit to the Purchaser for his approval a comprehensive programme in the form of PERT network/ bar chart and any other form as may be required by the Purchaser showing the sequence of order in which the Supplier proposes to carry-out the works including the design, manufacture, delivery to site, erection and commissioning thereof. After submission to and approval by the Purchaser of such programme, the supplier shall adhere to the sequence of order and method stated therein. The submission to and approval by the Purchaser of such programme shall not relieve the Supplier of any of his duties or responsibilities under the Contract. The programme approved by the Purchaser shall form the basis of evaluating the pace of all works to be performed by the supplier.

3.0 PREPARATION OF DRAWINGS FOR APPROVAL

The Supplier should visit the site to acquaint himself in respect of existing site conditions and to know the details/information required for understanding the nature and type of civil construction works involved in the project. The Supplier shall submit to the Purchaser for approval:

a. Within the time given in the specification or in the program, such drawings, samples, patterns and models as may be called for therein, and in numbers therein required.

b. During the progress of works and within such reasonable times as the Purchaser may require such drawings of the general arrangement and details of the works as the Purchaser may require.

The specifications/ conditions concerning the submission of drawings by the Supplier are detailed as under:

3.1 Within four weeks from the date of receipt of the Notification of Award, Supplier shall furnish a list of all necessary drawings as briefly described below which the Supplier shall submit for approval, identifying each drawings by a serial number and descriptive title and expected date of submission. This list shall be revised and extended if necessary, during the progress of work depending on the nature of the contract also.

The Purchaser shall signify his approval or disapproval of all drawings or such drawings that would affect progress of the contract as per the agreed programme.

Brief list of drawings:

I. Equipment drawings for fabricated items.

II. Equipment layout for main feed plant, storage silo system and steam generation plant.

III. Flow diagrams for main processing plant, storage silo system and various services.

IV. Service piping layouts in production, storage silo system and service blocks.
V. Electrical cable, conduit / cable tray / cable trench layout.

VI. Other miscellaneous drawings as required for erection work.

VII. Electrical single line diagram, PCC and MCC general arrangement drawing and wiring diagrams.

VIII. Automation system scheme, controls and network diagrams.

3.2 Drawings showing fabrication details, dimensions, layouts and bill of materials submitted for approval shall be signed by responsible representative of Supplier and shall be to any one of the following sizes in accordance with Indian Standards: A0, A1, A2, A3 and A4.

3.3 All drawings shall show the following particulars in the lower right hand corner in addition to Supplier’s name:

i. Name of the Purchaser.
ii. Project Title.
iii. Title of drawing.
iv. Scale.
v. Date of drawing.
vi. Drawing number.
vii. Space for Purchaser reference or drawing number.

3.4 In addition to the information provided on drawings, each drawing shall carry a revision number, date of revision and brief description of revision carried out. Whenever any revision is carried out, correspondingly revision number must be up-dated.

3.5 All dimensions on drawings shall be in metric units.

3.6 Drawings (three sets) submitted by the Supplier for approval will be checked, reviewed by the Purchaser, and comments, if any, on the same will be conveyed to the Supplier. It is the responsibility of the Supplier to incorporate correctly all the comments conveyed by the Purchaser on the Supplier’s drawings. The drawings, which are approved with comments, are to be re-submitted in quadruplicate to the Purchaser for purpose of records. Such drawings will not be checked / reviewed by the Purchaser to verify whether all the comments have been incorporated by the Supplier.

If the Supplier is unable to incorporate any comments in the revised drawings, Supplier shall clearly state in his forwarding letter such non-compliance along with the valid reasons.

3.7 Drawings prepared by the Supplier and approved by the Purchaser shall be considered as a part of the specifications. However, the examination of the drawings by the Purchaser shall not relieve the Supplier of his responsibility for engineering design, workmanship, quality of materials, warranty obligations and satisfactory performance on installation covered under the contract.

3.8 If at any time before completion of the work, changes are made necessitating revision of approved drawings, the Supplier shall make such revisions and proceed in the same routine as for the original approval.

3.9 Date of submission

In the event, the drawings submitted for approval require many revisions amounting to re-drawing of the same then the date of submission of the revised drawings would be considered as the date of submission for approval. Four sets of all the drawings finally approved for fabrication / execution of works along with their soft copy in AutoCAD on a CD/DVD shall be submitted to the Purchaser.
3.10 The Supplier shall furnish to the Purchaser before the works are taken over, Operating and Maintenance instructions together with four sets of hard & soft copy (on CD/DVD) of 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 until such instructions and drawings have been supplied to the Purchaser.

4.0 SUPPLIER’S SUPERINTENDENCE (AND) DEPLOYMENT OF ERECTION TEAM AND CONDUCT OF PERSONNEL

The Supplier shall employ one or more competent representatives, whose name or names shall have previously been communicated in writing to the Purchaser by the Supplier, 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 times, and any orders or instructions which the Purchaser may give to the said representative of the Supplier shall be deemed to have given to the Supplier. The said representative shall have full technical capabilities and complete administrative and financial powers to expeditiously and efficiently execute the work under the contract.

4.1 The Supplier shall execute the works with due care and diligence within the time for completion and employ Supplier’s team comprising qualified and experienced engineers together with adequate skilled, semi-skilled and unskilled workmen in the site for carrying out the works. The Supplier shall ensure adequate workforce to keep the required pace at all times as per the schedule of completion. Supplier shall also ensure availability of competent engineers during commissioning/start up, trial runs, Operation of the plant/equipment till handing over of the plant.

4.2 The Supplier shall furnish the details of qualifications and experience of their senior supervisors and engineers assigned to the work site, including their experience in supervising erection and commissioning of plant and equipment of comparable capacity.

4.3 When the Supplier or Supplier’s representative is not present on any part of the work, where it may be desired to give directions in the event of emergencies, orders may be given by the Purchaser and shall be received and observed by the supervisors or foremen who may have charge of the particular part of the work in reference to which orders are given. Any such instructions, directions or notices given by the Purchaser shall be deemed to have been given to the Supplier.

4.4 The Supplier’s employment records shall include any reasonable information as may be required by the Purchaser. The Supplier should also display necessary information as may be required by statutory regulations.

4.5 None of the Supplier’s supervisors, engineers, or laborers may be withdrawn from the work without notice to the Purchaser and further no such withdrawals shall be made if in the opinion of the Purchaser, it will adversely affect the required pace of progress and/or the successful completion of the work.

4.6 The Purchaser shall be at liberty to object to any representative or person, skilled, semi-skilled or unskilled worker employed by the Supplier in the execution of or otherwise about the works who shall, in the opinion of the Purchaser, misconduct himself or be incompetent, or negligent or unsuitable, and the Supplier shall remove the person so objected to, upon receipt of notice in writing from the Purchaser and shall provide in that place a competent representative at Supplier’s own expense within a reasonable time.

4.7 In the execution of the works no persons other than the Supplier, sub-Supplier and their employees shall be allowed on the site except by the written permission of the Purchaser.

5.0 PURCHASER’S INSTRUCTIONS
The Purchaser may in his absolute discretion, issue from time to time drawings and/or instructions, directions and clarifications which are collectively referred to as Purchaser's instructions in regard to:

5.1 Any additional drawing and clarifications to exhibit or illustrate details.

5.2 Variations or modifications of the design, quality or quantity of work or the additions or omissions or substitution of any work.

5.3 Any discrepancy in the drawings or between the schedule of quantities and/or specifications.

5.4 Removal from the site of any material brought there by the Supplier, which are unacceptable to the PURCHASER and the substitution of any other material thereof.

5.5 Removal and/or re-execution of any work erected by the Supplier, which are unacceptable to the Purchaser.

5.6 Dismissal from the work of any persons employed there upon who shall in the opinion of the Purchaser, misconduct himself, or be incompetent or negligent.

5.7 Opening up for inspection of any work covered up.

5.8 Amending and making good of any defects

6.0 RIGHT OF THE PURCHASER

6.1 Right to direct works:

6.1.1 The Purchaser shall have the right to direct the manner in which all works under this Contract shall be conducted, in so far as it may be necessary to secure the safe and proper progress and specified quality of the works. All work shall be done and all materials shall be furnished to the satisfaction and approval of the Purchaser.

6.1.2 Whenever in the opinion of the Purchaser, the Supplier has made marked departures from the schedule of completion or when circumstances or requirement force such a departure from the said schedule, the Purchaser, in order to ensure compliance with the schedule, shall direct the order, pace and method of conducting the work, which shall be adhered to by the Supplier.

6.1.3 If in the judgment of the Purchaser, it becomes necessary at any time to accelerate the overall pace of the plant erection work, the Supplier, when directed by Purchaser, shall cease work at any particular point and transfer Supplier's men to such other point or points and execute such works, as may be directed by the Purchaser and at the discretion of the Purchaser.

6.2 Right to order modifications of methods and equipment

If at any time the Supplier's methods, materials or equipment appear to the Purchaser to be unsafe, inefficient or inadequate for securing the safety of workmen or the public, the quality of work or the rate of progress required, the Purchaser may direct the Supplier to ensure safety, and increase their efficiency and adequacy and the Supplier shall promptly comply with such directives. If at any time the Supplier's working force and equipment are inadequate in the opinion of the Purchaser, for securing the necessary progress as stipulated, the Supplier shall if so directed, increase the working force and equipment to such an extent as to give reasonable assurance of compliance with the schedule of completion. The absence of such demands from the Purchaser shall not relieve the Supplier of Supplier's obligations to secure the quality, the safe conducting of the work and the rate of progress required by the contract. The Supplier alone shall be and remain liable and responsible for the safety, efficiency and adequacy of Supplier's methods, materials, working force and equipment, irrespective of whether or not the Supplier makes any changes as a result of any order or orders received from the Purchaser.
6.3 Right to inspect the work

6.3.1 The Purchaser's representative shall be given full assistance in the form of the necessary tools, instruments, equipment and qualified operators to facilitate inspection.

6.3.2 The Purchaser reserves the right to call for the original test certificates for all the materials used in the erection work.

6.3.3 In the event the Purchaser's inspection reveals poor quality of work/materials, the Purchaser shall be at liberty to specify additional inspection procedures if required, to ascertain Supplier's compliance with the specifications of erection work.

6.3.4 Even though inspection is carried out by the Purchaser or Purchaser's representatives, such inspection shall not, however, relieve the Supplier of any or all responsibilities as per the contract, nor prejudice any claim, right or privilege which the Purchaser may have because of the use of defective or unsatisfactory materials or bad workmanship.

7.0 SUPPLIER'S FUNCTIONS

7.1 The Supplier shall provide everything necessary for proper execution of the works, according to the drawings, schedule of quantities and specifications taken together whether the same may or may not be particularly shown or described therein, provided that the same can reasonably be inferred there from and if the Supplier finds any discrepancy therein, Supplier shall immediately refer the same to the Purchaser whose decision shall be final and binding on the Supplier.

7.2 The Supplier shall proceed with the work to be performed under this Contract in the best and workman like manner by engaging qualified and efficient workers and finish the work in strict conformance with the drawings and specifications and any changes/modifications thereof made by the Purchaser.

7.3 VARIATIONS

7.3.1.1 The Purchaser shall make any variation of the form, quality or quantity of the Works or any part thereof that may, in his opinion, be necessary and for that purpose, or if for any other reason it shall, in his opinion be desirable, he shall have power to order the Supplier to do and the Supplier shall do any of the following:

a. Increase or decrease the quantity of any work included in the contract,
b. Omit any such work,
c. Change the character or quality or kind of any such work,
d. Change the levels, lines, position and dimensions of any part of the works, and
e. Execute additional work of any kind necessary for the completion of the works and no such variation shall in any way vitiate or invalidate the contract, but the value, if any, of all such variations shall be taken into account in ascertaining the amount of the Contract price.

7.3.1.2 No such variations shall be made by the Supplier without an order in writing of the Purchaser. 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 Contract/Bill of Quantities. Provided further that if the Supplier shall within seven days confirm in writing to the Purchaser and such confirmation shall not be contradicted in writing by the Purchaser within 14 days, it shall be deemed to be an order in writing by the Purchaser.

7.3.2.1 All extra or additional work done or work omitted by order of the Purchaser shall be valued at the rates and prices set out in the contract if in the opinion of the Purchaser, the same shall be applicable. If the contract does not contain any rates or prices applicable to the extra or additional work, then suitable rates or prices shall be agreed upon between the Purchaser and
the Supplier. In the event of disagreement the Purchaser shall fix such rates or prices as shall, in his opinion, be reasonable and proper.

7.3.2.2 Provided that if the nature or amount of any omission or addition relative to the nature or amount of the whole of the works or to any part thereof shall be such that, in the opinion of the Purchaser, the rate or price contained in the Contract for any item of the works is, by reason of such omission or addition, rendered unreasonable or inapplicable, then a suitable rate or price shall be agreed upon between the Purchaser and the Supplier. In the event of disagreement the Purchaser shall fix such other rate or price as shall, in his opinion, be reasonable and proper having regard to the circumstances.

Provided also that no increase or decrease under sub-clause 7.3.2.1 of this clause or variation of rate or price under sub-clause 7.3.2.2 of this clause shall be made unless, as soon after the date of the order as is practicable and, in the case of extra or additional work, before the commencement of the work or as soon thereafter as is practicable, notice shall have been given in writing:

a. By the Supplier to the Purchaser of his intention to claim extra payment or a varied rate or price,

Or

b. By the Purchaser to the Supplier of his intention to vary a rate or price.

7.3.2.3 If, on certified completion of the whole of the works, it shall be found that a reduction or increase greater than 15 per cent of the sum named in the Letter of Acceptance results from the aggregate effect of all Variation Orders but not from any other cause, the amount of the Contract Price shall be adjusted by such sum as may be agreed between the Supplier and the Purchaser or, failing agreement, fixed by the Purchaser having regard to all material and relevant factors, including the Supplier's site and general overhead costs of the contract.

7.3.2.4 The Supplier shall send to the Purchaser's representative once in every month an account giving particulars, as full and detailed as possible, of all claims for any additional payment to which the Supplier may consider himself entitled and of all extra or additional work ordered by the Purchaser which he has executed during the preceding month.

No final or interim claim for payment for any such work or expense will be considered which has not been included in such particulars. Provided always that the PURCHASER shall be entitled to authorize payment to be made for any such work or expense, notwithstanding the Supplier's failure to comply with this condition, if the Supplier has, at the earliest practicable opportunity, notified the Purchaser in writing that he intends to make a claim for such work.

7.4 The work shall be carried out as approved by the Purchaser or his authorized representative/s from time to time, keeping in view the overall schedule of completion of the project. The Supplier's job schedule must not disturb or interfere with Purchaser's or other Suppliers' or Contractors' schedules of day-to-day work. The Purchaser will provide all reasonable assistance for carrying out the jobs.

7.5 Night work will be permitted only with prior approval of the Purchaser. The Purchaser may also direct the Supplier to operate extra shifts over and above normal day shift to ensure completion of contract as per schedule. Adequate lighting wherever required should be provided by the Supplier at no extra cost. The Supplier should employ qualified electricians and wiremen for these facilities. In case of Supplier's failure to provide these facilities and personnel, the Purchaser has the right to arrange such facilities and personnel and to charge the cost thereof to the Supplier.

7.6 The Supplier shall, in the joint names of the Supplier and the Purchaser naming Purchaser as the beneficiary, insure the received goods and equipment and so far as reasonably practicable the Works and keep each part thereof insured for the 110% of the Contract Sum or such other value as may be mutually agreed between the Purchaser and
the Supplier 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 Supplier shall insure against the Supplier's liability in respect of any or damage occurring whilst the Supplier is on Site for the purpose of making good a defect or carrying out the Tests on Completion.

7.7 The Purchaser shall not be liable for or in respect of any damages or compensation payable at law in respect or in consequence of any accident or injury to any workman or other person in the employment of the Supplier or any sub-Supplier, save and except an accident or injury resulting from any act or default of the Purchaser, his agents, or servants. The Supplier shall indemnify and keep indemnified the Purchaser against all such damages and compensation, save and except as aforesaid and against all claims, proceedings, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

7.8 The Supplier shall insure against such liability with an insurer approved by the Purchaser, which approval shall not be unreasonably withheld, and shall continue such insurance during the whole of the time that any persons are employed by him on the works shall, when required, produce to the Purchaser or Purchaser's representative such policy of insurance and the receipt for payment of the current premium.

Provided always that, in respect of any persons employed by any sub-supplier, the Supplier's obligations to ensure as aforesaid under this sub-clause shall be satisfied if the sub-supplier shall have insured against the liability in respect of such persons in such manner that the PURCHASER is indemnified under the policy, but the Supplier shall require such sub-supplier to produce to the Purchaser or Purchaser's representative, when required, such policy of insurance and the receipt for payment of the current premium.

7.9 Whenever proper execution of the work under the Contract depends on the jobs carried out by some other supplier, in such cases the Supplier should inspect all such erection and installation jobs and report to the Purchaser regarding any defects or discrepancies. The Supplier's failure to do so shall constitute as acceptance of the other supplier's installation / jobs as fit and proper for reception of Supplier's works except those defects which may develop after execution. Supplier should also report any discrepancy between the executed work and the drawings.

The Supplier shall extend all necessary help / co-operation to other suppliers working at the site in the interest of the work.

7.10 The Supplier shall keep a check on deliveries of the Goods covered in the scope of erection work and shall advise the Purchaser well in advance regarding possible hold-up in Supplier's work due to the likely delay in delivery of such Goods to enable him to take remedial actions.

7.11 The Supplier shall be permitted to substitute equipment of equal on better performance subject to approval by the Purchaser; which approval shall not be unreasonably withheld, provided however that the Supplier establishes to the Purchaser's satisfaction that the performance of the substituted equipment is equal or better than the performance of the equipment specified in the contract and without any increase in the Contract price.

8.0 DUTIES OF THE PURCHASER VIS-A-VIS THE SUPPLIER:

8.1 The Goods, if any, to be supplied by the Purchaser for erection, testing and commissioning by the Supplier, shall be as listed in the Contract

8.2 Necessary temporary water for carrying out the installation / testing shall be supplied at only one point within the project site by the Purchaser free of charge. All necessary distribution tapping from this point onwards shall be the Supplier's responsibility.
8.2.1 Necessary temporary power for carrying out the installation shall be arranged by the Supplier at Supplier's own cost. The necessary authorization letter will be issued by the Purchaser on written request by the Supplier.

8.2.2 If the power is provided by the Purchaser, the recovery shall be @ 0.5% of the total purchase order value (design, supply, installation, testing & commissioning). The charges will be deducted from the Supplier’s bills. However, the supplier shall supply all the items such as switchgear, cabling etc. required for getting temporary power.

8.3 The details of temporary water and power requirements shall be furnished one month in advance by the Supplier to enable the Purchaser to make timely arrangement.

8.4 If the Supplier suffers delay from failure on the part of the Purchaser to give possession of the civil works in accordance with the mutually agreed schedule, the Purchaser shall determine any extension of time to which the Supplier is entitled under Clause 21 of GCC.

9.0 SUPPLY OF TOOLS, TACKLES AND MATERIALS

The Supplier shall, at his own expense, provide all the necessary equipment, tools and tackles, haulage power, consumables necessary for effective execution and completion of the works during erection and commissioning.

10.0 PROTECTION OF PLANT

10.1 The Purchaser shall not be responsible or held liable for any damage to person or property consequent upon the use, misuse or failure of any erection tools and equipment used by the Supplier or any of Supplier's sub-suppliers even though such tools and equipment may be furnished, rented or loaned to the Supplier or any of Supplier's sub-suppliers. The acceptance and/or use of any such tools and equipment by the Supplier or Supplier's sub-supplier shall be construed to mean that the Supplier accepts all responsibility for and agrees to indemnify and save the Purchaser from any and all claims for said damages resulting from the said use, misuse or failure of such tools and equipment.

10.2 The Supplier and Supplier's sub-supplier shall be responsible, during the works, for protection of work, which has been completed by other Suppliers. Necessary care must be taken to see that the Supplier's men cause no damage to the same during the course of execution of the work.

10.3 All other works completed or in progress as well as machinery and equipment that are liable to be damaged by the Supplier's work shall be protected by the Supplier and protection shall remain and be maintained until its removal is directed by the Purchaser.

10.4 The Supplier shall effectively protect from the effects of weather and from damages or defacement and shall cover appropriately, wherever required, all the works for their complete protection.

10.5 The work shall be carried out by the Supplier without damage to any work and property adjacent to the area of Supplier's work to whomsoever it may belong and without interference with the operation of existing machines or equipment.

10.6 Adequate lighting, guarding and watching at and near all the storage handling, fabrication, pre-assembly and erection sites for properly carrying out the work and for safety and security shall be provided by the Supplier at Supplier's cost. The Supplier should adequately light the work area during nighttime also. The Supplier should also engage adequate electricians/wiremen, helper etc. to carry out and maintain these lighting facilities. If the Supplier fails in this regard, the Purchaser may provide lighting facilities as he may deem necessary and charge the cost thereof to the Supplier.
10.7 The Supplier 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 and in case any damage or loss shall happen to any portion of the works not taken over as aforesaid, from any cause whatsoever, the same shall be made good by and at the sole cost of the Supplier and to the satisfaction of the Purchaser. The Supplier shall also be liable for any loss of or damage to the works occasioned by the Supplier or the Supplier's Sub-Supplier in the course of any operations carried out by the Supplier or by the Supplier's Sub-Suppliers for the purpose of completing any outstanding work or complying with the Supplier's obligations.

11.0 UNLOADING, TRANSPORTATION AND INSPECTION

11.1 The Supplier shall be required to unload all the Goods from the carriers, received at site after Supplier's team arrives at site. The Supplier shall plan in advance, based on the information received from the Purchaser, Supplier's requirement of various tools, tackles, jacks, cranes, sleepers etc. required to unload the material/equipment promptly and efficiently. The Supplier shall ensure that adequate and all measures necessary to avoid any damage whatsoever to the equipment at the time of unloading are taken. Any demurrage/detention charges incurred due to the delay in unloading the material/equipment and releasing the carriers shall be charged to the Supplier's account. The Supplier shall be responsible for receipt at site of all Goods and Supplier's equipment delivered for the purposes of the Contract.

11.2 The Supplier shall safely transport/shift the unloaded Goods and equipment to the storage area.

11.3 In case of turnkey contracts, the cost incurred on unloading of all the Goods received by the Purchaser prior to arrival of the Supplier at site shall be debited to the Supplier and all such goods shall be handed over to the Supplier when it reports at site and there upon the Supplier shall inspect the same and furnish a receipt to the Purchaser. The manner in which the inspection shall be carried out is enumerated below:

11.3.1 The materials/equipment would be carefully unpacked by opening the wooden cases/other modes of packings as the case may be.

11.3.2 Detailed inventory of various items would be prepared clearly listing out the shortages, breakages/damages after checking the contents with respect to the supplier's packing list, the Purchaser's Contract and approved equipment drawings. The Supplier shall also check every equipment for any shortage/shortcoming that may eventually create difficulty at the time of installation or commissioning.

11.3.3 All the information and observations by the Supplier shall be furnished in the form of 'INSPECTION REPORT' to the Purchaser with specific mention/suggestions which in the opinion of the Supplier should be given due consideration and immediate necessary actions, to enable the Purchaser to arrange repair or replacement well in time and avoid delays due to non-availability of equipment and parts at the time of their actual need.

11.3.4 The inspection for all the Goods handed over to the Supplier shall be completed within three week's period.

11.4 The protection, safety and security of the Goods so taken over from the Purchaser shall be the responsibility of the Supplier, until they are handed over to the Purchaser after erection, commissioning and testing as per the terms of the Contract.

12.0 STORAGE OF GOODS

The Supplier shall be responsible for the proper storage and maintenance of all Goods under Supplier's custody. Supplier shall take all required steps to carry out frequent inspection of equipment/materials stored as well as erected equipment until the same are taken over by the Purchaser. The following procedure shall apply for the same.
12.1 The Supplier's inspector shall check stored and installed Goods to observe signs of corrosion, damage to protective coating to parts, open ends in pipes, vessels and equipment, insulation resistance of electrical equipment etc. The Supplier shall immediately arrange a coat of protective painting whenever required. A record of all observations made on Goods, defects noticed shall be promptly communicated to the Purchaser and Purchaser's advice taken regarding the repairs/rectifications. The Supplier shall thereupon carry out such repairs/rectifications at Supplier's own cost. In case the Supplier is not competent to carry out such repairs/rectifications, the Purchaser reserves the right to have this done by other competent agencies at the Supplier's responsibility and risk and the entire cost for the same shall be recovered from the Supplier's bills.

12.2 The Supplier's inspector shall also inspect and provide lubrication to the assembled Goods. The shafts of such equipment shall be periodically rotated to prevent rusting as well as to check freeness of the same.

12.3 The Inspector shall check for any signs of moisture or rusting in any Goods.

12.4 If the commissioning of Goods is delayed after installation of the Goods, the Supplier shall carry out all protective measures suggested by the Purchaser during such period.

12.5 Adequate security measures shall be taken by the Supplier to prevent theft and loss of Goods handed over to the Supplier by the Purchaser. The Supplier shall carry out periodical inventory checks of the Goods received, stored and installed by the Supplier and any loss noticed shall be immediately reported to the Purchaser. A proper record of these inventories shall be maintained by the Supplier. The Supplier should not sell, assign, mortgage, hypothecate or remove Goods which have been installed or which may be necessary for completion of the work without the written consent of the Purchaser.

12.6 A suitable grease recommended for protection of surfaces against rusting (refined from petroleum oil with lanolin minimum (70 deg C) and water in traces) shall be applied over all Goods as required once in every six months.

12.7 All Goods shall be stored inside a closed shed or in the open depending upon whether they are of indoor or outdoor design. The space heaters where provided into the electrical equipment shall be kept connected with power supply irrespective of their type of storage. Where space heaters are not provided adequate heating with bulb is recommended. For transformers heating of oil shall be done by giving 440 V supply and short-circuiting the LT terminals. Frequent checks on insulation resistance are essential for all electrical equipment and record of the inspection reports and megger readings shall be maintained equipment wise. Such records shall be presented to the Purchaser whenever demanded.

12.8 All the necessary Goods required for protection as described above shall be arranged by the Supplier and such cost shall be included in the Contract Price.

Should the amount of extra or additional work of any kind or any cause of delay referred to in these conditions, or exceptional or adverse climatic conditions, or other special circumstances of any kind whatsoever which may occur, as described in Clause 25 of the General Conditions of Contract, other than through a default of the Supplier, be such as fairly to entitle the Supplier to an extension of time for the completion of the works, the Purchaser shall determine the amount of such extension and shall notify the Supplier accordingly. Provided that the Purchaser is not bound to take into account any extra or additional work or other special circumstances unless the Supplier has within twenty-eight days after such work has been commenced, or such circumstances have arisen, or as soon thereafter as is practicable, submitted to the Purchaser full and detailed particulars of any extension of time to which he may consider himself entitled in order that such submission may be investigated at the time.
13.0 APPROVALS

13.1 The Supplier shall obtain the necessary approvals of the Factory Inspector, Boiler Inspector, Electrical Inspector, Weights & Measures Inspector, Explosive Inspector and any other state and local authorities as may be required and the cost of obtaining such approvals shall be included in the Contract Price. All the necessary details, drawings, submission of application and proformas will be furnished by the Supplier to the Purchaser for verification/signature. The necessary application duly filled-in, together with the prescribed fees shall be submitted to the appropriate authorities by the Supplier on behalf of the Purchaser. However all the actual statutory prescribed fees paid by the Supplier shall be reimbursed by the Purchaser upon production of the receipt/vouchers.

13.2 Wherever necessary or required, the Supplier shall furnish the necessary test and/or inspection certificates etc. from the appropriate authorities as per IER and other statutory regulations and the cost for obtaining these certificates shall be included in the Contract Price.

14.0 REVIEW AND CO-ORDINATION OF ERECTION WORK

The Supplier shall depute senior and competent personnel to attend the site co-ordination meetings that would generally be held at the site every month. The Supplier shall take necessary action to implement the decisions arrived at such meetings and shall also update the erection schedule.

15.0 EXTENSION OF TIME FOR COMPLETION

Should the amount of extra or additional work of any kind or any cause of delay referred to in these conditions, or exceptional or adverse climatic conditions, or other special circumstances of any kind whatsoever which may occur, as described in Clause 24 of the General Conditions of Contract, other than through a default of the Supplier, be such as fairly to entitle the Supplier to an extension of time for the completion of the works, the Purchaser shall determine the amount of such extension and shall notify the Supplier accordingly. Provided that the Purchaser is not bound to take into account any extra or additional work or other special circumstances unless the Supplier has within twenty-eight days after such work has been commenced, or such circumstances have arisen, or as soon thereafter as is practicable, submitted to the Purchaser full and detailed particulars of any extension of time to which he may consider himself entitled in order that such submission may be investigated at the time.
SPECIAL CONDITIONS OF CONTRACT
PART III - A

(MECHANICAL INSTALLATION)

1.0 MECHANICAL INSTALLATION

The installation work would comprise:

a. General installation i.e. positioning and installing all the processing, miscellaneous and service equipment as per approved layout drawings and as per the contract.

b. Supply and installation of structural platforms and tables.

c. Supply and installation of all service and product piping including ancillary items.

d. Insulation and cladding of piping and equipment including supply of materials.

e. Interconnections of services and electrical with equipment.

f. Guide line for expansion work.

g. Clean up of work site.

h. Supply of all cleaning chemicals and lubricants.

i. Testing, commissioning and start-up.

j. Painting including supply of paints as approved by the Owner.

k. Training of personnel.

Detailed specifications are given in the subsequent clauses.

2.0 GENERAL INSTALLATION

2.1 Positioning of Equipment

The work involves preparation of access for moving of the plant and equipment including their fittings from the work site godown or from the place within the site where they have been unloaded, to the place of erection, decorating and placing on the foundation wherever required. All the civil foundations as per the manufacturer/supplier's drawings shall be arranged by the Supplier. The Supplier shall place the equipment and carry out final adjustment of the foundations including alignment and dressing of foundation surface, embedding and grouting of anchor bolts and bedplates. The Supplier shall be responsible for obtaining correct reference lines for purpose of fixing the alignment of various equipment from master benchmarks provided by the Owner.

Tolerances shall be as specified in equipment manufacturers drawings or as stipulated by the Owner's Engineer. No equipment shall be permanently bolted down to foundations or structure until the alignment has been checked by the Supplier and witnessed by the Purchaser. The Supplier shall carry out minor alterations in the anchor bolts, pockets etc., at no extra cost and set the equipment properly as per approved layout, drawings and manufacturer's instructions. The Supplier shall supply all the necessary foundation/anchor bolts and bedplates if required without extra cost.

The Supplier shall supply, fix and maintain, at his own cost, during the erection work, all the necessary centering, scaffolding, staging required not only for proper execution and
protection of the said work but also for protection of the surrounding plant and equipment. The Supplier shall take out and remove any or all such centering, scaffolding, staging planking etc., as occasion shall require or when ordered to do so and shall fully reinstate and make good all things disturbed during execution of the work, to the satisfaction of the Owner. The Supplier shall be paid no additional amount for the above.

2.2 Structural Platforms, Service Pipe Bridge and Tables

Box type structural platforms shall be required to provide access for various equipments. Pipe support bridges/gantry shall be required for supporting the pipes from the ground, including road crossings outside the buildings. These platforms, bridges / gantry shall be fabricated keeping stability and other functional as well as aesthetic requirements into consideration as approved by the Owner. The payment shall be made on the basis of the actual weight executed and the unit rates agreed upon or as per provisions made in the contract for such items.

The Purchaser shall arrange for any civil works required for the above works based on the drawings and load details provided by the bidder. Necessary templates and other accessories required by the civil contractor shall be provided by the bidder.

3.0 SERVICE PIPING INSTALLATION

3.1 General Guidelines

All piping systems shall comply with the latest editions of the following regulations wherever applicable.

3.1.1 Regulations of explosives inspectorate.

3.1.2 Indian Boiler Regulations.

3.1.3 All applicable Indian Standards.

3.1.4 All applicable State Government/ Central Government laws /acts.

3.1.5 The Supplier has to prepare all erection drawings of the proposed plant including equipment positions and service-piping positions (Isometric), spacing between pipes, all other relevant details and submit these drawings to Purchaser for approval.

3.2 Scope of Supply

The Supplier shall supply all piping materials like pipes, fittings, flanges measuring instruments and all other items as shown in the flow diagram/specifications and schedule of quantities. All the pipes & fittings and insulation material etc. should be of class and make as approved by the Owner. Prior approval of the Owner must be obtained by the supplier for the class and make of all materials. The Supplier should furnish the details of makes selected by him, in the proforma given in Annexure I.

3.3 Scope of Piping Erection

This to be performed by the Supplier as outlined below:

3.3.1 The scope of erection for piping, includes all system covered in the flow diagrams and specifications.

3.3.2 The Supplier’s work commences / terminates at the pipe connections with valves or flanges as specified in flow diagrams / battery limits.

3.3.3 The Supplier shall also install necessary piping and any specialties furnished with or for equipment such as relief valves, built-in-pass and other items of this type.
3.3.4 The Supplier shall install primary elements for flow measurements, control valves and on-line metering equipment.

3.3.5 The Supplier shall perform necessary internal machining of pipes for installing orifices, flow nozzles, control valves etc.

3.3.6 The Supplier shall install all pipes, valves and specialties being procured from other sources.

3.4 Testing of Piping

3.4.1 The Supplier shall test all piping systems mentioned below including valves and specialties and instruments as per procedure mentioned under 3.4.4.

a) H.P. & L.P. Steam piping
b) Furnace oil & diesel piping
c) Soft and raw water
d) Compressed Air Piping

3.4.2 All piping shall be internally cleaned and flushed by the Supplier after erection in a manner suited to the service and as directed by the Owner.

3.4.3 For hydrostatic testing and water flushing, the Supplier shall furnish necessary pumps, equipment, instruments and piping etc.

3.4.4 The details of testing pressures for various pipelines are mentioned below:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name</th>
<th>Test Pressure Kg/cm²</th>
<th>Test Medium</th>
<th>Duration of Test (Hour)</th>
<th>Allowable Pressure Drop (Kg/cm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Steam Pipelines</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 a</td>
<td>H.P. Steam</td>
<td>27</td>
<td>Water</td>
<td>½</td>
<td>0</td>
</tr>
<tr>
<td>1 b</td>
<td>L.P. Steam</td>
<td>8</td>
<td>Water</td>
<td>½</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>Water Pipelines</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 a</td>
<td>Raw Water, Soft water</td>
<td>8</td>
<td>Water</td>
<td>½</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>Furnace Oil/ LSHS Pipelines</td>
<td>16</td>
<td>Water</td>
<td>½</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>Air Pipelines</td>
<td>12</td>
<td>Air</td>
<td>½</td>
<td>0.1</td>
</tr>
</tbody>
</table>

3.5 Other Guidelines

3.5.1 Colour code shall be used to identify pipe material. The Supplier shall be able to identify on request all random piping prior to field fabrication.

3.5.2 The Supplier shall be responsible for the quality of welding done by them and shall conduct tests to determine the suitability of the welding procedure by him.

3.5.3 All piping supports, guides, anchors, hangers, rollers with structural framework shall be supplied and erected by the Supplier. Only anchor fasteners of adequate size shall be provided for anchoring supports from RCC structures and Hilti Gun shall be used for fastening the anchors.
The kinds of pipe supports like CI clamps, PUF/wooden saddles, roller supports and support framework shall be as per the design approved by the Owner prior to taking up the work.

3.5.4 All piping shall be suspended, guided and anchored with due regard to general requirements and to avoid interference with other pipes, hangers, electrical conduits and their supports, structural members and equipment and to accommodate insulation and conform to buildings structural limitations. It is the responsibility to the piping Supplier to avoid all interference while locating hangers and supports.

3.5.5 Anchors and/or guides for pipelines or for other purposes shall be furnished, when specified, for holding the pipeline in position for alignment. Hangers shall be designed fabricated and assembled in such a manner that they cannot become disengaged by any movement of the support pipes.

3.5.6 All piping shall be wire brushed and purged with air blast to remove all rust, mill scale from inner surface. The method of cleaning shall be such that no material is left on the inner or on outer surfaces, which will affect the serviceability of the pipes. A thin coat of any lubricating oil shall be applied on entire inner surface of steel pipes (black) to prevent rusting.

3.5.7 Effective precautions such as capping and sealing shall be taken to protect all pipe ends against ingress of dirt and damage during transit or storage.

The outside of the steel pipes (black) shall be painted with two coats of red oxide paint or as directed by the Owner.

3.5.8 All pipes in the corridor shall be supported from the sidewall.

3.5.9 MS box section pipe supports for services / process equipment shall be provided by the supplier. Box section pipe supports for services and cable trays in other areas shall be of steel of suitable thickness coated with rust preventive paints and finish coated with dark admiral grey of approved shade. Where pipes and clamps are of dissimilar material, gaskets shall be provided in between. Spacing of utilities pipe supports shall not exceed the following:

<table>
<thead>
<tr>
<th>Pipe size</th>
<th>Spacing between supports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 12mm</td>
<td>1.5m</td>
</tr>
<tr>
<td>15 to 25mm</td>
<td>2.0m</td>
</tr>
<tr>
<td>30 to 150mm</td>
<td>2.0m</td>
</tr>
<tr>
<td>Over 150mm</td>
<td>2.5m</td>
</tr>
</tbody>
</table>

3.5.10 Vertical risers shall be parallel to walls and column lines and shall be straight and in plumb. Risers passing from floor to floor shall be supported at each floor slab by clamps or collars attached to pipe and with a 15 mm thick rubber pad or any resilient material. Where pipes pass through the terrace floor, suitable flashing shall be provided to prevent water leakage. Risers shall have a suitable clean out at a lower point and air vent at the highest point.

3.5.11 Pipe sleeves at least 3 mm thick, 50 mm / 100 mm larger in diameter than the pipes shall be provided wherever pipe passes through walls and slabs. Annular space shall be filled with fibre glass and finished with retainer rings. No extra payment shall be made on account of providing the sleeves.

3.5.12 All piping works shall be carried out in a workman like manner, causing minimum disturbance to the services, buildings, roads and structures. The entire piping work shall be organized, in consultation with other agencies work, so that laying of pipe support, pipes and pressure testing for each area shall be carried out in one stretch.

3.5.13 Cutouts details in the floors and slabs for installing various pipes are to be provided by the contractor immediately after receipt of the purchase order, so as to make the cutouts ready by civil contractor.
3.5.14 The contractor shall make sure that the clamps, brackets, clamp saddles and hangers provided for pipe supports are adequate. Piping layout shall take due care for expansion and contraction in pipes and include expansion joints wherever required.

3.5.15 All pipes shall be accurately cut to the required size in accordance with the relevant BIS code and burrs removed before lying. Open ends of the piping shall be closed as the pipe is installed to avoid ingress of foreign matters. Where reducers are to be made in horizontal runs, eccentric reducers shall be used for piping to drain fully. In other locations concentric reducers may be used.

3.5.16 All buried pipes shall be cleaned and coated with zinc chromate primer and bitumen paint, then wrapped with three layers of fibre glass tissue, each layer laid in bitumen.

3.5.17 Tee-off connections shall be through equal or reducing tees. Otherwise ferrules welded to the main pipe shall be used. Drilling and tapping of the walls of the main pipe shall not be resorted to.

4.0 SPECIAL INSTRUCTIONS AND SPECIFICATIONS

4.1 Steam Piping

4.1.1 Steam piping work can be classified into two categories:

a) High-pressure steam piping when the working pressure of steam is more than 3.1 kg/sq.cm (50 psi).
b) Low-pressure steam piping when the working pressure of steam is below 3.1 kg/sq.cm (50 psi).

All the pipes and fittings used for high pressure steam piping work should conform to IBR and they should be IBR certified and also to be identified with number and mark showing that they are tested by the Boiler Inspector and supported with duly authentic certificates to this effect. ALL HIGH PRESSURE STEAM PIPES SHALL BE SEAMLESS TYPE, SCHEDULE 40.

4.1.2 The high pressure steam piping after installation should be hydraulically tested in presence of the Boiler Inspector for his approval.

4.1.3 The high-pressure steam piping work should also include fabrication and installation of pressure reducing stations strictly conforming to IBR.

4.2 Water Piping:

All the piping for water, soft & raw water, steam & condensate, furnace oil, and air shall be generally of welded construction. Whenever welding is done for pipes of smaller size special care should be exercised to avoid clogging of flow area with the welding material.

5.0 INSULATION OF PIPING AND EQUIPMENT

5.1 Insulation of Steam, condensate and Hot Water Pipe Lines

All the steam and hot water pipelines shall be insulated with mineral wool or equivalent resin bonded pipe section of specified thickness. The insulation shall be carried out in the following manner and should be supplied in the form of properly required sizes.

5.1.1 Clean the surfaces to be insulated. Apply a coat of red oxide primer and fix glass wool / mineral wool / resin bonded pipe section of specified thickness, tightly to the pipes, butting all joints and tie with lacing wire.

5.1.2 It should then be covered with GI wire netting of 20 mm x 24 SWG.

5.1.3 In case the insulation does not have the desired insulation properties, the entire insulation will have to be redone at the Supplier's cost to give the desired results.
5.1.4 In case of condensate return piping all the steps mentioned above shall be executed except that thickness of the insulation shall be 25 mm.

5.2 Aluminum / GI Cladding

5.2.1 The ammonia accumulators, chilled water, ammonia, water, steam & hot water lines after insulations shall be covered by Aluminum / GI cladding as per the requirement and the payment will be made as per the executed items.

5.2.2 Aluminum cladding will be done with 22-gauge aluminum sheet with proper grooves and overlaps and screwed in position with 12 mm. self-tapping parker screws.

5.2.3 GI sheet cladding will be done with 22 gauge sheet with proper grooves and overlaps and screwed in position with 12 mm self tapping parker screw. The GI sheet cladding will finally painted with 2 coats of approved shade and quality of paint.

5.2.4 All the necessary materials of quantity and make approved by the Owner, required for carrying out insulation, cladding and other works mentioned above, shall be supplied by the Supplier.

6.0 INTER CONNECTIONS OF SERVICE AND ELECTRICALS WITH EQUIPMENT

6.1 The Supplier shall lay service piping and provide connections with the equipment complying strictly with the equipment manufacturers' instructions. The Supplier shall also carry out all the interconnecting service piping with the various items of plant/system. The work shall be complete with capillary piping if required and connections with instruments and controls supplied with the equipment.

6.2 The Supplier shall also carry out electrical connections for equipment with the control panels including equipment lighting as per the wiring diagrams of the equipment suppliers.

7.0 CLEAN UP OF WORKS SITE

7.1 All soils, filth or other matters of an offensive nature taken out of any trench, drain or other places shall not be deposited on the surfaces, but shall at once be carted away by the Supplier from the site of work for proper disposal.

7.2 The Supplier shall not store or place the equipment, materials or erection tools on the drive ways and passages and shall take care that his work in no way restricts or impedes traffic or passage of men and materials during erection. The Supplier shall without any additional payment, at all time keep the working and storage area used by him free from accumulation of dust or combustible materials, waste materials rubbish packing, wooden planks to avoid fire hazards and hindrance to other works.

7.3 If the Supplier fails to comply with these requirements in spite of written instructions from the Owner, the Owner will proceed to clear these areas and the expenses incurred by the Owner in this regard shall be payable by the Supplier. Before completion of the work, the Supplier shall remove or dispose off in a satisfactory manner all scaffolding, temporary structures, waste and debris and leave the premises in a condition satisfactory to the Owner. Any packing materials received with the equipment shall remain as the property of the owner and may be used by the Supplier on payment of standard charges to the Owner and with prior approval of the Owner. At the completion of his work and before final payment, the Supplier shall remove and shall restore the site to neat workman like conditions at his cost.
8.0 CLEANING CHEMICALS AND LUBRICANTS

The necessary quantities of cleaning chemicals and the first charge of oil and lubricants required for the installation, commissioning, testing and start-up of all the equipment till handing over are to be supplied by the Supplier and nothing extra would be paid for these.

9.0 TESTING, COMMISSIONING AND START-UP

9.1 The Supplier shall operate, maintain and give satisfactory trial run of the plant in such manner and for such periods as has been specified in Section IV (Technical Specifications). All rectification of damages / defects during the trial period should be carried out by the Supplier.

9.2 The commissioning shall also include the following for each equipment:

9.2.1 Field disassembly and assembly of equipment, instruments and controls where required for access to fixing or adjustment.

9.2.2 Clean out of lubrication system including chemical cleaning wherever required.

9.2.3 Circulation of lubricant to check flow.

9.2.4 Clean out and check out of all the service lines.

9.2.5 Check out and commissioning of instruments, equipment and plants, filtering of transformer and other oils so that if deteriorated, they shall attain the required properties / standards, specified tests in this regard must be carried out by approved authorities and their satisfactory reports submitted to the Owner before start-up.

9.2.6 Recharging or make-up filling of lubricant oil up to the desired level in the lubrication system of individual machine.

9.2.7 Operation in empty condition to check general operation details wherever required and wherever possible.

9.2.8 Closed loop dynamic testing with water wherever required.

9.2.9 Operation under load and gradual load increase to attain maximum rated output.

9.2.10 Trouble shooting during the trial period.

9.3 The Supplier shall demonstrate proper working of all mechanical and electrical controls; safety and protective device, in presence of the Owner's engineer and the same should be duly recorded.

Commissioning of automation system:

The supplier should provide a detailed schedule of testing all automation and control systems.

All controlled or monitoring devices on the plant should be tested from the relevant control centre and recorded to be operating as designed, including feedback detection.

A log of these operations is to be maintained, and each completed group of tests to be signed by the supplier's commissioning engineer.

The Purchaser reserves the right to witness as much of these test procedures, as he may feel necessary.

Testing procedures and commissioning period will be as specified in Section IV.
9.4 After conducting testing, in case, a particular equipment is not working properly or not giving rated output the Supplier will furnish a detailed report to the Owner stating therein the detailed account on the performance of the equipment with possible reasons for improper or not working of the same and will arrange the visit of the representative of original manufacturers to get the same commissioned satisfactorily.

9.5 After satisfactory commissioning and start-up, the Supplier shall keep/depute his representatives at the plant in the manner, for the duration and for the performance of such tasks as specified in Section III. During this period the Supplier shall ensure proper working of complete plant and equipment and attend any works required to be done for proper operation of the complete plant and equipment.

10.0 PAINTING

All the equipment / machineries like motors, pumps, HT / LT panel, transformer, switch boards, starters, junction boxes, isolators, storage tanks, supporting structures, pipe supports and MS/GI pipes and all exposed and visible iron parts included in the scope of erection / commissioning shall be given double coat of paint of approved shade over a double coat of anti-corrosive primer wherever necessary irrespective of the condition of original paint of equipment/machineries/ structures/supports. All surfaces, wherever required, must be properly cleaned from scale, dirt and grease prior to painting. Spray painting must preferably be used on all the equipment /machineries and wherever practicable. Suitable and necessary cleaning / wiping of sight / dial glasses, other non-metallic parts, flooring, walls and other surfaces which have been spoiled by paint during painting must also be carried out by the Supplier.

Lettering and other markings, including capacity and flow direction markings, shall also be carried out by the Supplier on the tanks, pipe lines, starters and wherever else necessary, as directed and as per the standard practice of installation. BIS colour codes and colour charts as mentioned in Annexure - II must be adhered to.

Supply of all paints and all other materials required for painting is included in the scope of supply of the Supplier under this contract/order.

11.0 TRAINING OF PERSONNEL

Necessary staff as may be deputed by the Owner shall be trained by the Supplier for operating the plant. The personnel will be associated for the training during the installation; testing, commissioning and start-up period and the training tenure shall be extended for a minimum period of one month from the date of commissioning and start-up. This training will be a continuous process during commissioning and stand by period and as described in the Technical Specifications.

- GENERAL SPECIFICATIONS FOR PIPES AND FITTINGS
  - Flanges shall be of good make. The supply of flanges shall also include supply of bolts, nuts, washers and suitable asbestos fibre/rubber insertion food grade gaskets (minimum 3mm thick).
  - The above specifications for valves are general specifications. However, pipes and valves shall be required to be supplied as per details mentioned in Section III - the technical specifications of plant and equipment.
- LIST OF APPROVED MAKES FOR MAJOR COMPONENTS
  A table of makes of various major components is given under Technical Specifications Section III. The supplier will adhere to makes of items as per this list only. For an item not mentioned in the table or item having more than one preferred / approved make, supplier will obtain approval of the Purchaser for the make before initiating actual procurement.
### Piping

<table>
<thead>
<tr>
<th>Service</th>
<th>Material</th>
<th>Specification</th>
<th>Ends</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HP Steam (IBR Approved)</strong></td>
<td>Heavy duty, seamless Cast Steel</td>
<td>Schedule 40, ASTM A 53</td>
<td>Piping to be welded type</td>
</tr>
<tr>
<td><strong>LP Steam</strong></td>
<td>ERW, Heavy duty (C-class)</td>
<td>BIS: 1239, 3601</td>
<td>Piping to be welded type</td>
</tr>
<tr>
<td><strong>Air</strong></td>
<td>ERW, Heavy duty (C-class)</td>
<td>BIS: 1239, 3601</td>
<td>Piping to be welded type</td>
</tr>
<tr>
<td><strong>Water Supply, bleeds, drains, etc.</strong></td>
<td>Galvanised steel (ERW)</td>
<td>BIS:1239/BIS:3589</td>
<td>Piping to be welded type</td>
</tr>
<tr>
<td><strong>SS Duct</strong></td>
<td>TIG welded, annealed and decailed, outside mirror polished &amp; inside pickled as per dairy standards</td>
<td>AISI 304</td>
<td>Welded concentric During with Flanged joints</td>
</tr>
<tr>
<td><strong>MANUALLY OPERATED VALVES:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hp Steam (IBR Approved)</strong></td>
<td>Cast steel body Globe / Piston Valve &amp; NRY with SS working parts</td>
<td>Flanged &gt; 25</td>
<td></td>
</tr>
<tr>
<td><strong>LP Steam</strong></td>
<td>Cast steel/GM body Globe/ Piston Valve &amp; NRV with SS working parts</td>
<td>Flanged &gt; 25</td>
<td></td>
</tr>
<tr>
<td><strong>Air</strong></td>
<td>Cast steel / GM body Globe/ Piston Valve &amp; NRV with SS working parts</td>
<td>Flanged&gt; 25 NB</td>
<td></td>
</tr>
<tr>
<td><strong>Soft / Raw water:</strong></td>
<td>CI, butterfly</td>
<td>IS: 778, 1703</td>
<td>Flanged&gt; 25 NB</td>
</tr>
<tr>
<td><strong>Water supply, bleeds, And drain</strong></td>
<td>Cast steel ball valve</td>
<td>IS:778</td>
<td>Flanged&gt; 25 NB</td>
</tr>
<tr>
<td>Sr.</td>
<td>Name of the item</td>
<td>Make Selected by Supplier</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------------------------------------------------------------</td>
<td>---------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1&lt;sup&gt;st&lt;/sup&gt; Preference</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; Preference</td>
</tr>
<tr>
<td>1</td>
<td>Steam Piping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 a</td>
<td>MS C’class pipes (Seamless)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 b</td>
<td>Cast Steel globe valves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 c</td>
<td>Bronze globe valves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 d</td>
<td>Cast Steel Non- return valves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 e</td>
<td>Gun metal Non- return valves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 f</td>
<td>Pressure reducing valves, safety valves, strainer, moisture separator, steam trap, expansion joints &amp; other steam fittings.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 g</td>
<td>Pressure &amp; temp. gauges</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Furnace oil piping/air piping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 a</td>
<td>MS C’class pipes (Seamless)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 b</td>
<td>Cast Steel globe/ Bronze globe valves/ Gun metal gate valves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 c</td>
<td>Gun metal NRV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 d</td>
<td>Pressure gauges</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Water piping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 a</td>
<td>GI ’B’ Class Pipe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 b</td>
<td>CI globe valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 c</td>
<td>Gun metal gate valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 d</td>
<td>Gun metal globe valves/ strainers / non- return valves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 e</td>
<td>Water Pump</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 f</td>
<td>Foot vavle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 g</td>
<td>Water meter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Insulation materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 a</td>
<td>Expanded polystyrene</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 b</td>
<td>Glass/ mineral wool</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 c</td>
<td>Resin bonded mineral wool</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 d</td>
<td>Polyurethane foam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Cables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 a</td>
<td>Powder Cables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 b</td>
<td>Control Cables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 c</td>
<td>Instrumentation &amp; Signal cables</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Important note:**

The make of all bought out items / components should be got approved at one instance only and the makes thus approved shall only be supplied.
CODE OF PRACTICE FOR PAINTING OF SERVICE PIPE LINES, EQUIPMENT AND STRUCTURAL WORK

1.0 PAINTING OF SERVICE PIPE LINES

1.1 On Non-insulated Pipe Line

1.1.1 Ground colour to be applied throughout the length of the pipeline.

1.1.2 Colour bands to be applied, over the ground colour, near every valve and branch connections as well as in every room near the entry.

1.1.3 The relative proportional widths of the 1st colour band to the subsequent bands shall be 4:1. The minimum width of colour band shall confirm to the following table:

<table>
<thead>
<tr>
<th>Nominal Pipes Size</th>
<th>Width of 1st Colour band</th>
<th>Width of 2nd Colour band</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 NB and below</td>
<td>100 mm</td>
<td>25 mm</td>
</tr>
<tr>
<td>100 NB to 150 NB</td>
<td>200 mm</td>
<td>50 mm</td>
</tr>
<tr>
<td>200 NB to 300 NB</td>
<td>300 mm</td>
<td>75 mm</td>
</tr>
<tr>
<td>350 NB and above</td>
<td>400 mm</td>
<td>100 mm</td>
</tr>
</tbody>
</table>

1.1.4 On the 1st band a white arrow to be put to indicate the direction of flow.

1.1.5 The arrows should be put on the bottom of the pipelines so that the same are visible from below in case of horizontal bank of pipes and on sides in case of vertical bank of pipes.

1.1.6 The valves should be painted with the same colour as the ground colour of the pipeline.

1.2 On Insulated Pipeline but without Aluminum Cladding Procedure same as above.

1.3 On Insulated Pipeline with Aluminum Cladding

1.3.1 Ground colour to be applied in a minimum length of 1000 mm of the pipe all round near every valve and branch connections as well as in every room near the entry. The complete length of the pipeline should not be painted.

Colour bands should be applied in the middle of every ground colour strip. The relative proportional widths of the 1st colour band to the subsequent bands shall be 4:1. The minimum width of colour band shall confirm to the following table:

<table>
<thead>
<tr>
<th>Nominal Pipes Size</th>
<th>Width of 1st Colour band</th>
<th>Width of 2nd Colour band</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 NB and below</td>
<td>100 mm</td>
<td>25 mm</td>
</tr>
<tr>
<td>100 NB to 150 NB</td>
<td>200 mm</td>
<td>50 mm</td>
</tr>
<tr>
<td>200 NB to 300 NB</td>
<td>300 mm</td>
<td>75 mm</td>
</tr>
<tr>
<td>350 NB and above</td>
<td>400 mm</td>
<td>100 mm</td>
</tr>
</tbody>
</table>

For insulated pipes, nominal pipe size means the outside diameter of pipe with insulation.

1.3.3 On the 1st band a white arrow is to be put to indicate the direction of flow of the fluid.
1.3.4 The arrows should be put on the bottom of the pipelines, so that the same are visible from below in case of horizontal bank of pipes and on sides in case of vertical bank of pipes.

1.3.5 The valves should be painted with the same colour as the ground colour.

1.4 The ground colours and the colours of the 1st and 2nd colour bands have been indicated on the enclosed list for the pipe lines carrying various types of fluids and gases. The list also indicates the shade nos. of the colours to be used. In case the exact shade is not available, the nearest possible shade in the same colour may be selected.

1.5 Only synthetic enamel paint should be used for the painting and band markings on the pipelines and it should be ensured that the finish should be glossy.

1.6 Where no colour bands have been recommended, only the ground colour is to be applied as per the above procedure. If only one colour band is recommended the width of the same should be as per the first band and applied on the ground colour. In case of 2 nos. colour bands, the 1st band and second band of width as per above table should be applied on the ground colour.

1.7 To avoid mixing of colours, it is recommended to apply the bands only after the ground colour paint is dry and subsequently to apply the arrow only after the 1st band paint is dry.

2.0 PAINTING OF EQUIPMENT & STRUCTURAL WORK

2.1 M.S. platforms/pipe supports/ Pipe bridges and any other Structures

2.2 Feed water tank, Water softening plant.

2.3 Coal handling equipment

2.4 HWG chimney and Generator exhaust

2.5 Air Compressors

2.6 Weigh scales

2.7 HT & LT panels

2.8 LT distribution switchboards

COLOUR CODE FOR PIPELINES AS PER IS 2379-1963

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Services</th>
<th>Application</th>
<th>Ground colour Colour Shade No. per BSI</th>
<th>First Band Colour Shade No. as per BSI</th>
<th>Second Band Colour Shade No. as per BSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HWG Feed Water</td>
<td>HWG feed water piping</td>
<td>Sea Green 217</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Drinking Water</td>
<td>Water lines For water coolers</td>
<td>Sea Green 217</td>
<td>French 166 Blue</td>
<td>Signal 537 Red</td>
</tr>
<tr>
<td>3</td>
<td>Treated Water</td>
<td>Soft water lines</td>
<td>Sea Green 217</td>
<td>Light 557 Orange</td>
<td>Canary 309 Yellow</td>
</tr>
<tr>
<td>4</td>
<td>Cold Water</td>
<td>Chilled Water supply &amp; return</td>
<td>Sea Green 217</td>
<td>French 166 Blue</td>
<td>Canary 309 Yellow</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Lines</td>
<td>Color</td>
<td>Color</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------</td>
<td>------------------------</td>
<td>----------------</td>
<td>--------------</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Untreated Water</td>
<td>Raw water lines</td>
<td>Sea Green 217</td>
<td>White</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Boiler Feed Water</td>
<td>Boiler</td>
<td>Sea Green 217</td>
<td>Gulf - Red</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Condensate</td>
<td>Steam Line</td>
<td>Sea Green 217</td>
<td>Light 410 Brown</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Compressed Air</td>
<td>All compressed air</td>
<td>Sky Blue 101</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Instrument air</td>
<td>Instruments</td>
<td>Sky Blue 101</td>
<td>French 166 Blue</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Soft Water Equipment</td>
<td>All plant and Steam</td>
<td>Sea Green 217</td>
<td>Light 410 Brown Signal 537 Red</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Steam</td>
<td>HP steam lines</td>
<td>Aluminum to IS 2339</td>
<td>French 166 Blue</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LP steam lines</td>
<td></td>
<td>Aluminum to IS 2339</td>
<td>Canary 309 Yellow</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Furnace Oil</td>
<td>Boiler &amp; Furnaces</td>
<td>Light 410 Brown</td>
<td>French 166 Blue</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Diesel</td>
<td>Diesel generating set</td>
<td>Light 410 Brown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Light Diesel Oil</td>
<td>Hot Water Generator &amp;</td>
<td>Light 410 Brown</td>
<td>Brilliant 221 Green</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Boiler</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Drainage</td>
<td>All drain lines</td>
<td>Black</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>from Equipment building &amp; OH water Tank</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SPECIAL CONDITIONS OF CONTRACT
PART III – B
ELECTRICAL INSTALLATION

1.0 SCOPE

The intent of this specification is to define the requirements for the installation, testing and commissioning of the electrical system like high tension switchyard with accessories and equipment, transformers, HT panel vacuum circuit breakers, LT panels and power control centres, motor control centers, distribution boards, capacitor banks & panels, power, control & instrumentation cables, remote push button stations, motors, earthing network, etc. Requirement of a particular project shall be as specified in schedule of quantities/approved drawings or as per the battery limits fixed in the contract.

2.0 STANDARDS

2.1 The work shall be carried out in the best workmanlike manner in conformity with this specification, the relevant specification/codes of practice of the Bureau of Indian Standards, approved drawings and the instructions issued by the Engineer-in-charge or his authorized representative, from time to time. Some of the relevant Indian Standards are listed in Annexure-III.

2.2 In addition to the standards as mentioned in 2.1, all works shall also confirm to the requirements of the following:

a). Indian Electricity Act and Rules framed thereunder.


c). Regulations laid down by the Chief Electrical Inspector of the State / State Electricity Board.

d). Regulations laid down by the Factory Inspector of the State.

e). Any other regulations laid down by the local authorities.

f). Installation & operating manuals of original manufacturers of equipment.

3.0 EQUIPMENT AND ACCESSORIES – SPECIFICATIONS

This defines specifications and requirements mainly for the equipment and accessories which are generally supplied by the erection agency and do not cover the specification of main electrical equipment such as Transformers, HT and LT panels, switch boards and motors etc., which may be supplied by the Owner.

All materials, fittings and appliances to be supplied by the Supplier shall be of best quality and shall conform to the specification given hereunder. The equipment shall be manufactured in accordance with current Bureau of Indian Standard Specifications wherever they exist or with the BS or NMA specifications, if no such BIS are available. In the absence of any specification, the materials shall be as approved by the Owner or his authorized representative.

All similar materials and removable parts shall be uniform and interchangeable with one another.

Makes of bought out items selected by the Supplier must be furnished by him.

3.1 Power Cables (HT)
Three core, Aluminium conductor, screened, XLPE insulated, armored shielded and PVC sheathed cables suitable for 11 / 22 / 33 KV, earthed system, conforming to IS 7098 (Part II) - 1988 amended upto date.

3.2 Power Cables (LT)

Power cables for use on 415 V system shall be of 1100 volt grade, aluminum conductor, XLPE insulated, PVC sheathed, armoured and overall PVC sheathed, strictly as per IS: 7098 (Part I) / 88. Conductor of cable shall be solid type for sizes upto 6 sq.mm and stranded for sizes above 6 sq.mm. Unarmoured cable to be used only if specifically mentioned in schedule of quantities.

The size of these cables shall be as specified in schedule of quantities or as per erection drawings. If neither of these are available, the size of cable shall be as specified in cable selection chart enclosed at Annexure-IV. NO CABLE OF SIZE LESS THAN 4 SQ. MM. with aluminum conductor or 2.5 SQ. MM with copper conductor SHALL BE USED.

3.3 Control Cables

3.3.1 Control cables for power

Control cables for use on 415 V. system shall be of 1100 volts grade, copper conductor, PVC insulated, PVC sheathed, armoured and overall PVC sheathed, strictly as per IS: 1554 (Part I) - 1976 amended upto date. Conductor of cable shall be solid type for sizes upto 2.5 sq. mm and stranded for higher sizes. Unarmoured cables to be used only if specifically mentioned in schedule of quantities.

The size of these cables shall be as specified in schedule of quantities or as per erection drawing. The minimum size of conductor shall be 1.5 sq. mm.

3.3.2 Screened control cables for Analogue signals:

These shall be used for carrying out analogue signals. Multi-stranded base annealed copper conductor, PVC insulated, cores colour coded, laid up, screened by braiding with ATC copper wire and finally overall PVC sheathed. Sizes of their cable shall be as specified in schedule of quantities/approved drawings. These cables shall be with armouring unless specified otherwise in Schedule of qualities/approved drawings.

3.4 Cable Trays

Functional requirement: Cable trays are used (based on the site condition) for laying the power and control cables inside the plant from PCC to the MCC & MCC to all motors/sub panels and wherever required.

Fabrication: These shall be perforated type, heavy duty, return flange or inward bend shape, manufactured from mild steel conforming to IS-2062 and hot dip galvanized as per IS 2629/BS-729. Width of cable tray shall be as per the requirement. Height to be minimum 50 mm and thickness of plate to be 1.5 mm up to 300 mm cable tray width. For cable trays having width more than 300 mm, height to be 75mm and thickness of plate to be 2.0 mm. Cable trays to be supplied to site in standard lengths of 2.5 M. Necessary accessories of cable trays such as coupler side plates for joining cable trays, bends, riser, inside riser, tee etc. must also be factory fabricated. Plain cable tray covers 1.5 mm thick to be supplied if specially required. Sample of cable tray to be got approved from Purchaser before supply. Cable tray for automation network /instrument /signal cables shall be separate from power & control cables.

3.5 Cable Glands
These shall be provided at both ends of armoured/ unarmoured electrical cables. Cable glands to be manufactured as per performance requirements of BS-6121 & IP 65 as per IS 13947 (Part I) amended as on date, with BRASS material accurately machined and NICKEL finish. These shall be of heavy-duty single compression type for cable conductor sizes above 35 sq.mm and weather proof double compression type for cable conductor sizes upto 35 sq.mm. Single compression cable glands to be complete with checknut, gland body, 3 nos. metal washers, and outer seal rubber ring and compression nut. Double compression glands to be complete with check-nut, gland body, neoprene inner ring, armour clamping cone, armour-clamping ring, armour clamping nut, neoprene outer ring, skid washer & outer seal nut. Sample of cable gland to be got approved from the Site In charge before supply.

3.6 Cable Connectors

Cable connectors, lugs/sockets, shall be of copper/aluminum alloy, suitably tinned solderless, crimping type. These shall be suitable for the cable being connected and type of function (such as power, control or connection to instruments, etc.). The current rating of the lugs shall be the same as that of the respective cable conductors. If the aluminum lug is terminated on a brass stud or copper bus bar then bimetallic washer shall be used.

3.7 Cable Route Markers

These shall be galvanized Cast Iron plate with marking (LT/HT) and of diameter 150 mm with 600 mm long 25x25 mm MS angle riveted/bolted with this plate. Sample to be got approved before use.

3.8 Cable Indicators

These shall be self-sticking type and of 2 mm thick lead Strap for overall cable. PVC identification numbers, Ferrule shall be used for each wire.

3.9 Pipes for Cables

For laying of cables under RCC floor, GI class ‘A’ pipes shall be used. For laying cable in air where cable trays are not being used, GI ‘A’ class pipe shall be used. Size of pipe shall depend upon the overall outer diameter of cable to be drawn through pipe. NO PIPE LESS THAN 40 MM DIA SHALL BE USED FOR THIS PURPOSE. To determine the size of pipe, assume that 40% area of pipe shall be free after drawing of cable. If length of pipe is more than 30 M, free area may be increased to 50%. All cable (power / control / instrument / signal) drops shall be in conduit pipe. The open ends of power/control cables at termination shall be protected through suitable conduit. Instrument/signal cable/wire drops upto termination point shall be also routed through conduits. The automation cables (plant/system/field bus, instrument/signal cables/wires) shall be laid in cable trays through GI conduit.

3.10 Motor Isolators

These shall be in Aluminum cast housing, completely dust, vermin and weather proof (IP 65), suitable for 30/25 A, 415 volts, 50 Hz with rotary type switch complete with cable gland for incoming and outgoing cables. Final finish of housing to be buffer mirror or powder coated grey. Instead of AL cast housing, thermoplastic housing with IP 55 / 65 protection can also be used. From isolator to motor, adequately sized flexible copper wire in suitable heavy duty (wire ribbed) PVC flexible conduit to be used. Sample of isolator housing and conduit to be got approved before supply. Isolators shall be used for all on line started motors receiving single cable.

3.11 Motor Junction Box/Control Junction Box

These shall be in Aluminum cast housing or unbreakable, self extinguishing thermoplastics of high quality, completely dust, vermin and weather proof (conforming to minimum IP 65 class of protection), suitable for 25A, 415 volts, 50 Hz, with heavy duty bakelite /equivalent
connector, complete with cable/conduit gland. These junction boxes are required on all floors near equipment for final connection of multi core control cables/signal cables to various field devices. They may also be used for star delta started motors for final connection to motor, through adequately sized flexible copper wire in suitable heavy duty (wire ribbed) PVC flexible conduit. Sample to be got approved before supply.

3.12 Remote Push Button Stations

These shall be used for remote ON-OFF for motors, away from MCC. These shall be suitable for surface/structure mounting in Cast Aluminum housing having IP-65 class of protection i.e., completely weather proof. For each motor, one ON, one OFF red mushroom half turn to lock button, one LED type indication lamp to be provided with a heavy duty connector inside the housing to receive control cables. If more than one motor is nearby, a common OFF station can be used of suitable size made from SS 304 2thk. Indication lamp can be combined with ‘ON’ (Green) push button in place of providing separate indication lamp and push button. Riveted type plastic nameplate to be provided for each feeder. If functionally required Ammeter also can be located in such ON-OFF station.

4.0 ERECTION OF EQUIPMENT

The cases containing the equipment (being supplied by the Purchaser) shall be handed over to the supplier. The Supplier shall make his own arrangements for safe transportation of all the items to the erection site and also carry out complete loading/unloading during transportation. Equipment shall not be removed from packing cases unless the floor has been made ready for installing them. The cases shall be opened in presence of the Engineer-in-charge or his authorized representative. These empty packing cases shall be returned to the stores and any document if found with the equipment shall be handed over to the Engineer-in-charge. Any damage or shortage noticed shall be reported to the Engineer-in-charge in writing immediately after opening of packing cases.

4.1 Transformer

4.1.1 Erection

Transformer complete with radiators, bushings, conservator and miscellaneous accessories shall be thoroughly inspected and any damage noticed shall be reported to the Engineer-in-charge. Before erection of transformer the level of rails on foundation shall be checked and minor corrections if necessary shall be carried out. After the completion of erection, necessary stoppers shall be provided at the wheels. All loosely supplied fittings/accessories shall be cleaned and mounted on the transformer and connections made. If the transformer oil is supplied in drums by the manufacturer, the same shall be tested for dielectric strength etc. and only approved oil “on test” shall be filled into the tank through filtration system. While filling in transformer with oil, samples shall be taken from the bottom and conservator and tested for dielectric strength. Fresh silica gel shall be filled in the breather. After complete assembling installation, filling and topping the transformer with oil, the transformer shall be cleaned and touch- up paint supplied by the manufacturer applied wherever necessary. All tank cover bolts shall be checked for proper tightness.

The foundation of transformer and rail fixing will be made by some other agency.

4.1.2 Testing

For testing of the dielectric strength of insulating oil in oil-immersed equipment, test samples of oil shall be drawn from equipment after filling. In case oil is supplied in separate containers for filling or topping up at the site, a test also shall be made with samples drawn from such oil container before the equipment is filled.

Minimum acceptable values for each test will be indicated by the Engineer-in-charge. However, dielectric strength of oil should be about 40 KV (RMS) for one minute.
By measuring the dielectric strength of the oil in the transformers, if tests indicate the presence of undue amount of moisture, the insulation oil shall be filtered by steam line filter. No extra charges shall be paid for filtration and the supplier shall arrange his own filtration machine, oil testing kit and other accessories.

Winding insulation resistance shall be measured from primary and secondary to ground and between primary and secondary.

Test the operation of Buchholz relay in accordance with the manufacturer's instructions.

Test the operation of the tap changer. Measure primary and secondary voltage ratios as per nameplates.

Check the polarity of terminals and the phase's sequence.

4.1.3 Performa for Transformer Tests

1. Transformer nameplate
2. Insulation resistance test with 1000 V Megger
   a. between primary to earth .... Mega ohm
   b. Between secondary to earth .... Mega ohm
   c. Between primary and secondary .... Mega ohm
3. Dielectric strength of oil in the transformer (test Voltage 40 KV for one minute).
4. Operation of Buchholz relay as per manufacturers Instructions.
5. Operation of the tap changer
   Operation of the tap at tap no.1
      tap no.2
      tap no.3
      tap no.4
      tap no.5
6. Polarity marking and phase sequence.
7. Condition of silicated crystals.
8. Earth resistance: Neutral / tank

   (This proforma shall be jointly signed by the Engineer-in-charge and the supplier).

4.2 Power control centres, MCC, Distribution Boards, Control Panels & Bus Ducts

4.2.1 Erection

Electrical panels and bus duct shall be delivered in convenient shipping section by the manufacturers. The Supplier shall be responsible for final assembly and inter-connection of busbars/wiring. Foundation channel shall be grouted in the flooring by the Supplier. Switchgear Panels shall be aligned and leveled on their base channels and bolted or tack welded to them as per the instructions of the Engineer-in-charge. The earth bus shall be made continuous throughout the length. Loosely supplied relays and instruments shall be mounted and connected on the switchgear. The contacts of the draw-out circuit breakers shall be checked for proper alignment and inter-changeability.

After erection the switchboard shall be inspected for dust and vermin proof. Any hole, which might allow dust or vermin etc. to enter the panel, shall be plugged suitably at no extra cost.
If the instrument transformers are supplied separately they shall be erected as per the direction of the Engineer-in-charge. The Supplier shall fix the cable glands after drilling the bottom / top plates of all switchboards with suitable holes at no extra cost.

Range of overload relays/timers etc. shall be checked with requirement of motor systems actually to be connected at site and if the same is under-sized/over-sized, it shall be brought to the notice of Engineer-in-charge, who shall arrange procurement of correct rated components. However, the supplier shall not charge anything extra for labour for such replacements.

The bus duct shall be suitably supported between Power Control Centre and transformer. The opening in the wall where the duct enters the switchgear room shall be sealed to avoid rainwater entry. The foundation of the Power Control Centre shall be raised suitably for minor adjustment to ensure proper alignment and connection of the bus duct at no extra cost. Expansion joints, flexible connection, etc. supplied by the manufacturer of the bus duct shall be properly connected.

4.2.2 Testing

Before electrical panel is energized, the insulation resistance of each bus shall be measured from phase to ground. Measurement shall be repeated with circuit breakers in operating positions and contact open.

Before switchgear is energized, the insulation resistance of all DC control circuits shall be measured from line to ground.

Before switchgear is energized, the test covered above shall be repeated with each breaker in its normal operating position.

Capacitor banks in capacitor control panel shall be tested as per manufacturer’s instructions. In addition test for output and/or capacitance, insulation resistance test and test for efficiency of discharge device shall be carried out.

All electrical equipment alarms shall be tested for proper operation by causing alarms to sound under simulated abnormal conditions.

The Supplier shall arrange testing and calibrations of relays. The testing equipment including primary and secondary injection sets (if required) etc. shall also have to be arranged by the Supplier. Payment for above work shall be deemed to have been included in the erection of switchboards/control panels.

4.2.3 Proforma for PCC, DB, Motor Control Centres test

1. Circuit (breaker or Supplier module designation/ bus no.).

2. Insulation resistance test (contacts open, breaker racked in position).
   a. Between each phase of bus -------: Mega ohm
   b. Between each phase and earth -------: Mega ohm
   c. DC and AC control & auxiliary Circuits -------: Mega ohm
   d. Between each phase of CT/PT & between CT & PT circuit, if any -------: Mega ohm

3. CT checks:
   a. CT ratio
   b. CT secondary resistance
   c. CT polarity check
4. Check for contact alignment and wipe.

5. Check/test all releases/relays.

6. Check mechanical interlocks.

7. Check electrical interlocks.

8. Check switchgear/control panel wiring.

9. Checking breaker/Supplier circuits for
   a. Closing- local and remote (wherever applicable)
   b. Tripping-local and remote (wherever applicable)

10. Opening time of breaker/contactor.

11. Closing time of breaker/contactor.

(The Engineer-in-charge and the Supplier shall jointly sign this proforma.)

4.3 Sealed Maintenance Free Batteries & Battery Charger

Batteries shall be erected on powder coated MS stands and insulators supplied by the manufacturer of the batteries. Interconnectors shall be made with leads supplied by the manufacturer. Charging discharging and recharging shall be carried out under the supervision of the Engineer-in-charge or his authorized representative. Erection of battery charger and DC board will be carried out by the Supplier under the supervision of the Engineer-in-charge or his authorized representative. The Supplier shall also offer such facilities as may be required for carrying out tests on the complete battery charger and DC board/AC board.

Battery charger shall be tested for proper operation and to verify the charger delivers its maximum rated output. The Supplier shall supply skilled/unskilled labour for carrying out the test by the engineer-in-charge.

Batteries shall be given a boost charge in accordance with the manufacturer's instructions and adjusted for float operation before being placed in regular service.

4.4 GEARED MOTORS AND GEAR BOXES:

These are required in feed plant for driving various slow speed machines. All slow speed machines to be run by geared motors only unless gear boxes have been specified in individual machines specification. The geared motor should use helical gears. The electric motor and helical gear box should be built as one unit. The geared motors/gear boxes should be suitable for minimum 15 start/stops per hour without undue heating, for continuous duty and minimum safety factor of 1.4.

The electric motors used for geared motors/gear boxes should be TEFC, degree of protection IP-55, squirrel cage, induction type, with class "F" insulation suitable for 415 V, 50 Hz, 3 phase AC supply.

Geared motors/gear boxes to be complete including key in the driven shaft, oil level indicator, oil filling plug, oil breather and drain plug. Suitable grade gear oil for first charge of geared motor/gear boxes should not be filled but should be packed separately in a drum and sent along with geared motor/gear boxes. Gear oil would be filled at site.

4.5 Electric Motors
All electric motors shall be energy efficient motors and shall comply with the following:

a) All poly phase motors of 0.375 kW or more shall have a minimum acceptable nominal full load motor efficiency not less than shown in Table below or as per the IS 12615 – 2004(Rev 1) for Ef1 energy efficient motors.

<table>
<thead>
<tr>
<th>Motor Size (KW)</th>
<th>Efficiency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Pole</td>
<td>4 Pole</td>
</tr>
<tr>
<td>0.37 (0.5 hp)</td>
<td>70.2</td>
</tr>
<tr>
<td>0.55 (0.75 hp)</td>
<td>74</td>
</tr>
<tr>
<td>0.75 (1 hp)</td>
<td>78.5</td>
</tr>
<tr>
<td>1.1 (1.5 hp)</td>
<td>82.2</td>
</tr>
<tr>
<td>1.5 (2 hp)</td>
<td>84.1</td>
</tr>
<tr>
<td>2.2 (3 hp)</td>
<td>85.6</td>
</tr>
<tr>
<td>3.0 (4 hp)</td>
<td>86.7</td>
</tr>
<tr>
<td>4.0 (5.5 hp)</td>
<td>87.6</td>
</tr>
<tr>
<td>5.5 (7.5 hp)</td>
<td>88.6</td>
</tr>
<tr>
<td>7.5 (10 hp)</td>
<td>89.5</td>
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<tr>
<td>11.0 (15 hp)</td>
<td>90.6</td>
</tr>
<tr>
<td>15.0 (20 hp)</td>
<td>91.3</td>
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<tr>
<td>18.5 (25 hp)</td>
<td>91.8</td>
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<tr>
<td>22.0 (30 hp)</td>
<td>92.2</td>
</tr>
<tr>
<td>30.0 (40 hp)</td>
<td>92.9</td>
</tr>
<tr>
<td>37.0 (50 hp)</td>
<td>93.3</td>
</tr>
<tr>
<td>45.0 (60 hp)</td>
<td>93.7</td>
</tr>
<tr>
<td>50.0 (75 hp)</td>
<td>94.0</td>
</tr>
<tr>
<td>75.0 (100 hp)</td>
<td>94.6</td>
</tr>
<tr>
<td>90.0 (120 hp)</td>
<td>95.0</td>
</tr>
<tr>
<td>110.0 (150 hp)</td>
<td>95.0</td>
</tr>
<tr>
<td>132.0 (180 hp)</td>
<td>95.3</td>
</tr>
<tr>
<td>160.0 (215 hp)</td>
<td>95.5</td>
</tr>
<tr>
<td>180.0 (240 hp)</td>
<td>95.5</td>
</tr>
<tr>
<td>200.0</td>
<td>95.8</td>
</tr>
<tr>
<td>225.0</td>
<td>96.0</td>
</tr>
<tr>
<td>250.0</td>
<td>96.0</td>
</tr>
</tbody>
</table>

b) Motor nameplates shall list the nominal full-load motor efficiencies and the full-load power factor.

c) Certificates shall be obtained and kept on record indicating the motor efficiency.

4.5.1 Erection and testing

Erection and coupling of motors with machines will be done under the mechanical erection. However, earthing, cable termination, testing and commissioning are covered under this section. Before starting the alignment and coupling of motors with machines, the insulation resistance of the motors will be measured and recorded by the Supplier. Wipe, brush or blow accumulated dirt from the frame and air passages of the motor. Feel for air being discharged from the cooling air ports. If the flow is weak or unsteady then clean it. Dry the motor before installation if it motor has been lying in the store for a long time. Motors having low meager readings because of contamination by moisture, oil or conductive dust should be thoroughly cleaned and dried. The direction of the rotation of the motor shall also be checked before the driven equipment is finally coupled. Motor bearings are to be checked and rectified including supply and changing of grease (if required), checking of fans
coupling with bodies etc. The Supplier shall take adequate precaution and care while executing the work.

For all damage due to negligence etc. the Supplier shall be responsible to replace/repair at his own cost.

Before connecting power cables to motors the insulation resistance of all motor windings shall be measured. Measurement shall be repeated after power cable terminations are completed and before first charging.

Motors shall be operationally tested together with the starting gear and auxiliary apparatus such as push button stations, the contactors, level and pressure controls, signal and alarm apparatus, power and control circuits etc.

- Check the anti-condensation heater and its circuit (if installed)

- Check the setting of the thermal overload protection / single-phase preventer. Testing of these devices is to be done wherever required as per the instructions of the Engineer-in-charge.

All motors shall run uncoupled for a maximum period of 4 hours before the driven equipment is placed in regular service.

4.5.2 Proforma for motor testing

1. Name plate details: Voltage..... HP..... KW.....
   Mounting.... Current.... RPM.... Frame size... Make.... S No.....
   Others........

2. Insulation test (before cable connection).
   a. Between phase and earth ... Mega ohms.
   b. Between each phase ... Mega ohms.

3. Insulation test (after cable connection).
   a. Between phase and earth ... Mega ohms.
   b. Between each phase ... Mega ohms.

4. No load current: R Phase .....Amps.
   Y Phase .....Amps. B Phase .....Amps.

5. Full load current: R Phase .....Amps.
   Y Phase .....Amps. B Phase .....Amps.

6. Temperature rise after 4 hours run: On no load 0°C. On full load 0°C. Ambient temperature during test 0°C.

7. Operation of thermal overload relay:
   i. At normal FL current of motor
   ii. At twice FL current of motor: trip in Seconds.

(This proforma shall be jointly signed by the Engineer-in-charge and the Supplier.)
4.6 DG Sets

4.6.1 Erection & Testing

The preassembled DG Set shall be placed over the foundation and aligned properly. Before termination of cable to the alternator, the insulation resistance of the alternator will be measured and bearings shall be checked. All pipe connections etc of the engine shall also be checked. Also, the level of lubricant & coolant in the engine. The setting of various protection & releases, power and control circuits of the DG set panel shall be checked before switching on the DG Set.

4.6.2 Proforma for Alternator testing

1. Name plate details: Voltage.... HP.... KW.... Mounting.... Current.... RPM.... Frame size... Make.... SNo..... Others ...........

2. Insulation test (before cable connection).
   a. Between phase and earth  ... Mega ohms.
   b. Between each phase  ... Mega ohms.

3. Insulation test (after cable connection).
   a. Between phase and earth  ... Mega ohms.
   b. Between each phase  ... Mega ohms.

4. No load current:  
   R Phase  .....Amps.
   Y Phase  .....Amps. B Phase  .....Amps.

5. Full load current:  
   R Phase  .....Amps.
   Y Phase  .....Amps. B Phase  .....Amps.

6. Temperature rise after 4 hours run: On no load  0 C. On full load  0 C . Ambient temperature during test  0 C .

7. Operation of thermal overload relay: At normal FL current of motor

8. No load & full load regulation :

4.6.3 Proforma for Diesel Engine testing

1. Speed regulation from no load to full load
2. Frequency at no load, 50% load & 100% load
3. Safety controls & protective devices
4. Specific fuel consumption:

5.0 INSTALLATION OF CABLE NETWORK

Cable network shall include power, control, signal & instrumentation and lighting cables which shall be laid in underground trenches, Hume pipes, open trenches, cable trays, GI/SS pipes, or on building structure surfaces as detailed in the relevant drawings. Cable schedules or as per the Engineer-in-charge's instructions. Supply & installation of cable trays,
GI / SS pipes/ conduits, cable glands sockets at both ends, isolators, junction boxes, remote push buttons stations, etc. shall be under the scope of the Supplier.

5.1 General requirements for handling of cables.

5.1.1 Before laying cables, these shall be tested for physical damage, continuity, absence of cross phasing, insulation resistance to earth and between conductors. Insulation resistance tests shall be carried out with 500/1000 volt Megger.

5.1.2 The cables shall be supplied at site, wound on wooden drum as far as possible. For smaller length and sizes, cables in properly coiled form can be accepted. The cables shall be laid by mounting the drum of the cable on drum carriage. Where the carriage is not available, the drum shall be mounted on a properly supported axle, and the cable laid out from the top of the drum. In no case the cable will be rolled on, as it produces kinks, which may damage the conductor.

5.1.3 Sharp bending and kinking of cables shall be avoided. The bending radius for PVC insulated and sheath armoured cable shall be as per IS 1255-1983 and shall not be less than 10 D Where 'D' is overall diameter of the cable.

5.1.4 While drawing cables through GI / SS pipes, conduits, RCC pipe, ensure that size of pipe is such that, after drawing cables, 40 % area is free. After drawing cable, the end of pipe shall be sealed with cotton/bituminous compound.

5.1.5 High voltage (11 KV and above), medium voltage (230 V and above) and other control cables shall be separated from each other by adequate spacing or running through independent pipes/trays.

5.1.6 Armoured cables shall never be concealed in walls /floors /roads without GI pipes, conduits / RCC pipes.

5.1.7 Joints in the cable throughout its length of laying shall be avoided as far as possible and if unavoidable, prior approval of site engineer shall be taken. If allowed, proper straight through epoxy resin type joint shall be made, without any additional cost.

5.1.8 A minimum loop of 3 M shall be provided on both ends of the cable, or after every 50 M of unjointed length of cable and on both ends of straight through cable joint. This additional length shall be used for fresh termination in future. Cable for this loop shall be paid for supply and laying if the contract awarded is on item rate basis.

5.1.9 Cable shall be neatly arranged in the trenches/trays in such a manner so that criss-crossing is avoided and final take off to the motor/switchgear is facilitated. Arrangement of cables within the trenches/trays shall be the responsibility of the Supplier.

5.1.10 All cable routes shall be carefully measured and cable cut to the required lengths and undue wastage of cables to be avoided. The routes indicated in the drawings is indicative only and the same may be rechecked with the Engineer-in-charge before cutting of cables. While selecting cable routes, interference with structures, foundations, pipeline, future expansion of buildings, etc. should be avoided.

5.1.11 All temporary ends of cables must be protected against dirt and moisture to prevent damage to the insulation. For this purpose, ends of all PVC insulated cables shall be taped with an approved PVC or rubber insulating tape. Use of friction type or other fabric type tape is not permitted. Lead sheathed cables shall be plumbed with lead alloy.

5.1.12 Wherever cable rises from underground/concrete trenches to motors/switchgears/push buttons, these shall be taken in G.I. Pipes of suitable size, for mechanical protection upto 300 mm distance of concerned cable gland or as instructed by the Engineer-in-charge.
5.1.13 Where cables pass through foundation/walls of other underground structures, the necessary ducts or openings will be provided in advance for the same. However, should it become necessary to cut holes in existing foundations or structures the electrical Supplier shall determine their location and obtain approval of the Engineer-in-charge before cutting is done.

5.2 Laying of Cables (underground system)

5.2.1 Cables shall be so laid in ground that these will not interfere with other underground structures. All water pipes, sewage lines or other structures, which become exposed by excavation, shall be properly supported and protection from injury until the filling has been rammed solidly in places under and around them. Any telephone or other cables coming in the way are to be properly shielded / diverted as directed by the Owner.

5.2.2 Cables shall be laid at minimum depth of 750 mm in case of LT & 1200 mm in case of HT, from ground level. Excavation will be generally in ordinary alluvial soil. The width of the trench shall be sufficient for laying of required number of cables.

5.2.3 Sand bedding 75 mm thick shall be made below and above the cables. A layer of bricks (full size) shall be laid on the edge, above sand bedding on the sides of cables and a flat brick to cover cable completely. More than one cable can be laid in the same trench by providing a brick on edge between two cables. However the relating location of cables in trench shall be maintained till termination. The surface of the ground after back filling the earth shall be made good so as to conform in all respects to the surrounded ground and to the entire satisfaction to the Engineer-in-charge.

5.2.4 For all underground cables, route markers should be used.
   a. Separate cable route markers should be used for LT, HT and telephone cables.
   b. Route markers should be grouted in ground with 1:2:4 cement concrete pedestal size 230 x 230 x 300 mm
   c. Cable markers should be installed at an interval not exceeding 50 M along the straight routes of cables at a distance of 0.5 M away from centre of cable with the arrow marked on the cable markers plate indicating the location of cable. Cable markers should also be used to identify change in direction of cable route and for location of every joint in underground cable.

5.2.5 RCC Hume pipe for crossing road in cable laying shall be provided by Owner. No deduction shall be made for cable laying in Hume pipe for not providing bricks, sand and excavation. RCC Hume pipe at the ends shall be sealed by bituminous compound after laying and testing of cable by electrical Supplier without any extra charge.

5.3 Laying of Cables Under Floors

5.3.1 GI class ‘A’ pipe shall be used for laying of outgoing cables from distribution boards to motors, isolators/junction boxes of motors, starter of motors and push button stations under floors. Preferably one cable shall be drawn through one pipe. Size of pipe shall be such that after drawing of cable 40 % area is free. If length of pipe is more than 30 M, free area may be increased to 50%.

5.3.2 Uses of elbows are not allowed at all and number of bends shall be kept minimum. Instead of using bends with sockets, pipe-bending machines shall be used for making long radius smooth bends at site.

5.3.3 Ends of pipe shall be sealed temporarily while laying with cotton/jute/rubber stopper etc. to avoid entry of building material.

5.3.4 Exact location of equipment motor/isolator/push buttons etc. shall be ascertained prior to laying of pipe.
5.4 Laying of Cable in Masonry Trenches

5.4.1 Masonry/concrete trenches for laying of cable shall be provided by Owner. However steel members such as MS angles/flats etc. shall be provided & grouted by electrical Supplier to support the cables without any extra charge. Cables shall be clamped to these supports with aluminum saddles/clamps. More than one tier of cables can be provided in the same trench if the numbers of cables are more. If required, cable trays can also be provided in trenches.

5.4.2 Entry of cables in trenches shall be sealed with bituminous MASTIC compound to stop entry of water in trenches.

5.5 Laying of Cables in Cable Trays

5.5.1 Cable trays and supporting steel members such as MS angle/channel/flats etc. shall be provided and fixed by the Supplier.

5.5.2 Cables shall be laid in cable trays in single tier formation and cables shall be clamped with aluminum flat clamps and galvanized bolts & nuts. Cables from cable tray to individual drive, control panel, remote push button station and other miscellaneous equipment shall be dropped in GI/SS conduit.

5.5.3 Earthing flat/wire can also be laid in cable tray along with cables.

5.5.4 After laying of cables minimum 20 % area shall be spare.

5.6 Laying of Cables on Building Surface/Structure

5.6.1 Such type of cable laying shall be avoided as far as possible and will be allowed only for individual cables or small group of cables, which run along structure.

5.6.2 Cables shall be rigidly supported on structural steel/masonry using individual cast/malleable iron galvanized saddles and these supports shall be approximately 400 to 500 mm for cables upto 25 mm overall diameter and maximum 1000 mm for cables larger than 25 mm. Unsightly sagging of cables shall be prevented. Only aluminum/GI clamps with GI bolts/nuts shall be used.

5.6.3 If drilling of steel structure must be resorted to, approval must be secured from the Engineer-in-charge and steel must be drilled where the minimum weakening of the structure will result.

5.7 Termination and Jointing of Cables

5.7.1 Use of Glands

All PVC cable upto 1.1 KV grade, armoured or unarmoured shall be terminated at the equipment/junction box/isolators/push buttons/control accessories/instruments, etc by means of suitable size compression type cable glands. Armour of cable shall be connected to earth point. The Supplier shall drill holes for fixing glands wherever necessary. Wherever threaded cable gland is to be screwed into threaded opening of different size, suitable galvanized threaded reducing bushing shall be used for approved type.

In case of termination of cables at the bottom of the panel over a cable trench having no access from the bottom, close-fit holes should be drilled in the bottom plate for all the cables in one line, then bottom plate should be split in two parts along the centre line of holes. After installation of bottom plate and cables with glands, it shall be sealed with cold sealing compound.

5.7.2 Use of Lugs/Sockets
All cable leads shall be terminated at the equipment terminals, by means of crimped type solder less connectors unless the terminals at the equipment ends are suitable for direct joining without lugs/sockets.

The following is the recommended procedure for crimped joints and the same shall be followed:

a. Strip off the insulation of the cable ends with every precaution so as not to severe or damage any strand. All insulations to be removed from the stripped portion of the conductor and ends of the insulation should be clean and square.

b. The cable should be kept clean as far as possible before assembling it with the terminal/socket. For preventing the ingress of moisture and possibility of re-oxidation after crimping of the aluminum conductors, the socket should be filled with corrosion inhibiting compound. This compound should also be applied over the stripped portion of the conductor and the palm surface of socket.

c. Correct size and type of socket/ferrule/lug should be selected depending on size of conductor, and type of connection to be made.

d. Make the crimped joint by suitable crimping tool.

e. If after crimping the conductor in socket/lug, some portion of the conductor remains without insulation the same should be covered sufficiently with PVC tape.

5.7.3 Dressing of Cable Inside the Equipment

After fixing of cable glands, the individual cores of cable shall be dressed and taken along the cable alleys/wiring trough (if provided) or shall be fixed to the panels with polyethylene straps. Cable shall be dressed in such a manner that small loop of each core is available inside the panel.

For motors of 20 HP and above, terminal box if found not suitable for proper dressing of aluminum cables, the Supplier shall modify the same without any additional cost.

Cables inside the equipment shall be measured and paid for if the contract awarded is on item rate basis.

5.7.4 Identification of Cables/Wires/Cores

After laying & pulling cable, the contractor shall provide the cable identification tags to be tied by GI wire at each end of the cable. Power cables shall be identified with red, yellow & blue PVC tapes for trip circuits identification, additional red ferrules shall be used only in the particular cores of control cable at the termination points in the switchgear/control panels and control switches.

In case of control cables all cores shall be identified at both ends by their wire numbers by means of PVC ferrules or self-sticking cable markers, wire numbers shall be as per schematic/connection drawing. For power circuit also wire numbers shall be provided if required as per the drawings of switchgear manufacturer.

5.7.5 Cable between Isolators/Junction Box & Motors/Controls.

Wherever possible Copper Conductor Armoured cables with glands shall be used between isolator/junction box (installed near motor/controls) and motors/controls. However, if terminal box of the motor or control switch is not suitable for accepting armoured cable or it is difficult to lay, multi strand copper conductor, multi-core, unarmoured flexible cable in PVC flexible conduit (steel reinforced) with flexible conduit glands shall be used.
5.7.6 Termination of cables of 6.6 kV and above shall be carried out using heat shrinkable sleeves. This termination must be no-tracking and weather resistant.

5.8 Testing of Cables

5.8.1 Before energizing, the insulation resistance of every circuit shall be measured between conductors and between each conductor and ground. This requires 3 measurements if one side is grounded and 6 measurements for 3 phase circuits. Continuity test on each lead of cable shall also be tested.

5.8.2 Where splices or terminations are required in circuits rated above 650 volts, measure insulation resistance of each length of cable before splicing and/or terminating. Report measurements after splices and/or terminations are complete.

5.8.3 DC High Voltage test shall be made after installation on the following:

All 1100 Volts grade cables in which straight through joints have been made. All cables above 1100 V grade.

For record purposes test data shall include the measured values of leakage current versus time.

The DC High Voltage test shall be performed as detailed below:

Cables shall be installed in final position with the entire straight through joints complete. Terminations shall be kept unfinished so that motors, switchgear transformer etc. are not subjected to test voltage.

The test voltage and duration shall be as per relevant codes and practices of Indian Standards Institution.

5.9 Proforma for Testing Cables DATE OF TEST

a. Drum No. From which cable taken
b. Cable from to
c. Length of run of this table meter
d. Insulation resistance test:
   Voltage of Megger ................... Volts
   between core-1 to earth............... Mega-ohm
   between core-2 to earth............... Mega-ohm
   between core-3 to earth............... Mega-ohm
   between core 4 (neutral) to earth...Mega-ohm
   between core-1 to core-2............. Mega-ohm
   between core-2 to core-3.......... Mega-ohm
   between core-3 to core-1............ Mega-ohm
   between core 4(neutral) to core 1..Mega-ohm
   between core 4(neutral) to core 2..Mega-ohm
   between core 4(neutral) to core 3..Mega-ohm

e. High voltage test VoltageDuration

   between cores and earth
between individual cores

(This proforma shall be jointly signed by the Engineer-in-charge and the Supplier).

6.0 Earthing Network

The entire earthing installation shall be done in accordance with the earthing drawings, specification and instructions of the Engineer-in-charge. The entire earthing system shall fully comply with the Indian Electricity Act and Rules framed thereunder. The Supplier shall carry out any changes desired by the electrical inspector or the Owner in order to make the installation conform to the Indian Electricity Rules, at no extra cost. The exact location of the earth pits, earth electrode and conductors and earthing points of the equipments shall be determined at site, in consultation with the Engineer-in-charge. Any change in the methods, routing, size of conductor etc shall be subject to approval of the owner/engineer-in-charge before execution.

6.1 Earth Pit with Electrode

Plate or pipe type earth electrode with earth pit shall be provided for this work unless otherwise advised by the Engineer-in-charge due to typical site conditions. Earthing electrode and pit shall be as per IS: 3043-1987 (reaffirmed 2001) - code of practice for Earthing). All earth electrodes shall preferably be driven to a sufficient depth to reach permanent moist soil.

For plate type earth pit, size of earth electrode for body earthing of equipment/electrical panels (LT/MCC/ Switch Board ) shall be 600 mm X 600 mm X 6 mm GI plate whereas that for the neutral earthing of transformer, DG Set, PLC & instrumentation earthing shall be 600 mm X 600 mm X 3 mm Copper plate. For pipe type earth pit, size of earth electrode shall be 100 mm NB GI pipe. For ready reference, sketches for pipe and plate type earth electrode earthing pits have been shown in Annexure – III.

PRIOR APPROVAL OF THE ENGINEER-IN-CHARGE SHALL BE TAKEN FOR SELECTING TYPE OF EARTH ELECTRODE (PIPE OR PLATE).

6.1.2 Earth pit centre shall be at a minimum distance of 3m from nearest building, unless otherwise advised. The minimum 3 m distance shall be maintained between centres of 2 earth pits.

6.1.3 Earthing electrodes for Main plant lighting panel shall be plate type with double earthing.

6.2 Earth Bus, Earthing Lead and Earth Wire/Strip

6.2.1 All electrical equipment is to be doubly earthed by connecting two-earth strip/wire conductor from the frame of the equipment to an earthing pit/main earthing ring. The earthing ring will be connected via links to several earth electrodes. The cable armoured will be earthed through the cable glands. Conductor size for connection to various equipment shall be as specified in the drawing / as instructed by the Engineer-in-charge. However, the length of the branch leads from equipment to earthring grid/ring shall not be more than 10 to 15 meters.

6.2.2 All hardware for earthing installation shall be hot dip galvanized. Spring washers shall be used for all earthing connections of equipment having vibrations.

6.2.3 Size of earthing lead / wire shall be as specified in schedule of quantities/drawings.

Following may be considered as general guidelines: Sizing of earthing lead/wire
Sr. No. | Item | Size
--- | --- | ---
1 | Control switches/ glands | PVC insulated 4 sq. mm copper conductor wire.
2 | Motor / Isolators up to 10 HP | PVC insulated 4 sq. mm copper conductor wire.
3. | Motor / Isolators above 10 HP upto Cable tray & GI strip 25 X 3 mm | PVC insulated 4 sq. mm copper up to 40 HP conductor wire.
4 | Motor above 50 HP upto 125 HP | GI strip 40 X 3 mm
5 | Motor above 125 HP | GI strip 25 X 6 mm
6 | Switch Board / Motor Control Centre | GI strip 50 X 6 mm
7 | Earthing main in trenches | GI strip 50 X 6 mm
8 | Power Control Centre / LT Panel Of Sub Station | GI strip 50 X 6 mm

When earthing wire is to be drawn under floor / in underground, Copper conductor wire of 4 sq mm with PVC insulation shall be used.

However, while deciding type & size of earth lead, the resistance between the earthing system and the general mass of the earth shall be as per IS code of practice. The earth loop impedance to any point in the electrical system shall not be in excess of 1.0 ohm in order to ensure satisfactory operation of protective devices.

6.2.4 Copper wire shall be connected to the equipment by providing crimping type socket / lug.

6.2.6 Wherever earthing strip to be provided in cable tray, it shall be suitably clamped on cable tray and electrically bonded to the cable tray at regular interval.

6.2.6 Excavating & refilling of earth, necessary for laying underground earth bus loops, shall be responsibility of the Supplier.

6.2.7 Wherever earth leads/strips/wire are laid in cable trenches, these shall be firmly and suitably cleated to the walls/supporting steel structure on which cable is clamped.

6.2.8 The neutral of the transformer shall be connected to earth pit independently and earth pit shall have copper earth plate of 600 mm X 600 mm X 3 mm.

6.2.9 Long runs of GI strip shall be connected at each end with lap type welding to ensure continuity.

6.2.10 The following selection table shall be followed for starters of motor feeders unless otherwise specified:

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>415 V Motor HP</th>
<th>Contactor Rating Amps</th>
<th>MCCB Rating Amp.</th>
<th>MPCB Rating Amp.</th>
<th>Type of Starter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Up to 3 HP</td>
<td>9</td>
<td>-</td>
<td>9</td>
<td>DOL</td>
</tr>
<tr>
<td>2</td>
<td>5 to 10 HP</td>
<td>16</td>
<td>-</td>
<td>16</td>
<td>Do-</td>
</tr>
<tr>
<td>3</td>
<td>12.5 to 15 HP</td>
<td>25</td>
<td>-</td>
<td>25</td>
<td>Star Delta</td>
</tr>
<tr>
<td>4</td>
<td>20 to 25 HP</td>
<td>-</td>
<td>-</td>
<td>40</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>30 to 35 HP</td>
<td>-</td>
<td>-</td>
<td>50</td>
<td>Do-</td>
</tr>
<tr>
<td>6</td>
<td>40 HP</td>
<td>-</td>
<td>63</td>
<td>-</td>
<td>Do-</td>
</tr>
<tr>
<td>7</td>
<td>45 HP</td>
<td>-</td>
<td>100</td>
<td>-</td>
<td>Do-</td>
</tr>
<tr>
<td>8</td>
<td>50 to 60 HP</td>
<td>-</td>
<td>125</td>
<td>-</td>
<td>Soft Starter</td>
</tr>
<tr>
<td>9</td>
<td>65 to 70 HP</td>
<td>-</td>
<td>200</td>
<td>-</td>
<td>Do-</td>
</tr>
<tr>
<td>10</td>
<td>75 to 90 HP</td>
<td>-</td>
<td>200</td>
<td>-</td>
<td>Do-</td>
</tr>
<tr>
<td>11</td>
<td>100 to 125 HP</td>
<td>-</td>
<td>250</td>
<td>-</td>
<td>Do-</td>
</tr>
<tr>
<td>12</td>
<td>150 to 180 HP</td>
<td>-</td>
<td>400</td>
<td>-</td>
<td>Do-</td>
</tr>
<tr>
<td>13</td>
<td>200 to 250 HP</td>
<td>-</td>
<td>400</td>
<td>-</td>
<td>Do-</td>
</tr>
<tr>
<td>14</td>
<td>275 to 400 HP</td>
<td>-</td>
<td>630</td>
<td>-</td>
<td>Do-</td>
</tr>
</tbody>
</table>
For capacitors, either special capacitor duty contactors shall be used or the rating of contactors / MCCB shall be double of rated current of capacitor.

- The above selection table provides the general guideline. However, technical requirement / specifications, if any mentioned under Section V, will supersede the table given above.

7.0 TWO / FOUR POLE STRUCTURE

7.1 ISMB 200 x 100 mm to be grounded in concrete 1:2:4 for at least 1/5th length i.e. 2 meters size of concrete pedestal 500x500mm. All necessary civil works such as excavation, centering, concreting and back filling is included in supplier’s scope of work.

7.2 Interconnecting by aluminum conductor jumpers with connectors/PG clamps etc.

7.3 Installation, testing and commissioning of complete two/four pole structure including ISMB & cross channels, G.O. switch, insulators and other items mentioned under equipment supplied for two pole structure.

7.3 Complete structure to be provided with two coats of aluminum paint.
### ANNEXURE - III

**BUREAU OF INDIAN STANDARDS TO BE FOLLOWED FOR ELECTRICAL ERECTION**

1. PVC insulated cables (light duty) for Working voltage up to 1100 V Part I & II - 694-1990
2. PVC insulated cables (heavy duty) for Voltage up to 1100 volts Part I - 1554-1988
3. -- do -- for voltage 3.3 KV to 11 KV Part II - 1554-1988
4. Specification for polyethylene insulated PVC Sheathed heavy duty electric cables, voltage Part I not exceeding 1100 V - 5959-1970
5. -- do -- voltage 3.3 KV to 11 KV Part II - 5959-1970
7. Code of practice for installation and Maintenance of power cables up to 33 kV - 1255-1983
15. Code of practice for electrical wiring Installation (system voltage exceeding 650 V) - 2274-1963

Guide for testing three-phase induction - 4029-1967

**Motor**

18. XLPE Cables for working voltage up to And including 1100 Volts - 7098
   - 1988 Part I
19. --- Do --- up to 33 kV- 7098 – 1988

20. Boxes for enclosures of electrical accessories - 5133

21. Electric Power connectors - 5561-

22. HRC Cartridge Fuse Link up to 650 V - 2208-

23. Code of Practice for Selection, Installation & Maintenance of Fuse up to 650 V -3108-

24. Cables methods of testing - 10810-

25. Danger / Lattice Boards -3551-

RECOMMENDED CABLES SIZES FOR INDUSTRIAL WIRING

The following selection table shall be followed for cables of motors unless otherwise specified:

<table>
<thead>
<tr>
<th>3 Phase</th>
<th>Aluminum Conductor Cable Size- Sq. mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>415 V</td>
<td>DOL Starter/Soft starter Star- Delta Starter</td>
</tr>
<tr>
<td>Motor H.P</td>
<td>Supply side Motor side Supply side Motor side</td>
</tr>
<tr>
<td>Up to 7.5</td>
<td>4 4 4 2X4</td>
</tr>
<tr>
<td>10</td>
<td>6 6 6 2X4</td>
</tr>
<tr>
<td>15</td>
<td>10 10 10 2X4</td>
</tr>
<tr>
<td>20</td>
<td>16 16 16 2X6</td>
</tr>
<tr>
<td>25</td>
<td>25 25 25 2X10</td>
</tr>
<tr>
<td>30</td>
<td>25 25 25 2X10</td>
</tr>
<tr>
<td>40</td>
<td>35 35 35 2X16</td>
</tr>
<tr>
<td>50</td>
<td>50 50 50 2X25</td>
</tr>
<tr>
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<tr>
<th>3 Phase</th>
<th>Copper Conductor Cable Size- Sq. mm</th>
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<tr>
<td>415 V</td>
<td>DOL Starter/Soft starter Star- Delta Starter</td>
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<tr>
<td>Motor H.P</td>
<td>Supply side Motor side Supply side Motor side</td>
</tr>
<tr>
<td>Up to 7.5</td>
<td>2.5 2.5 2.5 2X2.5</td>
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<tr>
<td>10</td>
<td>4 4 4 2X2.5</td>
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<td>25 25 25 2X10</td>
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</tr>
<tr>
<td>425</td>
<td>2X240 2X240 2X240 2X240</td>
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</table>

In case LAPP/Concab / Equi design of steel braided Copper Cables are used then Minimum size for various rating of motors to be laid between MCC & motors shall be as given in the table below

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Motor ratubg HP</th>
<th>Full Load Current (Amp.)</th>
<th>Type of Starter</th>
<th>Power cable rating (At Amb. Temp. of 45 sq.mm.)</th>
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</table>

COMFED                                                 Page 153 of 410  
Tender, Dehri-on-Sone
<table>
<thead>
<tr>
<th>No.</th>
<th>HP</th>
<th>Current</th>
<th>Cable Type</th>
<th>Size</th>
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<tbody>
<tr>
<td>1</td>
<td>0.5</td>
<td>1</td>
<td>DOL</td>
<td>3 C or 4 C x 1.5 sq. mm</td>
</tr>
<tr>
<td>2</td>
<td>0.75</td>
<td>1.3</td>
<td>DOL</td>
<td>3 C or 4 C x 1.5 sq. mm</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>1.9</td>
<td>DOL</td>
<td>3 C or 4 C x 1.5 sq. mm</td>
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<tr>
<td>4</td>
<td>1.5</td>
<td>2.6</td>
<td>DOL</td>
<td>3 C or 4 C x 1.5 sq. mm</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>3.7</td>
<td>DOL</td>
<td>3 C or 4 C x 1.5 sq. mm</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>4.8</td>
<td>DOL</td>
<td>3 C or 4 C x 1.5 sq. mm</td>
</tr>
<tr>
<td>7</td>
<td>4</td>
<td>5.2</td>
<td>DOL</td>
<td>3 C or 4 C x 1.5 sq. mm</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>7.8</td>
<td>DOL</td>
<td>3 C or 4 C x 1.5 sq. mm</td>
</tr>
<tr>
<td>9</td>
<td>7.5</td>
<td>11.2</td>
<td>DOL</td>
<td>3 C or 4 C x 2.5 sq. mm</td>
</tr>
<tr>
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<td>10</td>
<td>16</td>
<td>DOL</td>
<td>3 C or 4 C x 2.5 sq. mm</td>
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<tr>
<td>11</td>
<td>12.5</td>
<td>19</td>
<td>Star delta starter</td>
<td>3 C pr 4 C x 4 sq. mm (2 runs)</td>
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<tr>
<td>12</td>
<td>15</td>
<td>20.8</td>
<td>Star delta starter</td>
<td>3 C pr 4 C x 4 sq. mm (2 runs)</td>
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<td>13</td>
<td>20</td>
<td>28</td>
<td>Star delta starter</td>
<td>3 C pr 4 C x 6 sq. mm (2 runs)</td>
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<td>14</td>
<td>25</td>
<td>34</td>
<td>Star delta starter</td>
<td>3 C pr 4 C x 10 sq. mm (2 runs)</td>
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<td>15</td>
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<td>3 C pr 4 C x 10 sq. mm (2 runs)</td>
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<td>16</td>
<td>40</td>
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<td>Star delta starter</td>
<td>3 C pr 4 C x 16 sq. mm (2 runs)</td>
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<tr>
<td>17</td>
<td>50</td>
<td>65</td>
<td>Soft starter</td>
<td>3 C pr 4 C x 25 sq. mm</td>
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<td>18</td>
<td>60</td>
<td>78</td>
<td>Soft starter</td>
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<tr>
<td>19</td>
<td>75</td>
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<td>20</td>
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<td>131</td>
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<td>Soft starter</td>
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<td>22</td>
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<td>189</td>
<td>Soft starter</td>
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<tr>
<td>23</td>
<td>180</td>
<td>227</td>
<td>Soft starter</td>
<td>3 C pr 4 C x 185 sq. mm</td>
</tr>
<tr>
<td>24</td>
<td>215</td>
<td>271</td>
<td>Soft starter</td>
<td>3 C pr 4 C x 240 sq. mm</td>
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<tr>
<td>25</td>
<td>250</td>
<td>325</td>
<td>Soft starter</td>
<td>3 C pr 4 C x 300 sq. mm</td>
</tr>
<tr>
<td>26</td>
<td>275</td>
<td>360</td>
<td>Soft starter</td>
<td>3 C pr 4 C x 185 sq. mm (2 runs)</td>
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<tr>
<td>27</td>
<td>300</td>
<td>390</td>
<td>Soft starter</td>
<td>3 C pr 4 C x 185 sq. mm (2 runs)</td>
</tr>
<tr>
<td>28</td>
<td>335</td>
<td>400</td>
<td>Soft starter</td>
<td>3 C pr 4 C x 240 sq. mm (2 runs)</td>
</tr>
<tr>
<td>29</td>
<td>375</td>
<td>NA</td>
<td>Soft starter</td>
<td>3 C pr 4 C x 300 sq. mm (2 runs)</td>
</tr>
</tbody>
</table>

Note: Cables for motors above 20 HP have been indicated considering soft starters.

For motor rating, 200 HP and above, suitable rating of Bus Duct shall have to be provided depending upon the site requirement / as per the Site Engineer’s direction.
SECTION- VI

Technical Specifications

Plant Works
SCOPE OF WORK AND BASIS OF DESIGN

The dairy plant shall be designed, supplied installed and Commissioned by the bidder. The major area covered under the scope of work shall be reception, process, packaging (toned & standard milk), product, CIP and allied works with utilities including process/ services piping systems, power / control cable network, earthing network, safety devices, instruments etc. as per requirement for the dairy plant for smooth operation & maintenance of the system.

The brief of processing requirement and equipment details are mentioned hereunder.

1.1 RAW MILK RECEPTION (30,000 LPH X 2 UNITS)

The Raw chilled milk having temperature of 10 deg. C shall be received at Dairy dock in tankers (8000L-9000L). Around 45 tankers shall arrive in a day.

Milk received in tankers shall be weighed in the electronic weighbridge and the operator shall manually enter relevant tanker details in the weighbridge PC and the weighment shall be taken automatically.

Milk sample shall be taken manually from the tanker and the details of the sample shall be fed to testing system for measurement of necessary parameters of Fat, SNF, pH and temperature. Based on the acceptable parameters and actual results the consignment shall be accepted or rejected.

Tanker shall be connected manually to the unloading line. Each tanker shall be emptied out in 25-30 minute duration.

The milk reception rate through tanker is assumed as 20,000 LPH average and 30,000 LPH maximum. The total milk received in a day shall be 5,00,000 litres maximum. The average fat and SNF percentage in the raw milk shall be 4.0% and 8.6% respectively.

The tankers reception bay shall receive two tankers at a time. There shall be two independent raw milk reception lines through which the milk shall be emptied out from the tankers simultaneously and milk shall be transferred to any one of the raw milk silos (3 x 100 KL) through 30KLPH Chillers.

Reception bay- It shall also have point for bulk milk dispatch through road milk tankers.

1.2 MILK PROCESSING PLANT (20,000 LPH X 2 UNITS)

The raw milk at 4 degree centigrade shall be drawn from any of the raw milk silos to the balance tank of the any of the two milk pasteurization plants for pasteurization & separation.

The capacity of the pasteurization plant & Separator shall be 20,000 LPH each. The dairy plant shall be designed to run either both the pasteurizers simultaneously or one at a time. The milk separator shall be self- cleaning auto flush. The pasteurized skimmed/formulated/ standardized milk shall be stored in the processed silos (3 x 100KL & 2 x 20KL)

To enable SNF addition for manufacturing of different varieties of milk (viz. Standard/ toned/ double toned), a reconstitution system comprising of funnel & venture unit, tanks (un-insulated) , pump, duplex filter, chiller etc. shall be provided. This high SNF pasteurizer. Skim Milk powder bags shall be manually cut opened and dumped in the hopper of funnel & venture.

The skimmed milk / formulated / standardized milk shall be sent to the different sections as follows:

a) Powder plant for SMP / WMP/ Dairy Whitener manufacturing. In case of the WMP production the milk feed shall be at 3% fat. The plant shall be designed for separation and mixing of raw & skimmed milk to get the milk at 3% fat quality. The formulated milk
shall have 8.5% total solid for SMP production and shall have 12% total solid for WMP production.

b) Liquid milk packaging section for packing through pouch filling machine.

The transfer milk to powder plant and any one of the other section should be made possible simultaneously.

1.3 CREAM PROCESSING PLANT (3000 LPH X 2 UNIT)

The cream shall be collected in each cream intermediate tanks (1000L) from either of the cream separators and shall be pasteurized in the cream pasteurization plant. The dairy plant shall be designed to run either both the pasteurizers simultaneously or one at a time.

The capacity of each cream pasteurization plant shall be 3000 LPH. The total cream produced in a day shall be 48755 kg. (4,00,000 4.9% x 99%/40%).

The cream after pasteurization shall be stored in three numbers of the cream storage tanks each is having 20,000 Litres capacity.

1.4 BUTTER SECTION

The cream, after ripening, shall be pumped from cream storage tanks at the rate of 3200 kg/hr to the CBMM. Cream pump located in the process hall shall be operated based on the level in the common float balance tank of the CBMMs. The butter shall be manufactured through Continuous Butter Making machines (CBMM). The plant shall have two numbers of CBMM and each is having capacity of 800kg/hr. This section shall be provided with PV station (HMI) station for process interactions.

The butter produced from CBMM shall be pouched in bulk packing of 15Kg or taken to the ghee section. The butter shall be taken in either hoppers of butter packing machine or will be transferred directly to the BMV (Butter melting Vat) through a (lobe/screw) pump.

Necessary arrangements for efficient conveying of butter through pipelines shall have to be taken care of by the suppliers. The bulk packs/cartoons shall be stored in butter deep freeze.

The butter milk shall be collected, chilled and sent to Raw Milk Silo for recovery of milk solids.

1.5 GHEE SECTION

The dairy shall be equipped with required ghee manufacturing facilities for production of 5,000kg/day in batch processes. The butter from butter making machine shall be taken to ghee section through butter trolley fitted with auger and butter pump. Butter from deep freeze shall be transported in butter trolleys and transferred manually to butter melting vat. Molten butter shall be pumped to pre stratification tank and subsequently to ghee boilers.

Ghee made in the ghee boiler shall be transferred to ghee settling tank through balance tank and pump. After settling, the ghee shall be clarified, cooled and stored in the ghee storage tanks.

Ghee made in the ghee boiler shall be settled in ghee settling tank. After settling, the ghee shall be clarified and stored in the ghee storage tanks. The stored ghee shall be taken to retail / bulk ghee filling. Entire Ghee manufacturing section shall be through manual control in form of SS-RCP push button stations.

A provision for Fat recovery system i.e collection of wash water from ghee boilers & serum from pre-stratification tank shall be provided to avert through piping. The liquid shall be treated with cooling water separate fat manually.
1.6 LIQUID MILK PACKAGING SECTION

It is planned that initially 30,000 L of standard/ toned/double toned milk shall be packed in to 500 ml/ 1000 ml poly pouches by three nos mechanical type pouch filling machines.

The processed milk stored in pasteurized milk silos shall be transferred to any one of the HMST (2 Nos. X 10KL) at packing section (Mezzanine). Milk from the HMST(s) shall be taken to any/all of the pouch-filling machine (3Nos mechanical type 500PPH) by gravity. At a time only one variety of milk shall be packed.

For milk crate management, empty crates shall be received at crate reception dock from the trucks and manually fed to the in feed conveyor of the crate washer (capacity 800 CPH) in an inverted position. The cleaned crates from the crate washer shall be automatically inverted to the correct position and conveyed to the crate store area on conveyors. Washed crate shall be stacked in the crate store. Crate stacks shall be provided to pouch machines manually. A power driven chain conveyor shall be provided in front of pouch filling machine to carry filled crates to the cold store through hatch door. Crates shall move from the conveyor in to the cold store over roller conveyor.

Provision for wastes/leakage milk collection should be made with connection from packaging machine trays. The leakage milk collection vat (200L) with strainer is to be provided with transfer pump to transfer the milk to rinse milk tank at process hall.

1.7 CLEANING-IN-PLACE (CIP)

1.7.1 General

There shall be two automatic CIP systems. While CIP system I shall have two circuits, CIP 2 will have 3 circuits of operation. All circuits of each CIP system as well as both the CIP system shall be possible to operate simultaneously and independently, with its own set of CIP tanks, PHE, filters, pumps, valves and fittings etc. The CIP systems shall clean all the milk handling equipment storage tanks and pipe line network including milk transfer line from processed milk silo up to milk storage tanks of packing section. The CIP systems shall be operated, controlled and monitored from central control room. The details of the ongoing CIP programme shall be displayed in central control room.

Necessary controls and instrument viz. level sensor, conductivity probes, temperature sensors, transmitters shall be provided to achieve the required CIP operations.

The system shall be totally secured against mixing of the cleaning solutions with the products in case of malfunctioning in the system or power failure.

The system shall be fully automatic and pre-programmed with facilities with the products in case of malfunctioning in the system or power failure.

The system shall be fully automatic and pre-programmed with facilities of selecting and modifying the cleaning sequence and duration from the main control room.

1.7.2 Bulk Storage: 15,000 Liters x 2 Nos. (One each for Acid & Lye)

Acid and lye shall be received in bulk in road tankers and shall be unloaded in to bulk storage tanks. There shall be chemical unloading pump suitable, for the acid and lye application, for unloading of acid and lye. The unloading pump capacity shall not be less than 10,000 LPH at suitable head. Two numbers of bulk storage tanks (one for acid and one for lye) having capacity of 15,000 Litres each shall be provided. The unloading pumps shall be inter-locked with the high-level of the Acid / Lye tanks for stopping the pumps once pre-determined level is reached.
The tank shall be provided with high level and low-level indicator—cum-alarm system. High-level switch provided in the storage tank shall trip the respective pump for pumping of the solution to that tank. Vapour outlet from each bulk storage tank shall be provided with water seal arrangement. The tank shall be provided with mechanical type level indicator.

The acid and lye solution from the bulk storage tank shall be transferred to the respective tanks meant for Tanker CIP, Dairy Process Plant CIP, APS plant and Powder Plant CIP. The acid & lye transfer pump shall be installed near the bulk storage tanks area and shall be of capacity 1 KLPH (MIN) at suitable head. The tanker unloading pumps shall also be used for concentrated chemical transfer to buffer tanks installed at powder plant & APS plant. These pumps shall also be interlocked with respective buffer tanks.

The pump for acid & lye solution transfer shall be of SS316L in construction for all the parts coming in contact with the concentrated solution. The bidder shall also supply the unloading hoses for acid and lye.

1.7.3 Tanker CIP: Two Circuits

There shall be two separate sets of tanks one for Process CIP and another for Tanker CIP. Tanker CIP shall have two circuits with each circuit dedicated for one tanker CIP bay.

The plant shall be provided with 3000 Litres of acid, lye and hot water tanks and 4000 litres of recuperation tanks. The tanks shall be provided with conductivity meter for feeding of desired quantity of acid / lye solution from the respective concentrate storage tanks.

Two CIP forward pumps and two numbers of CIP return pumps shall be provided with suitable flow rate and head. The contact parts of the pumps shall be AISI 316. Pump shall be centrifugal type with open impeller and sanitary design complete with motor and base frame.

CIP programme shall ensure that the line connection for the tankers is made and the man way is open before starting the CIP operation. Dummy cover with two spray ball arrangement shall be provided for each tanker openings for proper cleaning.

Suitable tanker hoses shall provided for collection of CIP solution from the outlet of the tankers.

SS folding type platform with SS railing on RCC walk way for tanker man way (4 nos) approach shall be provided.

1.7.4 Dairy Plant Process CIP: Three circuits

The plant shall be provided with 5000 Litres of acid, lye, hot water tanks and 8000 litres of recuperation tank. The tanks shall be provided with conductivity meter for feeding of desired quantity of acid / lye solution from the respective concentrate storage tanks.

Three CIP forward pumps and require numbers of CIP return pumps shall be provided with suitable flow rate and head. The contact parts of the pumps shall be AISI 316. Pump shall be centrifugal type with open impeller and sanitary design complete with motor and base frame. The number of routes in each circuit shall be decided by the bidder based on the system offered.

1.7.4.1 Cleaning Programme

The CIP system shall generally comprise the following sequence.

- Water pre rinse
- Hot detergent circulation
- Hot/Cold water rinse
- Hot acid circulation
- Hot/Cold water rinse
• Hot water sterilization
• Mains soft water rinse

By passing of any operation after detergent circulation from the above sequence of programme shall be made possible.

At the end of detergent and acid cleaning, the solution shall be recovered with the help of sensors provided in the return line and sub standard solution shall be automatically diverted to drain.

Intermediate rinse shall be with plain hot/ cold water and this shall be recovered and re used after acid circulation.

The alkaline/ Acidic traces shall be removed with the help of cold/ hot water. Hot water rinse shall ensure satisfactory cleaning of he lines and equipment. Final rinse water shall be recovered in the recuperation tank.

Concentration of detergent and acid shall be maintained with the help of an automatic dosing system equipped with necessary conductivity probes. Chemical dosing shall not be carried out during the CIP in progress. Dosing shall be done in between successive cleaning cycles based on the strength of the solution measured by the conductivity meters installed on the recirculation lines. Duration of the recirculation of the solution shall be carried out such that the homogeneous strength of the solution is obtained.

The completion of CIP of every circuit shall be signaled with an audiovisual alarm.

The temperature and concentration of cleaning solution shall be continuously monitored and corrected automatically. In case of non compliance of any of the parameters, the sequence shall remain suspended for such time and resume to “NORMAL’ when corrected.

The route for CIP circulation shall be pre-programmed. The solution spray shall be only through spray balls. CIP solution shall be returned back to CIP tanks through self-priming CIP return pumps in each routes.

If the programme execution stops at particular step due to power failure of fault, then commencement of programme execution, after rectification, should be from the same step where the programme was terminated.

Sequence of operation and detergent acid consumption shall be automatically recorded in the process computer and shall be recalled on the screen on demand.

1.7.4.2 RINSE MILK RECOVERY SYSTEM

A time controlled water purge (quantity of water equivalent to the holding capacity of milk pipe and milk processing equipment) shall be given to push the milk from the pipe line and equipment to the rinse milk storage tank.

The rinse milk recovery tank shall be used to collect the pre rinse milk up to a pre determined concentration / dilution (pre-programmed) from various milk pipelines, equipment and storage tanks over the day. Once the SNF concentration level goes below the preset level, the conductivity sensor mounted over the CIP return line will sense it and automatically divert the rinse water to drain.

1.8 AIR HANDLING SYSTEM

There shall be two numbers non-lubricated reciprocating compressor of suitable capacity (1working + 1 standby) for the generation of moisture free instrument air. The compressors shall have advanced control system for capacity control and for performance monitoring. Suitable
refrigerated air dryer and filters for achieving the quality of air suitable for the instrumentation, air receiver with drain shall be included in the scope of work.

Air distribution piping up to all the utilities shall also be included in the scope of work. Necessary arrangements shall be made for taking feed & control for automation interface.

The bidder shall indicate the pressure and quantity of dehumidified air required in the plant.

1.9 WATER HANDLING SYSTEM

Water handling system shall meet the entire raw and soft water requirement. Raw water shall be mainly used for floor cleaning and general purpose and soft water shall be used for the entire dairy plant processing and cleaning.

The Purchaser shall make raw water and the soft water UG sump at water treatment building. Further distribution of raw / soft water from the sump through hydro flow system / softener up to various buildings & utilities shall be included in the scope of the work including necessary M.C.C. income for this shall be taken from process MCC.

Hydro flow system for raw water shall comprise of 2 nos of vertical inline multistage SS pumps of (1w+1s) and pressure tanks with necessary valves, pressure transmitter, gauges and controls etc.

Hydro flow system for soft water shall comprise of 3 nos of vertical inline multistage SS pumps of (2w+1s) and pressure tanks with necessary valves, pressure transmitter, gauges and controls etc.

Pumps shall be interlocked with respective pressure transmitter and controls and level probes in the UG sump.

Measurement and recording of raw water, soft water and chilled water shall be provided. The same shall be made accessible at the central control room.

Requirement of soft water for powder plant (20 hours of operation) may be assumed as 120 cum/day with peak load as 20 cum/hr. Requirement of soft water for refrigeration plant may assumed as 6.0 cum/hr (20 hours of operation).

1.10 CONDENSATE RECOVERY SYSTEM

The system shall consists of facilities for receiving condensate by gravity from the various process equipment to condensate recovery tank/ tanks tank and pumping back to the feed water tank at boiler house.

Two different circuits one for process and CIP section and another one for product section shall be connected to a common condensate recovery tank of 5000 Litres. There shall be two numbers of condensate return pump (1 W+1S) interlocked with the levels sensors of the condensate collection tank.

1.11 FUEL HANDLING SYSTEM

Fuel handling system shall consist of 2 numbers each 50 KL. Furnace oil storage tanks, day tank of boiler house with set of unloading cum supply pumps, un loading hose, valves, instruments, mass flow meter & controls, piping, electrical heat tracer, insulation & cladding etc as per statutory requirement including necessary approvals.

Pumping and distribution from unloading point of FO yard up to day tank located in boiler house is included in the scope of bidder.
Pumping and distribution from unloading point of FO yard up to day tank located in the powder plant is included in the scope of the bidder. (Supply installation of powder plant day tank shall be carried out by powder plant contractor including level sensors) Interlocking of this level with the FO pump is included in the scope of the bidder.

Interlocking the levels of day tanks with starters of respective FO pumps shall be included in the scope of the bidder.

1.12 ELECTRICALS

Electrical distribution system shall be suitable to operate, control, and maintain all the parameters required for receiving the milk through tankers, chilling, storing, milk pasteurization, separation, processed milk storage, processed milk packaging and transfer to Powder Plant, cream pasteurization, storage, transfer to butter making machines, butter bulk packing, butter melting, butter oil transfer, ghee making, ghee settling, ghee clarifier, storage and packing, granulations etc. complete as specified in the process requirement for milk, milk packaging & milk product manufacturing.

Required number of Motor Control Centers and ancillary panels with complete switchgears as per the requirement of the equipment shall be provided for effective and safe operation of the processing plant.

Required quantity of armored cable, control cable, Instrument cable, GI perforated cable trays, GI drop conduit pipes, SS drop conduits pipe in process section, plate type earth pit, earthing network, earthing conductors, load break Isolators, PB station near motors for emergency isolation, rubber mats for panels etc. shall also be provided.

The sizes of power cables for different capacity of loads / Motor rating shall be as indicated in cable selection charts. All the power & control cables shall be laid through GI perforated trays SS shrouds for all pumps & motors shall be provided. Supply & placement of rubber mats of proper size as per Electrical Inspectorate rules shall be provided.

The electrical LT distribution system specification is detailed below.

1.12.1 Electric Motors

All electric motors shall be energy efficient motors and shall comply with the following:

a) All poly phase motors of 0.375 kW or more shall have a minimum acceptable nominal full load motor efficiency not less than shown in Table below or as per the IS 12615 – 2004 Eff 1 for energy efficient motors.

<table>
<thead>
<tr>
<th>Motor Size (KW)</th>
<th>Efficiency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Pole</td>
<td>4 Pole</td>
</tr>
<tr>
<td>1.1 (1.5 hp)</td>
<td>82.2</td>
</tr>
<tr>
<td>1.5 (2 hp)</td>
<td>84.1</td>
</tr>
<tr>
<td>2.2 (3 Ph)</td>
<td>85.6</td>
</tr>
<tr>
<td>3.0 (4 Ph)</td>
<td>86.7</td>
</tr>
<tr>
<td>4.0 (5.5 Ph)</td>
<td>87.6</td>
</tr>
<tr>
<td>5.5 (7.5 Ph)</td>
<td>88.5</td>
</tr>
<tr>
<td>7.5. (10Ph)</td>
<td>89.5</td>
</tr>
<tr>
<td>11.0 (15 Ph)</td>
<td>90.6</td>
</tr>
<tr>
<td>15.0(20 Ph)</td>
<td>91.3</td>
</tr>
<tr>
<td>18.5 (25 Ph)</td>
<td>91.8</td>
</tr>
<tr>
<td>22.0 (30 Ph)</td>
<td>92.2</td>
</tr>
</tbody>
</table>
(b) Motor nameplate shall list the nominal full-load motor efficiencies and the full-load power factor.

(c) Certificates shall be obtained and kept on record indicating the motor efficiency. Whenever a motor is rewound, appropriate measures shall be taken so that the core characteristics of the motor are not lost due to thermal and mechanical stress during removal of damaged parts. After rewinding, a new efficiency test shall be performed and a similar record shall be maintained.

1.12.2 MOTOR CONTROL CENTER (MCC)

The MCC shall be suitable for indoor installation with provision for expansion (20% spare feeders). The motor control center shall be completely dust & vermin proof conforming to IP 44 standard. The MCC shall be fabricated, as per detailed specification. The bus bar rating of each MCC shall be capable of carrying 1.25 times of full load current of all the feeders of respective MCC. For calculating full load current, the connected load of MCC shall be considered.

The Incomer of each MCC shall have 4 poles EDO (motorized & draw out type), ACB of suitable rating with built in Microprocessor based protective device with all accessories. Also the Incomer shall have 3-phase 4-wire energy meter with necessary Indications, Voltmeter, and Ammeter with selector switches and CTs and phase Indication lamps.

Each MCC shall be provided with two incomers (one for each section) and a bus coupler. The entire load connected to the MCC shall be divided in such a way that 50% of total connected load (operating & standby) is on each incomer. In case of any breakdown in any incomer of the MCC, it should be possible to transfer the entire load on other incomer of the MCC. Thus the rating of each incomer and bus coupler should be rated for taking care of entire connected load to that MCC.

For Incomer of the panel, the rating of the switchgear shall be 1.25 times of rated full load current of connected load of the panel. The incoming and outgoing feeders from the MCCs in the electrical control room shall have all the feeders entry & exit from the bottom. However, cables from feeders going to plant equipment shall be laid in cable trays along with the wall and ceiling in the rest of the plant building.

The MCCs would receive, control & distribute electrical power at 440 V, 50 HZ. AC to all electrical loads to be connected in reception, process, CIP & Product section including air compressors.

Additional 20% spare feeders for future load of different ratings shall be provided in each MCC. One no of 100 A TPN SDF unit for welding point shall be provided. The welding receptacle shall be provided at appropriate locations in each section (e.g., Process, APS, Milk Packaging etc) of the plat.

In addition to the required number of outgoing feeders of individual MCC, one number feeder of suitable rating / type for shunt capacitors (All PP type) for motors of 50 HP or more rating shall be provided on panel or near motor terminal. In such cases the switchgear size shall be designed considering the shunt capacitors. Auto ON / OFF of capacitors arrangement based on ON / OFF of the motors shall be provided.

All outgoing feeders shall have isolation facilities switch dis-connector fuse units, contactors, thermal / magnetic overload protection & necessary operating controls.

The bidder shall provide power cables of suitable rating and no. of runs from PCC to each MCC in the electrical room.
1.13 AUTOMATION

1.0 DESIGN OBJECTIVE

The entire Control & Automation system (C&A) shall be designed, supplied and commissioned to enable the operator to operate the dairy plant in a safe, efficient and reliable manner, without exceeding plant operational limits and ensuring the overall performance guarantee conditions.

The C&A System shall be designed utilizing state-of – the art technology to ensure:

- High degree of System availability and and reliability. Extensive Diagnostic capability to pinpoint failure areas.
- Low downtime and high meantime between failures System flexibility and modular expansion capability.
- Safety of the main equipment, system and operating personnel.
- Open connectivity using OPC (Client Server architecture) Hot swappable system modules.
- Communication of all field instruments with DCs shall be through Field Bus only. Instruments shall be of Smart type.

2.0 GENERAL DESCRIPTION

The integrated control system proposed for the new Dairy plant shall be fully automatic, which will have the better features of both PLC and DCS system.

All the operations from weighment, milk reception, milk processing and storage, cream processing and cream storage, cream transfer to butter section, rinse milk recovery system and CIP operations shall be automated and be controlled from control system.

The automatic control shall include starting operation, operation during process, shut down and CIP.

All the data referring to raw materials, products and utilities shall be made available for transfer to the main MIS server.

The automation system should be capable of operating continuously in the ambient temperature experienced in the plant. The system should be able to record and report all the production parameters.

The automation system should be also capable of interfacing with Powder plant, milk packaging only the Utility sections like Refrigeration, Boiler etc. The Bidder shall consider necessary hardware for interfacing the different sections mentioned above with the main automated systems.

All the independent automation systems (other than main or central DCS automation system) shall have communication port suitable for the main automation system all these systems shall be seamlessly connected to the main system. There shall be no hardware handshake signals with the main DCS systems. All the systems must communicate digitally to have better information exchange.

The central automation system shall be located in the control room of Dairy and shall directly control milk reception and Dairy plant operations. This shall include the overall process management and monitoring (PMMS) for data logging and management of the entire dairy plant.
HMI (Human Machine Interface) panel shall be provided for monitoring and controlling of milk reception activity and shall be connected to the main control network for interfacing with the main system.

The system shall also receive data for inventory control from all other PC’s connected on same Network, these PC’s are located at the product dispatch, stores, weighbridge, laboratory and services. All the operators will manually enter the data at all these PC’s and MIS reports are to be generated. Energy meters of all MCCs and PCC should be able to communicate with central automation system for data transfer.

Service section except air compressor (for instrument air generation) shall be controlled at their local control panels but log events and important data shall be transmitted from each section to the central system through keyboard. However, the system shall include the measurement and monitoring of services and utilities operating parameters and consumption data for all services in the Dairy complex.

All required instruments for generation of MIS reports shall also be considered.

Reception and storage of chemicals and butter & Ghee sections shall be controlled locally.

The system shall be able to offer redundancy at all levels to provide a high level of fault tolerance. Operator stations, servers, the plant bus, controllers, field networks and I/O modules shall be made redundant as per requirement.

The automation system shall be expandable for eventual inclusion of all data and controls required for the dairy expansion up to 10.0 LLPD.

Automation of various sections shall be designed as given below.

2.0 RAW MILK RECEPTION

2.1 Milk mass measurement shall be determined by weighbridge system and also cross checked by electronic mass flow meters system installed in each reception lines. There are two electronic weighing platforms wherein the data is generated by digitizers which are connected to one common computer. The system shall be flexible such that the gross weight (in) and tare weight (out) can be taken from any of the weigh scale.

2.2 Milk tankers shall be driven after weighment at weighbridge and collection of milk samples at the reception lab directly to any free reception bay. There shall be touch screen type PV stations in each for tanker reception bay. The process is operated in following steps.

2.2.1 The weighbridge operator will enter tanker registration no., which will be treated as Tanker ID and related data as per the DC received, in weighbridge computer. The weight data will be received on PC through communication with Weighbridge supplier’s digitizers, from any of the weigh scales. However, provision shall be kept for entering the weight data in case of failure of communication with digitizers.

2.2.2 The laboratory person shall take samples from the tanker for analysis. All the tankers, for which data is entered and saved by the weighbridge operator, shall be displayed on laboratory PC after pressing ‘Get data from server’. When any of these tankers is selected, all relevant data like incoming Fat, SNF, weight etc. appears on screen. The milk-scan machine that measures Fat, SNF shall be connected to this laboratory PC. The results are displayed automatically on PC after each sample is tested. Appropriate data can be selected from screen or it can be entered under respective. Tanker ID. The acceptance or rejection of the milk is done immediately as the analysis is over. The tanker can be received from any of the two reception bays after the quality control department confirms to the system that the milk is of acceptable quality. Override of the reject system shall be done by the manager’s pass ward.
2.2.3 The tanker bay operator connects the house to the tanker and Enables the line on which the unloading is to be done by switching on the lockable button installed on respective PV station. He enters Taker ID (last four digits of registration no.) in the PV station. If the lab analysis is over and the data is entered in the PC, tanker accepted is visible on PV station else it shows rejected and tanker ID resets. If the milk accepted, the tanker bay operator sends request for tanker unloading to control room. This request pops-up the tanker reception menu on OS.

2.2.4 After checking the various interlocks and acquiring the data from reception and lab, reception process shall be started and continued as per the requirement of control philosophy.

2.2.5 After the unloading is over, the tanker shall go to record tare weight data on weighbridge. This completes the tanker reception process and oe transaction in MIS system. Net weight is logged in the MIS through weighbridge data, additionally flow meters give continuous data on SCADA screen.

2.2.6 If the tanker reception point is not reused within a preset time, the line shall be flushed automatically or blow milk through to the chillers to prevent milk spoilage in the reception lines. Potable water purge points shall be provided in the milk transfer line from each unloading station to minimize the milk solids losses. These purges shall also be operated prior to the commencement of CIP of milk lines on a preset time delay basis from the automation system.

2.2.7 Tanker CIP operations. After unloading is over, the tanker shall be moved to the CIP position, and the dummy man way cover and spray head shall be lowered by electric hoist and placed over tanker’s man way. Full tanker CIP shall be carried out, and milk solids shall be recovered to milk recovery system. Bidders are required to state their Proposed CIP programme for road milk tankers.

2.2.8 All vessels in a group shall be pre-selectable for filling and emptying operations. When the first selected vessel to full, the second selected vessel commences filling. When the first selected vessel is emptied, the second selected vessel commences emptying. It shall be possible to transfer milk from one silo to any other silo within a group, and to empty any silo to a road milk tanker in case of emergency.

2.2.9 There should be possibility of loading the milk in the one silo from two reception lines.

3.0 PROCESSING

3.1 There shall be two parallel lines on which milk processing (i.e. milk pasteurization and cream separation) can be done at 20 KLPH flow rate.

3.2 The system shall prompt the operator to commence pasteurizing after the necessary conditions are checked and requirements are met with. Pasteurizing can be commenced at any time, but the prompt shall be logged as an event. The automation system shall start all the processing equipment.

3.3 Pasteurization parameters shall be fully controllable from the automation system. Temperatures shall be logged for each stage of process and service sections, and trend charts retained by the system.

3.4 The sterilization of pasteurizer shall be done before starting the milk processing. The sterilization process has to be planned by the CCR operator in such a way that it starts before milk processing and continues to run till milk processing is started. This is to ensure proper sterilization of pasteurizers and also to reduce the diversion time during cold start conditions.
3.5 The milk pasteurizers shall be fitted with differential temperature sensors between hot water and milk sections to detect plate fouling. Pasteurizers shall close down and short clean at pre-selected intervals (about 4 to 6 hours) or when the differential temperature sensor indicates the need to clean. Full CIP cleaning shall be selected by the operator only at the end of the days run.

3.6 If high level is reached in the selected processed milk silo, the loading automatically switches over to next preferred processed milk silo, if selected before starting the process. Similarly if high level is reached in the selected cream tank, cream loading will switch over to second tank. However if any silo or tank is selected in second preference, the same is not available in any other process and show in use status. If second preference is not given for silo or cream tank, sequence shall be terminated at the high level of selected silo or cream tank with flashing of relevant alarm and resetting the selections.

3.7 Each line shall have a cream separator, which has to be started approximately 15 minutes before starting the milk processing sequence.

3.8 Each separator PLC shall give data to main DCS to show the status of separator. Similarly, DCS gives data for controlling the separator. This communication may be done through Profit Bus communication network and not in form of digital and analogue Input/Outputs or otherwise, depending upon the software of cream Separator supplier.

3.9 Self cleaning separators shall be provided with timer based cleaning cycles. Separator manual cleaning shall be taken up when solid losses through de-sludging operation becomes excessive.

3.10 The system shall maintain a continuous log of tank and silo contents, all operating parameters, and the status (emptying/filling etc) of the vessel and also the type of product, and temperature. The system shall be capable of an instantaneous inventory check of all vessels in the plant. Agitator operation shall be automatically selected by the system.

3.11 At completion of emptying a vessel the system shall flash display indicating the readiness for cleaning in OS and prompt the operator to commence CIP cleaning. The time of this working shall be logged. No vessel shall be reused without CIP cleaning unless otherwise cleared by the managers override.

3.12 The system shall be provided with online standardizes which can be controlled to any desired fat content in the pasteurized, standardized or skim milk.

3.13 Pasteurization, storage & transfer operation of cream shall be carried out from main control room. The system shall prompt the operator to commence pasteurizing after the necessary conditions are checked and requirements are met with.

3.14 The control system provided in the processing section shall control all milk transfer to the Milk Pouch Packaging section, Powder plant, UHT/APS plant and CIP of the milk transfer line. At completion of milk transfer, the system shall receive a signal to stop milk transfer, and the processing system shall stop milk flow and purge the line with water.

3.15 The Powder plant system shall indicate when CIP cleaning of the milk transfer line may be commenced, and accordingly the processing system will control CIP cleaning of the milk transfer.

3.16 A separate menu shall be created in the main control station programme to control the separator and to display and monitor various alarms and status.

4.0 SERVICES
4.1.1 None of the services shall be controlled from this automation system. Each services section shall have local control loops and local control panels. The services shall, however, send data to the processing system for data logging, monitoring, and analysis. This shall include pressures, temperatures, flow rate, voltage, current, kW etc., from the services plant, and from each section of the process plant.

4.1.2 There would be separate control rooms in the refrigeration plant & Boiler plant. The refrigeration plant & Boiler plant automation systems shall also send production data for monitoring, analysis and report generation.

4.1.3 Controlling and monitoring of air compressor meant for instrumentation air shall be carried out from the OS.

5.0 SCOPE OF SUPPLY

5.1 The scope of work shall cover design, project engineering, control philosophy, software development, manufacture, assembly, shop testing, packing, transportation to site, unloading at site, storage, erection, site testing & pre-commissioning, commissioning, initial & successful operation and performance testing of the entire control & instrumentation package of the dairy plant on turn-key basis.

5.1.1 The bidder shall developed application software including data base graphics, mimics, logs and report format generation etc.

5.1.2 The bidder shall develop suitable management Information software.

5.1.3 The bidder shall provide necessary training for Operators, systems engineers and maintenance engineers.

5.1.4 The bidder shall provide necessary manuals and documents, including submission of I/O List, loop diagram, logic diagram, specification / data sheets and other necessary drawings in printed and electronic medium for approval of Purchaser in multiple sets.

5.15 The Bidder shall supply necessary hardware and software for the automation as per requirement and control philosophy proposed. Bidder shall submit the detailed automation system configuration without deviating the basic configuration and the functional requirement.

5.2 AUTOMATION SYSTEM

Microprocessor based Distributed Control System (DCS) shall be used for centralized operation of the plant. The DCS system offered shall have open architecture and shall use common engineering tool for operator station, automation system, communication system, engineering system and I/O. Sub systems are integrated together with standard & proven networks with fully optimized & standard open protocols. All the components shall use single database.

Scalability: The offered system should be suitable for future expansion. Comprehensive self-diagnostic features shall be provided to facilitate easy fault location and detection of failure without individually checking each module. On-line testing facility of control system while the unit is in operation, shall be provided with suitable indication for easy identification of faulty module.

The process / final control element interface section shall comprise of various signal interface cards suitable for digital communication with intelligent / smart field devices, distributed I/O stations, local control panel, intelligent actuator/ sensor, frequency drives and standard Motor Control System.

Sensors will be checked for open and short circuit conditions. Failure of sensor/ transmitter shall not lead to malfunction of the corresponding control system.

5.3 SEEVER

Quantity: 1 No.

Server will store all the relevant information from the DCS and all networked computers connected and shall generate the MIS reports. Necessary RDBMS software either ORACLE or
SQL Server ad D2K or Visual Basis as front end shall be considered for data storage and MIS reports generation.

5.4 HUMAN MACHINE INTERFACE (HMI) OPERATOR STATION PC

Quantity: 2 Nos.

Each monitoring / control terminal shall be fully capable of addressing any plant data thus, will function as a single window for operation and monitoring. Each terminal shall be independent with its support hardware including adequate local memory for resident database to reduce data traffic through the highways. The resident data will be continuously updated at all terminals. 22” wide screen colour TFT LCD panels of resolution 1680 X 1050 @ 60 Hz shall be connected to HMT PCs. The H:MI software shall support Multi Screen Technology and PC’s shall consist of Key Board, mouse, and graphic and report Printers and necessary hardware & software.

All the Personnel Computers other than OS PCs shall have 19” color TFT – LCD display panels of resolution 1280 X 1024 @ 60 Hz. All the PCs shall have latest configuration (with Core 2 Duo 2.0 GHz or higher Processor) at the time of ordering.

5.5 WIGHBRIDGE PC

Quantity: 1 No.

Weighbridge shall be connected to this PC via. RS232C port and will read the weights from the load cell transmitter and will freeze the value into the corresponding fields. Necessary driver software will be developed for communication between weighbridge transmitter and the computer. System shall generate the weight slip in a specified format, which forms the basis of payments. If there is failure in weighbridge communication the operator can manually enter data declared value or weighbridge local display. Only after tanker entry is completed the data will be transferred to file server, before going to unloading bay weighbridge operator will give unloading slip for tanker driver with a unique number generated by system. The driver after unloading must get final printout indicating the milk quantity unloaded along with the process parameters.

5.6 RECEPTION LABORATORY PC

Quantity: 1 No.

Reception Lab PC will be located in Reception Laboratory and will be connected on same network. Two instruments (Milko-Scan and Acidometer) are connected to this PC via. RS232C port for analysis of Milk. Necessary driver software have to be developed for connectivity of these instruments via. RS232C port. Manual data entry of various test results is also possible in case communication fails between computer and instruments.

Once operator inputs the value and gives analysis command for the particular product code, values read from instruments are compared with the limit setting. This record will then be saves along with the warning if any. The remarks will appear in the report. Only after test results are completed, the data will OK the Sample. OK will appear against the remark column, else warning will be given. Remarks given by manager shall be transferred to file server.

5.7 BUTTER & GHEE DISPATCH PC

Quantity: 1 No.

Dispatch PC will be located in dispatch doc and will be connected on same network. This will be manual data entry terminal. All the dispatch report and schedules will be generated here.

5.8 STORES PC

Quantity: 1 No.

Stores PC will be manual data entry terminal located in stores room and will be on same Network. Terminal will be used for stores items inventory purpose and report generation.

5.9 MAIN LABORATORY PC
Quantity: 1 No.

Main Lab PC will be located in Main Lab and will be connected on the same network. Two instruments (Milko Scan and Acidometer) are connected to this PC via RS232C port for analysis of Milk. Necessary driver software is to be developed for connectivity of these instruments via RS232C port. Manual data entry of various test results is also possible in case communication fails between computer and instruments. This PC shall be used to generate analytical information of the Milk and Powder in all storage tanks in the Plant. All these data shall be transferred to file server for report generation.

5.10 LIQUID MILK PACKAGING DESPATCH PC

Quantity: 1 No.

Liquid Milk packaging & dispatch PC will be located in milk dispatch office and will be connected on the same network. This will be manual data entry terminal. All the dispatch report and schedules will be generated here.

5.11 UTILITIES PC

Quantity: 1 No.

This PC shall be located in central control room and shall be used to view information related to HT / Power, Refrigeration, Boiler etc by picking up them from respective automation system.

5.12 ADMINISTRATION BLOCK PC

Quantity: 2 No.

These PCs shall be located in Administration block (one at GM Room / Conference room and one at MIS server room). This shall be used to view information related to process. Administration PC shall be able to see all the screens of process, plant information data like ON/Off status of different sections, critical parameters of process of different sections without any rights to control. Graphics depicting process information along with data (read only) and MIS data shall be made available on Administration PC.

5.13 PRINTERS

Laser Jet B/W suitable for A4 - 1 No. LaserJet Colour suitable for a4- 1 No.

Dot Matrix 132 column- 5 Nos. (lab, weigh bridge, stores, dispatch, milk packaging)

5.14 NETWORK HARWARE

Fiber Optic Cable- 1 Lot UTP/ STP Cables- 1 Lot Switches – As required.

5.15 SYSTEM SOFTWARE

The system software will preferably be based on open architecture and shall support minimum 32 bit processing platform. For network TCP/IP or ISO- OSI model will be in use. It shall be latest object oriented software, which result in fully scales of software shall be used. The system shall support Client Server Architecture with Fiber optics as a backbone.

5.16 MIS SOFTWARE

This shall be based on REBMS software. Following minimum reports are envisaged from the system. Necessary forms to be developed on the network PC’s for entering the data. All the reports shall be developed after the discussion with the customer, however following minimum reports are to be considered for development.

- Weighbridge reports.
- Milk analysis report
- Milk Reception report.
- Milk Transfer report.
- Utility consumption report.
- CIP log report.
- Milk production report
- Milk Packaging & Dispatch report
- Steam generation & consumption
- Refrigeration generation & consumption report.
- Solid Loss report to ETP.
- Power consumption (section wise)
- Water consumption
- CIP chemicals consumption.
- Maintenance Report.
- Lab reports.
- Inventory report of the plant.
- Packing material inventory, wastage and consumption report.
- Stores Materials Inventory Report.

Requirement of maintenance of pneumatic valves, cleaning of PHE, separator & other equipment shall be indicated with alarm in the report with time and date. The detailed maintenance report shall be developed based on the customer requirement during the detail engineering.

5.17 CONTROL DESK / CABINET

The design of all console / panels / cabinets and layout shall be based on human engineering considerations, fully keeping in view the convenience of operation and maintenance personnel. Operator’s Consoles shall be free-standing type. All keyboards and other cursor control devices will be mounted on the horizontal part of the console. The monitors will be mounted on the raised part of the console.

All system modules, power supply components as required for completeness of the systems shall be housed in System cabinets. The cabinets shall be totally enclosed free-standing type equipped with full height front and rear doors. Cabinets shall be designed for front access to system modules and rear access to wiring. The cabinets shall be, in general, designed for bottom entry of cables and shall have non-welded construction only.

Constructional Features: Modular steel internal Structure. Wood /metal work surface Powder coated MS structure Under Counter Keyboard trays Slide out CPU shelves Footrest.

Telephone mounting shelves
Binder storage
Under counter pencil trays
Printer table
Revolving Chairs (with back tilting arrangement) one for Each PC

6.0 CONTROL PHILOSOPHY

1.0 Reception:

1.1 The system shall check following interlocks at various stages before the control room operator can start reception sequence by pressing start button from menu. The silo selection button shall be available only if all the conditions given below are satisfied for a particular silo. For easy understanding, the silo status (i.e. manhole open/high level or silo in use) shall be displayed in the menu instead of the button.
1) Signal is available from Manhole proximity
2) High level is not present
3) Tanker reception from any reception bay to the silo is not ON
4) End flush from tanker bay to silo is not ON.
5) CIP of selected raw milk silo is not ON
6) Dispatch to tanker from selected raw milk silo is not ON.
7) Dispatch to pasteurizer from selected raw milk silo is not ON
8) Silo to Silo transfer from/ to selected raw milk silo is not ON
9) Rinse milk, butter milk transfer to the silo is not ON
10) Recover line to the silo is not ON
11) End flush from cream storage tank to the silo is not ON

After silo selection is done, Go Ahead button shall be available only if following conditions are satisfied.

1) System Enable switch is ON.
2) Request for tanker unloading is available from respective reception bay.
3) Lab acceptance is available to unload the tanker or the MIS bypass is available from respective menu (MIS bypass can be done managerial pass work in case of failure of MIS or PC)
4) CIP of tanker reception line is not ON.
5) The reception sequence is in Auto mode.
6) Signal is not available from proximity of CIP /End flush line. (To ensure that the hose is not connected to CIP /End flush line in tanker reception bay)

1.2 The control room operator shall enter following in to Tanker reception Menu.
- Silo number in which the milk is to be received
- Initial Flushing required or not and Initial Flush time if flushing required
- Go ahead signal.
- Start the reception (This is optional as the start /stop is done by the reception bay operator)

1.3 The system gives following indication on respective PV station as well as PB station.
- Ready to start
- TR bay operator can do the sequence start /stop, from respective PB station or the control room operator can do the same from menu. The TR bay operator checks for hose connection etc. and starts the unloading process by pressing Start button on PB station.

1.4 First of all the system opens chilled water valve in reception chiller and checks for chilled water flow OK signal i.e. Flow switch signal and chilled water valve open feedback, both should be available. At the same time it opens milk inlet valve to the start stop unit.

1.5 If the flow OK signal is available sequence immediately goes to the next step. But if the signal is not available in 20 sec., sequence gets terminated and following alarm message is flashed on OS and PVS. @ CHILLED WATER NOT AVAILABLE IN RECEPTION CHILLER

1.6 If flow switch signal is available, open-air release valve, check for signal from level switch in the de-aeration tank. The air release valve remains open for 5 seconds after the signal is available from level switch. This is to avoid any air lock in reception pump during start-up. If the signal is not available from level switch after 30 sec., no further steps are executed, sequence gets terminated and following alarm is displayed on OS and PVS @ TR BAY: AIR LOCK / TANKER VALVE NOT OPEN /HOSE NOT CONNECTED.

1.7 System Starts unloading pump, and Checks for following feedbacks Pump On feed back and Valve close feed back
If OFF feedback from the valve or start feedback from the motor is not available in present time, system display AIR RELEASE VALVE OPEN or fail to start for the motor on OS & PVS and terminate the sequence.

Following description is with selection of tanker reception bay 1 and silo 1. Only valve number and motor number changers with different bay selection and silo selection, process remains same. As per design, any raw milk silo can be loaded from any bay.

1.8 If initial flush is selected and Initial Flush time is not zero, Open flushing valve in raw milk silo valve cluster, Wait till Initial flush time set by the operator is elapsed Close flush valve.

1.9 If Initial Flush time is elapsed OR initial flush is not selected OR Initial Flush time is zero, system checks if close feedback is available from flushing valve, Close F/b is available then, Ready to start indication is OFF Running indication on TR panel is ON, Open silo- loading valves.

1.10 If OFF feedback is not available from flushing valve in present time, system displays on OS & PVS @ TR BAY: FLUSHING VALVE OPEN
Terminate the sequence (If this valve is not closed properly, milk may get drained.)

-STEADY STATE –

1.11 System checks for following terminating conditions, at various stages, after start button is pressed from menu.
1) More then one silos are selected from menu or none of the silos are selected.
2) Start-stop unit Level low during initial start-up for 30 seconds (indicates air lock in system, tanker outlet valve not opened or hose not connected to tanker)
3) Start-stop unit Level low after start-up, steady state condition (switch signal goes OFF), which means the milk is over either in the tanker or in a compartment)
4) Stop signal from CCR or from TR bay
5) Chilled water OK signal is not available continuously for 20 seconds
6) Hose not connected to tanker (flushing/CIP proximity signal is available) during start-up phase.
7) High level in selected silo
8) Alarm for any of the valves or pumps during or after start-up System terminates the sequence immediately, gives respective alarm on OS and the sequence goes in to complete /finished state.

-COMPLETE-

1.12 Once the sequence reaches Complete /finished status, following indications are flashed on PV and PB stations.
Running indication is OFF
Finished indication is ON
The finished indication remains ON for 30 seconds, after which, the sequence can be restarted as described above. After the unloading is over, the tanker goes to record Tare weight data on weighbridge. This completed the tanker reception process and one transaction in MIS system. Net weight is logged in the MIS through weighbridge data: additionally flow meters give continuous data in RS Vies.

Note: The line Enable lockable selector switch is given to prevent any unauthorized access to the PV station. If the same is kept in OFF condition, the reception process will not reach ready to start status.

The Stop push-button placed on PB stations can be used as an emergency stop button to terminate the process in case of emergency. The process can be restarted again as the steps described above.
2.0 Processing:

2.1 Following controls shall be possible to be made from the OS

<table>
<thead>
<tr>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Separator On</td>
</tr>
<tr>
<td>2) Separator OFF</td>
</tr>
<tr>
<td>3) Product On</td>
</tr>
<tr>
<td>4) Product OFF</td>
</tr>
<tr>
<td>5) CIP On</td>
</tr>
<tr>
<td>6) Standardization ON/OFF</td>
</tr>
<tr>
<td>7) Circulation / Failure</td>
</tr>
<tr>
<td>8) Clarification</td>
</tr>
<tr>
<td>9) Perform Overflow/ Total dislodging</td>
</tr>
<tr>
<td>10) Perform partial dislodging</td>
</tr>
<tr>
<td>11) Reset alarms</td>
</tr>
<tr>
<td>12) Feedback product pump</td>
</tr>
<tr>
<td>13) Milk Set point</td>
</tr>
</tbody>
</table>

Messages from Separator PLC

<table>
<thead>
<tr>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Separator On/OFF</td>
</tr>
<tr>
<td>2) Separator Standstill</td>
</tr>
<tr>
<td>3) Product Start-up</td>
</tr>
<tr>
<td>4) Ready for Operation</td>
</tr>
<tr>
<td>5) Separator Emergency Stop</td>
</tr>
<tr>
<td>6) Separator Slow down</td>
</tr>
<tr>
<td>7) Partial dislodging</td>
</tr>
<tr>
<td>8) Total Dislodging</td>
</tr>
<tr>
<td>9) Separator product</td>
</tr>
<tr>
<td>10) Separator CIP</td>
</tr>
<tr>
<td>11) Separator Overflow</td>
</tr>
<tr>
<td>12) Milk Standardization ON/OFF</td>
</tr>
<tr>
<td>13) Product Pump</td>
</tr>
<tr>
<td>14) Failure separator start- up</td>
</tr>
<tr>
<td>15) Failure speed drop</td>
</tr>
<tr>
<td>16) Failure Deseeding</td>
</tr>
<tr>
<td>17) Failure operating Water</td>
</tr>
<tr>
<td>18) Failure control Air</td>
</tr>
<tr>
<td>19) Failure speed max</td>
</tr>
<tr>
<td>20) Failure Analogue Input speed</td>
</tr>
<tr>
<td>21) Failure Analogue Input Current</td>
</tr>
<tr>
<td>22) Bowl Speed</td>
</tr>
<tr>
<td>23) Motor Current</td>
</tr>
<tr>
<td>24) Milk-Fat actual value</td>
</tr>
<tr>
<td>25) Actual valve feed inlet</td>
</tr>
</tbody>
</table>

2.2 The system shall check following interlocks at various stages before the control room operator can start milk- processing sequence by pressing start button from menu.
2.3 The silo/tank selection buttons shall be available only if all the conditions given below are satisfied for a particular silo/tank. For easy understanding, the silo status (i.e. manhole open/high level or silo in use) is displayed in the menu in place of the button.

Raw milk silo button visibility conditions

1) Tanker reception from any reception bay to the silo is not ON
2) End flush from tanker bay to silo is not ON
3) CIP of raw milk silo is not ON
4) Dispatch to tanker from raw milk silo is not ON
5) Dispatch to pasteurizer from raw milk silo is not ON
6) Silo to Silo transfer from/to raw milk silo is not ON
7) Butter Milk transfer to the silo is not ON
8) Rinse milk transfer to the silo is not ON
9) Cream transfer to the silo is not ON
10) End flush from cream storage tank to the silo is not ON
11) Low level is not there is raw milk silo
12) Silo is not selected In other milk process

Processed milk silo button visibility conditions

13) High level is not there in processed milk silo
14) Manhole should be closed of processed milk silo
15) CIP of processed milk silo is not ON
16) Dispatch to tanker/powder plant from processed milk silo is not ON
17) Milk process to processed milk silo is not ON
18) Silo to Silo transfer from/to processed milk silo is not ON

Cream tank button visibility conditions

19) High level is not there in selected cream tank
20) CIP is not ON in selected cream tank

Start button visibility conditions

2.4 The CCR operator selects following parameters from milk Processing menu.

2.5 Raw milk silo selection 1, 2, or 3)
Processed milk silo selection (4, 5, or 6)
Processed milk silo second preference (4, 5, or 6)
Process milk tank for packaging (1 or 2)
Process milk tank for packaging second preference (1 or 2)
Cream tank selection (1, 2 or 3)
Cream tank second preference (1, 2 or 3)
Initial Flush in milk line required or not
Milk Initial flush time if Initial flush selected

Initial Flush in cream line required or not
Cream Initial flush time if Initial flush selected
Pasteurization temperature set point Separator milk
Temperature set point Milk diversion set point
Chilled milk outlet temp. Limit
Speed selection of balance tank pump
Speed selection of booster pump
Start the process
2.5 Following example is with selection of raw milk silo-1 and processed milk silo-4. The process remains same for the selection of any raw milk silo and any processed milk silo, only loading unloading valve number changes.

When start button is pressed, system starts following
Start PID loop for milk heater
Start PID loop for separator milk heater
Start hot water pump
If the feedback of hot water pump is available
Open chilled water valve
Check for the signal from flow switch

If the signal is available, sequence goes to next step immediately. If not available in 20 Sec., sequence gets terminated and following alarm is flashed on OS.

@MILK PROCESSING: CHILLED WATER NOT AVAILABLE IN PASTEURIZER-1 (or 2 as selected)

1. Open raw milk silo unloading valves.

The system always keeps track of milk balance tank level so that the milk does not overflow from the balance tank and at the same time adequate milk supply to the process is maintained. Following steps are executed during start-up as well as after steady state.

If low level signal is available from level controller, Open valve, Start pump.

If high-level signal is available from level controller, Close Valve, Stop pump.

If feedback is available from valve Start pasteurizer pumps, at the speed selected in the men. Open cream line valve.

2. If feedbacks are available from pumps and valve steps a and b are simultaneously started.
   a. If Milk initial Flush is selected and Initial Flush time is not zero,

Open valve

After the set time is elapsed, close valve, wherein pasteurizer diversion time is excluded.

If OFF feedback is not available in preset time, system displays on OS @ MILK PROCESSING; MILK FLUSHTING VALVE OPEN
Terminates the sequence.

   b. If Cream initial Flush is selected and Initial Flush time is not zero.

Open valve.

If valve fail to open, alarm for respective valve on OS and terminate the sequence

After the set time is elapsed, close valve pasteurizer diversion time is excluded.
If OFF feedback is not available in preset time, system displays on OS

@MILK PROCESSING: CREAM FLUSHING VALVE OPEN

Terminate the sequence.

3. Step a and b are executed parallel. If cream flushing time is less, step b is executed before a.
   a. If Milk initial flushing is not selected or Initial flush time is zero or Initial flush time is elapsed.
      Open silo loading valves,
   b. If Cream initial flushing is not selected or Initial flush time is zero or Initial flush time is elapsed.
      Open cream tank loading valves,

System checks for the feedbacks of following valves, if available, reach to steady state.

If Homogenization is required it has to be started from a separate menu. Clicking the homogenizer graphic pops-up start/stop menu. Homogenizer can be started and stopped any time during process, as there is a bypass route that always remains open. When started, homogenizer takes the milk from the line, as it is a positive pump.

-STEADY STATE-

4. System checks for following signals as terminating conditions,
   1) Low level in selected raw milk silo and time delay of 240 Sec. is elapsed (as the low level probe is be installed slightly higher than the bottom of the silo, some amount of milk will remain there even if the instrument doesn't sense it. If unloading is On, certain time delay has to be given by the system before stopping the sequence to remove this milk.)
   2) High level in second preferred processed milk silo
   3) Chilled milk outlet temperature above set valve
   4) High level in second preferred cream tank
   5) Chilled water is not available for 20 Sec.
   6) Alarm from any of the valve or pump started during sequence.
   7) Product pump signal is not available from separator
   8) Stop signal from milk processing menu.

Note: If second preference is not given for silo or cream tank, sequence will be terminated at the high level of selected silo or cream tank.

In case any of above signal is available, relevant alarm is flashed and the sequence is terminated, all the selections are reset.

- COMPLETE-

There are three PID loops in this sequence. Brief description about the functioning of these loops is given below.

1.6.1 Main milk beater loop (in cascade control): - Milk is not heated directly by steam but, water is heated by steam in the PHE (pasteurizer) and subsequently it is used to heat-up the milk to the pasteurization temperature. The hot milk temperature value (process variable) is checked after holding, the hot water temperature is also measured after heating for control purpose. The final control element is PID valve in the steam line. The temperature set point is given in milk processing menu. Actual milk temperature is compared with milk heating set point given in process menu. The output generated by this first loop is used as the set point for second loop. The second loop process value is hot water temperature after getting heated by steam. The difference is compared and the steam PID is operated accordingly. Before starting the loop, it has to be ensured manually that hot water balance tank is completely filled with water. Any lapse in ensuring
the same may result in improper pasteurization or leakage in steam heating side of pasteurizer due to continuous steam injection.

When the milk processing sequence and PID loops are put in to manual mode, the PID valve can be operated directly by giving output from 0-100%

1.7 Separator milk heater loop: The inlet milk temperature to the separator should be between 45-55 deg. C in order to get best standardization. As per the PHE design, the temperature of milk going to separator remains between 50-55deg C. therefore this loop is not activated normally. The final control element of this loop is a three- way valve, which is placed in the hot water line after main milk heater. This three-way valve remains fully open in the main heater side. But when the milk temperature reduces from set valve (54deg C app.), this valve opens and allows hot water flow in separator milk heater side until eventually the set point is reached.

1.8 Balance tank pump speed control: The process value is taken from separator flow meter installed after balance tank. The speed set point is given from milk processing menu. The final control element is balance tank pump Based on comparison of set point and actual flow, the frequency of balance tank is changed which intern changes. The speed of pump and maintains flow. During milk processing, sterilization and recovery the speed set point is taken from menu whereas during CIP the pump is run at maximum speed.

1.9 Booster pump speed control: From the milk processing menu, the speed of pump can be changed from 0 to 100% by changing the frequency from 0 to 50Hz. Normally the speed is kept 100% in all process and CIP.

One more important aspect of milk processing sequence is that it diverts the milk back for re-heating if the heated milk temperature goes below milk diversion set point entered in process menu. The diversion valve opens and diverts the milk to balance tank the valve closes and allows the milk into forward path only when actual temperature reaches diversion set point value plus the one °C.

Note: The philosophy given above is for general guidance. The requirement for cream pasteurizer lines are also to be considered similar to that of milk processing lines with necessary checks and controls.

7.0 TECHNICAL REQUIREMENTS

1.0 General

All equipment, system and accessories furnished shall be from latest proven product range of established / reputed manufacturers and shall conform to applicable national and international standards.

The design of various control systems and related equipment shall adhere to the principle of failsafe operation implying that lose of signal, loss of power supply or failure of any component will not lead to hazardous conditions, while at the same time, prevent occurrence of false and unrelated trips.

All the instruments should be suitable for digital communication with proven Field bus technology.

1.1 Climatic Condition

The instruments / control system shall be suitable for environmental conditions that are normally encountered in utilities in India. All equipment / system / sub-system etc. shall be fully tropicalized.

Ambient Temp. 55 deg C
1.2 System Power Supply Condition

For applications requiring AC power, 240 V AC, 50 Hz uninterrupted power supply shall be made available by supplier from UPS complete with voltage and frequency regulators.

The 10 KVA True Online UPS should be considered for DCS power supply. On total failure of the incoming A.C. supply to the plant, sufficient battery back-up has been envisaged to allow all control and instrumentation equipment to operate for at least 30 minutes to allow safe shutdown of the plant.

24 V DC power supply shall be used wherever applicable for Control System and will be derived from UPS. Any other voltage level required for the system shall be the responsibility of the Bidder along with required hardware.

Control & Instrument (C&I) equipment furnished shall incorporate necessary techniques for protection against electrostatic discharge and radio frequency interface, as per international codes and standards.

Safety earthing and C&I System earthing shall be separate. Safety earth bus shall be connected to main plant earth pit. Separate earth pit's shall be provided for system earth bus (electronic earth) Electronic earth shall be cabled directly to the corresponding earth bar.

All instruments shall have clear access for maintenance, removal, lay- down, calibration etc.

All readable instruments shall be clearly visible unassisted.

Access platforms shall be provided for easy access of instruments, valves and actuators. All prefabricated plugged cables, power supply cable for Bidder’s System.

System Cabinet, Marshalling Cabinet and Power Supply Cabinet to fulfill the system requirement

Power Distribution Cabinet for extension of power supply to field instruments

2.0 Sanitary Pneumatic Seat Valves

Type: Two way / three way pneumatically operated sanitary valves of mix-proof (safe flow), On-OFF seat valves, flow diversion valves etc. types.

Mix proof valves are with basic external cleaning version
Material: AISI 304
Sealing: Positive
Controls: Electrically or electronically operated integral

The Pneumatic valves shall have the following features to cater to fulfill the above functional requirements:

Housing shall be ball shaped for the ideal flow characteristics to ensure 100% clean ability by CIP. Housing closed by covered by cover plates should not create a sump or dead corners. Housing interconnections shall be by detachable type clamp connection. The seals such as housing seals, stem seals and disc seals shall be flush mounted.

Digital valve petitioners shall be suitable for two way digital communication based on Field bus technology, this shall ensure real time notification of current and potential valve and instrument problems.

Valves shall have low/ very low susceptibility for the pressure surge. Valve shall have the short leakage outlet to recognize the leakage immediately.
Valve shall have open lantern installed between the actuator and the product area of the valve to assure that leakages occurring at the stem seal shall be immediately visible and also shall act as a protection against overheating of the actuator.

Mix proof valves shall be used wherever the CIP and the process liquids are inter-crossing in the piping system. The CIP of the isolation area is possible and also the leakage shall be easily identified.

3.0 Field Instruments, Control Valves and Accessories.

2.6 General

Field Instruments shall be suitable for area in which these are located. In general, field instruments shall be weatherproof, dust tight and corrosion resistance with Protection Class IP-65. Field instruments shall be suitably mounted, supported and terminated in local junction boxes.

Die cast aluminum or stainless steel casing shall be used as case material in general.

Dial size for all pressure and temperature gauges shall be 150 mm and any lower size selection specific to the application shall be subject to the Purchasers approval.

In general the minimum accuracy of the instruments shall be as below:

Electronic transmitters: +/- 0.15% of FSD:

Pressure & temperature gauge: +/- 1.0% of FSD; Conductivity analyzer: +/- 0.25% of FSD:

Level gauges: +/- 5.0 mm of the reading;

The repeatability of pressure, temperature, level and flow switches shall be +/- 2.0% of FSD.

Temperature stub to be welded on process pipe / vessel and shall match with thermo well process connection and size. Thermo well shall be drilled out of bar stock and the length & construction shall comply with process requirement / relevant standards. Material of construction of thermo well shall be SS 316 suitable for the applications.

The cable inlet at the instruments mounted on the plant will have a female threaded connection for protection pipe with nominal diameter ½” NPTF.

The instruments pneumatic connections will be ¼” NPT female.

All field instruments / equipments shall be provided with stainless steel (SS) tag plates with engraved tag no. and service description. The tag plate shall be secured to the instrument / equipment with SS chain.

2.7 Process transmitters: 1 Lot

All the Process Transmitters shall be based on Field bus technology ad shall support serial, two way digital communication system. Transmitters shall be provided with local Digital Indicator.

Measuring ranges of transmitters shall be selected in such a way that the rated valve of the measuring variables appears at approx. 50-70% of the span.

The sensing elements and internal parts shall be constructed with AISI 316. In case of stock and corrosive fluid application, diaphragm seal type transmitter with capillary is foreseen.
Transmitters shall generally be installed on Instrument Stands made of 2" SS pipes located at convenient points.

3.3 Process gauges: 1 Lot

Process gauges shall be provided for local indication on all utility lines. Pressure gauge sensing element shall be Bourdon / Bellow / Diaphragm type in general depending upon the process condition. Direct reading Pressure / Differential Pressure gauges shall be used of SS 316 sensing element and AISI 304 movement material.

Local temperature measurement shall be done bi-metal Temperature gauges. Temperature gauges may be direct mounted type (multi-angle) or with SS capillary extension (at least 3 Mtrs) as per the application area.

The sensing element / bulb / capillary etc. shall be of SS 316 for temperature gauges.

3.4 Temperature elements: 1 Lot

All Temperature Sensors Elements shall be of Duplex type with SS 316 sheath and MgO filled. Depending on temperature ranges, Pt-100 Resistance Temperature Detector (RTD) or thermocouple shall be used.

Thermocouple / RTD heads, with chain holder, shall be of the waterproof type, with duplex terminal block, casketed cover and stainless steel chain. Screwed covers shall be use.

3.5 Process switches: 1 Lot

Local switches for pressure, differential pressure, temperature, level etc. shall be blind type and shall be suitable for Field bus communication.

Set points shall be adjustable throughout the range. Switching differential shall be adjustable.

3.6 Flow Elements: 1 Lot

Measurement of flow for clean fluids and employing differential pressure principles, flow nozzles or concentric square edge orifice plates shall be provided. All flow element calculation, design and construction shall be based on BS/ ASME standard.

Beta ratios (d/D) for flow nozzles and orifices shall not be less than 0.5 and not more than 0.70.

Flow nozzle and flow orifice plates shall be 316 stainless steels. Accuracy of the primary element shall be plus or minus 0.25% or better.

3.7 Magnetic flow meter: 1 Lot

Magnetic flow meters shall be true smart type with Field bus output. The flow tube material shall be of AISI 304 with PTFE lining. The electrode material shall be SS 316L depending upon process condition. In general, SMS type process connection may be used for magnetic flow meters.

Accuracy of magnetic flow meter shall be plus or minus 0.5% of flow rate or better.

Local digital flow rate as well as totalize display shall be provided.

Earth ring SS 316 shall be provided for proper grounding of mage flow meter.

3.8 Mass flow meter: 1 Lot
The Mass flow meter envisaged shall be Carioles' straight tube type. The electronics part shall be microprocessor based. The Mass flow meter shall be capable of measuring mass flow rate. Density, temperature, volumetric flow rate and totalized flow.

Mass flow meters shall be true smart type with Field bus output. The flow tube/ wetted parts material shall be SS 316 / SS 316L or as per the requirement of process fluid. SMS type process connection may be used for mass flow meters.

Accuracy of Mass flow meter shall be plus or minus 0.2% of flow rate or better. Digital display of mass flow rate, density, temperature, volume flow rate as well as totalized flow shall be provided.

3.9 Level instrument: 1 Lot

Flange mounted diaphragm seal type level transmitters shall be used for level measurement on tanks. The wetted parts shall be of SS 316 or suitable material to suit process fluid. The process connection with the tank / vessel shall be 3" flanged.

For clean liquid, water, condensate service etc.(Other than milk applications) normal differential pressure type level transmitters shall be used.

Level gagesues shall be of the reflex / transparent / tubular type as per the application area and made of stainless steel and fitted with toughened borosilicate glass Each gauge shall be fitted with top and bottom- isolating valves with full bore drain valve at the bottom and plugged vent a the top. Flanged connections, rated same as the vessel, shall be use. Gauges shall be arranged so that the visible length is in excess of the maximum operating range.

Displacement / float type instruments and switches shall be mounted in external cages with flanged connections, rating same as the vessel. This type of instrument shall not be used for applications involving viscous, corrosive or flashing liquids. The cage material shall be carbon steel in accordance with vessel material and the float shall be of 316 SS. Drain and vent shall be provided on the cage.

3.10 Conductivity analyzer: 1 Lot

The conductivity analyzer may be installed on line or at a distance connected by sampling line. The necessary mounting of analyzer electronic unit shall be taken care suitably. The process connection shall be SMS type.

The conductivity analyzer shall be microprocessor based. The electrode and cell material shall be of SS 316.

Automatic temperature compensation shall be provided with the analyzer.

The meter shall be Field bus compatible.

Special cable for connection between electrode and transmitter.
3.11 **LIST OF MAJOR INSTRUMENT**

The following list of instrument is suggestive only the bidder shall provide all the necessary instrument as per the requirement of process and automation.

<table>
<thead>
<tr>
<th>Item</th>
<th>Location</th>
<th>Qty</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow meters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow meters</td>
<td>Raw water header</td>
<td>1</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Soft water header</td>
<td>1</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Chilled Water header</td>
<td>1</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Steam header</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass Flow Meter</td>
<td>Processed milk silo to powder plant UHT Plant / Dispatch</td>
<td>1</td>
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</tr>
<tr>
<td></td>
<td>Cream transfer to butter section</td>
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</tr>
<tr>
<td></td>
<td>Tanker reception line- Milk</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Magnetic flow meter milk pasteurizer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow Meter</td>
<td>Fuel oil flow meter for FO line</td>
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<tr>
<td>Level transmitters</td>
<td>Milk silos</td>
<td>6</td>
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</tr>
<tr>
<td></td>
<td>Bulk lye and acid tanks</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Cream ripening tanks</td>
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</tr>
<tr>
<td></td>
<td>Pasteurized Vertical Milk Storage Tanks</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>HMST (milk pouch packaging)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Butter milk tank</td>
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<td></td>
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<tr>
<td>Conductivity Sensors</td>
<td>Process CIP Acid and lye tanks</td>
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</tr>
<tr>
<td></td>
<td>Tanker CIP Acid and lye tanks</td>
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</tr>
<tr>
<td></td>
<td>Process CIP return lines</td>
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<td></td>
<td>Tanker CIP return lines</td>
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<td></td>
<td>Rinse recovery line</td>
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<tr>
<td>Temperature Indicator</td>
<td>Milk silos</td>
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</tr>
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<td></td>
<td>Cream ripening tanks</td>
<td>3</td>
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</tr>
<tr>
<td></td>
<td>Past. Water storage Tank</td>
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</tr>
<tr>
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<td>Past. Vertical Milk Storage tank</td>
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</tr>
<tr>
<td></td>
<td>Past. Hor. Milk Storage tank(packaging)</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Butter milk storage tank</td>
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</tr>
<tr>
<td></td>
<td>Rinse milk storage tank</td>
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<td>No</td>
</tr>
<tr>
<td></td>
<td>Intermediate Milk tank (packaging)</td>
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<td>No</td>
</tr>
<tr>
<td></td>
<td>BM Vat</td>
<td>1</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Ghee boiler</td>
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<td>No</td>
</tr>
<tr>
<td></td>
<td>Ghee settling tank</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Ghee storage tank</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td>Level switch-</td>
<td>CIP tanks (Process and tanker CIP)</td>
<td>18</td>
<td>No</td>
</tr>
<tr>
<td>Float type</td>
<td>Underground water sump</td>
<td>4</td>
<td>No</td>
</tr>
<tr>
<td>Level switch-</td>
<td>De aeration tank</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td>Tuning fork type</td>
<td>Milk silos</td>
<td>6</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Pasteurized Vet Milk Storage Tanks</td>
<td>2</td>
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</tr>
<tr>
<td></td>
<td>Pasteurized HMST (pouch packaging)</td>
<td>2</td>
<td>No</td>
</tr>
</tbody>
</table>
3.0 MAJOR RESPONSIBILITIES OF BIDDER

3.1 Responsibilities of bidder

It is not the intent of these technical specifications to specify completely all details of design and fabrication of any plant/equipment, nevertheless, the equipment shall confirm in all respects to high standards of engineering design & workmanship and be capable of performing in continuous commercial operation up to agreed performance standards in a manner acceptable to the Purchaser/client.

The Purchaser/client will interpret the meaning of various equipment specification and drawings and shall have the power to reject any material/equipment which in their opinion is not in full accordance to tender specifications.

The successful Bidder shall be responsible to undertake all work involved in implementing the project. This shall include but not limited to design, manufacture, supply installation and commissioning of the entire project component including process equipment, process pipe-work, utilities equipment, services pipe-work, electrical equipment, power cabling instruments and controls, control cabling, pneumatics, and automation. Also all necessary supports, support structures, cable ducts, trenching, conduits etc. required to complete the installation and to meet the Client’s high standards are included. No exclusions of any nature are acceptable, other than those detailed in this Tender document to be in the supply of Client, or in the scope of one of the other Tender Packages.

In particular the Supplier shall be responsible for:

- Developing the process design, complete engineering design manufacture and/ or supply of all goods and services and ensuring best performance of individual equipment/system/process plant as a whole. The supplier shall avail the assistance of reputed specialists in their respective fields, wherever required.

- Development of Automation schemes, soft wares, interfaces etc. and their incorporation in the project to the entire satisfaction of the Purchaser/clients.

- Providing Client with technical data, technical literature. Production and service load calculations.

- Arranging for approvals from various statutory authorities on behalf of the client. The statutory fees shall be reimbursed by the client/ on production of receipts.

- First charge of oil, lubricants and consumables. First charge means that these items shall be replenished until the successful completion of product trials.

- Execution of the project in accordance with the prevailing Indian Standards, Indian Electricity Rules, Indian Boilers Regulations, Indian explosives Act, Indian Factories act, Indian Pollution Act and any other Act which may be relevant to the project and obtaining approvals thereof. Wherever Indian Standards are not available the bidder shall follow international Standards.

- Ensuring satisfactory performance and After Sales service of all items included in the scope.

- Test equipment, test kits, instrumentation & materials required for establishing performance parameters.

- Necessary man-power an tools.
Ancillary services like spares inventory, maintenance schedules, special tools/tackles etc.

Testing, commissioning and operation of the plant during production trials to the satisfaction of the Client. Performance guarantees with regards to the following:

Rates performance of section(s) and complete system(s)

Product quality standards conforming to the prevailing International Standards

Consumption of utilities section-wise and for the complete system

Training of clients personnel in use of the automation systems, plant operation and control, maintenance and repair of systems and equipment

**SELF CLEANING TRI PURPOSE CENTRIFUGE**

1.0 Functional requirement: It would be used as a separator/clarifier/standardize for milk at incoming temperature of approximately 45 deg. C to 50 deg. C.

2.0 Capacity: Cream Separation: 20,000 LPH and Standardization/Clarification: 25000 LPH (min)

   In case of fat separation by the centrifuge, the % of fat in the skim milk should not be more than 0.1%.

3.0 Sludge Discharge: The centrifuge should have automatic sludge discharge system with automatic control unit equipped with timers and other accessories required for this system. The self-cleaning bowl shall eject the accumulated solids from the sludge holding space of the separator bowl automatically at pre-selected time intervals through sediment ejection port at the bottom of the bowl by means of the hydraulically operated mechanism whilst the bowl is rotating at operating speed. The opening and closing of the sludge ejection port should be done by water, which should be controlled by the automatic control unit.

4.0 Cleaning-in-Place: The machine should be designed for Cleaning-in-Place and it should be possible to incorporate the same in the plant CIP system controlled by Programmable Logic Control. It should be possible to clean the separator with 2% lye and 2% nitric acid solution at about 90 deg C without any adverse effect on the metal or gaskets etc. All parts of the separator in contact with milk as well as outside the bowl, the inside of frame hood and the sludge discharge outlet should be cleaned perfectly without any manual labour.

5.0 Noise Level: The separator should be of such design that the noise level should be less than 80 dB A.

6.0 Drive: The drive for the centrifuge may be just under the centrifuge or mounted vertically by the side of centrifuge on a common frame and integrated together. The drive motor should be suitable for power connection of 415 V, 50 Hz, 3 phase AC supply should also include a Variable Frequency Drive (FFD) for smoother start and long life of the motor Transmission of power from the drive to Centrifuge machine shall be either through flat belt or gearbox.

7.0 Accessories:

   Cyclone of AISI 304-1 No.

   Lubrication system: Force-feed with gear type oil pump or splash type lubrication system-1 set.

   Controls: Fittings and controls to maintain required degree of standardization-1 set.
Flow Gauge: For continuous measurement of flow of milk and cream - 2 nos.

Pressure Gauge: For continuous measurement of discharge pressure of skim/standardized milk - 1 no.

Oil Pressure Gauge: For continuous measurement of lubricating oil pressure. - 1 no.

Tachometer: For continuous measurement of RPM of disc assembly. - 1 no.

Brake: It should be provided with manual brake for quick slow down of drum. - 1 no.

Gasket: The gasket should be of food grade rubber. It should be non-toxic, fat resistant and non-absorbent. It should have smooth surface.

Other Accessories: It should include regulating valve for skim milk outlet, shut-off valve for CIP and manual standardizing device. - 1 set.

SS Panel: The separator should be supplied with a SS remote control panel with push buttons and indication lamps for operation. Sludge discharge should be programmable. - 1 no.

8.0 Tools: Essential special tools should be supplied with the machine without charging any extra cost. - 1 set.

Note: Automatic standardization (Stand mat) is not envisaged. There shall be arrangement to fully/partially separate the milk and setting for the same shall be done manually. Suitable provision should be made for incorporating the automatic standardization unit (stand mat) in future.

**CONTINUOUS BUTTER MAKING MACHINE**

1.0 Functional requirements: Cream having fat content of 40-45% would be fed to the machine for continuous production of white butter at the rate of 800 Kg/Hr. The butter produced by the machine should comply with the latest ISI and Agmark standards.

2.0 The Churn: The churn should be made from stainless steel conforming to AISI 316. It should comprise of churning vessel, beater, washing device and header. The design should facilitate in place cleaning.

3.0 Drive: The machine should be complete with necessary drive built-in with easily removable cover.

4.0 Accessories

Cooling System: The chilled water-cooling system to maintain the desired temperature of cream during churning and working. - 1 set.

Control Panel: Pre-wired electrical control panel with electrical switch gears, push buttons etc for the entire system. - 1 set.

CIP System: Close circuit CIP arrangement should be provided in the machine. - 1 set.

Float Balance Tank: Stainless steel (AISI 316) float balance tank of 100L capacity for incoming cream complete with float cover & outlet with flanged plug type stainless steel (AISI 316) valve with complete union- 1 no.

Balance Tank: Stainless steel (AISI 316) balance tanks 100 litres capacity each for butter milk and butter wash water with covers and outlet with flanged plug type stainless steel (AISI 316) valve with complete union. - 2 no.
Legs: The balance tanks should have suitable stainless steel legs with stainless steel ball feet. The ball feet should have provision for height adjustment of 50 mm. - 4 no each.

Cream Pump: Positive displacement pump of suitable capacity with drive and accessories for cream delivery from float balance tank to the churning vessel. The pump should be provided with variable speed drive arrangement and pressure release valve. -1 no.

Centrifugal Pump: Suitable capacity pumps, one each for buttermilk and butter wash water. – 2 no.

Shovels: Sand blasted stainless steel (AISI 316) shovels for butter- 2 no.

5.0 Tools Essential special tools should be supplied with the machine without charging any extra cost.

**BUTTER TROLLEY**

1.0 Functional requirements: Butter trolley would be used for transportation of butter from one section to other within the dairy.

2.0 Design requirements

Capacity: 600 Kg.
Dimensions: Overall height (from ground level) and width of the trolley should not exceed 800 mm and 900 mm respectively.
Finish: All welding joints are to be ground smoothly. All stainless steel outer surfaces are to be shot blasted with oxide particles of 10 grits. Butter trolley inner side should be sand blasted with no. B grits particles.
Slope: Generous slope should be provided towards the outlet. Joint Curvatures: All inside corners should have minimum radii of 25 mm.
The Body: The main body should be made from minimum 2 mm thick stainless steel sheet conforming to AISI 316.

2.1 Accessories

Wheels: 200 mm diameter nylon wheels, of which front pair should be swivel type- 2 pairs.
Drain Nipple: Stainless steel drain nipple of 51 mm diameter and 75 mm length ending in a stainless steel blank end complete union. -1 no.

**BUTTER CARTON TROLLEY**

1.0 Functional requirements: It would be used for transporting butter cartons) (24 numbers if butter cartons) within the dairy

2.0 Dimensions: 850 mm length x 650 mm breadth x 1250 mm height.

3.0 Body: The body of transporter should be mild steel and the construction should be rugged. The whole body should be spray galvanized after fabrication.

4.0 Wheels: it should have four wheels in which two should be of swivel type.

**BULK BUTTER FILLING MACHINE**

1.0 FUNCTIONAL REQUIREMENTS

The butter bulk filling machine is required to fill 15 kgs. of butter in hard board cartoons.
3.0 DESIGN REQUIREMENTS

Capacity: 20 Cartons/hr

2.1 Filling Principle: The filling operation should be semi-automatic, i.e. the preformed carton will be placed under the filling head. The machine should fill 15 kgs. Of butter and come to halt till the filled carton is removed manually and an empty carton is placed. The filling of the carton should be by volume. The filled carton should be separated from the machine by butter cutting knife.

2.2 The carton will be pre-formed with all the four sides and bottom in closed position.

2.3 Finish: All the SS surfaces coming in contact with butter should be sand blasted. All non product SS surfaces should be finished to 150 grits. All MS surfaces should be hot dip galvanized after fabrication.

2.4 Accuracy: The filling accuracy should be plus minus 1% (one percent) by weight.

2.5 All parts coming in contact with butter should be made of AISI 304

3.0 SCOPE OF SUPPLY

3.1 Filling Machine:
3.1.1 The machine should be floor mounted free standing type.
3.1.2 The butter would be fed to SS hopper of machine manually.
3.1.3 The frame for the machine is to be fabricated from mild steel pressed/rolled section or from MS C class pipe.
3.1.4 The filling head should be of screw type with all accessories.
3.1.5 Drive Unit: Drive unit for screw and gear box should be supplied. The motor should be suitable for 415 V 3 Phase 50 Hz. AC supply.
3.1.6 Push Button Panel: A suitable SS panel having the push buttons and starters for the machine should be supplied and fitted at a suitable location. The panel should be complete with push buttons, indication lamps, starter, relays etc. Only one point power supply to the panel will be made.
3.1.7 The machine and tables should be completely shrouded with 2mm thick SS sheet conforming to AISI 304.

3.2 A suitable table fabricated from mild steel c class pipe.
The frame of the table should be hot dip galvanized after fabrication and then shrouded with SS 304 2mm sheet from all the four sides. The top should be of AISI 304 mm 2 mm SS sheet capable of keeping minimum of 3 butter cartons.

4.0 Test

All the welding joints should be tested by DP test

5.0 The supplier should prepare the detailed general assembly drawing showing plan, elevation, end view and cross sectional view of the machine with complete bill of materials. This drawing should be got approved by COMFED before starting fabrication. The bought out items should be clearly indicated with make, model & type.

5.0 The bidder should inform the total electrical load of the machine along with the bid.

GHEE CLARIFIER

1.0 Functional requirements: It would be used for clarification of ghee at the incoming temperature of 50-60 degree C at the rate of 2000 LPH.

2.0 The Centrifuge: All the product conduct contact surfaces of centrifuge such as bowl body, bowl hood, discs, distributor etc. should be made from stainless steel conforming to AISI 304. The separator frame shall be cast iron duly finished with epoxy paint. It should be designed for proper grouting. 1 no.

3.0 Drive: The drive for the centrifuge should be mounted on the centrifuge frame underneath the bowl and integrated together. The bowl spindle shall be connected to the motor shaft through a suitable drive mechanism. -1 no.

3.1 Accessories.
Lubrication System: Force-feed lubrication system with gear type oil pump or splash lubrication shall be provided. – 1 set.

Oil Pressure Gauge: For continuous measurement of lubricating oil pressure. – 1 no.

Tachometer: For continuous measurement of R.P.M. of disc assembly - 1 no. Alternatively pulsation counter shall be provided.

Gasket: The gasket should be of food grade rubber. It should be non-toxic, fat resistant and non-absorbent. It should have smooth surface.

Painting: All mild steel surfaces are to be painted with a coat of epoxy primer followed by two coats of epoxy paint after through de-rusting.

4.0 Tools: Essential special tools should be supplied with the machine without charging any extra cost.

GHEE POUCH FILLING MACHINE (Mechanical type with photo cell)

1.0 Design requirements

<table>
<thead>
<tr>
<th>Capacity (Minimum)</th>
<th>Minimum 800 Packs/ Hr of sizes 200 ml. or 500 ml. or 100 ml.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>+ 0.5% for 1000 m.</td>
</tr>
<tr>
<td>Type</td>
<td>The design of the machine should be hygienic. All the functions of the machine shall be controlled using cam timer switches/cam and the machine shall be mechanical cam operated.</td>
</tr>
<tr>
<td>Elec. Power</td>
<td>3 Phase, 415 V (+/- 10%), 50 Hz. (+/-2%), 4 wire</td>
</tr>
<tr>
<td>MCC</td>
<td>All the ghee contact parts of the machine should be made from stainless steel conforming to AISI 304.</td>
</tr>
<tr>
<td>Finish</td>
<td>All stainless steel inner surfaces are to be polished to 150 grits. The outside surface of the machine shall be circle polished to 150 grits.</td>
</tr>
</tbody>
</table>

2.0 Accessories

Float Balance tank: Stainless steel AISI 304 float balance tank of capacity at least 50 litres should be provided at the top of the pouch filling machine. The balance tank shall be provided with mechanical type float valve and an overflow connection ending in a SS 304 sanitary type ball valve. The overflow SS 304 pipe is to be extended down up to the bottom of the machine.

The machine should consist of SS 304 body built on a treated Aluminum chassis. All subassemblies are to be mounted on these plates. All tapped holes on chassis shall have helical steel inserts for longevity of chassis.

Spool bearer Assembly & Film guide: The heat sealable film roll up to 20 Kgs. shall be mounted on spool bearer at the rear bottom of the machine. The spool bearer assembly should be sliding type to facilitate easy changeover of the film roll. The spool roller bracket assembly shall be made of SS 304 material.

The film layer is then passed through various rollers and subassemblies such as: End of film loosening.

Subsequently, it should be passed over a set of ultra violet tubes for sterilization of the film. The film layer should then form in to a tube.

Vertical seal: The film shall be overlapped and sealed into to be by vertical electrode. The jaw should be mechanical cam operated and shall be of water-cooled. The vertical jaw support shall be of SS 304. The vertical electrode winding rod support shall be of Aluminum and necessary slots are to be provided for easy cleaning.

Downward feed: Downward movement of the film tube should be controlled by a set of rubber nip roller driven by a motor through a reduction gear unit. The nip roller support shall be of SS 304.
Injection system: The product from the float balance tank is passed through injection tube into the film tube. The filled quantity of the product in each pouch is controlled by opening of the valve at the lower end of the injection tube. The flow of product through injection tube in the pouches should be continuous and by gravity. The sealing should take plate through the product.

Horizontal seal: The horizontal sealing and cutting should take places at the same time by the horizontal electrode mounted on the fixed horizontal jaw. The fixed horizontal jaw is water-cooled. The rear moving jaw shall be mechanical cam operated.

Electrical control panel: The indicating lamps, electrical switches, control relays, solid state variances, digital pouch counter, Hour meter etc. should be mounted in this panel. Only MCB’s are to be used instead of HRC fuses. The machine shall also be equipped with single phase 5 Amps and 15 Amps adaptors. Facility to transfer pouch totalize data to the computer/PLC system shall be provided.

Photo mark Scanner: The machine shall be provided with photocell with all mounting arrangements to control the length the pouch.

Additional features:

Auto operation facility shall stop the machine and audiovisual alarm should be provided if the film roll is exhausted.

Emergency switch to stop the machine shall be provided on front side of the machine. The machine should stop if the front door or back door is open.

The machine should stop automatically for ghee ending

Facility to insert a closed circuit in place cleaning system for the machine shall be provided. The CIP adaptors and hoses are in the scope of supply.

3.0 Date coding device: It shall have 12 characters with each character of 3 mm height and facility to accommodate digits.

4.0 Tools: Essential special tools should be supplied with the machine without charging any extra cost.

5.0 Statutory Requirement: The pouch filling machine shall be duly stamped by the weight and measure department and the test certificate shall be submitted by the supplier.

6.0 The supplier should furnish along with the offer the following details in absence of which the offer will be treated as incomplete.

<table>
<thead>
<tr>
<th>Capacity of machine Packs/Hr ml &amp; 1000 ml</th>
<th>-----------</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy of filling at 200 ml, 500 ml &amp; 1000 ml</td>
<td>-----------</td>
</tr>
<tr>
<td>Leakage % on 200ml, 500 ml and 1000</td>
<td>-----------</td>
</tr>
<tr>
<td>Weight &amp; dimensions of the pouch filling machine</td>
<td>-----------</td>
</tr>
<tr>
<td>Utility consumption:</td>
<td>-----------</td>
</tr>
<tr>
<td>a) Electrical power (KW)</td>
<td>-----------</td>
</tr>
<tr>
<td>i) Connected</td>
<td>-----------</td>
</tr>
<tr>
<td>ii) During operation</td>
<td>-----------</td>
</tr>
<tr>
<td>b) Cooling water (LPH)</td>
<td>-----------</td>
</tr>
</tbody>
</table>
LINED CARTON GHEE FILLING MACHINE

1.0 FUNCTIONAL REQUIREMENT

The filling machine would be used for filling of ghee in lined cartons. Ghee would be delivered to the SS balance tank of packing machine at around 45 degree C. The machine should be suitable for 1000 ml & 500 ml packs.

2.0 DESIGN REQUIREMENT

2.1 Capacity: 12 packs per minutes (Min.) for 1000 ml.
2.2 Finish: All stainless steel joints are to be ground smooth and finish to 150 grit. All stainless steel surfaces are also to be polished to 150 grit.
2.3 Operation: The machine should be fully automatic operated from a control panel. The operation of the machine should be
   * Carton ejection (pre-formed carton will be used)
   * Heat sealing of bottoms of liner
   * Coding and closing of carton bottom
   * Filling and check weight of product
   * Full sealing of liner
   * Gluing of top flap of carton and closing of the same.
   * Discharge of carton.

All the above operations should be dust free.

2.4 Accuracy

2.4.1 Filling Accuracy:

It should fill the carton with weight accuracy of plus minus 0.5 per cent

2.5 Available Services

Compressed are - at 6 Kg/sq. cm.
Elect. Power - 415 V, 3 Phase, 50 Hz AC supply.

2.7 Material: All product contact parts should be fabricated from AISI 304 stainless steel.

3.0 Accessories:

Balance tank: Stainless steel AISI 304 float balance tank of capacity at least 50 litres should be provided at the top of the filling machine. The balance tank shall be provided with mechanical type float valve and an overflow connection ending in a SS 304 sanitary type ball valve. The overflow SS 304 pipe is to be extended down up to the bottom of the machine.

Carton Release: the machine should have proper carton magazine and release system for ejection of pre formed lined cartons.

Bottom Closer: The machine should first erect the carton and then close the bottom with high pressure heat sealing before discharging to filling unit.

Filling Unit with Check Weighing System. The machine should have the filling unit with check weighing system. The flow of product of required capacity/ quantity from the balance tank is suitably controlled to fill the carton.

Sealing Unit: to complete the sealing of liner followed by top closing and sealing of cartons.

Code and Date Printer: The machine should have ink type code and date printer suitable to operate with quick drying type ink.
Instruments and controllers: A SS control panel of IP 55 standard with all necessary instruments and controllers should be supplied and fixed at suitable location on the machine.

CIP: The machine should have facility to insert a close circuit cleaning in place system. It should be suitable for wet cleaning.

Safety features: The machine should have in built relevant safety features including no carton no fill and empty carton detection.

Drive: The machine should be complete with necessary drive and accessories including control. The necessary arrangement should be there for variable speed and change over to different size of cartons.

Counter: Carton counter to count the number of cartons filled by machine with resetting arrangement.

Sterilization: A set of sterilizing lamps should be provided for sterilizing the formed cartons immediately prior to filling with product.

Statutory Requirement: The machine shall be duly stamped by the weight and measure department as per requirement and the test certificate shall be submitted by the supplier.

4.0 Tools and Spares: Necessary set of tools and spares suitable for 2 years operation should be supplied. The list of spares should be given with the offer.

5.0 Painting: All non SS surfaces are to be degusted, degreased and then coated with two coats of anticorrosive epoxy primer followed by two coats of epoxy paint with Ivory colour.

6.0 Test: DP test for all the welding joints.

7.0 The supplier should furnish along with the offer the following details in absence of which the offer will be treated as incomplete.

<table>
<thead>
<tr>
<th>Capacity of machine Packs/Hr of sizes 500 ml or 1000 ml.</th>
<th>-----------</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy of filling at 500 ml, 500 ml &amp; 1000 ml.</td>
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</tr>
<tr>
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</tr>
<tr>
<td>b) Compressed Air</td>
<td>-----------</td>
</tr>
<tr>
<td>i) Connected</td>
<td></td>
</tr>
<tr>
<td>ii) During operation</td>
<td></td>
</tr>
<tr>
<td>b) Compressed Air at ...... Kg/sq.cm</td>
<td></td>
</tr>
</tbody>
</table>

WATER SOFTENING PLANT

1.0 Capacity: The through put of the softener shall be 30 Cum./hr. The softener is of automatic regenerating type with Na Cl (common salt) as regenerating medium.

The entire regeneration sequence such as opening and closing of valves, brine injection, beginning of next regeneration etc. are fully automatic. The sequence of the above activities should be initially by an electricity operated reset timer. At the end of every re-generation, the unit should automatically go in to service. Manual regeneration facility should also be provided.

Changeover from one softener unit to another whenever a water softener unit goes under regeneration should be automatic.

2.0 Design requirement:

Mild steel pressure vessel with inlet and outlet connection, resin charging and withdrawal connection and supports. The vessel shall be internally rubber lined and painted externally with anticorrosive paint.
Brine tank of MS rubber lined construction to store and measure salt for regeneration of the softener complete with brine level indicator.

3.0 **Accessories:**

- Raw water feed pump 1w+1s - 2 no.
- Hydraulically operated brain injector - 1 no.
- Initial charge of ion exchange resin for
  The softener vessel - 1 lot
- Hardness test kit - 1 set
- Inlet and outlet pressure gauges - 1 set
- Inlet and outlet sample valve - 1 set
- Water flow meter with totalizer - 1 no.

4.0 Quality of Raw water: Quality of raw water given below is for the guidance. However, actual quality of water shall be analyzed and softener shall be selected accordingly by the bidder.

Odour : Nil
Ph : 7.8
Total Hardness : 224 ppm.
Total hardness in treated water : less than 5 ppm.

**ROAD WEIGH BRIDGE**

1.0 Type: Pit less type weigh bridge of static type with electronic sensing and indication.

2.0 Capacity: 60,000 kgs with resolution of 10 kgs. The total weighing system shall conform to internationally adopted OIML recommendations conforming to Weights and Measures Act in India. Accuracy to be minimum +/- 0.025% of full scale.

3.0 Platform: Size 12m x 3 m (Minimum), steel platform, complete with non-skid plate deck, girders etc. Platforms should be provided with horizontal movement constrainers, if required.

4.0 Electronics: The electronics will be configured around a suitable microprocessor and shall have the following INPUTS/ OUTPUTs.

4.1 Inputs

The primary inputs shall be from resistive strain gauge type load cells. There shall be a minimum of 4 nos. of load cells.

The sensor inputs shall be up to isolated.

A to D conversion shall be of the dual slope conversion type.

Load cells shall conform to the following requirements.

i. Should be capable of sensing from zero to rated capacity.
ii. Should have built in suppression of interference voltage.
iii. Should be compensated for variations in temperatures.
iv. Should be hermetically sealed, dust, vermin and waterproof. Protection to be minimum IP 67
v. Should be supplied with screened cables and suitable mounts.

4.2 DATE, TARE WEIGHTS, VEHICLE NO/ROUTE NO. ETC. should be fed through the key board of the local computer.

4.3 Outputs
These shall be for the following:

   a) Balance and balance limit.
   b) Test
   c) Tare entry
   d) Gross weight/ Net weight
   e) Over- range, under range.

Read Out: using 7 segment LEDs or vacuum fluorescent read outs at least 10 mm high. The read out should not flicker.

Hard Copy: This should be available on a local printer. The printer interface should be RS 232C with baud rate selectable from 300 to 1200 bauds.

The printer should print only after the system has stabilized and hard copy should provide the following information.

   1. Date
   2. Truck no./Code/route no.
   3. Tare weight
   4. Gross weight
   5. Net weight.

4.4 Interface Rs 232 C and/or MA serial output, baud rate selectable from 300 to 1200 bauds for connection to remote computer.

5.0 Power Supply Unit: For powering the above mentioned circuitry and the load cells. Interference and surge suppressors should be built into the power supply unit (PSU). The system shall be powered from a single phase source of 220V AC +/- 10%, 50 Hz +/- 2%.

6.0 All the electronics involved i.e. the processor, input/ output modules, interfaces, keyboard, PSU should be housed in one unit which shall be dust and vermin proof.

The system shall incorporate automatic zero tracking and span drift correction should be built in the system.

7.0 Special Note: The supplier shall arrange for inspection and stamping of the weigh bridge by local weights and measures authorities. The fees for stamping, if any, will be reimbursed to be supplier against documentary proof.

SS TUBES AND SUPPORT PIPES

1.0 Type: TIG welded, annealed and de-scaled tubes shall be manufactured as per the standard ASTM-A270. Outer surface of the tubes should be mirror polished and inner surface should be pickled as per dairy standard.

2.0 Material of construction and thickness:

3.0 All the pipes unless otherwise stated shall conforms to AISI 304. The average wall thickness of tubes should be 1.6 mm up to 50.8 mm diameter and 2.0 mm for diameters 63.5 and above. The wall thickness at any point shall of vary more than 12.5% over and under from the average wall thickness specified. The joviality on the open ends shall be within the permissible limit specified in the ASTM A 270.

4.0 Support pipes shall have wall thickness of 2.6 mm up to 40 NB pipe and 3.2mm for higher size pipes up to 63B
5.0 Testing: All the process tubes shall be hydraulically tested at the manufacturer’s works at 1500 PSI for pipes up to 38.1 mm diameter and 1000 PSI for tubes size 50.8 and above. All the tubes shall bear the heat mark. The supplier is required to furnish the test certificate of the tubes with respect chemical composition, tensile test and mechanical test.

**SS FITTINGS**

6.0 **Plug Valves:** The plug valve shall be in 2 way or 3 way configuration with SMS end connection as specified. The valve body and plug shall be made out of investment casting using AISI 304 material. The inner side of the valve body and the contact surface of the plug shall be ground smooth and then lapped to get full metal-to-metal contact. The outer visible surface of the valve body and the plug shall be mirror polished. The nozzle port shall be provided with SMS union complete with nut, liner, male part and neoprene food grade rubber gasket. The male part shall be integral part of the valve body casting. The manufacturer is required to test each valve on a hydraulic pressure of 7.5 Kg/cm2.

7.0 **Manual Butterfly Valve:** The butterfly valve shall be of sanitary design and all liquid contacting parts shall confirm to AISI 316. The valve sealing gasket shall be EPDM / Nitril rubber material suitable for hot water sterilization temperature of 100 Deg. C and hot acid and lye solution of 2% concentration at 85 Deg. Celsius. The valve shall be provided with SS handle. The valve shall be with plain ends shall be suitable for direct welding on the pipes.

8.0 **Non Return Valve:** The non return valve shall be of sanitary design and all liquid contacting parts shall confirm to AISI 304. The valve sealing gasket shall be EPDM / Nitril Rubber material suitable for hot water sterilization temperature of 100 Deg. Celsius and hot acid and lye solution of 2% concentration at 85 Deg. Celsius. The non return valve shall be with plain ends shall be suitable for direct welding on the pipes.

9.0 **Unions:** All the parts unless otherwise specified shall be made out investment casting using AISI 304 material. The union shall be complete with liner, male part, nut and sealing ring (neoprene food grade rubber gasket). The liner and male part should be suitable for expansion joints. All the inside as well as outside surface of the union shall be mirror polished.

10.0 **In-line Sight Glass:** The in-line sight glass should be complete with SMS unions at both ends having toughened heat resistant glass and protective stainless steel cover.

It should have quick replacing arrangement for replacement of glass by flange and bolts. The material of construction shall be AISI 304 unless otherwise specified. All the inside as well as outside metal surfaces shall be mirror polished.

11.0 **Crushproof Hose Pipe for Tanker Unloading:** The flexible hose shall be crushproof reinforced plastic spiral construction with vulcanized end connection and SS fittings. The hosepipe shall be resistant to CIP cleaning liquid and should withstand a hot water sterilization temperature of 100 Deg. C and hot acid and lye solution of 2% concentration at 85 Deg. C.

12.0 **Bend, Tee, Elbow:** These fittings shall be made out of AISI 304 unless otherwise specified, process tube, TIG welded, annealed, de-scaled having outer surface mirror polished and inside pickled, manufactured as per ASTM A279. The thickness of the fittings made from the tube section should not be less than 1.6 mm up to 63.5 mm dia and should not be less than 2.0 mm for above 63.5 mm dia. The wall thickness at any point shall not vary more than 12.5% over and under from the average wall thickness specified.

Bends and elbows shall be free from wrinkles. Tee shall have uniform flaring on the branch connection. The joviality on the open ends shall be within the permissible limit specified in the ASTM A270.
MOTOR CONTROL CENTRE (SHEET STEEL)

Functional requirements.

To receive, control and distribute electrical power at 440 V, 50 Hz, AC in sheet steel housing.

1.2 Design Requirement and Scope of Supply

1.2.1 Statutory Requirements:

Motor control center is to be manufactured/ assembled as per the latest ISI Specification, Indian Electricity Rules, including special requirements of concerned State Electricity Inspectorate and the detailed specification mentioned below.

1.2.2 Housing Details:

The switchboard shall be fabricated using pressed and shaped cold rolled steel sections structure of adequate thickness. The sheet steel used for panel shall be min. 14 SWG sheet except that the partition plates and inter-panel barriers may be made of 16 SWG. The switchboard shall consist of free standing front openable panels arranged to form a continuous line-up of uniform height. Cold rolled sheets shall be used for doors and front covers. Front doors shall be hinged type and bus bars and cable alleys covers shall be bolted type.

1.2.3 Switch Board shall be extensible at both the ends by addition of vertical sections. Ends of the bus bars shall be suitable drilled for this purpose. Panels at Extreme ends shall have openings, which shall be covered with plates screwed to the panel. The switchboard shall be provided with integral base frame. The panel base plate/cable gland plate shall be 2.5 mm thick.

1.2.4 The switchboard shall be totally enclosed, dust, weather and vermin proof. The switchboard shall conform to degree of protection not less than IP 44. Gaskets of durable material shall be provided for doors and other openings. Suitable hooks shall be provided for lifting the boards. These hooks when removed shall not leave any opening in the board.

1.2.5 All bard ware shall be corrosion resistant. All joints and connections shall be made by galvanized zinc passivated or cadmium plated high tensile strength steel bolts, nuts and washers secured against loosening.

1.2.6 The switch board shall be in cubicle design (each feeder components are housed in individual cubicle) suitable for indoor installation. Suitable cable & bus bar alleys shall be depth may be increased suitably to accommodate cables/ buses on back of MCC. All components of the switch board shall generally be approachable from front. However, MCC can be in double front execution also if specifically asked for. The maximum and minimum operating handle/ push button height of any feeder shall not be more than 1900 mm or less than 300 mm with reference to panel bottom. Supporting arrangement for dressing of power and control cables in cable alleys also shall be provided. Maximum shipping Motor length of MCC shall be 2500 mm.

Approximate Size of Cubicles for Starter Feeders

<table>
<thead>
<tr>
<th>Motor</th>
<th>Cubicle for DOL Starter Width</th>
<th>Height</th>
<th>Depth</th>
<th>Cubicle for Star-Delta Width</th>
<th>Height</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 10 HP</td>
<td>400</td>
<td>300</td>
<td>350</td>
<td>400</td>
<td>450</td>
<td>350</td>
</tr>
<tr>
<td>12.5 to 30 HP</td>
<td>-</td>
<td></td>
<td></td>
<td>400</td>
<td>450</td>
<td>350</td>
</tr>
<tr>
<td>40 to</td>
<td>-</td>
<td></td>
<td></td>
<td>400</td>
<td>600</td>
<td>350</td>
</tr>
</tbody>
</table>
Approximate Size of Cubicles for SFU/ MCCB Feeders

<table>
<thead>
<tr>
<th>Current Rating</th>
<th>Cubicle for SFU</th>
<th>Cubicle for MCCB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>Height mm</td>
<td>Depth mm</td>
</tr>
<tr>
<td>Up to 63 A</td>
<td>400</td>
<td>300</td>
</tr>
<tr>
<td>100 A to 250 A</td>
<td>400</td>
<td>450</td>
</tr>
<tr>
<td>400 A &amp; Above</td>
<td>400</td>
<td>600</td>
</tr>
</tbody>
</table>

Minimum depth of cubicle for ACB Feeder shall be 1000 mm
Minimum width of cable and bus bar alleys shall be 300 mm

1.2.7 Paining:
All metal surfaces shall be thoroughly cleaned and degreased to remove all scales, rust, grease and dirt. Fabricated structures shall be pickled and treated to remove any trace of acid. The under-surface shall be prepared by applying a coat of phosphate paint and a coat of yellow zinc chromate primer. The under surface shall be made free from all imperfections before undertaking the final coat.

After preparation of the under surfaces, the panel shall be spray painted with final two coats of approved shade of powder coating.

The finished panels shall be dried in staving ovens in dust free atmosphere. Panel finish shall be free from imperfections like pin holes, orange peels, run-off paint, etc.

All unpainted steel parts shall be cadmium plated or suitably treated to prevent rust, corrosion, etc.

1.2.8 Nameplates:
Nameplates for all incoming and outgoing feeders shall be provided on doors of each compartment. Nameplates shall be fixed by screws only and not by adhesives. Engraved nameplates shall preferably be of 3-ply (Black-White-Black) acrylic sheets or anodized aluminum. Special danger plates shall be provided as per requirement.

Inside the panicle, stickers should be provided for all components giving identification no. as per detailed wiring diagram.

1.2.9 Bus bar Sizing Connection and Supports:
The bus bars shall be made from high conductivity electrolytic aluminum conforming to grade E91E of IS 5082. The bus bars and supports shall be capable of withstanding the rated and short circuit current stated in the single line diagram/feeder details. Minimum size of power bus bars shall be 200 Amps rating. Maximum current density permissible for Aluminum bus bars shall be 0.8 Amps/ mm² for bus bar area above 500 mm² & 1.0 Amp/ for bus bar area below 500 mm². An earthing bus bar of minimum 150 mm² section aluminum shall be provided outside panel at bottom throughout the length of the panel. Provision shall be made to connect the
earthing bus bar to the plant earthing grid at two ends. All doors shall be earthed using flexible copper connections to the fixed frame of the switch board.

1.2.10 The bus bars shall be provided with heat shrinkable PVC insulating sleeves of 1100 V grade. Red, yellow and blue colour shall be used for phase bus bars and black colour shall be used for neutral bus bars. Joints shall be shrouded suitably. Supports for bus bars shall be made of suitable size non-hygroscopic and non-inflammable epoxy compound SMC/DMC blocks and these should be adequate in number so as to avoid any sag in the bus bars.

1.2.11 Minimum clearance between phase to phase shall be 25 mm and that between phase to neutral/earth shall be 20 mm.

1.3 Power Connection:

1.3.1 For power interconnection within the panel board:

Copper conductor PVC insulated cables of adequate cross section shall be used. FOR CURRENT RATING ABOVE 63 AMPS ALUMINIUM BUSBAR STRIPS OF ADEQUATE RATING SHALL BE USED. MINIMUM SIZE OF COPPER CONDUCTOR TO BE USED SHALL BE 4.0 MM2. Cable lugs/sockets of suitable size and type shall be used for all interconnections.

1.3.2 For all aluminum to copper connection: The copper surface will be silver plated and the aluminum surface will be properly cleaned and supplied with oxide inhibiting grease.

1.3.3 For all outgoing motor feeders, the suitable size terminal blocks shall be provided in cable alleys and wiring up to these from contactors shall be done by panel supplier. These terminal blocks shall be heavy duty type to withstand high starting currents.

1.3.4 For incoming and outgoing feeders of the MCC, aluminum conductor cable will be used and hence the panel is to be designed for receiving these and wherever required cable boxes with bus bar extensions for receiving more no. of cables, shall be provided in panel by supplier. Removable gland plates of 12-gauge thickness shall be provided on top/bottom of panel, for cable entries.

1.3.5 To prevent accidental contacts, all interconnecting cables/bus bars and all terminals also shall be shrouded.

1.3.6 Standard colour code of red, yellow and blue for phases and black for Neutral to be followed for all bus bars/conductors.

1.4 Auxiliary wiring and Terminals:

1.4.1 Wiring for all controls, protection, metering, signaling etc. inside the switch board shall be done with 1100 volts gray colour PVC insulated FRLS copper conductors. Minimum size of these conductors shall be 1.5 mm2, however, cT circuit wiring shall be done with 2.5 mm2. Control wiring to components fixed on doors shall be flexible type.

1.4.2 The complete panel would be sub-divided into different sections by Purchaser and each section shall have its own control circuit with fuse and indication. Terminal block (Minimum 3-ways) for control wiring shall be provided for each outgoing Motor feeder in its cubical. 10% spare terminals shall always be available in each terminal block. Control wiring up to these terminal blocks shall be done by supplier.

1.4.3 All control wiring should be provided with necessary cable sockets/lugs at both ends.

1.4.4 Conductors shall be terminated using compression type lugs. Each termination shall be identified at both the ends by PVC ferrules. The identification termination numbers should match with those on drawings.
1.4.5 Control wiring for motor feeders should be such that the “green” light of motor feeder is “ON” only when control as well as power circuit of feeders is “ON” and it shall have its own fuse.

14.6 For all motor starter feeders, provision for control wiring to remove ON/OFF control is to be made. The auxiliary wiring for the same shall be brought up to terminal block in the feeder’s cubicle.

1.5 Switchgears:

1.5.1 Air Circuit Breakers (ACBs)

These shall be electrically operated (motorized), fully draw out type with built-in microprocessor based programmable protection, and suitable for 415 V, 50 Hz supply. Microprocessor based programmable protection unit shall have settings for overload, short circuit, instantaneous and earth fault currents with time delay and LED indicators to show various conditions such as Power On, Overload, Short- circuit, Instantaneous Earth fault, Percentage load, Self Diagnostic Test etc. current rating, short circuit current, protection relays etc. shall be as specified in feeder details. Mechanical interlock shall be provided such that it shall not be possible to plug in a closed circuit breaker or to draw out a circuit breaker in closed position. It shall not be possible to operate a circuit breaker unless it is in fully plugged-in, test or fully isolated position. In test position, the breaker shall be tested without energizing the power circuit. The ACB feeder cubical door cannot be opened when ACB is “ON”. However, it shall be possible to defeat this interlock for inspection purpose. Trip coil shall work under the following voltage variation conditions:

| Closing Coils | - | 85% to 110% of rated voltage |
| Trip coils | - | 50% to 130% of rated voltage |

The circuit breaker shall be provided with mechanically operated emergency tripping device. This device shall be available on the front of the panel.

The circuit breaker position shall be indicated electrically. The following indicating colours shall be used:

| BREAKER ‘CLOSE’ | - | RED |
| BREAKER ‘OPEN’ | - | GREEN |
| BREAKER ‘AUTO’ | - | AMBER |
| TRIP’ | - |

Note: The air circuit breaker for incoming feeder shall be of 4 pole construction, unless stated otherwise.

15.2 Molded Case circuit Breakers (MCCB)

MCCBs shall always be provided with separate operating handle mechanism with door interlocking. The MCCBs shall be of triple/ four pole construction (as required in the feeder details) arranged for simultaneous three/ four pole manual closing or opening and automatic instantaneous tripping on short circuits. MCCBs shall be provided with adjustable type tripping device with inverse time characteristics for over load protection. All MCCBs are to be provided with operating handles interlocked with cubicle doors.

Closing mechanism shall be quick make, quick break and trip free type. Operating handle shall give a clear “ON” “OFF” & ‘TRIP’ indication. Control voltage for MCCB shall be 240 volts. The ratings shall be as specified in feeder details.

Minimum rated breaking capacities shall be as under:

| MCCBs up to 100 Amps | - | 25 KA |
| MCCBs 120 to 200 Amps | - | 35 KA |
| Above 200 Amps | - | 50 KA |
Note: All feeders having MCCB shall be provided with neutral link complete with isolating link. However, the MCCBs for incoming and non-motor feeders shall be of 4 pole construction, unless stated otherwise.

1.5.3 Switch Disconnect or fuse units: The load break switches shall be heavy duty, air break type suitable for continuous maximum rating with manual quick make / break mechanism. These shall have positive isolation with positive indication of contact separation. They shall have high short circuit making and withstanding capacities. Breaking capacity shall correspond to AC 23A utilization category. Mechanical interlock shall be provided to prevent opening of door in switch ‘closed’ position and prevent closing of switch in door ‘open’ position. However, it should be possible to defeat this arrangement for testing purpose. Live terminals of the switch shall be shrouded.

1.5.4 Fuses: shall be non deteriorating HRC cartridge link type with operation indicator which will be visible without removing fuses for the service. These shall be complete with molded Phenolic fuse base and cover. Wherever required fuse pullers shall be provided. The fuse base shall be so located in the modules to permit insertion of fuse pullers and removal of fuse links without any problem. One set of fuse puller to cover entire range of fuses used in the panels shall also be provided.

1.5.5 Contactors: The rating of the power contactors shall be as

Required depending upon the feeder rating indicated in the specifications and as per the table provided in this specification below.

Contactors coils shall be suitable for 240 volts, 50 Hz. Unless otherwise specified. All contactors shall be supplied with minimum 2 no + 2 NC auxiliary contacts. Additional contacts if required for interlocking etc. shall also be provided. Rating of contactors shall be based on the feeder ratings.

All contactors of motor starters shall be suitable for AC3 duty unless specified otherwise.

1.5.6 Protective Devices:

Bimetal overload relays with inbuilt single phase protection shall be provided for all motor feeders. The relays shall be adjustable and self reset type.

Heavy duty starters shall be provided with securable type current transformer operated overload relays only, which shall be suitable for motor starting time of 15.60 seconds.

Any other relays, if required for incoming & outgoing feeders shall be specified in the feeder details.

1.5.7 Times:

The timers shall be continuously adjustable and electronic type. Suitable for 240 V, 50Hz supply. The timers for star Delta automatic starters shall have time delay of 0 to 60 seconds between change over of contacts.

1.5.8 Push Buttons (PBs):

Push Buttons shall be complete with actuator and contact block and shall be generally mounted on doors of the cubicles. Colours shall be as follow:

Stop/open/emergency - Red
Start/Close - Green

It should have minimum 1 no +1NC contacts. Push buttons shall conform to IP-65 protection against dust and Water ingress.

1.5.9 Indication Lamps:

All outgoing & incoming feeders shall be provided with ON indication lamps. Colours shall be as under:
Phases: Red, Yellow & Blue
ON: Red
OFF: Green
TRIPPED: Yellow

Indication lamps shall be in the form of cluster of high intensity light emitting diodes (LED) to give bright indication. These lamps shall be of 22.5 mm dia and having operating voltage of 240 V. AC.

1.5.10 Current Transformers (CTs):

CTs shall be cast resin insulated type. Primary and secondary terminals shall be marked indelibly. CTs shall preferably be mounted on stationary parts. These shall be capable of withstanding momentary short circuit and symmetrical short circuit current for 1 second and shall have a minimum rating of 10 VA. Neutral side of CTs shall be earthed.

Protection CTs shall be of low reactance, accuracy class SP1 and an accuracy limit factor greater than “10” Instrument CTs shall be of accuracy class “1.0” and accuracy limit factor less than “5.0”.
Separate CTs to be provided for protection and metering purpose.

1.5.11 Measuring Instruments:

These shall be of square pattern having approximate dimensions 96 mm x, flush mounting type. Necessary auxiliary instruments like CTs, VTs, etc. are also included in the scope of supply.

All AC meters shall be of Digital type for displaying three phases reading. Suitable selector switch shall be provided if the digital meter does not have provided for simultaneous display of three phase readings.

Voltmeters shall be suitable for direct line connection.
Voltmeters shall be connected through fuses only.

Intelligent panel meter shall be provided with incoming feeder for the MCC for the measurement and digital display of multifunctional Electrical Parameters such as voltage, current, active power, reactive power, frequency, power factor, active energy, reactive energy, etc.

All motor feeders above 10 HP shall be provided with ammeters shall always be CT operated.

1.6 Special Requirements:

1.6.1 All motor feeders above 10 HP shall have automatic Star Delta Starters and up to 10 HP shall have DOL starters unless specified otherwise.
1.6.2 All motor feeders of rating 15 HP and above shall be provided with ammeters with selector switches.
1.6.3 All motor feeders up to 40 HP shall be provided with MPCB as specified in the feeder details and motor feeders above 40 HP shall be provided with MCCB’s having a minimum breaking capacity as specified in the clause 1.5.2 above.
1.6.4 All the power contactors of Star-Delta starters shall have same current rating.
1.6.5 The following selection table shall be followed for switches & contactors of motor feeders unless otherwise specified:
For motors of smaller ratings, MPCB with suitable thermal release may also be provided as per the requirement given in the feeder details. The following selection table shall be followed for MPCB & contactors of motor feeders unless otherwise specified:

<table>
<thead>
<tr>
<th>Sl.</th>
<th>415V Motor HP</th>
<th>Contactor Ratings</th>
<th>MPCB Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>0.5 to 01 HP</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>02</td>
<td>1.5 HP</td>
<td>16</td>
<td>3.2</td>
</tr>
<tr>
<td>03</td>
<td>02 HP</td>
<td>16</td>
<td>05</td>
</tr>
<tr>
<td>04</td>
<td>03 HP</td>
<td>16</td>
<td>06</td>
</tr>
<tr>
<td>05</td>
<td>05 HP</td>
<td>16</td>
<td>08</td>
</tr>
<tr>
<td>06</td>
<td>7.5 HP</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>07</td>
<td>10 HP</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>08</td>
<td>12.5 HP</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>09</td>
<td>15 HP</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td>17.5 HP</td>
<td>16</td>
<td>25</td>
</tr>
</tbody>
</table>

For capacitors, rating of contactors/switch shall be double of rated current of capacitor.

For incoming feeder of rating higher than 600 Amps., ACB shall be provided unless otherwise stated in the feeder details.

1.6.6 If the outgoing feeder rating is higher than 63 Amp., MCCB shall be provided unless stated otherwise and preferably these shall be located at the lower portion of the panel. These feeders shall also have isolating link for neutral in case 3 pole MCCBs are to be supplied as per the requirement given in feeder details.

1.6.7 Electrical interlocking shall be provided between various feeders as required by the process and specified in feeder details.

1.6.8 If the total operating load on MCC is more than 600 Kw, MCC shall be provided with two incoming feeders with a bus coupler unless specified otherwise. Each incoming feeder shall have independent instrumentation and protection.

1.6.9 Induction motors (above 15 HP) having 3000 RPM shall require higher rating for fuses, contactors and electronic timers due to very high starting current. MCC supplier has to specially check this requirement from Purchaser.

1.6.10 Supplier has to submit GA & power circuit drawing for approval to Purchaser before starting manufacturing of MCC. All the major components of an MCC shall be of same “Make”.

1.6.11 The following selection table shall be followed for cables of motors unless otherwise specified.
### 3 phase 415 V Aluminum Conductor Cable Size-Sq.mm

<table>
<thead>
<tr>
<th>Motor H.P.</th>
<th>Direct-on-line starter</th>
<th>Star-Delta Starter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Supply Side</td>
<td>Motor Side</td>
</tr>
<tr>
<td>Up to 7.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>15</td>
<td>10</td>
<td>10</td>
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<tr>
<td>20</td>
<td>16</td>
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<td>40</td>
<td>35</td>
<td>35</td>
</tr>
</tbody>
</table>

### 3 phase 415 V Aluminium Conductor Cable Size-Sq.mm

<table>
<thead>
<tr>
<th>Motor H.P.</th>
<th>Direct-on-line starter</th>
<th>Star-Delta Starter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Supply Side</td>
<td>Motor Side</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td>60</td>
<td>70</td>
<td>6</td>
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<tr>
<td>75</td>
<td>95</td>
<td>10</td>
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<td>100</td>
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<td>125</td>
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<td>180</td>
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<td>200</td>
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<tr>
<td>250</td>
<td>-</td>
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<tr>
<td>275</td>
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<td>-</td>
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<tr>
<td>300</td>
<td>-</td>
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</tr>
</tbody>
</table>

Note: For DOL starter up to 7.5 HP motor 4 sqm. cable should be used.

1.6.12 The following selection table shall be followed for earthing of electrical loads. All earthing shall be made with two runs.

- Control switches/glands – Copper wire 14 SWG
- Motor up to 10 HP – GI wire 8 G.
- Motor above 10 HP up to 125 HP – GI strip 25 x 3 mm
- Motor above 125 HP GI strip 25 x 6 mm
- Switch board/ motor control centre- GI Strip 40 x 6 mm
- Earthing main in trenches - GI Strip 40 x 6 mm
- Cable trays - GI Strip 25 x 3 mm

**ELECTRICAL ITEMS**

1.1 **MOTOR ISOLATORS (AL. DIE CAST)**

1.1 These isolators shall be installed inside the main plant or outside as per the site conditions for isolating the power to the motor. This shall be of metal clad plug & (IP65 protection) type of isolator.

1.2 **General Requirement.**

1.2.1 The isolator box should be of cast aluminum, dust, vermin and either proof suitable for wall/structural mounting. The enclosure shall be cast out of superior quality Al. Alloy. All the surfaces should be suitably cleaned and the surface must be made smooth. The enclosure should be finally achromatized and coated with epoxy powder by static charge spray method of light grey confirming to shed 631 of IS 5. All external hardware used must be of stainless steel. All the rating surface should be provided with round rubber gasket (min 6mm) in the groove so as to make it effectively dust and vermin roof.
1.2.2 The enclosure box should be of IP 65 class and the minimum size must be 210 x 125 mm. Each isolator must be provided with suitable MCB. Two nos. holes of 3/4" dia at the bottom for the cable entry must be provided. 30 amps 6 way terminal block is to be provided inside the isolators. All wires/ cables must be terminated using suitable crimping type copper lugs. Two nos. brass screws with washers must be provided on either side of box for earthing.

2.0 CABLE TRAYS

2.1 Functional requirement: Cable trays are used (based on the site condition) for laying the power and control cables inside the plant from PCC to the MCC and wherever required.

2.2 Fabrication: These shall be perforated type, heavy duty, return flange or inward bend shape, manufactured from mild steel conforming to IS-226 and hot dip galvanized as per IS – 2629/BS-729. Width of cable tray shall be as per the requirement. Height to be minimum 50mm and thickness of plate to be 1.5 mm u to 300mm cable try width. For cable trays having width more than 300mm, height to be 75mm and thickness of plate to be 2.0mm . Cable trays to be supplied to site in standard lengths of 2.5 M. Necessary accessories of cable trays such as coupler side plates for joining cable trays, bends, riser, inside riser, tee etc. must also be factory fabricated. Plain cable tray covers 1.5mm thick to be supplied if specially required. Sample of cable tray to be got approved from COMFED before supply.

2.3 The detailed specifications for various electrical items are provided in the special conditions of contract Electrical installation.

3.0 CABLE CLANDS

These shall be provided at both ends of armoured/unarmored electrical cables. Cable glands shall be manufactured as per performance requirements of BS6121, AMENDED AS ON DATE, WITH BRASS MATERIAL ACCURATELY MACHINED AND NICKEL PLATED. The shall be of heavy duty single compression type for cable conductor sizes above 35 sq.mm and weather prof double compression type for cable conductor sizes up to 35 sq.mm. Single compression cable glands will be complete with check nut, gland body, 3nos. metal washers, outer seal rubber ring and compression nut. Double compression glands shall be complete with check nut, gland body, neoprene outer ring, armour clamping cone, armour clamping ring, armour clamping nut, skid washer & outer seal nut.

4.0 CABLE CONNECTORS.

5.1 Cable connectors, lugs/sockets, shall be copper/ Aluminium alloy, suitably tinned, solder less crimping type.

6.0 CABLE INDICATORS.

These shall be self sticking type and of 2mm thick lead strap for overall cable. PVC identification numbers, ferrule shall be used for each wire.

7.0 CONDUITS.

For lying of cables under floor, GI class ‘A’ pipes shall be used. For laying cable in air whereas cable trays are not being used, MS ‘B’ class pipe shall be used. Size of pipe shall
depend upon the overall outer diameter of cable to be drawn through pipe. No pipe less than 40 mm dia shall be used for this purpose. In dairy process area wherever required SS-304 pipes, 1.6mm thick shall be used.

8.0 LT POWER CABLES

Power cables for use on 415 V system shall be of 1100 volt grade, aluminum conductor, PVC. Insulated, PVC sheathed, armored and overall PVC sheathed, strictly as per IS: 1554 (Part-I) – 1976.
The size of cable shall be as specified in cable selection chart. No cable of size less than 4 sq.mm shall be used.

9.0 LT CONTROL CABLES.

Control cables for use on 415 V system shall be of 1100 volts grade, copper conductor, PVC insulated, PVC sheathed armored and overall PVC sheathed, strictly as per IS: 1554 (Part-I)– 1976. The minimum conductor diameter shall be 2.5 sq.mm.

SERVICE PIPES, VALVES AND FITTINGS

1.0 The main supply pipe sizes of various utilities shall be designed keeping in view the future expansion/modifications.

Technical Specification for Boiler

GENERAL DESCRIPTION:

The oil cum gas (LPG) fired energy efficient boiler would be required to generate dry saturated steam for use in vacuous processes in dairy plant. Dryness of steam shall not be less than 98%. To achieve this, boiler shall be provided with adequate drum internals/steam separator etc. It would cater to considerable varying steam requirements depending on various process schedules.

Capacity and working pressure: Capacity of each boiler shall be 10000 Kg & 6000 Kg/ Hr F&A 100 Deg C, rated pressure17.5Kg/Hr.

Steam pressure and quantity (Approx peak) requirement is given for suppliers guidance. There shall be a common header in the boiler house. From the boiler house header the HP steam line is laid up to process hall corridor of dairy plant ending with PRS. The supplier shall work out actual line as per requirement.

Note: No extra payment shall be made on account of change in the pipeline size or length.

DESIGN REQUIREMENTS

Dryness of steam: Dryness of steam required is 98% (min.). The boiler shall be designed for adequate size of barrel having steam separator or alternatively separator with all accessories shall be provided immediately after the main steam valve.

The boiler shall be designed for minimum of 3 pass, wet back arrangement for obtaining higher boiler efficiency.

Fuel: The boiler shall be designed to use furnace oil as well as LPG. It shall be easily converted on any of the fuel. The net caloric value of FO is 9780 Kcal/Kg (approx.) and 11200Kcal/Kcal/Kg (approx.) LPG respectively.

Thermal efficiency: The thermal efficiency on NCV basis of oil & gas under normal working conditions shall exceed 88% (Min.) at all times.
The steam generated in the boiler shall be capable of meeting the following minimum requirement for the respective process conditions.

LP Steam @ minimum of 3.5 kg/cm² at the outlet flange of the LP side of the PRS, at one point in the dairy plant. Peak requirement of steam for dairy plant is around 2377 Kg/hr.

The peak steam requirement for powder plant and UHT plant shall be considered separately and it is not within scope of this contract.

STATUTORY REQUIREMENTS

The boiler shall comply with the latest Indian Boiler Regulations (IBR), International Standards Organization (ISO), PCB and other statutory regulations/requirements. The minimum requirement shall be as per the details furnished hereunder.

The electrical equipment, installation shall comply with the latest Indian Electricity Regulations, CEIG and the E regulations of the state in which the boiler is installed.

The boiler shall be got approved by the supplier from the statutory authorities and any modifications or changes if suggested by the authorities, the same shall be carried out by the supplier without any additional cost. Original IBR certificate shall have to be handed over to the purchaser/Project Authority.

SCOPE OF SUPPLY

Steam generating equipment

The complete boiler having steam generating arrangement, casing, burner and all necessary accessories is to be supplied. The each boiler unit shall be provided following minimum construction.

Pressure parts consisting of fusion vended shall, flue tube, tube plates, tubular passes, end plates, reversing chambers, steam drier units with all associated accessories.

The furnace designed to have optimum volumetric heat release rate for complete combustion.

- Front and back smoke boxes
- Front casing with hinged door
- Rear casing with removable doors
- Rear casing with removable doors
- Suitable thermal insulation on the outer shall covered by galvanized MS sheets of minimum 20 Gauge thick and duly painted with two coats of heat resistant paint such that the temperature of the outer shell shall not be more than 10°C of the ambient temp or 50°C whichever is less.

Burner and accessories.

Fully automatic and step less modulating (25% to 100%), high-pressure jet spill return burner comprising a nozzle, ignition transformer with electrode, solenoid valve and necessary instruments shall be supplied. The burner also shall have provision for oil return and isolating controller to program burner operation for automatic ‘cut in’ and ‘cut out’ operation. The noise level shall not exceed 90 DBA at 1kl Mtr. distance.

The burner shall have provisions for oxygen tram system, fan speed control, and nozzle shut off along with other inbuilt features. The burner motor shall be of TEFC and having IP 55 class of protection.
Burner and ring main system shall be suitable for heavy oil, having maximum viscosity (in accordance with DIN 51603) 450 CST at a temperature of 50 deg C.

The burner shall also be suitable for LPG. As such the supplier shall select suitable type of burner accordingly and specify the same in their bid.

Drive for blower motor: The blower fan motor shall be provided with suitable VFD as per requirement. The VFD drive & Electrical accessories shall be able to handle starting current load of 31 amps 3 phase 38-440 ac the control panel for shall be self mounted type with 3 phase indication on panel the electrical circuit shall have facility to bypass VFD & switch over to starter with the help of contactor.

The VFD shall be housed in a separate self standing panel and installed at suitable location as per site conditions.

Burner Management system

Burner Management system shall have electronic compound regulation for combustion Air, Oil, Gas and Regulating sleeve, synchronizing with 02 Trim and Speed Control.

The system shall give linkage free fine and accurate tuning of combustion Air, Gas, Oil and Regulating Sleeve by individual Stepping Motors. It shall sense 02 % in flue gas by 02 sensor and 02 Module and according to that it shall set all the parameters like Air damper, Regulating sleeve and Speed of motor to maintain the 02 % in Flue gas at set point.

This Burner Management system shall be managing Burner Operation with ○ 2 sensor, ○ 2 Module, and Inbuilt loan Controller. It shall be possible to set regulating sleeve and combustion air damper very precisely by 10th part of Degree to improve combustion efficiency. Regulating Sleeve shall facilitate the following:

- Reduced Excess Air.
- Improve air velocity for every load position
- Improve turndown ratio.
- Improve intermixture of fuel and air in partial load.

The Movement of the regulating sleeve in the combustion head shall ensure that the air velocity for the every load position throughout the capacity range remains same, to result in optimum mixing velocity the whole range of regulation.

The system shall increase miming pressure at partial load, which improves the intermixture of the fuel land air, to reduce excess air and to improves combustion efficiency with constant air and fuel ratio.

The burner and management system shall have following Features.

**Elimination of play and hysteresis associated with mechanical compound regulation with usage of individual stepping motor on each control element.**

- Elimination of linkages to reduce the maintenance.
- E-bus system shall be used to reduce tedious electric cable wiring
  - Repetitive and precise position control through directly connected precise stepping motor improves air/ fuel mixer in lower load positions.
- Interface with computer or modem through Rs. 323 socket.
  - Stepping motor used in system shall have 900 steps in 90 degree, i.e. accuracy of 0.1 Degree.
Future upgradation shall be easier with electronic compound regulation. Only change in control system shall be incorporated for future upgradation.

All readings and fault messages shall be in clear text so that understanding operating and repairing of system is easier for operator.

- Fault data bank for service personnel to analyze the problem very fast.
- Inbuilt hour counters to know total operating hours of system.
- E-bus shall be available to connect to any other external device.
- It shall be possible to set burner through computer and data back up in computer with necessary software.
- Data back shall be readily available in display and operating unit for faster data transfer in case of change of combustion manager.
- Linkages free Electronic Compound Regulation with regulating Sleeve.
- Display and Control unit
- Inbuilt load controller
- Flame supervising with Infrared (QRI)
- 02 % Control.

**Flue gas oxygen analyzer**

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>01 NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make</td>
<td>To be indicated by the supplier</td>
</tr>
<tr>
<td>Model</td>
<td>To be indicated by the supplier</td>
</tr>
<tr>
<td>Type</td>
<td>In -situ</td>
</tr>
<tr>
<td>Measuring Element</td>
<td>500 mm Zirconia Oxide Zirconia oxide Probe, Diffusion Type</td>
</tr>
<tr>
<td>Analyzer</td>
<td>Electronic, Detachable From Sensor.</td>
</tr>
<tr>
<td>Housing</td>
<td>Sheet Metal</td>
</tr>
<tr>
<td>Protection</td>
<td>Weather Proof, IP 65</td>
</tr>
<tr>
<td>Output</td>
<td>4- 20 MA, DC</td>
</tr>
<tr>
<td>Local Display</td>
<td>Back Lit Alphanumeric Display</td>
</tr>
<tr>
<td>Alarm Output</td>
<td>System Fault Alarm 230 V AC , 1A</td>
</tr>
<tr>
<td>Accuracy of Measurement</td>
<td>+ /- 1.01 % 02</td>
</tr>
<tr>
<td>Accuracy of display</td>
<td>+ /- 1.01 %of excess 02</td>
</tr>
<tr>
<td>Response time</td>
<td>0.5 sec</td>
</tr>
<tr>
<td>Process connection</td>
<td>DN 65 , PN 6 standard</td>
</tr>
<tr>
<td>Electrical conduit</td>
<td>Quick disconnect plug</td>
</tr>
<tr>
<td>Power supply</td>
<td>230 V AC, 50 Hz.</td>
</tr>
<tr>
<td>Material of construction Wetted parts)</td>
<td>SS 316 Ti</td>
</tr>
<tr>
<td>(Probe Housing)</td>
<td>Cast Aluminum, powder coated.</td>
</tr>
<tr>
<td>Power consumption</td>
<td>100 -200 VA</td>
</tr>
<tr>
<td>Calibration</td>
<td>Through key pad using Calibration gas</td>
</tr>
<tr>
<td>Analyzer</td>
<td>Wall mounted housing with 6 m cable &amp; plug provided.</td>
</tr>
<tr>
<td>Mounting Accessory</td>
<td>Mating flange to be provided by the supplier.</td>
</tr>
</tbody>
</table>

The above table described general requirement of analyzer. The exact details of the item offered are to be furnished in the bid by the supplier.

Fuel Oil system
Ring main system
Common ring main system shall be provided for the two boilers including provision for one no. future boiler of same capacity. The duplex type ring main system shall essentially consist of following:

- Gear type pumps – 2 nos. (1 working + 1 Standby)
- Filter -120 Mesh, 15 litres capacity – 2 nos.
- Change over CS ball valves – 8 Nos
- Pressure gauge – 1 for each pump outlet.
- Non return valves ½” – 2 nos.
- Control panel for ring main system components – 1 no.

The pumps shall be geared type complete with built in pressure regulating device and suitable electric motor. The motors for oil pump shall be TEFC and having IP – 55 class of protection.

**Fuel oil piping**

- MOC of pipes: MS ‘C’ class ERW.
- Qty: suitable length from service in boiler house to ring main system and then to boiler and return line up-to service tank.
- Accessories: One pressure-regulating valve in each oil return line
- The pipeline shall be suitably insulated and gladded with 22 SWG Al. Sheet.
- Steam oil preheated.

The supply, installation and commissioning of electrical heat tracing system for heavy grade furnace oil lines shall also be included in the scope of the suppliers.

For the fuel oil pipe length of less than 6M, 220 V AC heaters of minimum capacity 2 kW shall be provided and the for the fuel oil pipe length of more than 6 M, 20 V AC heaters of minimum capacity of 3 kW shall be used.

Air/ gas separator shall be provided in the fuel supply line to the burner.

**Feed Water System**

**Pumps**

Type: Multi stage vertical centrifugal pumps
Capacity: To match the capacity of the boiler.

Qty: 2 nos. (1 working + 1 stand by)

Construction: SS impellers, mechanical seal.
Accessories for each pump:

- Suction strainer – 01 no.
- Suction strainer valves – 01 no.
- 100mm dia. Pressure gauge on delivery side– 01 no
- Feed check valve – 01

**Piping**

MOC of pipes: MS ‘C’ class ERW.

Accessories: 1 no of100 dia temperature- indicating gauge to measure the temperature of feed water.
Qty: suitable length from fed water service tank in boiler house to feed water pump and then to boiler shall be supplied and installed by the supplier.

The pipeline shall be suitably insulated and gladded with 24 SWG Al. Sheet.

Steam piping system

Steam at the required pressure generated shall be taken to dairy plant. This shall include all the steam lines particularly from the steam outlet in the boiler to the common header at the dairy plant. The following steam piping is included in the scope of supply.

Main HP Steam Header:

Steam at the required pressure generated shall be taken to dairy plant. This shall include all the steam lines particularly from the steam outlet in the boiler to the common header at the dairy plant. The following steam piping is included in the scope of supply.

Main HP Steam Header:

The main HP steam header of min.150NB dia. And suitable length shall consist of following nozzles with steam isolation valves.

<table>
<thead>
<tr>
<th>Nozzle description</th>
<th>Size (Dia. In mm)</th>
<th>Qty. (nos)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steam inlet from boilers</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>Outlet to dairy plant</td>
<td>80</td>
<td>1</td>
</tr>
<tr>
<td>Outlet to powder plant</td>
<td>80</td>
<td>1</td>
</tr>
<tr>
<td>Outlet to APS</td>
<td>80</td>
<td>1</td>
</tr>
<tr>
<td>Outlet to FO yard</td>
<td>40</td>
<td>1</td>
</tr>
<tr>
<td>Spare outlet</td>
<td>80</td>
<td>1</td>
</tr>
<tr>
<td>Pressure gauge</td>
<td>15</td>
<td>1</td>
</tr>
</tbody>
</table>

Any other nozzle required for safety/ control are also to be considered. The drawing of the header shall be submitted for approval before fabrication/ supply.

Quantity and sizes of HP steam piping:

<table>
<thead>
<tr>
<th>Description</th>
<th>Size (Dia. In mm)</th>
<th>Length (mtr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>From boilers to main header</td>
<td>100</td>
<td>30</td>
</tr>
<tr>
<td>Main header to dairy plant</td>
<td>80</td>
<td>110</td>
</tr>
<tr>
<td>Main header to PRS of FO yard</td>
<td>40</td>
<td>10</td>
</tr>
</tbody>
</table>

The supplier is required to quote unit price for steam piping (supply & installation) for any variation in quantity.

The steam pressure requirement of process equipment is minimum 3.5 kg/sq. cm. HP steam pipelines along with necessary steam pipeline fittings, expansion bends, valves and steam traps, insulation etc. shall be provided. All installation shall be executed as per IBR regulations. All the relevant approval certificates shall be submitted to the Purchaser.

RCC pipe bridge shall be provided between Boiler house and process hall be the purchaser. Supplier shall provide necessary pipe supports for all the piping network. Steam trap lines shall be taken at suitable location maintaining the aesthetic.

6.6 Pressure reducing station
The steam pressure requirement of process equipment at the dairy plant is minimum 3.5 kg/sq.cm.

The supplier has to supply and install IBR approved pressure reducing station (for dairy processing equipment) above the dairy plant corridor adjacent to the refrigeration section.

Another PRS (pressure requirement is 3.5kg/sq.cm.) shall be supplied and installed in the Boiler house for the requirement of FO handling system.

6.7 Chimney & Ducting

The chimney for operation of two boilers (with provision of connection one future stand-by boiler of same capacity) shall be of self supporting type, made out of mild steel sheets of suitable thickness. The steel plates and sections used in construction of the chimney along with other materials such as rivets, bolts, nuts, washers, gaskets including all consumables like welding rods. etc., shall conform to the relevant IS. The corrosion allowance for thickness of chimney shall be considered for minimum of 20 years life.

The chimney height shall be as per the Pollution Control Boards regulation. The design and construction of the chimney shall be conforming to IS: 6533 –part 1 & 2–1989 with latest revision The height of the chimney, if indicated at respective section, is the minimum requirement and it will be the successful suppliers responsibility to provide the same as per the PCB regulation.

While calculating the load on the chimney the following shall be considered:

Dead load considering the weights of the chimney shall and permanent fixtures such as ladders with protection cage, platforms with railings, baffles, helical strakes, flanges, fasteners and all accessories.

The imposed load of minimum 300 kg/ sq.m shall be on the sampling platform.

Wind loads in accordance with the provisions contained in IS 875 (part3) 1987. The wind load force on the ladder sand other fixtures and accessories fixed to the chimney shall also be determined and added to the force on the chimney.

Earthquake loads in accordance to IS 1893: 1975.

The chimney design and the foundation design for the chimney shall be determined by considering the maximum forces, effects and stress calculated from combination of any of the following combinations.

a. Dead load + wind load
b. Dead load + earthquake load
c. Dead load + load due to the lining + imposed load on service platforms + winds load.
d. Dead load + load due to the lining + imposed load on service platforms + Earthquake load.

6.7.2 The chimney shall consist of all the accessories and the minimum requirement of few are follows:-

a) Base plate with gussets plate (minimum thickness of 8mm) and base stool.

b) Inspection door with minimum size of 500 W x 800 W shall be provided. The door shall have handles and all associated accessories The cutout made on
the chimney shall have stiffeners of not less than 50 x 50 x 6 mm angles welded on the periphery of the cutout in the chimney.

c) Access ladder with protection cage:

The ladder shall start from 3 meter from the base of the chimney and it shall be up to the top of the chimney. The ladder shall be supported from the chimney with structural members of not less than 50 x 50 x 6 mm ISA and the ladder rung shall be located at a distance of 150 mm from the chimney. The ladder rung shall be made of 20 mm dia rod, the width of the rung shall be of minimum 400 mm and the ladder step shall be at a frequency of 200 mm C/C.

Safety enclosure or cage shall be provided for the ladder.

Platform for flue gas sampling and inspection:

The platform width shall be not less than 800mm and shall have 1000mm high railings, one additional support shall be provided in the middle of the railings, toe guard support shall be provided at the bottom of the railing. There shall be suitable arrangement in the platform for draining out the rain water. Sampling port shall be provided for flue gas sample analysis as per the PCB regulation.

The minimum cowl diameter shall be 1.5 times the diameter of the top of the chimney section.

Twin aviation lights and warning lights.

Aviation obstruction light fixture shall be made of aluminum alloy casing with separate galleries to house two 100 watts GL on BC type bulb holder. The lamp fixture shall have suitable red domes on the galleries and the lamp fixture shall be of reputed make.

Aviation obstruction light point shall be connected from the lighting circuit available in the boiler plant room with 3C x 2.5 sq. mm. PVC sheathed, insulated copper cable. The circuit cable shall be run on the rigid PVC conduit, 2mm thick and shall be fixed on the chimney surface with suitable saddles and clamps mounted on the epoxy based insulators.

h) Lightening arrestor:

The lightening arrestor shall be of copper with minimum 5 prongs, the lightening arrestor shall be connected to the two earth stations. The earthling conductor shall not be less than GI 25 x 6 mm/or of equivalent size and conductor material as approved by the local statutory authorities. The earthling conductor shall be mounted on the epoxy based insulators and not directly fixed to the chimney surface. Two earthling conductors shall run parallel from the lightening arrestor and each connected to the independent earth stations. The earth stations in turn shall be interconnected with one another.

The earth station shall be of GI plate conductor and constructed as per IS 3043 latest edition. The earth station shall be complete with excavation, filling with
charcoal/ salt, watering pipe, funnel, earthing conductor, test link, 350 x 350mm CI cover and complete withal masonry works.

i) Flue gas inlet:

Flue gas ducting shall be provided from the boiler to the chimney, it shall be made from MS sheet of thickness not less than 3 mm and shall be provided with baffle plates. The cutout made on the chimney shall have stiffeners of not less than 50 x50 x6 mm angles welded on the periphery of the cutout. The opening made on the chimney for the flue gas duct shall be extended by 200 to 300 mm and terminated on counter flanges to facilitate connection of the ducting on the chimney.

Helical strakes to reduce wind excited oscillations for the top 2/3rd height of the chimney:

k) Chimney bottom up to 3M height shall be insulated by 50 mm white mineral wool followed by cladding with 3 mm MS sheet. The mild steel cladding shall be of butt welded construction.

l) All MS parts of the chimney shall be given initial surface treatment including degreasing, degusting etc., then a coat of premier shall be applied. The chimney shall be finally painted with two coats of suitable heat resistant paint.

m) Foundation bolt of adequate length and diameter shall be provided along with the anchoring channel of section ISMC 150 on the bolt base. Template shall be provided suitable for the foundation bolts for casting the chimney foundation.

6.8 Boiler fitting and accessories.

Each boiler shall have all necessary standard mounting and fittings for safe and efficient operation of the boiler and in accordance with the latest IBR regulations.

Any item not listed in this specification but require by the statutory regulations shall be provided by the supplier without any additional cost.

Only major items/components are described in the following table:

<table>
<thead>
<tr>
<th>SlNo</th>
<th>Item description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Spring loaded full lift type safety valve having a total discharge rate exceeding the maximum steam producing capacity of boiler with exhaust pipe to discharge outside the boiler house.</td>
<td>2 sets</td>
</tr>
<tr>
<td>02</td>
<td>Main steam stop valve with counter flanges</td>
<td>1 no</td>
</tr>
<tr>
<td>03</td>
<td>Non-return valve forma in steam with counter flanges</td>
<td>1 no</td>
</tr>
<tr>
<td>04</td>
<td>Steam stop valve with counter flanges for auxiliary steam connection.</td>
<td>1 no</td>
</tr>
<tr>
<td>05</td>
<td>Steam pressure gauge of minimum size 200 mm dia. With siphon tube and cock.</td>
<td>1 no</td>
</tr>
<tr>
<td>06</td>
<td>Auxiliary steam connection with cock for fixing test pressure gauge and for removal of air.</td>
<td>1 no</td>
</tr>
<tr>
<td>07</td>
<td>Water leve3l sight glasses with safety shields and isolating cocks.</td>
<td>1 no</td>
</tr>
<tr>
<td>08</td>
<td>High, low and extra low water level alarms with isolating valve and drain point having a drain pipe up to blow down pit.</td>
<td>1 no</td>
</tr>
<tr>
<td>09</td>
<td>Flame observation port/ fire view glass of suitable thickness and design shall be of rotating type with blue tinch colour glass/ plain glass and the glasses not be exposed to fire.</td>
<td>1 no</td>
</tr>
<tr>
<td>10</td>
<td>Access ladder service platform and top walk way platform complete with railings.</td>
<td>1 no</td>
</tr>
</tbody>
</table>
Steam flow meter, density compensated vortex type with digital display for flow rate, total flow, pressure, temperature etc. 1 no. for each boiler shall also be provided.

It will be the suppliers responsibility to indicate any components not listed in this specification but required as per the statutory regulations. All such additional components/items considered shall be furnished item wise separately in their offer.

Painting: All the exposed MS surfaces shall be thoroughly cleaned with sand blasting followed by two coats of heat resistance anti corrosive primer followed by two coats of heat resistance paint of approved choice

6.9 Automatic blow down control system.

Automatic blow down control system proven to monitor the TDS level of the boiler water as close as possible to the optimum TDS level will be supplied and installed. The system shall ensure effective operation of blow down valves so as not to waste additional heat by means of excessive blow down.

The system shall have isolating valves, control valve, non return valve, sensor of suitable range and material of construction SS 316 controller to control and monitor TDS level of the boiler water, blow down control valve, up & downstream steam piping (IBR approved), TDS sensor (O-323 deg.C) with pneumatic control valve and all other associated accessories.

The complete assemble shall have a bypass line with manual blow down valve with counter flanges & necessary handles for operating the valves Necessary pipes and fittings up to blow down pit which will be located outside the boiler house shall also be included in the scope.

6.10 Control and instrumentation

6.10.1-Efficiency monitoring system.

Microprocessor based controller comprising of 2-line displays and bar graph indicator shall be used for the system with necessary data acquisition & diagnostic software package.

<table>
<thead>
<tr>
<th>Qty.</th>
<th>01 No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply</td>
<td>230 v/110 V ac, 50Hz</td>
</tr>
<tr>
<td>Input</td>
<td>Analog/ Digital/ Frequency</td>
</tr>
<tr>
<td>Output</td>
<td>Analog/ Digital/ Relay contacts</td>
</tr>
<tr>
<td>Version</td>
<td>Dual microprocessor based</td>
</tr>
<tr>
<td>Display</td>
<td>3½ digit led with Bar graph indication.</td>
</tr>
<tr>
<td>Adjustment</td>
<td>Digital pulsar knob</td>
</tr>
<tr>
<td>Update time</td>
<td>Less than 100 mille second</td>
</tr>
</tbody>
</table>
This shall provide general mimic screen displaying complete boiler equipment with instantaneous parameter value. Parameter screen displays graphical trends for measured parameter, losses & efficiency calculations. Alarm & diagnostic screen displays all deviations form desired results with diagnostic tips to resolve the same. Data log screen indicates all important parameters & trends suitable for hard copy reports on shift/ daily basis.

Boiler supplier shall provide required I/O panel, necessary hardware interface inter face with required drivers for interfacing of signal with the main dairy automation system in central control room. Utility PC, installed at central control room, shall be in the scope of purchaser.

The system shall indicate following parameters (indicative).

- Overall boiler efficiency,
- Stack losses,
- Combustion efficiency,
- Blow-down loss %,
- Radiation loss Enthalpy loss.
- Enthalpy loss.
- Flow rate & temperature of flue, steam & feed water.
- 02 %
- Boiler water TDS.

System hardware shall comprise of all instrument that are required to be provided for the above efficiency monitoring system.

All data shall be made available on user-friendly PC software indicating mimic, historical and real time trends, alarm summary and user configurable reports.

Boiler supplier shall provide required I/O panel necessary hardware interface with required drivers and to connect with the main dairy automation system.

Flow transmitter shall be installed at the inlet of the day tank by dairy erection contractor.

The complete control panel shall be supplied and installed with all suitable instruments and components such as sequential controller, push buttons, indicating lights, window enunciator, temperature/pressure controller, digital temperature indicators etc.

The Control panel be made from 14 Gauge CRCA sheet duly pretreated and painted. It shall also have audio alarming system for all the fault condition, which shall appear, visually on enunciator window.

Few of the fault conditions are:

<table>
<thead>
<tr>
<th>Input</th>
<th>Alarm/ Controls/ Interlocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flame failure</td>
<td>Audio, visual alarm and burner trip</td>
</tr>
<tr>
<td>Low oil pressure</td>
<td>Audio, visual alarm and burner trip</td>
</tr>
<tr>
<td>Higher Steam Pressure</td>
<td>Audio, visual alarm</td>
</tr>
<tr>
<td>Electrical heater on</td>
<td>Indications.</td>
</tr>
<tr>
<td>High, Low and extra low water level</td>
<td>Audio, visual alarm. The low and extra levels apart from audio – visual alarm shall switch off</td>
</tr>
<tr>
<td>Fuel inlet conditions like temperature pressure</td>
<td>The boiler cannot be started till set value is reached.</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>TDS sensor</td>
<td>Automatic blow down</td>
</tr>
</tbody>
</table>

The hooter shall stop once it is acknowledge, but the enunciator shall keep light ‘ON’ till the time fault conditions are attended.

The control panel shall have suitable incoming and outgoing feeders. All contactors, switchers, starters, HRC fuses, relays, Terminals etc., shall be neatly mounted and pre wired in the panel board terminating in suitably rate terminal blocks/epoxy based insulators. All fuses shall be HRC link type. The components of the control panel shall also selected as follows:

- The main incomer to the control panel shall be of suitably rated, TP, 35 KA, MCCB, with shunt coil. Suitable copper terminal extensions shall be made and fixed on posy-based insulators for terminating the incoming power cable to the control panel.

- Ammeter and voltmeters shall be provided with selector witches. Resin cast CT shall be provided for connecting the ammeter and the voltmeter shall have control fuses.

- The outgoing feeders shall be of suitably rated TP&N, 440V, PANEL MOUNTING TYPE SFU. Each outgoing feeder shall be located in separate compartment or each feeder shall be shrouded with one another by lam/ FRP sheet of minimum 3 mm thickness.

- All contactors shall have rated coil voltage of 2240 V AC. Individual isolators, fuses, starts, controls etc., shall be provided for each of the outgoing feeders.

- Minimum rating of contactor shall be j16 Amps.

- The wiring within the panel shall be done using copper cables. Minimum section of power cables shall be 2.5 sqmm and that of control cable shall be 1.5 sq.mm. Indicating ferrules at both cable ends shall be provided. Lugs shall be provided for all power and control cable terminations.

- Star-Dalta starters shall be provided for the motor ratings above 10 HP. DOL starters shall be provided for the motor ratings of 10 HP and below. However, for feed water pumps DOL starters may be provided irrespective of pump horse power.

- Minimum earth bus of 25x6 mm or equivalent area cross section shall be provided at the bottom of the panel for connecting the earth grid to the panel at two places.

All starters, fuses, insulator, heater ON/OFF pushbutton indicating lamp etc. shall be mounted in the panel and the same shall be dust and vermin proof.

Indicators, rotary switches etc. shall be provided on top of the panel and the same shall be at a convenient operating height.

The panel shall be complete type wired. The electric supply shall be 415 volts, 50Hz. AC.

The panel board shall be installed in boiler house as per approved layout.

Necessary isolators near motors shall be provided as per statutory requirement.

All feeders above 10 HP to be provided with ammeter with selector switch.
6.103 Electric Motors.

All electric motors shall be energy efficient motors and shall comply with the following.

All poly phase motors of 0.375 kW or more shall have a Minimum acceptable nominal full load motor efficiency not less than shown in Table below or as per the IS 12615 – 2004 Eff 1 for energy efficient motors.

Table for minimum Acceptable Motor Efficiencies.

<table>
<thead>
<tr>
<th>Motor Size (KW)</th>
<th>2 Pole</th>
<th>4 Pole</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 (1.5 hp)</td>
<td>82.2</td>
<td>83.8</td>
</tr>
<tr>
<td>1.5 (2 hp)</td>
<td>84.1</td>
<td>85.0</td>
</tr>
<tr>
<td>2.2 (3HP)</td>
<td>85.6</td>
<td>86.4</td>
</tr>
<tr>
<td>3.4 (4 hp)</td>
<td>86.7</td>
<td>87.4</td>
</tr>
<tr>
<td>4.0 (5.5 hp)</td>
<td>87.6</td>
<td>88.3</td>
</tr>
<tr>
<td>5.5 (7.5 hp)</td>
<td>88.5</td>
<td>89.2</td>
</tr>
<tr>
<td>7.5 (10 hp)</td>
<td>89.5</td>
<td>90.1</td>
</tr>
<tr>
<td>11.0 (15 hp)</td>
<td>90.6</td>
<td>91.0</td>
</tr>
<tr>
<td>15.0 (20 hp)</td>
<td>91.3</td>
<td>91.8</td>
</tr>
<tr>
<td>18.5 (20 hp)</td>
<td>91.8</td>
<td>92.2</td>
</tr>
<tr>
<td>22.0 (25 hp)</td>
<td>92.2</td>
<td>90.6</td>
</tr>
<tr>
<td>30.0 (30 hp)</td>
<td>92.9</td>
<td>93.2</td>
</tr>
<tr>
<td>30.0 (40 hp)</td>
<td>93.3</td>
<td>93.6</td>
</tr>
<tr>
<td>37.0 (50 hp)</td>
<td>93.7</td>
<td>93.9</td>
</tr>
<tr>
<td>45.0 (60 HP)</td>
<td>94.0</td>
<td>94.2</td>
</tr>
<tr>
<td>55.0 (75 HP)</td>
<td>94.6</td>
<td>94.7</td>
</tr>
<tr>
<td>75.0 (100 HP)</td>
<td>85.6</td>
<td></td>
</tr>
</tbody>
</table>

b) Motor name plates shall list the nominal full-load motor efficiencies and the full load power factor.

d) Certificates shall be obtained and kept on record indicating the motor efficiency Whenever a motors rewound, appropriate measures shall be taken so that the core characteristics of the of the motors not lost due to thermal and mechanical steps ring removal of damaged parts. After reminding, a new efficiency test shall be performed and similar record shall be maintained.

6.10 Electrical viz. power, control, signal & instrumentation cables, conduits & cable trays, earthing etc.

Required quantity of armored aluminum & copper cable, copper control cable, signal & instrument cable, GI perforated cable types, GI conduit pipe, plate type earth pit, earthing network, earthing conductors, load break Isolators/ Plug& sockets with Emergency Stop Push Button near motors for emergency isolation, rubber mats for panels etc. shall also be provided.

All armored cables between feeders in MCC and plug & socket/ isolator junction boxes near motors shall be of cope conductor for cable size up to 35 Sq mm. Armored a aluminum conductor cable shall be used only for cable size beyond 50 sq mm. Connection from plug & socket/isolator junction boxes to motor junction box shall be with PVC insulated flexible copper cable in flexible conduit.

Plug in type isolators with emergency stop push button in cast aluminum water tight enclosure (min. IP55) should be provided for all motors below 10 KW. For motors of 10 KW& above Cast Aluminum water tight junction box (min. IP 55) with emergency stop push button shall be provided.
Separate earthing not work for power & instrumentation/control system shall be provided.

The suppliers shall quote their rates with the quantity breakup for essential spares considering normal operation of the plant for two years. All spare components shall be duly quantified and included in the offer with price breakup for each of the spare component.

Following in brief are few essential components, which are to be quoted. Purchaser will at its discretion decide which item from the list of spares to be considered in the final order.

<table>
<thead>
<tr>
<th>Boiler tubes</th>
<th>Minimum 2% of the total tubes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil pump</td>
<td>01 no.</td>
</tr>
<tr>
<td>Manhole gasket</td>
<td>01 no.</td>
</tr>
<tr>
<td>Mud hole gasket</td>
<td>01 no.</td>
</tr>
<tr>
<td>Tube cleaning brush</td>
<td>01 no.</td>
</tr>
<tr>
<td>SS Float, road &amp; Magnet assay</td>
<td>02 nos.</td>
</tr>
<tr>
<td>Pressure switch</td>
<td>01 no.</td>
</tr>
<tr>
<td>Fusible Flung</td>
<td>01 no.</td>
</tr>
<tr>
<td>Toughened glass</td>
<td>02 nos.</td>
</tr>
<tr>
<td>Sequence controller</td>
<td>01 no.</td>
</tr>
<tr>
<td>Ignition electrode</td>
<td>02 Nos.</td>
</tr>
<tr>
<td>Electrode cable with cap</td>
<td>01 no.</td>
</tr>
<tr>
<td>Oil pressure gauge</td>
<td>01 no.</td>
</tr>
<tr>
<td>Heater element</td>
<td>02 nos.</td>
</tr>
<tr>
<td>Photo cell</td>
<td>01 no.</td>
</tr>
<tr>
<td>Ignition transformer</td>
<td>01 no.</td>
</tr>
<tr>
<td>Stepping motor</td>
<td>01 no.</td>
</tr>
<tr>
<td>Solenoid valves</td>
<td>01 no.</td>
</tr>
</tbody>
</table>

Other accessories, which are not listed above but are required for normal functioning of the boiler for two years of operation shall also be supplied by the supplier.

It may please be noted that, any spares required during startup and up to successful commissioning of the boiler and all its associated equipments, the same shall be deemed to be included in the quoted process of the steam raising plant.

**ERECTIION AND COMMISSIONING:**

**Scope of Work**

The scope of work in brief includes positioning of the boiler on foundation, connecting feed water, oil land drain lines, up to main valves, safety valve vent line outside building, blow down lines up to blow down pit, electrical panel installation, power & control supply installation & termination to electric, double earthing of the panel and all the equipment, fabrication of ducting as per layout, positioning of the chimney on the foundation and making all necessary connections, completing all other associated works.
The following items in brief shall be supplied and installed by boiler manufacturer as per the battery limits mentioned at 9.0.

a) The steam pipes (HP/LP, vent lines), water pipes, and oil pipes along with pipe fittings for the above.

b) Safety valves, controls, instruments, gauges (dial type and digital type), valves, sensors and all associate instruments / gadgets.

c) Insulation of steam line and oil pipelines as per the battery limits and cladding with 24 Gauge aluminum sheet.

d) Asbestos rope insulation of drain lines and safety lines as per requirement.

e) Heat tracing materials for fuel oil pipeline.

f) All foundation bolts.

g) Cables, wires with all interconnections, Earthing materials and laying of the earthing conductor (on surface, indoor and outdoor trenches including excavation & back filling of the outdoor trenches.

h) Supply and installation of earth station(2nos) complete with earth electrode and associated accessories as per relevant IS, including excavation for the earth pit, back filling, providing CI chamber and the associated concrete masonry work, of pit etc. complete.

i) Supply and installation of 1 number of earth station (for process instrumentation) complete with copper earth electrode and associated accessories as per relevant I, including excavation for the earth pit, back filling, providing CI chamber and the associated concrete masonry work, of pit etc. complete.

j) Necessary bolts, nuts, fittings, consumables, tools and tackles and labour for the job.

k) Equipment layout for boilers, ducting, chimney details, P&I diagram, electrical load requirement etc. shall be prepared & submitted along with the bid by the supplier based on the attached boiler room layout drawing.

It will be the successful suppliers responsibility to indicate any works not listed above and in this specification but are require as per the statutory regulations. All such additional works considered shall be furnished item wise separately in their offer.

It will be the successful suppliers responsibility to execute any works, which are neither furnished in the specification, nor additionally listed by the supplier in their offer and the same are found to be required as per the statutory regulations, Successful supplier shall execute such works within the scope of the tender price and no additional cost will be considered for the same.

The boiler shall be transported by the supplier after receiving intimation regarding readiness of the foundation. Boiler shall be insured, transported and unloaded on foundation by the supplier.

All mountings, fittings, accessories etc. Shall be installed, aligned and piping, electrical connection etc. Shall be carried out as per the latest engineering practices.

Chimney and ducting shall be fabricated after getting the drawings approved from the concerned office of COMFED and statutory authorities.
For commissioning and trial run of the boiler, necessary material for first charge like lubricating oil, grease etc. Shall have to be supplied by the supplier. However cleaning chemicals, water, fuel etc. Shall be supplied by the concerned dairy.

After commissioning the boiler the following parameters are to be established and recorded by the supplier.

- Steam generating capacity
- Efficiency of the boiler
- Dryness fraction of steam
- Fuel consumption
- Electricity consumption
- Water consumption

The supplier has to specify the methodology proposed to be adopted by them for establishing the design parameter. It will be the successful supplier’s responsibilities to provide all the necessary additional instruments required for establishing the design parameters during testing and till the time the results are achieved and accepted by the COMFED / purchaser.

Thereafter, the boiler shall be on trial run for minimum 30 days, during this period training shall be imparted to the authorised operating personal before handing over the boiler to purchaser/ project authorities.

The erection and commissioning shall be carried out as per general terms and conditions of erection contract mentioned in the tender.

**MAKES OF MAJOR EQUIPMENT/ ITEMS**

The table below specifies the preferred makes of major bought out equipment/ accessories/ instruments etc. The offer must be complete with an indication of the make(s) considered for the actual execution.

<table>
<thead>
<tr>
<th>Item description</th>
<th>Preferred makes</th>
<th>Make offered by the supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiler (oil fired)</td>
<td>JNM/ Thermax/ Dunphy/ REILCO/ Combustion concepts/industrial boiler/ energy pack/version</td>
<td>Energypack</td>
</tr>
<tr>
<td>Boiler steel drum plate</td>
<td>SAIL/TISCO/IISCO/RINL/ESSAR</td>
<td>SAL</td>
</tr>
<tr>
<td>Boiler tubes</td>
<td>TATA/ISMT/Equivalent conforming to IBR</td>
<td>IBR</td>
</tr>
<tr>
<td>HP steam pipes and fittings</td>
<td>TATA/ISMT/Equivalent conforming to IBR</td>
<td>IBR</td>
</tr>
<tr>
<td>HP steam pipe fittings</td>
<td>IBR approved</td>
<td>IBR</td>
</tr>
<tr>
<td>Feed water pump</td>
<td>Grundfoss / WILO</td>
<td>Grundfoss</td>
</tr>
<tr>
<td>FO pump</td>
<td>Neels – Entees /Suntec/ Prakash equivalent</td>
<td>Neel-Entees/ prakash</td>
</tr>
<tr>
<td>FD fan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequence controller</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Photocell</td>
<td>Weishaupt</td>
<td>Weishaupt</td>
</tr>
<tr>
<td>Component</td>
<td>Supplier(s)</td>
<td></td>
</tr>
<tr>
<td>---------------------------------</td>
<td>------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Burner Management system</td>
<td>Forbes Marshall/ Armstrong, USA/ Uniklinger/ Thermax/ Audco/ BHEL</td>
<td></td>
</tr>
<tr>
<td>Steam valves</td>
<td>Forbes Marshall/ Armstrong, USA/ Uniklinger/ Thermax/ Audco/ BHEL</td>
<td></td>
</tr>
<tr>
<td>Steam NRV</td>
<td>Forbes Marshall/ Armstrong, USA/ Uniklinger/ Thermax/ Audco/ BHEL</td>
<td></td>
</tr>
<tr>
<td>Blow down valves</td>
<td>Spirax marshall/ levcon/ Equivalent Spirax marshall/ levcon</td>
<td></td>
</tr>
<tr>
<td>Water valves</td>
<td>Forbes Marshall/ Unik linger / Audco/ KSB/BDK Audco/ KSB/BDK</td>
<td></td>
</tr>
<tr>
<td>Steam flow meter</td>
<td>E&amp;H(Germany), Emerson (Rosemount), Forbes marshall Emerson</td>
<td></td>
</tr>
<tr>
<td>Water flow meter</td>
<td>KRONE-Marshall/ E&amp;H/ Emerson (Rosemount) Emerson</td>
<td></td>
</tr>
<tr>
<td>Oil flow meter</td>
<td>Forbes Marshall/ Toshniwal/ E&amp;H/ Emerson (Rosemount) Emerson</td>
<td></td>
</tr>
<tr>
<td>Single element water level controller</td>
<td>Llevcon / KDG Mobrey (UK) Llevcon / KDG Mobrey (UK)</td>
<td></td>
</tr>
<tr>
<td>Safety valve</td>
<td>Spirax marshall/ Armstrong, USA/ fainger lesser/ sempell/ Mazda fainger lesser</td>
<td></td>
</tr>
<tr>
<td>Control valve</td>
<td>ARCA/ Dembla/ MIL/Avcon ARCA/Dembla/ MIL/ Avcon</td>
<td></td>
</tr>
<tr>
<td>Level controller</td>
<td>Malhotra Malhotra</td>
<td></td>
</tr>
<tr>
<td>Level indicator</td>
<td>MH Bros/Teleflo/ Tectrol/ Leader MH Bros</td>
<td></td>
</tr>
<tr>
<td>Level Transmitter</td>
<td>E&amp;H(Germany)/Emerson(Rosemount) E&amp;H(Germany)/ Emerson(Rosemount)</td>
<td></td>
</tr>
<tr>
<td>Pressure gauge</td>
<td>Forbes Marshall/ Thermax/ H Guru/ Fiebig/ Gluck Fiebig</td>
<td></td>
</tr>
<tr>
<td>Guage glass</td>
<td>Phoenix (germany) Phoenix</td>
<td></td>
</tr>
<tr>
<td>Thermocouple</td>
<td>General instrument/Nagman General instrument</td>
<td></td>
</tr>
<tr>
<td>Pressure switch transmitter, Diff. Pressure transmitter</td>
<td>Danfoss Emerson (Rosemount)/ Yokogawa Danfoss Emerson (Rosemount)/ Yokogawa</td>
<td></td>
</tr>
<tr>
<td>Orifice plate</td>
<td>General instrument/ Baliga Baliga</td>
<td></td>
</tr>
<tr>
<td>Transducer</td>
<td>EE/Equivalent EE</td>
<td></td>
</tr>
<tr>
<td>Fuel efficiency monitor</td>
<td>Neotronic forbes marshall, Bentone Neotronic forbes marshall, Bentone</td>
<td></td>
</tr>
<tr>
<td>All LT switchgear/ push buttons/timers</td>
<td>Siemens /L&amp;T/ ABB/ Schneider L&amp;T</td>
<td></td>
</tr>
<tr>
<td>VFD</td>
<td>Danfoss/ Siemens /ABB/ Allen Bradley (Rockwell)/Schneider ABB</td>
<td></td>
</tr>
<tr>
<td>Digital temperature indicator</td>
<td>RADIX/HONEYWELL/PROTROL Honeywell</td>
<td></td>
</tr>
<tr>
<td>Structural steel</td>
<td>SAIL/TISCO/RINL/IISCO/ESSAR SAIL</td>
<td></td>
</tr>
<tr>
<td>Electrical motors</td>
<td>Bharat bijlee / Siemens/ NGEF/ Kirloskar/ Crompton greaves Crompton greaves</td>
<td></td>
</tr>
<tr>
<td>LT power</td>
<td>LAPP KABEL/ finolex /CCI/RPG Asian/ polycab</td>
<td></td>
</tr>
</tbody>
</table>
Bihar State Milk Co-Operative Federation Limited
DAIRY DEVELOPMENT COMPLEX, P.O. - BIHAR VETERINARY COLLEGE,
PATNA-800014(BIHAR)
Phone No- 2224083,2228953,2228347,2220387, Fax No-0612-2228306
E-Mail: engineeringcomfed@gmail.com, Website: www.sudha.coop

<table>
<thead>
<tr>
<th>cables(copper)</th>
<th>Fort gloster/ polycab</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT copper control cables</td>
<td>LAPP KABEL/ finolex /CCI/RPG Asian/</td>
</tr>
<tr>
<td></td>
<td>RR cables (unilay)/ poly cab/ concab</td>
</tr>
<tr>
<td>Signal and instrument cable</td>
<td>LAPP KABEL/concab/ belden/ plycab</td>
</tr>
<tr>
<td></td>
<td>polycab</td>
</tr>
<tr>
<td>Automatic blow down control system</td>
<td>Spirax Marshall/ Thermax</td>
</tr>
<tr>
<td></td>
<td>Spirax Marshall/Thermax</td>
</tr>
</tbody>
</table>

*Note: where more than one make is considered for an item or no make is mentioned in the bid/order, supplier shall obtain prior written approval of purchaser before commencing the manufacturing, placing an order on vendor as the case may be.

**DETAILS OF THE BOILER**

<table>
<thead>
<tr>
<th></th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Continuous water evaporation at the rate of 10000 kg &amp; 6000 /Hr from &amp; at 100 deg c water.</td>
</tr>
<tr>
<td>2</td>
<td>Pressure</td>
</tr>
<tr>
<td>3</td>
<td>Quantity</td>
</tr>
<tr>
<td>4</td>
<td>Turn down ratio (minimum)</td>
</tr>
<tr>
<td>5</td>
<td>Chimney</td>
</tr>
<tr>
<td>6</td>
<td>Chimney quantity</td>
</tr>
<tr>
<td>7</td>
<td>Type of chimney</td>
</tr>
<tr>
<td>8</td>
<td>Length of flue gas duct</td>
</tr>
<tr>
<td>9</td>
<td>Burner</td>
</tr>
<tr>
<td>10</td>
<td>O2 meter for flue gas</td>
</tr>
<tr>
<td>11</td>
<td>Steam flow meter</td>
</tr>
<tr>
<td>12</td>
<td>Water flow meter</td>
</tr>
<tr>
<td>13</td>
<td>Fuel oil flow meter</td>
</tr>
<tr>
<td>14</td>
<td>Heat tracing system(electrical)</td>
</tr>
<tr>
<td>15</td>
<td>Initial firing system</td>
</tr>
</tbody>
</table>

**TECHNICAL DETAILS OF THE BOILER-TO BE FURNISHED BY THE SUPPLIER**

Supplier shall furnish technical detail of the boiler offered in the following performs.

<p>| 13.1 | Boiler general details |
| 13.1.1 | Type of boiler |
| 13.1.2 | Model |
| 13.1.3 | Wet back/dry back |
| 13.1.4 | No. of passes |
| 13.2 | Steam generation |
| 13.3 | Steam condition |
| 13.3.1 | Max. Total solids(ppm) |</p>
<table>
<thead>
<tr>
<th>13.3.2</th>
<th>Silica (ppm)</th>
<th>Nil</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.3.3</td>
<td>Dryness fraction</td>
<td>98%</td>
</tr>
<tr>
<td>13.4</td>
<td>Steam pressure</td>
<td>17.5 kg/sq.cm</td>
</tr>
<tr>
<td>13.4.1</td>
<td>Safety valve set pressure (kg/sq.cm)</td>
<td>16.5 &amp; 17.0 kg/sq.cm</td>
</tr>
<tr>
<td>13.4.2</td>
<td>Modulating pressure control range (kg/sq.cm)</td>
<td>17.0 &amp; 10 kg/sq.cm</td>
</tr>
<tr>
<td>13.4.3</td>
<td>Burner cut-off pressure switch setting (kg/sq.cm)</td>
<td>17.0 kg/sq.cm</td>
</tr>
<tr>
<td>13.4.4</td>
<td>Boiler thermal efficiency</td>
<td></td>
</tr>
<tr>
<td>13.5</td>
<td>Boiler efficiency (%) based on N.C.V fuel</td>
<td></td>
</tr>
<tr>
<td>13.5.1</td>
<td>At 100% load</td>
<td>89 +/- 2%</td>
</tr>
<tr>
<td>13.5.2</td>
<td>At 75% load</td>
<td>88 +/- 2%</td>
</tr>
<tr>
<td>13.5.3</td>
<td>At 50% load</td>
<td>87 +/- 2%</td>
</tr>
<tr>
<td>13.5.4</td>
<td>At 25% load</td>
<td>86 +/- 2%</td>
</tr>
<tr>
<td>13.6</td>
<td>Boiler water concentration limits:</td>
<td></td>
</tr>
<tr>
<td>13.6.1</td>
<td>Hardness as caco3 (ppm)</td>
<td>Less than 5 ppm</td>
</tr>
<tr>
<td>13.6.2</td>
<td>Total dissolved solids (ppm)</td>
<td>3500 ppm</td>
</tr>
<tr>
<td>13.6.3</td>
<td>Suspended solids (ppm)</td>
<td>50 ppm</td>
</tr>
<tr>
<td>13.6.4</td>
<td>Alkalinity as caco3 (ppm)</td>
<td>350 ppm</td>
</tr>
<tr>
<td>13.6.5</td>
<td>Ph value:</td>
<td>8.5 to 9.5</td>
</tr>
<tr>
<td>13.6.6</td>
<td>Free CO2 (ppm)</td>
<td>Nil</td>
</tr>
<tr>
<td>13.6.7</td>
<td>Dissolved oxygen (ppm)</td>
<td>Minimum</td>
</tr>
<tr>
<td>13.6.8</td>
<td>Silica (ppm)</td>
<td>0.4 of caustic alkalinity</td>
</tr>
<tr>
<td>13.6.9</td>
<td>Phosphates of PO4 (ppm)</td>
<td>Nil</td>
</tr>
<tr>
<td>13.6.10</td>
<td>Sodium sulphite as SO3 (ppm)</td>
<td>30 to 70 ppm</td>
</tr>
<tr>
<td>13.7</td>
<td>Connected electrical load:</td>
<td></td>
</tr>
<tr>
<td>13.7.1</td>
<td>Feed water pump</td>
<td>2</td>
</tr>
<tr>
<td>13.7.2</td>
<td>Fuel oil pump</td>
<td>2</td>
</tr>
<tr>
<td>13.7.3</td>
<td>Electrical heater</td>
<td>1</td>
</tr>
<tr>
<td>13.7.4</td>
<td>FD fan</td>
<td>1</td>
</tr>
</tbody>
</table>

Any other equipment

Utilities Consumption at maximum Rated capacity:

- Fuel: Furnace Oil (Kg/hr): 314 kg/hr.
- Electricity (KWH): 21 KWH
- Water (kg/hr): 6000 kg/hr.
### Overall dimension of boiler

(Length x Breadth x Height) 7x3.2 x 4.2 mtr.

### Recommended size of boiler house

Suitable for 3 (1 w + 1s +1future) nos. boilers (Length x Breadth x Height) 21 x 17.5 x 7.0 mtr.

The boiler plant room drawing along with the tentative layout is enclosed, suppliers are to submit the same along with their offer superimposing their boiler dimensions and the clearances require as per the statutory regulation.

### 13.10 Mechanical Details of the Boiler

- **Heating surface area (sq.m)**: 160 sq.m
- **Tubes**
  - OD x Thickness (mm): 63.5 OD x 3.66 thk.
  - Quantity (non): 133 nos.
- **Materials of construction**: BS 3059 IBR

#### 13.10.3 Shell

- **Thickness (mm)**: 20mm
- **Length (Mtrs)**: 5650mm
- **Size (mtrs)**: 2350 mm
- **Material of construction**: SA 515/516/Gr. 70

#### 13.10.4 Design Code

- As per latest IBR

#### 13.10.5 Water content when full (cu.m)

- 16.2723 cu.m

#### 13.10.6 Steam space (cu. m)

- 3.3391 cu.m

#### 13.10.7 Water content when at working level cu.m)

- 12.9332 cu.m

### 13.11 Feed Water Arrangement

#### 13.11.1 No. of Pumps

- 2nos. (1W + IS)

#### 13.11.2 Stand by water pumps

- One

#### 13.11.3 Type of pump

- Vertical centrifugal

#### 13.11.4 Capacity of each pump

- 6.0 cu.m/ hr at 190 MWC head

#### 13.11.5 Water flow meter provided

- Yes

#### 13.11.6 Max. temperature water meter can with stand.

- 90 deg. C

#### 13.12 Valves in water feed piping
<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stop valve at pump outlet</td>
<td>Yes</td>
</tr>
<tr>
<td>Non-return valve at pump outlet</td>
<td>Yes</td>
</tr>
<tr>
<td>Pressure gauge at pump outlet</td>
<td>Yes</td>
</tr>
<tr>
<td>Pump suction side isolating</td>
<td>Yes</td>
</tr>
<tr>
<td>Valve</td>
<td></td>
</tr>
<tr>
<td>Firing arrangement</td>
<td></td>
</tr>
<tr>
<td>Burner – Type</td>
<td>Modulating</td>
</tr>
<tr>
<td>Burner – Make</td>
<td>Weishaupt</td>
</tr>
<tr>
<td>Burner - Model</td>
<td>RMS 50/2A</td>
</tr>
<tr>
<td>Burner - rating (Kcal / hr)</td>
<td>3100000 Kcal/hr</td>
</tr>
<tr>
<td>Turn down ratio</td>
<td>1:4</td>
</tr>
<tr>
<td>Alarm and Burner trip on flame failure.</td>
<td>...</td>
</tr>
<tr>
<td>Alarm and Burner trip on extreme low water level</td>
<td>..</td>
</tr>
<tr>
<td>Alarm and Burner trip on low oil pressure</td>
<td>...</td>
</tr>
<tr>
<td>Alarm and Burner trip on high steam pressure.</td>
<td>..</td>
</tr>
<tr>
<td>Alarm and Burner trip on flue damper closed.</td>
<td>.</td>
</tr>
<tr>
<td>Alarm and Burner trip on low air temperature.</td>
<td></td>
</tr>
<tr>
<td>Heating and pumping units</td>
<td></td>
</tr>
<tr>
<td>No. of fuel pumps</td>
<td>2Nos (1 W + 1 S)</td>
</tr>
<tr>
<td>Stand by fuel oil pumps</td>
<td>Yeas (Loose)</td>
</tr>
<tr>
<td>Type and Duty</td>
<td>Gear type</td>
</tr>
<tr>
<td>Capacity of each pump</td>
<td>1.0 cu.m/ hr at 250 MWC head</td>
</tr>
<tr>
<td>Electric pre heater provided:</td>
<td>..</td>
</tr>
<tr>
<td>Steam pre heater</td>
<td>..</td>
</tr>
<tr>
<td>Oil temperature gauge</td>
<td>..</td>
</tr>
<tr>
<td>Furnace oil flow meter</td>
<td>..</td>
</tr>
<tr>
<td>FD fan</td>
<td>..</td>
</tr>
<tr>
<td>Quantity (nos) :</td>
<td>1 no.</td>
</tr>
<tr>
<td>Type</td>
<td>Centrifugal</td>
</tr>
<tr>
<td>Capacity</td>
<td>5500 cu.m/hr as per standard supply Weishaupt burner.</td>
</tr>
<tr>
<td>Flue Gas opening size on boiler</td>
<td>435 mm</td>
</tr>
<tr>
<td>(mm)</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Chimney:</td>
<td>18850 mm</td>
</tr>
<tr>
<td>Dia at base of the chimney:</td>
<td>700 mm</td>
</tr>
<tr>
<td>Dia at base of the chimney:</td>
<td>9 nos.</td>
</tr>
<tr>
<td>Number of chimney sections:</td>
<td>1.85/1.66/1.47/1.275/1.083/0892/0.70/0.70/0.70</td>
</tr>
<tr>
<td>Dia at top of each section (mtr):</td>
<td>1.66/1.47/1.275/1.083/0.892/0.70/0.70/0.70/0.70</td>
</tr>
<tr>
<td>Height of each section (mtr):</td>
<td>5.0/5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5./5.</td>
</tr>
</tbody>
</table>
Boiler Losses:
(Break up details of losses in %
to be furnished on NCV basis).

<table>
<thead>
<tr>
<th>Loss Type</th>
<th>% Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry stack loss</td>
<td>6%</td>
</tr>
<tr>
<td>Sensible heat loss</td>
<td>5%</td>
</tr>
<tr>
<td>Moisture in air loss</td>
<td>0.5%</td>
</tr>
<tr>
<td>Radiation loss</td>
<td>0.5%</td>
</tr>
<tr>
<td>Unaccounted loss</td>
<td>-</td>
</tr>
<tr>
<td><strong>TOTAL LOSS</strong></td>
<td><strong>12%</strong></td>
</tr>
</tbody>
</table>

Furnace oil

**REFRIGERATION COMPRESSOR UNIT**

Capacity: Suitable as per plant requirement, The design for which may be Submitted. (Capacity 450 TR)

Type: Ammonia based Rotary Screw Compressor

Refrigerants: R - 717

Evaporating Temp.: As per requirement

Condensing Temp.: + 40 Deg.C

Non-contributing suction: + 5 Deg.C superheat

The unit is to be inclusive of all internal piping and electric wiring and inclusive of the following main components:

Rotary Screw Compressor:

Casting is close grain, cast iron to ensure structural integrity and mechanical and thermal stability under all operating conditions. The rotors are machined from steel forging to the exacting tolerances of the latest SRM asymmetric profile.

Variable capacity control 100% - 10% by use of a movable slide valve.

- a) Suction and discharge line stop valves
- b) Suction and discharge line check valves
- c) Suction scale trap with strainer
- d) Controls and instruments comprising of pressure transducers, temperature switches, solenoid valve, etc.
- e) Drive coupling and coupling guard
- f) Lubrication system:

The compressor is designed specifically for operation without oil pump under normal operating conditions. All oil required for lubrication is provided by positive gas differential pressure.

- g) Oil separator / Reservoir.

Three-stage horizontal oil separator/ reservoir with coalescent separator elements.

Oil separator is supplied with Safety valve.
Electric heater in oil separator

h) Oil Cooler:

Water-cooled shell and tube type oil cooler. The cooler is designed and constructed according to ASME Section VIII Div. 1.

i) Single oil filter designed for vertical mounting and furnished with isolation stop valves and drain connections for ease of servicing.

j) Control panel:

Microprocessor based control panel is to be provided for automatic Control and setting of correct volume ratio, according to actual running conditions. Furthermore, for necessary safety controls and display readings of temperatures and pressures. The Control panel is to be factory mounted, completely piped and wired with all the required safety and operating devices.

**MOTORS FOR ABOVE COMPRESSORS**

Suitable rating 2 pole, TEFC, horizontal foot mounted, squirrel cage, induction motor having degree of protection IP 55, suitable for operation on 415V, 50 Hz, 3 phase, AC supply. The motor shall be equipped with winding thermistors.

Alternative rate with 3 nos. equivalent to 9” X 9” (one no. stand by) and 450 XL series high speed ammonia compressor with motor etc in lieu of screw compressor must be quoted.

### 3.2 ELECTRONIC SOFT STARTER

Suitable capacity for starting of compressor motor. The starter will be located in the Motor Control Center in the refrigeration room. The starter shall incorporate the following:

- Motor feeder HRC fuses
- Microprocessor based protection & metering relay with Communication with DCS.
- Main isolating contactor
- ON/OFF push buttons
- Ammeter, voltmeter
- Time totaliser

### 3.3 CONDENSER

<table>
<thead>
<tr>
<th>Type</th>
<th>Plate type heat exchanger</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of condensers</td>
<td>One</td>
</tr>
<tr>
<td>Heat rejection capacity</td>
<td>Bidders to specify</td>
</tr>
</tbody>
</table>

### 3.4 LIQUID AMMONIA RECEIVER

The receiver shall be complete with all the fittings and mountings.

The details of the receiver are as follows:

<table>
<thead>
<tr>
<th>Type</th>
<th>Horizontal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity (Holding)</td>
<td>Bidders to specify</td>
</tr>
<tr>
<td>Design Code</td>
<td>IS code 2825</td>
</tr>
<tr>
<td>Shell material</td>
<td>SA 516 Gr. 70</td>
</tr>
<tr>
<td>Nozzle</td>
<td>SA106</td>
</tr>
<tr>
<td>Flanges</td>
<td>SA105</td>
</tr>
</tbody>
</table>
Radiography : 100%

3.5 FLASH TYPE ECONOMIZER

Complete with all the fittings and mountings.

3.6 AMMONIA EVAPORATOR

Detail specifications of chiller are as under.

Type : Semi welded plate type
Heat rejection capacity : Bidders to specify
No of plates : Bidders to specify
No of cassettes : Bidders to specify
Plate thickness : 0.6mm
Plate material : AISI 316
Pressure plates material : SA516 Gr. 70
Surface area : Supplier to specify
Water flow : Bidders to specify
Ammonia evaporating temperature: 0.5 deg C
Chilled Water inlet temperature : 4 deg C
Chilled water outlet temperature : 1.5 deg C

3.7 LIQUID SEPARATOR (SURGE DRUM) FOR THE CHILLER.

The surge drum shall be complete with all the fittings and mountings.

The details of the receiver are as follows:

Type : Horizontal
No. of receivers : One
Capacity (Holding) : Bidders to specify
Design Code : IS code 2825
Shell material : SA 516 Gr. 70
Nozzle : SA106
Flanges : SA105
Radiography : 100%

3.8 OIL RECTIFIER

For oil return arrangement from the chiller to the compressor suction line. Bidders to specify the size of the rectifier.

3.9 COOLING TOWER

Capacity : Suitable

3.10 COOLING WATER CIRCULATION PUMPS (2W +1S)

Capacity : Suitable
Type : Back pullout type
Impeller : Bronze

Each pump shall be coupled with TEFC sq. cage induction motor suitable for operating on 415 V, 50 Hz, and 3 phase AC supply. The pump will circulate cooling water from cooling tower to condenser and oil cooler of compressor.
3.11 CHILLED WATER TANK

Tank size: Bidders to specify.

In MS plates conforming to IS 2062 having two compartments i.e. hot and cold well complete with thermal insulation (expanded polystyrene).

3.12 ICE BANK TANK

Size: as required.

MS Ice Bank Tank fabricated from 8mm thick MS plates from bottom and 6mm thick MS plates for sides and walls with adequate ISMC 100x50x5 sections.

IBT shall be in three compartments. Each compartment shall have agitator. The size of the tank is indicative and supplier to work out to suit the peak load requirement of plant and indicate in the offer.

Ice Accumulating coils fabricated from 32 NB MS C class pipes. The length of the ice accumulating coil arrived at by the Supplier shall be indicated. The IBT selection histogram shall be submitted along with the bid. Necessary provision for Ice thickness controller shall be considered.

Each compartment shall have agitator. MS staircase approach to IBT top is size of the tank shall be included in scope of supply.

3.13 PRIMARY CHILLED WATER PUMPS

Capacity: Suitable
Type: Back pullout type
Impeller: Bronze

Each pump shall be coupled with TEFC sq. cage induction motor suitable for operating on 415 V, 50 Hz, 3 phase AC supply. The pump will circulate water from Chilled water tank to PHE evaporator.

3.14 SECONDARY CHILLED WATER PUMPS

Capacity: Suitable
Type: Back pullout type
Impeller: Bronze

Each pump shall be coupled with TEFC sq. cage induction motor suitable for operating on 415 V, 50 Hz, and 3 phase AC supply. The pump will circulate cooling water from IBT/Chilled water tank to plant.

3.15 AMMONIA PIPING, VALVES & FITTINGS

Heavy duty MS pipes in welded construction to interconnect the various refrigeration equipment such as compressors, condensers, evaporators, etc. The piping should be complete with Ammonia valves, controls and fittings etc. Necessary PUF insulation is also included in the scope. Break up rates of offered quantities may be indicated.

3.16 CHILLED WATER PIPING, VALVES & FITTINGS

GI ‘B’ class pipes and fittings to interconnect chilled, chilled water tank and chilled water pump sets. The pipes shall be as per IS 1239 for size 150NB and below & as per IS3589 for sizes above 150 NB.
The necessary pipe support, valves, non-return valves etc. as per compact layout. Necessary PUF insulation is included in the scope. Break up rates of offered quantities may be indicated.

3.17 COLD STORE INSULATION

Thickness: 100 mm for wall and ceiling
: 75 mm for flooring

Material: Puff panels to be considered approx. 0.028 K.Cal/Sq.m/hr/Deg.C and vapour transmission rate of not more than 0.4% by volume in 24 hours.

Supporting wooden frame work shall be of teak wood of good quality. Cement plaster / flooring on the PUF Panel floor shall be done by the Purchaser as per the instructions received form the successful bidder.

Break up rates of offered quantities may be indicated.

3.18 FIRST CHARGE OF AMMONIA GAS

As required for the complete plant. The quantity offered quantities may be indicated.

3.19 FIRST CHARGE OF LUBRICATING OIL

As required for the complete plant. The quantity offered quantities may be indicated.

4.0 WATER DISTRIBUTION SECTION

Raw water shall be made available at underground sump and from there it is to be transferred to raw water overhead tank. From overhead tank raw water shall be fed to the water softener and to the process.

From water softener soft water shall be transferred to the soft water overhead tank. From this overhead tank it shall be transferred to the consumption through pipe lines.

4.1 Raw water pump

Type : Centrifugal
Capacity : 20 KLPH
Head : Suitable

The raw water pumps shall be used to transfer the water from underground sump to overhead storage tank for raw water.

The body of the pump shall be made from cast iron while impeller shall be bronze. The motor shall be 3 phase 415 V, 50 Hz. TEFC squirrel cage type with IP 55 protection. The motor and the pump shall be mounted on a common base frame. The pump shall have packed glands, casing vent and drain. The shaft shall be supported in deep group ball bearing. The pump shall be supplied with GI protection cover to avoid rain water.

4.2 Over head tank two compartment

Suitable two compartment overhead tank shall be provided by purchaser for storage of raw and soft water.

4.3 Water softener

Capacity: 20 M3 /Hr
Type: Ion – Exchange

The softener shall be of down flow manual regenerating type, regeneration cycle being 12 hrs.
Water quality: Raw water hardness – 500 ppm as Ca.
Treated water hardness – less than 5 ppm.

Necessary brine tank of FRP construction set of manually operated CI diaphragm valve for normal operation and regeneration. Initial charge of resin for the MS rubber lined pressure vessel, hydraulically operated brine ejector, hardness test kit, orifice board for indicating wash and rinse flow rate, inlet and outlet pressure gauge, inlet and outlet sample valve, water flow meter and inter connecting pipe and fittings shall be supplied with water softener.

4.4 Soft water pumps

Type : Centrifugal
Capacity : 20 KLPH
Head : Suitable

The soft water pumps shall be used to transfer the soft water from soft water sump to overhead storage tank.

The body of the pump shall be made from cast iron while impeller shall be bronze. The motor shall be 3 phase 415 V, 50 Hz. TEFC squirrel cage type with IP 55 protection. The motor and the pump shall be mounted on a common base frame. The pump shall have packed glands, casing vent and drain. The shaft shall be supported in deep group ball bearing. The pump shall be supplied with GI protection cover to avoid rain water.

4.5 Water pipes, valves and fittings

Type : GI `B’ class welded type piping with diaphragm/ butterfly valves

Supporting: In mild steel painted execution.

Accessories: Pipe sleeves, support clamps etc.

LIST OF APPROVED MAKES FOR MAJOR COMPONENTS

Note: The bidder must indicate the approved makes selected. More than two (2) makes are not to be indicated.

<table>
<thead>
<tr>
<th>Sr No.</th>
<th>Description</th>
<th>Makes</th>
<th>Makes selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Main Compressor</td>
<td>Frick/Kirloskar</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Compressor motor</td>
<td>Kirloskar/Bharat/ABB/Bijllee/Crompton</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Compressor Control</td>
<td>Danfoss</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Hatch Door (Hinge)</td>
<td>Frick/Rinac/Neptune</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Liquid Ammonia Pumps</td>
<td>Witt/Hydrodyne/Hermatic/Frick</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Condensor PHE Type</td>
<td>IDMC/Alfa lavel/Gea</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Pre chiller unit PHE</td>
<td>IDMC/Alfa lavel/Gea</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Air Curtains</td>
<td>RUSSEL\ RADEN\ ALMONARD</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Forces Draft Cooler (Ammonia)</td>
<td>Frick/Rinac/Star Cooler /Coil Company</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Decorative type fan coil unit</td>
<td>Frick/Rinac/Star Cooler /Coil Company</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Refrigeration Pipes</td>
<td>Tata/Kalyani/MSL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Item Description</td>
<td>Brand/Models</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------------</td>
<td>-------------------------------------</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Refrigeration Valves &amp; Control</td>
<td>Danfoss/Alco/Halson</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Insulation materials</td>
<td>Lloyds/Beardsell</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Saddles for cold insulation</td>
<td>Supertherm/Lloyds/Beardsell</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Pressure &amp; Temperature gauge</td>
<td>FIEBIG/H GURU</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Water Pump</td>
<td>KSB/Beacon/Kirloskra/Grundfoss</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>MS &amp; GI Pipes</td>
<td>TATA/GST/JINDAL</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Water/Air/Oil line NRV's</td>
<td>AUDCO/LEADER</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Geared Motor/Gear Box</td>
<td>PBL/ELECON</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>FRL for Air lines</td>
<td>SHAVO NORGREN/Festo</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Water foot valve</td>
<td>Kirloskar/CG</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Electrical heat tracing</td>
<td>Thermopad</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Water softening plant</td>
<td>Ion Exchange/Thermax</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>PID Controller</td>
<td>Eurotherm/Yokogawa</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Electric motor</td>
<td>Bharat Bijlee/Siemens/ABB/CG</td>
<td></td>
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<tr>
<td>26</td>
<td>Air circuit breaker</td>
<td>L&amp;T/Siemens/Havel’s/ABB/Schneider</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>MCCB, MPCB</td>
<td>L&amp;T/Siemens/Havel’s/ABB/Schneider</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Contactors</td>
<td>L&amp;T/Siemens/Havel’s/ABB/Schneider</td>
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<td>29</td>
<td>Starter Overload relays</td>
<td>L&amp;T/Siemens/Havel’s/ABB/Schneider</td>
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<tr>
<td>30</td>
<td>Timer electronic</td>
<td>L&amp;T/Siemens/BCH</td>
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<tr>
<td>31</td>
<td>Switch Fuse units</td>
<td>L&amp;T/Siemens/GE/Schneider/Havel’s</td>
<td></td>
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<tr>
<td>32</td>
<td>MCB</td>
<td>L&amp;T/Siemens/Havel’s/ABB/Schneider</td>
<td></td>
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<tr>
<td>33</td>
<td>Push Buttons</td>
<td>Teknic/L&amp;T/Vaishno/Binay</td>
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<tr>
<td>34</td>
<td>Inicating lamp</td>
<td>Teknic/L&amp;T/Vaishno/Binay</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Ammeter</td>
<td>Rishabh/IMP/Meco/AE</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>Voltmeter</td>
<td>Rishabh/IMP/Meco/AE</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>Energy meter</td>
<td>Havel/Jaipur</td>
<td></td>
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<tr>
<td>38</td>
<td>Power factor meter</td>
<td>Rishabh/IMP/Meco/AE/Havel’s</td>
<td></td>
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<tr>
<td>39</td>
<td>Current transformer</td>
<td>Kappa/Meco/Indcoil</td>
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<td>40</td>
<td>Power cable LT/HT</td>
<td>Fort gloster/CCI/Havel’s/Universal/Polycab</td>
<td></td>
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<tr>
<td>41</td>
<td>Power capacitors</td>
<td>Mehar/Havel’s/Khatau Jankar</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>APFC Relay</td>
<td>Syntron/Beul/Budra/Rudra</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>Electronic soft starter</td>
<td>Siemes/Allen Bradley/L&amp;T/ABB</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>Servo Voltage Stabilizer</td>
<td>Suvik/Alab/Neel/Crycard</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>Control Cables</td>
<td>Finolex/Fort Gloster/Havel’s</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>Cable tray</td>
<td>MEK/Indiana</td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>Isolating Switches</td>
<td>Cutler Hammer/Siemens/Havel’s/L&amp;T/Schneider/ABB</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>Junction boxes for motor</td>
<td>Hansu/Rittal/Hensal</td>
<td></td>
</tr>
</tbody>
</table>
2.0 MATERIALS FOR PIPING

For raw water and soft water, chilled waterlines: Galvanized steel (ERW) IS 1239-3589, 3601, 4736 (medium duty)

2.1 For steam lines and compressed air line: MS “C” class pipes (ERW) IS 1239-3589, 3601, 4736.

<table>
<thead>
<tr>
<th>Service</th>
<th>Size</th>
<th>Specification</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>LP Steam 03</td>
<td>02</td>
<td>16</td>
<td>05</td>
</tr>
</tbody>
</table>

Flanges/counter flanges shall be as per BS tables:
- Table F for HP & LP steam
- Table D for Water.
- Table E for Ear.

4.0 For pipeline sizing following velocities of the fluid shall be considered.

4.1 LP steam : 20m/s.
4.2 Water steam : 3m/s.
4.3 Air : 20m/s.

5.0 Note: The payment shall be paid ON LOT BASIS for all pipes and valves. The cost of accessories like flanges, counter flanges, bolts, nuts, bends, tees, gaskets, clamps, PUF saddle for CW lines, structural supports, anchor fasteners associated civil works etc, are to be included in the cost of piping. The bidders have to work out the total quantity for each of the services based on the service pipe layout and the respective service schematic and quote their rates accordingly.

4.0 GENERAL TECHNICAL REQUIREMENT FOR PUMP, PHE & TANKS.

1.0 SS milk & CIP Pumps.

Pump impeller and casting shall be of AISI 316 for all process pumps. Prime mover: 3 Phase, 415 V (+10%), 50 Hz (+5%), TEFC squirrel cage AC INDUCTION MOTOR WITH Class “F” insulation of suitable HP as per I: 12615-2004 Eff 1.

2. MATERIALS FOR PIPING

For raw water and soft water, chilled waterlines:
Galvanized steel (ERW) IS 1239-3589, 3601, 4736 (medium duty) Stainless steel (AISI 316) inlet and outlet should end in stainless steel complete SMS union. Quick opening sanitary fittings.

The motor part of the pump should be provided with stainless steel AISI 304 shroud. The shroud should be easily dismountable. It should have provisions for air circulation and entry of electric cable.

All stainless steel surfaces are to be polished to 150 grits.

**Pump for CIP return shall be self priming.**

The sealing gaskets must ensure complete sealing and prevent any cross leakage between product and service liquids. Gaskets shall be of sanitary type. It should be of "SNAP-IN/LOC IN" glue-less type made out of EPDM.

The inlets and outlets for chilled water/hot water and product should be provided with complete stainless steel (AISI304) forged type SMS unions.

All weld joints are to be ground smooth and finished to 150 grit. All stainless steel surfaces are to be polished to 150 grits.

Essential special tools should be supplied with each PHE without charging any extra cost. The supplier shall supply minimum 20% of each type of gasket as spares along with the plate pack free of cost for each PHE.

Thermo well and provision for RTD sensors for digital thermometers and temperature transmitter and each inlet and outlet port of each section shall be provided.

The plate diagram should be submitted.

A safety device should be provided in the hot water side of heating section (plate pack) to avoid damage to the heat changer caused by excessive pressure. It should be of sanitary design.

A suitable steam pressure reducing valve, steam control valve with PID controller along with by-pass valves should be supplied with the pasteurization plant so that the steam pressure is limited within 1.5 kg/cm².

The condensate assembly from the pasteurizer shall end with a CS trainer; float type steam trap and by-pass SS ball valves.

Automatic controls should be provided to insure that the pasteurization temperature is maintained. If the required temperature is not reached, the flow of product should be automatically diverted back to the float balance tank with an audiovisual electric horn. The flow diversion valve shall be of electro pneumatic type. The temperature accuracy should be plus minus 0.50°C.

A name plate of suitable size and its fixing bracket made out of AISI 304 material shall be provided on the front supporting block.

**3.0 SS Storage tank**

The volume of the tank should be such that after filling it up-to the rated capacity, the level would be 100 mm below the line where cylindrical shall joints the conical tip.

The only metal to metal contact between the inner and outer shells should be at the places where fittings for the tank are provided.

All stainless steel welding joints are to be ground smooth and polished to 150 grits. All stainless steel surfaces shall be left with original mill finished or polished to 150 grits.
The insulation should be applied in staggered joints. All joints should be sealed with bitumen. The bitumen should be applied uniformly on both the surfaces of first and second layers of insulation and on inside surface of third layer of insulation.

Suitable size of man way at appropriate location shall be provided with the storage tanks. Sampling Cock should be provided on the inlet-cum-outlet nozzle pipe and should be in stainless steel (AISI 304) CONSTRUCTION WITH SANITARY DESIGN.

All SS storage tanks shall be provided with high and low level probes and level transmitter. Thermo well of 25mm AISI 304 10 G pipe with ¾”BSP thread shall be provided. The portion of the thermo well, which is in the jacket, should be insulated with rock wool or equivalent and totally shrouded so that hot water or chilled water does not come in contact with the insulating material.

Lifting lug 16mm thick stainless steel (AISI 304) lifting lugs should be provided at tip- 3 nos.

The tank shall be manufactured following good manufacturing practices.

General arrangement of this equipment should be as per the attached reference drawing. A name plate of size 1580 mm x100 mm and its fixing bracket made out of (AISI 304) material shall be provided.

Drive unit for agitator: The driving geared motor for the agitator shall be of suitable capacity with helical gear and minimum service factor of 1:4. The geared motor shall be complete with key in the driven shaft, oil level indicator, oil filling plug, oil breather, drain plug and suitable geared out for the first charge of the geared motor to be provided. The electric motor shall be energy efficient TEFC, squirrel cage induction type with IP55 degree of protection with class “C” insulation, suitable for 415V(+/- 10%) three phase AC supply. Performance of motor in general should confirm to IS: 12615-2004 Eff 1 values. The geared motor should be provided with stainless steel (AISI 304) shroud. The shroud should be easily dismountable. It should have provisions for air circulation and entry of electric cable.

Safety valve for steam release and pressure gauge on the main steam inlet nozzle should be provided for jacketed vessel.

SS milk storage tanks of 30 KL and above shall be provided with side agitators.

Condensate outlet assembly should be provided with strainer, float type steam trap, sight glass and bypass valve arrangement. It should be provided with suitable flange joint for each removable component for jacketed vessel.

MILK RE-CONSTITUTION SYSTEM: - TERBOBLENDER TYPE
(CRATE WASHER WITH DRIER)

1.0 FUNCTIONAL REQUIREMENTS.
Crate washer should be designed for washing HDPE; pouch crates of 10 liters capacity of ‘Prepac’ Nagema and ISI type.

2.0 DESIGN REQUIREMENTS.
2.1 Capacity : (Minimum) 800 Crates per hour.
(Maximum dimensions of crates L-570, W- 378, H-175)
Configuration : Straight through, single track

2.3 Washing Sequence
2.3.1 Fresh Water Pre-rinse: Pressure hot water first rinse having minimum 3.5 kg/Sq cm discharge head and 55 Deg. C temperature (Return water from the after rinse shall be used).
2.3.2 Pressure hot detergent rinse having minimum 3.5 kg/sq cm discharge head and 70 Deg. C temperatures.
2.3.3 Pressure hot water after having rinse minimum 3.5 kg/sq cm discharge head and 80 Deg. C temperature

2.4 Available Services.

2.4.1 Steam: at pressure 3 kg/sq. Cm(G).

2.4.2 Water: Raw/ Soft water at 2.to3 Kg/Sq cm pressure

2.4.3 Air drying at 70 Dg. C. temperature.

2.4.4 Electric power: 3 Phase, 415 V (+10%), 50 Hz (5%) electrical power supply from MCC to terminal box of the crate washer.

2.4.5 Finish: All welding joints are to be ground flush and all stainless steel surfaces are to be polished to 150 grits.

2.4.6 Temperature Control: It should have temperature control of detergent tank and hot water.

2.0 SCOPE OF SUPPLY

3.1 Main Enclosure: The main enclosure which houses washing & sterilizing sections should be made from 2mm thick stainless steel sheet conforming to AISI 304. For easy accessibility, it should contain removable stainless steel AISI 304 inspection doors all along the length on both sides. Crates guides should be provided all along the length on both sides of crate washer.

3.2 Under Frame: The complete under frame should be made from SS 304 pipe section. The assembly should have sufficient number of SS 304 legs with the stainless steel ball feet having 50mm vertical adjustment.

3.3 Conveyor chain and drive system: The conveyor chain shall be made of poly acetyl chain link with SS connecting pins. The operation of chain system should ensure proper spacing between the individual crates. The drive motor, transmission drive shaft and idler shaft should have adequate and accessible provision for adjustment and tensioning. The motor for the conveyor shall be 3 Phase, 415 V (+ 10%), 50 Hz (+ 5%), TEFC, squirrel cage ac INDUCTION MOTOR WITH CLASS “Insulation of suitable HP. The drive should be provided with stainless steel AISI 304 shroud. The shroud should be easily dismantle able. It should have provisions for air circulation and entry of electric cable.

3.4 Washing Stations.

3.4.1 Washing: The pumping and jetting arrangements should supply sufficient washing liquid to the inside and outside surfaces of the crates.

3.4.2 Filter: A pressure filter should be provided in the liquid (hot detergent) re-circulation line to prevent choking of pump impeller and stainless steel 304 adjustable nozzles. The filters shall be fabricated from AISI 304 SS material.

3.4.3 Sump Tanks (3nos): These tanks should be made from stainless steel conforming to AISI 304 and would be used as feed tanks for various washing liquids. Correct operating levels shall be maintained automatically in tanks with necessary SS 304 float valve assembly.

There should not be any inter mixing between different liquids. Necessary strainers shall be provided in the sump tanks to prevent choking of pump impeller.

3.4.4 Water Heating Arrangements: For hot water, direct steam injection system should be providing using steam water ejector for mixing steam with water. In case of detergent heating, indirect steam heating system using SS 304 coil should be used. The heating coil shall end with a steam trap. Condensate from the heating coil should be discharged in to hot water tank for heat recovery. Temperature of liquids will be maintained by main static controls. Suitable drain points shall be provided to drain the used liquid.
3.4.5 Air Heating Arrangement: Drying of crates should be done by hot air at drying temperature 70 Deg. C. The hot air dryer consist of an axial fan blowing directly in to two heaters. The blower, air heater and ducting etc. should be provided. The impeller housing of blower and ducting should be from SS 304 whereas coil of air heaters and fins should of copper. The first heater recovers heat from condensate discharged by steam traps The second heater is a steam heater unit to raise the air temperature to 70 Deg. C. All the sections of the dryer are radially accessible through lift out panels.

3.4.6 Jet Nozzles: One lot of adjustable angle type nozzles made of stainless steel conforming to AISI 304 should be provided. The jet nozzles shall be removable type for easy cleaning.

3.4.7 Pumps: (3 Sets).

Suitable capacity centrifugal mono bloc type pump sets having cast iron impeller, cast iron body, and SS shaft having 35 MWC discharge pressure shall be supplied. The pump should be provided with flanged type electrical motor with mechanical sealing arrangement. The pump and drive should be integrate together. The motor shall be 3 Phase, 415V (+10%), 50Hz (+5%) TEFC, squirrel cage ac induction motor with Class “F” insulation of suitable HP. Suitable The motor part of the pump should be provided with stainless steel AISI 304 shroud. The shroud should be easily dismountable. It should have provisions for air circulation and entry of electric cable.

3.5 Instrumentation: Suitable connections/thermowell shall be provided on the delivery side of the pumps and on the sump tanks for fixing pressure and temperature gauges. The temperatures and pressures of delivery sides of pumps and sump tanks should be indicated on an instrument panel located on main enclosure. Instrument panel fabricated from SS 304 with acrylic cover should contain dial type pressure gauges and digital temperature indicator (with automatic selection of measuring points).

3.6.1 Electrical Control Panel.

Main Enclosure: The enclosure and the supporting structure shall be made from Stainless steel sheet conforming to AISI 304. The enclosure shall be made out of 2mm thick SS 304 sheet and shall be moisture, dust and vermin proof. The panel shall be mounted on the top of the crate washer near to the drive end for operator convenience.

3.6.2 Push Buttons and Indicating Lamps: It should contain ON/ OFF push buttons and indicating lamps for all the motors. All indicating lamps shall be LED type and shall contain related inscriptions. The panel should also have an emergency lockable switch to stop total operation of the crate washer in case of emergency.

3.6.7 Wiring: The control panel should be completely pre-wired. The wiring should be done by ISI quality copper cables and should be dressed in accordance with the standard practice.

3.7 Termination points: All distribution piping should be pre-assembled and terminated at a single flange for each service connections.

3.8 SPARES BOX: The spares box fabricated from GI 20 G: Sheet size 900mm x 400mm height with hinges and lockable arrangement (including Godrej Naval Lock) which consists of following items, shall be supplied along with the crate washer.

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Item description</th>
<th>Qty</th>
<th>Unit.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>100 ML container of FEVICOL ANRO 1 solution to lock conveyor nuts.</td>
<td>1</td>
<td>No.</td>
</tr>
<tr>
<td>2.</td>
<td>100 ML container of FEVIBOND adhesive for mounting rubber seals.</td>
<td>2</td>
<td>No.</td>
</tr>
<tr>
<td>3.</td>
<td>Window rubbers</td>
<td>5</td>
<td>M</td>
</tr>
<tr>
<td>4.</td>
<td>Door rubbers</td>
<td>15</td>
<td>M</td>
</tr>
<tr>
<td>5.</td>
<td>Discharge filter gasket</td>
<td>4</td>
<td>No.</td>
</tr>
</tbody>
</table>
6 Discharge filter nylon bags 25 No.
7 Conveyor poly-acetyl links and SS linchpins 10 No.
8 V-belts 4
9 Detergent nozzles (tips only) 10 No.
10 Rinse nozzles (tips only) 5 No.
10 General arrangement drawing for the crate washer/operation and maintenance manual for crate washer/control wiring drawing/P&I drawing for steam/ water/ hot water piping of the equipment/ Pump manufactures manual/Manual for geared drive unit. 3 Set

3.9 The following information is to be furnished by the bidder:
A) - For pumps

<table>
<thead>
<tr>
<th>Pump details</th>
<th>Unit</th>
<th>Details to be furnished by the bidder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make of pump</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of pump</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model no.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity of pump</td>
<td>LPH</td>
<td></td>
</tr>
<tr>
<td>Head</td>
<td>MWC</td>
<td></td>
</tr>
<tr>
<td>Pump efficiency</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Inlet/outlet size</td>
<td>Mm/mm</td>
<td></td>
</tr>
<tr>
<td>BKW</td>
<td>KW</td>
<td></td>
</tr>
<tr>
<td>Motor</td>
<td>KW</td>
<td></td>
</tr>
<tr>
<td>Motor RPM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor make</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor efficiency</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Coupling arrangement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical seal type, material and make.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B) - For Drive Conveyor:

<table>
<thead>
<tr>
<th>Conveyor</th>
<th>Unit</th>
<th>Details to be furnished by the bidder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make of Gearbox</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model no.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gear box Ratio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor</td>
<td>KW</td>
<td></td>
</tr>
<tr>
<td>Motor RPM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor make</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor efficiency</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Coupling arrangement</td>
<td></td>
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</tr>
</tbody>
</table>

FILLED CRATE CONVEYORS

1.0 FUNCTIONAL REQUIREMENT:

The conveyors shall be used to transport empty HDPE crates from the outlet of crate washer to pouch filling machines and HDPE crates filled with milk (in polythene pouches) from the packing table to the milk Cold Store. The filled crates shall be manually loaded on to the conveyor, which is passing below a pouch-crating table.

2.0 Design requirement:
3.0 SCOPE OF SUPPLY

FRAME

The conveyor shall have stable structure framework fabricated using hot dip galvanized Indian standard square/circular steel sections. The thickness of the galvanization shall be minimum 80 microns and shall be carried out as per IS standard. The conveyor shall be supplied on an adjustable ball feet.

Geared motor (IP55) of suitable rating, complete with sprockets, idlers etc. An SS protection cover shall be provided for the drive, chain etc. the drive shall be of reputed make.

CHAIN & TRACK

The chain shall be poly-acetyl moving in a track of suitable material and type.

4.0 ACCESSORIES TO BE SUPPLIED

4.1 Trough for chain dips cleaning:

An SS 304 trough of suitable size to hold the water for the chain dip cleaning with drain valve (Audco make ball valve) shall be provided.

4.2 Lubrication

Suitable lubrication arrangement for the poly-acetyl chain is to be provided. The bidder shall furnish the details.

The cost of all the accessories (4.1 and 4.2) shall be included in the cost of the chain conveyor and nothing extra shall be paid.

MILK POUCH FILLING MACHINE (MECH. TYPE WITH PHOTOCELL).

1.0 FUNCTIONAL REQUIREMENTS

The milk would be fed by gravity flow to the float operated bane tank of the twin head mechanical type pouch-filling machine. The machine should form pouches of film, fill with milk and seal the same.

3.0 DESIGN REQUIREMENTS.

<table>
<thead>
<tr>
<th>Capacity (Minimum)</th>
<th>Minimum 5000 packs/ Hr of size 200 ml. or 500ml. or 1000 ml.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>+0.5% for 1000ml.</td>
</tr>
<tr>
<td>Elec. Power</td>
<td>3 Phase, 415 V(+/-10%),50 Hz.(+/-2%),4wire.</td>
</tr>
<tr>
<td>Cooling water</td>
<td>3 to kg/sq. cm at less than 20 Deg. C</td>
</tr>
<tr>
<td>Finish</td>
<td>All stainless steel inner surfaces are to be polished to 150 grits. The outside surface of the machine shall be circle polished to 150 grits.</td>
</tr>
</tbody>
</table>
3.0 SCOPE OF SUPPLYS

3.1 The machine: The double head mechanical type pouch filling machine should automatically form, fill land seal milk in pouches from polyethylene film, continuously supplied from a roll. The design of the machine should be hygienic. All the milk contact parts of the machine should be made from stainless steel conforming to AISI 304. All the functions of the machine shall be controlled using cam timer switches and the machine shall be mechanical cam operated.

3.2 Float Balance tank: Stainless steel AISI 304 float balance tank of capacity at least 50 litres should be provided at the top of the pouch-filling machine. The balance tank shall be provided with mechanical type float valve and an overflow connection ending in a SS 304 sanitary type ball valve. The overflow SS pipe is to be extended down up to the bottom of the machine.

3.3 The machine should consist of SS 304 body built on a treated aluminum chassis. All sub-assemblies are to be mounted on these plates. All tapped holes on chassis shall have helical steel inserts for longevity of chassis.

3.3.1 Spool bearer Assembly & Film guide: The heat sealable film roll up to 20 kgs shall be mounted on spool bearer at the rear bottom of the machine. The spool bearer assembly should be sliding type to facilitate easy change-over the film roll. The spool roller bracket assembly shall be made of SS 304 material. The film layer is then passed through various rollers and subassemblies such as:

- End of film
- Film loosening
- Film brake etc.

Subsequently, it should be passed over a set of ultra violet tubes for sterilization of the film. The film layer should then form into a tube.

3.3.2 Vertical seal: The film shall be overlapped and sealed into a tube by vertical electrode. The jaw should be mechanical cam operated and shall be of water-cooled. The vertical jaw support hall be or SS 304. The vertical electrode winding rod support shall be of Aluminium and necessary slots are to be provided for easy cleaning.

3.3.3 Downward feed: Downward movement of the film tube should be controlled by a set of rubber nip roller driven by a motor through a reduction gear unit and electro magnetic clutch break system.

3.3.4 Injection system : The product from the float balance tank is passed through injection tube into the film tube. The filled quantity of the product in each pouch is controlled by opening of the valve at the lower end of the injection tube. The flow of product through injection tube in the pouches should be continuous and the sealing should takes place through the product.

3.3.5 Horizontal seal: The horizontal sealing and cutting should takes place at the same time by the horizontal electrode mounted on the fixed horizontal jaw. The fixed horizontal jaw is water-cooled. The rear moving jaw shall be mechanical cam operated.

3.3.6 Electrical control panel: The indicating lamps, electrical switches, control relays, solid state variacs, digital pouch counter, Hour meter etc. should be mounted in this panel. Only MCB’s are to be used instead of HRC FUSES. The machine shall also be equipped with single phase 5 Amps and 15 Amps adaptors. Facility to transfer pouch totalizer data to the computer/PLC system shall be provided.

3.3.7 Drive System: The machine shall be equipped with duel drive assembly to control the pouch length of individual head separately.

3.3.8 Photo mark Scanner:

The machine shall be provided with photocell on each head with all mounting arrangement to control the length the pouch.

3.3.9 The machine shall also be provided with the following additional features:
Individual head operation shall be possible. Option of packing 1 litre on one head and ½litre on another head should be possible at the same time.

Auto operation facility shall stop the machine and audiovisual alarm should be provided if the film roll is exhausted.

The machine should stop automatically if any obstacle comes in between horizontal jaws.

Emergency switch to stop the machine shall be provided on front side of the machine.

The machine should stop automatically for milk ending and also for the overlap of film.

3.3.10 Facility to insert a closed circuit in place cleaning system for the machine shall be provided. The CIP adaptors and hoses are in the scope of supply.

3.3.11 Date coding device: It shall be heat embossing type, 12 characters with each character if 3mm height and facility to accommodate digits.

3.3.12 Tools: Essential special tools should be supplied with the machine without charging any extra cost.

4.0 Manufacturing Code:
The equipment shall be manufactured following good manufacturing practices.

5.0 Statutory Requirement:
The pouch-filling machine shall be duly stamped by the weight and measure department and the test certificate shall be submitted by the supplier.

6.0 Remarks

6.1 The supplier should furnish along with the offer the following details in absence of which the offer will be treated as incomplete.

<table>
<thead>
<tr>
<th>CAPACITY OF MACHINE</th>
<th>PACKS/ Hr of sizes 200 ml. or 500 ml. or 1000 ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy of filling at 200ml.,500 ml. and 1000ml.</td>
<td></td>
</tr>
<tr>
<td>Leakage% on 200ml, 500ml and 1000 ml pouches.</td>
<td></td>
</tr>
<tr>
<td>Weight &amp; dimension of the pouch filling machine</td>
<td></td>
</tr>
<tr>
<td>Utility consumption</td>
<td></td>
</tr>
<tr>
<td>Electrical power.</td>
<td>Connected ........... KW</td>
</tr>
<tr>
<td></td>
<td>During operation .... KW</td>
</tr>
<tr>
<td>Cooling water</td>
<td>.... LPH at .... Deg. C.</td>
</tr>
</tbody>
</table>

STEAM & WATER MIXING BATTERY

1.0 FUNCTIONAL REQUIREMENTS

It would be used for generating hot water for washing dairy floor and other uses.

2.0 DESIGN REQUIREMENTS.

2.1 Operating Principle: Principle of operation should be direct injection of steam in to water.

3.0 SCOPE OF SUPPLY

3.1 STEAM Valve: ½"three pieces ball valve with SS working stainless steel working parts – 1 no.

3.2 Water valve: ¼"three pieces ball valve for water – 1 no.
3.3 Non return valve: ½” non return valves on both steam and water lines. - 2 no.

3.4 Steam Mixing Chamber: It should be made of chromium plated gun metal- 01 no.

3.5 Out Let: 1/2” Tapered outlet for connecting rubber hose. It should be made of chromium plated gun metal.

3.6 Bracket: It would be used for hanging rubber hose and should be made of chromium plated mild steel – 01 no.

3.7 Clamp: Serrated strip type metallic hose clamps for each battery should be supplied- 2 no. each.

3.8 Hose Pipe: A rubber hose pipe of diameter ½” should be supplied loose with each battery. It should be suitable for use of hot water and steam – 10 m. Each.

3.9 Spray Gun: A suitable water spray gun should be provided at the end of the hose.

**MILK POUCH CRATE TROLLEY**

<table>
<thead>
<tr>
<th>functional requirement</th>
<th>It would be used to transport milk filled crates.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Requirement</td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td>One stack of 6 to 10 crates</td>
</tr>
<tr>
<td>Operation</td>
<td>The crate trolley is to be driven manually.</td>
</tr>
<tr>
<td>Scope of supply</td>
<td>The trolley should be made from milk steel. The complete trolley should be galvanized after fabrication. The wheels should be of rubber with mild steel (galvanized). The rubber should be adoration free and suitable to work under load. The dia of the wheel should be 250 mm.</td>
</tr>
</tbody>
</table>

**TECHNICAL SPECIFICATION AND SCOPE OF SUPPLY OF MILK STORAGE SILO**

**CAPACITY:** 100 KL

**SCOPE OF SUPPLY**

Supply of 100 KL Vertical Milk Storage Silo with Side entry agitator.

**FUNCTIONAL REQUIREMENT**

The milk silo would be used to store chilled raw / pasteurized milk at 4 °C temperature and shall be installed outside.

**DESIGN REQUIREMENTS**

**Capacity:** 100,000 Liters.

The volume of the tank shall be such that after filling it up to the rated capacity, the level would be 100 mm below the line where cylindrical shell joins the conical top.

**Constructional Features:**

The tank shall be vertical, double walled, Insulated and welded construction of sanitary design. The vessel shall be made of SS conforming to AISI 304.

**Slope:**

The bottom of the silo shall have 1:15 slope towards inlet cum outlet for free and complete drainage of liquid.
Metal Contact:

The only metal-to-metal contact between the inner and outer shells shall be at the places where fittings for the tank are provided. At the places where mild steel stiffeners are provided, insulated padding shall be fixed between the inner stainless steel shell and stiffeners.

Finish:

<table>
<thead>
<tr>
<th>Surface Type</th>
<th>Finish Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Surface</td>
<td>Original 2B Mill Finish / 150 Grit Finish</td>
</tr>
<tr>
<td>External Surface</td>
<td>Original 2B Mill Finish with all burs removed.</td>
</tr>
<tr>
<td>Weld-joint</td>
<td>Ground smooth &amp; finished to 150 Grits.</td>
</tr>
<tr>
<td>MS Stiffener</td>
<td>Two coats of epoxy primer after proper de-rusting.</td>
</tr>
</tbody>
</table>

Joint Curvatures:

The radius of all welded and permanent attachment joints shall be at least 6 mm. where the conical top and flat bottom join the cylindrical shell and radii shall not be less than 25 mm.

Installation:

It shall be suitable for outside installation. Accessories mounted on top shall be weather proof.

**SCOPE OF SUPPLY:**

**Inner cylindrical body:**

The inner shell & conical top shall be fabricated from 3mm thick stainless steel conforming to AISI 304. The inner flat bottom shall be fabricated from 4mm thick stainless steel conforming to AISI 304.

**Outer cylindrical body:**

The outer shell & conical top shall be fabricated from 2mm and 3mm thick stainless steel respectively conforming to AISI 304.

**Insulation:**

The entire inner shell (including alcove portion), conical top and flat bottom shall be insulated as follows:

Inside of Outer shell & Outside of Inner shell shall be coated with two coats of Black Bituminous Paint:

1. **1st layer** - 15 mm thick Polyurethane having density 30-35 Kg/m$^3$ each longitudinally.
2. **2nd layer** - 50 mm thick Expanded Polystyrene foam having density of 16-20 Kg/m$^3$ applied radially in staggered joint with CPRX compound Sealing.
3. **3rd layer** - 50 mm thick Expanded Polystyrene foam having density of 16-20 Kg/m$^3$ applied longitudinally in staggered joint with CPRX compound Sealing.
4. **4th layer** – 42 SWG (0.1mm thick) Aluminum foil shall be covered over the insulation on shell. This is for the Moisture control.

Suitable stiffeners shall be providing as per approved design. All the cladding joints shall be welded in design.

**5.0 Accessories**

**Alcove:**
The alcove arrangement shall be of size 1800 mm X 1500 mm and projecting 900 mm from the silo with bottom plate. The alcove shall accommodate thermometer pocket, level transmitter, inlet cum outlet, low level switch, sampling cock and man-way. The Alcove shall be provided in welding construction.

**Inlet cum Outlet:**

100mm diameter cup type inlet cum outlet with manual operated butterfly type valve (size 76.1mm) stainless steel (AISI 304) flanged valve ending in complete stainless steel union.

**Air Vent:**

Stainless steel (AISI 304) 450 mm dia. Standard design air vent to prevent formation of particle vacuum during CIP and pressure during filling.

**Man-way:**

Stainless steel (AISI 304) side elliptical man-way of 405mm x 550mm diameter and located at the bottom of the silo and provided with air tight hinged insulated stainless steel (AISI 304) door with tightening and locking device. The man-way door gasket shall be neoprene or nitrile rubber of food grade quality.

**Light Glass:**

Stainless steel (AISI 304) light glass assembly shall be provided with toughened glass and stainless steel lamp shade for mounting 24V, 100 watt bulb. The lamp holder shall be made from brass.

**Side Agitator:**

Side mounted mechanical agitator with 3 blade propeller type impeller having sweep dia. of ~300mm. Agitator shall provide with 7.5HP @ 6 or 8 Pole motor of BBL / ABB Make, single dry mechanical seal of Burgmann Make & Bearing Housing. The agitation system to ensure uniform mixing & agitation of the milk. The agitator shaft shall be made of SS rod. The motor shall be provided with SS weather proof cover for protection. 1 Set

**Level Indication:**

Sanitary type liquid level indicator and transmitter shall be provided. All the milk contact parts shall be of SS 304 material. The liquid level indicator shall be diaphragm type. Suitable level indicators shall be provided to indicate the leveling the silo. It shall work on 24 V DC, two wire type. It shall be duly calibrated and shall have an accuracy of ± 0.25%. 1 No.

**Spray Ball:**

Removable stainless steel (AISI 304) cleaning device located at the apex of the conical tope to provide for flooding of liquid over the complete interior surface during CIP. The spray ball shall be of 100mm dia. stationary type with holes 180 deg. This shall be connected to 51mm dia. SS pipe and with stainless steel SMS union at the outer end connection with blind end. 1 No.

**Sampling Cock:**

Sampling cock shall be provided on the Inlet, cum Outlet and will be stainless steel constructions of sanitary design. 1 No.

**Level Probe and socket:**

High level, Medium Level (Agi. Cutt off Sensor) and Low level probe with provision shall be provided of E & H make.
Thermo well:

200 mm long stainless steel (AISI 304) inclined pocket suitable for monitoring stem type dial thermometer / temperature sensor shall be suitably located in the alcove. It shall have 21mm BSP male threads. Thermometer / PT 100 (Temperature sensor) of radix make shall be provided. The temperature indicator shall be housed in SS control panel.

Drain Hole:

The outer shell shall be provided with one or more drain holes at the lowest point. Any aperture in the shell shall be designed so as to prevent ingress moisture.

Lifting Lug:

Stainless steel (AISI 304) lifting lugs shall be provided at top.
4 Nos.

Anchor Points:

Anchor points, pipes and socket shall be provided on top of the tank so that safety railing and platform shall be welded to them after installation.

Sight Glass:

Stainless steel (AISI 304) sight glass assembly shall be provided with toughened glass. It shall be provided in such a way that one can easily read from the lowest level up to the highest level marks.

Railing:

The necessary railing of 900mm height in SS 304 shall be provided with the help of 38.1mm & 25.4mm OD tube which is 1.6mm thick. The toe guard of 150mm x 2mm thick in SS 304 shall also be provided. The railing pipe shall be supplied loose and shall be assembled / welded at the site as per the requirement.

Sand blasted Level Marking:

It shall be calibrated at 500Ltrs. Interval provided on the inner shall at opposite side of sight glass.

Paintings:

All the mild steel stiffeners used in the construction of the silo shall be painted with two coats of epoxy primer after thorough de-rusting.

Control Panel:

SS 304, 2mm thick control panel shall be provided comprising with Level indicator, Temperature indicator, Cyclic timer & soft starter for agitator, Push buttons, On/off buttons, Alarm & internal wiring of panel.

TESTS

The following tests shall be conduct by supplier at their works.

Dye penetration test for weld joints. Water fill-up test of inner vessel for water tightness before insulation. Final inspection prior to dispatch including agitator trial needs to be provided. When man-way is closed and covered tightened without gasket then the gap at any place between the man-way neck and cover shall not exceed 0.5mm.
Bihar State Milk Co-Operative Federation Limited
DAIRY DEVELOPMENT COMPLEX, P.O. - BIHAR VETERINARY COLLEGE,
PATNA-800014(BIHAR)
Phone No: 2224083,2228953,2228347,2220387, Fax No-0612-2228306
E-Mail: engineeringcomfed@gmail.com, Website: www.sudha.coop

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Description</th>
<th>Qty.</th>
<th>Make</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hydrostatic type Level Transmitter of DN 65 DRD flange</td>
<td>1</td>
<td>E &amp; H</td>
</tr>
<tr>
<td>2</td>
<td>Level Indicator, suitable for level transmitter.</td>
<td>1</td>
<td>West</td>
</tr>
<tr>
<td>3</td>
<td>Tuning fork type High, Medium (Agi. Cutt off sensor) &amp; Low Level Switches.</td>
<td>3</td>
<td>E &amp; H</td>
</tr>
<tr>
<td>4</td>
<td>Temperature Sensor - PT 100, 12&quot; Long ½” BSP end conn., Range : 0 to 150 deg. C</td>
<td>1</td>
<td>Radix</td>
</tr>
<tr>
<td>5</td>
<td>Temperature indicator</td>
<td>1</td>
<td>Radix</td>
</tr>
<tr>
<td>6</td>
<td>Control panel</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**Milk Pasteurization Plant with all accessories**

Capacity : 20 KLPH
Make : Tetra Pak / APV / GEA only

Function: This shall be used for pasteurization of fresh as well as reconstituted milk and subsequently chilling it.

Design Parameters:
- Temperature Programme : 12-45/55-60/65-80-4 Deg. C
- Raw milk feed temperature : 12 Deg. C
- Holding time for pasteurization. : 20 Sec.
- Finished milk discharge temp. : 4 Deg. C
- Heat regeneration : 93%
- Chilled water feed temp. : 1.5 Deg. C
- Chilled water flow rate : 3 times the milk flow Rate.

Required water and compressed air to be made available. Bidder to specify complete technical data of the pasteurizer.

Finish: All welding joints shall be ground smoothly. All stainless steel surfaces are to be polished to 150 grits.

**Scope of Supply:**

Heat Exchanger - Plate Pack

**Plates:** The plates shall be made from stainless steel conforming to AISI 316 and shall be of sanitary design. All the milk contact and exterior surfaces shall be easily accessible or readily removable for cleaning and inspection.

**Gaskets:** The sealing gaskets shall ensure complete sealing and prevent any cross - leakage between product and service liquids. Gaskets shall be of sanitary type (SNAP IN TYPE)/Loc-in-type. These shall be continuously bonded to the heat transfer surface. Gasket shall be made of non toxic, fat resistant, non absorbent and should be smooth surface materials.

The gaskets material shall be of food grade rubber and shall withstand a water sterilization temperature of 100 degree C and 2% caustic solution at 80 degree C. Gasket material shall be non - toxic. fat resistant, non - absorbent and shall have smooth surface.
Holding section: It shall be designed for continuous holding of the product for at least the minimum specified holding time at the pasteurization temperature. The tubes shall be made of SS 304. The holding section shall be tubular type on supporting stand.

Supporting frame: The supporting frame for the plate pack shall be of a self-supporting design made of stainless steel (AISI 304) cladded mild steel with a manually operated stainless steel (AISI 304) tightening device. The tightening device shall be able to exert uniform pressure on all the parts of heat transfer plates. The frame and tightening device shall prevent the plates from deflecting under pressure differential of minimum 4 kg/cm².

Accessories:

Inlets/Outlets: The inlets and outlets in each section of the heat exchanger for products as well as services shall be provided with complete stainless steel (AISI 304) unions.

Thermo-wells: Stainless steel (AISI 304) pockets for thermometer/sensors on all the inlets and outlets of products and services. Each pocket shall be complete with a stainless steel (AISI 304) guard for mounting glass thermometers/PT 100 sensors.

Ball feet: The frame shall be provided with adjustable stainless steel ball feet with provision for height adjustment of 50mm.

Safety Device: A safety device shall be provided in the hot water side of heating section to avoid damage to the heat exchanger caused by excessive pressure. It shall be of sanitary design.

Float Balance tank: The suitable capacity of balance tank shall be fabricated from 2 mm thick stainless sheet conforming to AISI 304. The tank shall be provided with cover, sanitary type SS 304 float valve with no foam milk inlet, outlet, return milk inlet, inlet for water, over flow, high & low level probes, and adjustable stainless steel ball feet. The float valve should be designed to withstand inlet pressure of 3 Kg/cm².

Milk pump: The pasteurizer stainless steel feed pump shall be of sanitary design as per dairy standard. Its capacity shall be 50% higher than that of the capacity of pasteurizers. The pump shall generate head of 30 MWC. The TEFC drive squirrel case motor shall be fitted with stainless steel shroud with louvers for air-cooling and suitable arrangement for cable connection. All other specifications shall be same as mentioned anywhere else for the centrifugal pump.

A suitable capacity Booster Pump in order to maintain the positive pressure on the pasteurized milk side.

Flow controller: Stainless steel flow control device is required to automatically maintain the required flow rate under varying pressure conditions. The flow controller shall be of a sanitary design and shall be suitable for the continuous run against the increased resistance due to milk scale formation.

Duplex Filter: Duplex filter in standard design made from 2 mm thick SS plate shall be provided for hot milk filtration prior to centrifugal separation.

Heating Device: Final stage of heating shall be done with steam heated water. The hot water generation system shall be through a hot water PHE. The heating section shall be complete with PHE, hot water pump, necessary inter connecting pipes & fittings. The hot water pump shall be industrial type of Grundfoss make.

Ball Feet for floor mounted equipments: All the floor mounted equipments shall have ball feet with provision for height adjustment of 50 mm.
Instrumentation and control panel:

Automatic controls shall be provided to ensure pasteurization temperature of product. If the required temperature of product is not reached, the flow of product shall be automatically diverted to the float balance tank with an audible alarm. The flow diversion valve shall be of pneumatic type.

The instrumentation and control panel shall be made in standard execution built to dust and vermin proof design. The control panel shall be leg supported and house the following components all pre-wired to terminal strip PID controller for temperature of pasteurized product with display of set temperature and actual product temperature. The controller has a facility to automatically tune to the requirement of set temperature.

Six point strip chart recorder shall be provided.

Audio alarm with hooter and acknowledge and reset push button.

Auto manual selection switches and forced forward flow provision i/p convertor for steam control valve operation and electrically operated solenoid valve for air supply to flow diversion valve.

Air pressure regulator cum moisture separator with isolating valve cum air filter to ensure proper air supply to the i/p convertor and solenoid valves.

INCOMING ON/OFF SWITCH FOR CONTROL SUPPLY.

Ten sets of `on` and `off` push buttons with indicating lamps and suitable inscriptions shall be provided for operation of motors of various modules. (Two numbers spare push buttons are included) indication lamp for showing the Position of Flow Diversion Valve (Forward/Diverted Mode)

PIES AND FITTINGS (SS 304): All Inter Connecting Pipes With Necessary Fittings For Product As Well As Service Shall Be Supplied Within The Specified Battery Limits And Exclusions.

PRODUCT: The Supply Shall Include All The Necessary Ss 304 Pipes And Fittings From Float Balance Tank To The Finished Pasteurized Product Outlet As Required Interconnecting The Above Equipment.

HOT WATER: The Supply Shall Also Include Necessary Ss 304 Pipes And Fittings For Pumping Hot Water To The Heating Section Of The Pasteuriser And Return To The Hot Water Set.

TOOLS: Essential special tools shall be provided along with 20% spares gasket and 2 nos. each type of plate.

Milk chiller

Capacity: 30 KLPH
Make: Tetra pak / GEA / APV Only

Function: The single section plate heat exchanger shall be used for chilling raw /whole milk with chilled water.

Design Requirements:

- Milk feed temperature: 35 degree C
- Milk discharge temperature: 4 degree C
- Chilled water feed temperature: 1.5 degree C
- Maximum permissible chilled: 3 times the milk flow rate
- Water flow rate
- Maximum pressure drop on: 1.0 Kg/Sq mm
- Milk Side

Finish: All welding joints shall be ground smoothly. All stainless steel surfaces shall be polished to 150 grits.
Scope of Supply:

Plate Pack:

Plates: The plates shall be made from stainless steel conforming AISI 316 and shall be of sanitary design. All milk contact and exterior, surfaces shall be easily accessible or readily removable for cleaning and inspection.

Gaskets: The sealing gaskets shall ensure complete sealing and prevent any cross leakage between product and service liquids. Gaskets shall be of sanitary type (SNAP IN TYPE) or Loc-in-type of good quality nitrile rubber. It shall be continuously bonded to the heat transfer surface.

The gasket material shall be of food grade rubber and shall withstand a water sterilization temperature of 100 degree C and 2% caustic solution at 80 degree C. Gasket material shall be non toxic, fat resistant, non absorbent and shall have smooth surface.

Supporting frame: The supporting frame for the plate pack shall be of a self supporting design made of MS cladded with AISI 304 SS sheet with a manually operated tightening device. The tie rods shall be of SS 304 with pipe sleeve of AISI-304 to protect the rod.

The frame and tightening device shall prevent the plates from deflecting under pressure differential of minimum 4 kg/cm sq.

Inlets/Outlets: The inlets and outlets for chilled water and product shall be provided with complete stainless steel (AISI 304) SMS unions.

Thermo-well: Stainless steel (AISI 304) pockets for thermometer on all the inlets and outlets. Each pocket shall be complete with stainless steel (AISI 304) guard for mounting glass thermometers/PT 100 sensors.

Ball feet: The frame shall be provided with adjustable stainless steel ball feet with provision for height adjustment of 50mm.

Tools: Essential tools shall be supplied with the chiller without charging any extra cost. 2 nos. of each type of plate and 20% of each type of gasket to be supplied as pares without extra cost.

3. A MILK TRANSFER PUMP

Capacity: 30 KLPH
Head: 35 MWC.
Type: Centrifugal.
Approved Make: LKM/APV/Alfa laval / Any Standard Make

Function: The pump shall be used for transfer of milk from milk tanker to raw milk Silos via chiller and also used for transfer of milk from pasteurized milk Silos to pasteurized HMST-10KL.

Design: The pump shall be sanitary design and centrifugal mono block construction.

Finish: All stainless steel surfaces shall be polished to 150 grits.

Scope of Supply:

The Pump: It shall be made from stainless steel conforming to AISI 316.

Drive: The pump shall be provided with flanged motor with hygienic sealing arrangement. The motor shall be squirrel cage TEFC with IP55 protection and class “F” insulation suitable for 415 V 50 HZ AC supply. The pump and drive shall be integrated together. The pump shaft
end for fixing the impeller shall be of stainless steel.

Accessories:

Inlet/Outlet: Stainless steel (AISI 316) inlet and outlet shall end in stainless steel complete union. The inlet shall be 230 mm above the finished floor level.

Motor Shroud: The motor part of the pump shall be SS 304 shrouded. The shroud shall be easily removable. It shall have provisions for air circulation and entry of electric cable.

Legs: The pump with drive shall be supported on legs with SS ball feet. The ball feet shall have provision for height adjustment of 50mm.

Anti splash guard should be provided to protect the motor from water splashing.

**Tri – purpose centrifuge cum clarifier**

**Functional requirements**

It shall be use as separator, clarifier and standardiser for milk at the incoming temperature of 40-50 degree C.

**Capacity : 20,000 LPH**

**Type** : Self Cleaning Type Centrifugal Separator  
**Make** : GEA / Tetra Pak / Alfa laval

**TECHNICAL FEATURES:**

**PRODUCT TO BE PROCESSED** : COW BUFFALO MILK at min. 45°C  
**Fat content** : 5-6 %  
**TOTAL MILK SKIMMING** : 20,000 LPH  
**SKIMMING EFFICIENCY** : < 0.05% (Rose – Gottlieb method)

**TECHNICAL DETAILS: 20000 LPH – CREAM SEPARATORS**

**FEEDING PRESSURE** : 1 bar min  
**SKIM MILK OUTLET PRESSURE** : 4 bar approx.  
**CREAM OUTLET PRESSURE** : 2.5 bar approx.  
**MILK OUTLET PRESSURE** : 4 bar approx.  
**STANDARD VOLTAGE** : 400/415 V / 50 Hz / 3 phases  
**STANDARD FITTINGS** : SMS Standard

**CONSTRUCTION DETAILS:**

- The cast iron frame should be entirely stainless-steel-plated to ensure the highest corrosion strength.

- All the components of the bowl should be made of special stainless steel to resist to mechanical stress and corrosion.

- All parts in contact with the product shall be manufactured in stainless steel and the surfaces are accurately finished (lapped) to ensure optimum separation efficiency and perfect cleaning after the use.

- The diameters of the two belt pulleys should have been design in such a way to optimize the diameter-ratio in order to achieve the maximum mechanical efficiency.

- The vertical shaft’s assembly shall be designed to allow easy disassembling whenever maintenance operations are required.

- Innovative lubrication system: oil bath / forced lubrication.
- Oil level can be easily checked through a proper sight glass placed on machine's body.

**Operating Features:**

1. Flat belt drive.
2. Motor operated by frequency converter.
3. Emergency braking, electronically controlled by the frequency converter.
4. The self cleaning centrifugal separators, electronically-controlled sludge’s discharge, ensure extremely high and constant separation efficiency throughout the whole working cycle.
5. Product feeding as well as the outlet of heavy and light phases takes place under pressure.
6. The quantity of cream to be separated and the cream concentration are adjustable by means of the plug cocks that are the part of manual standardization device (compact type).
7. Sludge’s discharges take place during machine’s working and are operated by a hydraulic system which is controlled by the CPU installed in the control panel.
8. The duration of the time interval between two discharges as well as the duration of the discharges is programmed according to the characteristics of the product to be processed.
9. **No disassembly is required to clean the machine once the production cycle is completed as the separator can be cleaned by the C.I.P. unit serving the plant.**

**Control Panel for Separator:**

Stainless steel cabinet, IP 55 protection degree, manufactured according to CEI 44-5/Indian standards. The control panel shall be composed of two sections:

**Control Section including:**

Electronic panel both for the programming (CPU) of the working cycles and for the display of: duration of sludge’s discharges, duration of the time interval between discharges, bowl speed (RPM), hour recording meter.

- **Working mode selector (production/ CIP cleaning).**
- **Push-button panel for: machine start/ stop, product feeding pump start/ stop, partial and total discharges (manual mode).**
- **Pilot light indicating low oil flow rate in the lubrication system.**
- **Amperometer displaying the current absorbed by the motor.**
- **Flash-light indicating “bowl in rotation”.**

**Power section including:**

**Main switch**

- **Magnetic starter with overload and under voltage protection for the product feeding pump**
  - Overload cut-out for the water booster pump.
  - Frequency converter which controls the following:
    - **Motor start-up:** It is programmed in such a way to linearise the curve of the absorbed current and limit its value.
    - **Motor recycling after sludge’s discharges:** It is carried out as above.

- **Dynamic braking of the motor:** The frequency converter is programmed to control the emergency braking in order to prevent belt slippage and excessive mechanical stress.
- **Absorbed current value:** The value of the current absorbed by the motor is continuously monitored and its value is maintained as low as possible. The motor will be switched off automatically if, due to mechanical problems, an excessive torque and subsequently an excessive current are drawn.
Set of standard accessories supplied with the machine

- Hydraulic Jack for pressing the disc packs – 1 Set
- Service maintenance instruction manual. 2 Sets
- Set of special service tools – 1 Set
- Set of standard spare parts – 1 Set
- Oil Charges for initial start up and first charge 2 Sets
- Foundation plate with bolts (supplied if machine is to be fixed to the floor)

Other Accessories

1.0 Tank Pump unit for water feeding – to ensure proper feeding of the hydraulic system which operates bowl opening/closing

- Including Stainless steel tank with cover and float
- Centrifugal Stainless steel pump
- Water Cartridge Filter
- The unit is to be connected to the separator on site unless the separator is sold as a skid mounted machine

2.0 Hydraulic Hoist for Bowl – Wheeled hydraulic crane for easy bowl lifting

3.0 Flow Indicator for feed flow

4.0 Flow Indicator for Cream Flow

BIDDER CAN ALSO QUOTE OPTIONAL PRICE FOR SOLID BOWL TYPE MILK SEPARATOR.

BUTTER MELTING PLANT

1.0 FUNCTIONAL REQUIREMENT

1.1 General description- Butter /butter oil would be melted in a butter melting vat by hot water generating system before taking it to the ghee/ reconstitution section.

1.1 Capacity- 2000 L/batch

2.0 DESIGN REQUIREMENTS

The butter/butter oil melting plant would mainly comprise of the butter melting vat and the hot water generating and circulating system.

2.1 The melting vat- Should be double walled rectangular SS tank having inside dimensions of approximately 2200 mm x 1200 mm and 899 mm height.

- The inner vessel of the melting Vat should be fabricated from minimum 2 mm thick stainless steel conforming to AISI 316. The cover of the vat should be in 3 pieces with lifting handles and should be fabricated out of 1.5 mm thick stainless steel conforming to AISI.304.
- The inner vessel should be bent over the outer vessel and down to about 50 mm from the top edge and overlapping with the outer vessel.
- The outer vessel should be fabricated from 2 mm thick SS conforming to AISI 304.
- The top of the inner vessel should be covered with a net- work of stainless steel hot Water heating coils.
- The hot Water heating coils should be fabricated from 25 mm dia stainless steel tube having a center to center spacing of 100 mm.
- The heating coils should be properly clamped and supported from the inner SS vessel at about 100 mm below the top of the inner vessel.
- The inlet and outlet of the hot water for the heating coil network should be kept out side the outer vessel.
The heating coils should be of quick removable for proper cleaning of the coils and the melting vat.

The melting vat should be provided with 4 nos. MS tubular legs cladded with SS and having SS ball feet capable of 50 mm vertical adjustment.

One number of SS agitator with geared motor should be provided on the melting vat. The agitator assembly should be mounted on a suitable MS structure and the same should be supported on the vat.

The hot water jackets of the melting vat should be provided with inlet and outlet for the hot water and drain connection properly sized.

The melting vat should be provided with 51 mm SS melted butter/butter oil outlet with a two way flanged valve. Make of valve must be indicated.

The hot water jacket of the melting vat should be provided with a proper hot water distribution arrangement.

3.0 The hot water/generating and circulation system- This would include the following:

- 100 lit. Capacity hot water balance tank with top cover, fabricated out of 2 mm SS of AISI 304 quality. The balance tank should be provided with a pocket to insert the probe of thermo-statical controlled steam regulating valve.

- Hot water circulating pump of 5000 l/h capacity against a load of 10 to 15 m WC. The pump should be complete with electric motor suitable to run on 400/440 V 3 phase 50 Hz. 4.c. supply.

- Silent steam/ Water mixing equipment suitable for water flow rate of 5000 l/h. and a steam flow rate of 500 kg/h.

- Thermostatically controlled steam regulating valve to maintain the temperature of hot water between 60 to 80 degree C.

- The hot water balance tank should be provided with SS overflow pipe of 38 mm at the center of the balance tank.

- MS hot water pipes and fittings to connect hot water tank, steam/water mixing equipment, thermostatically controlled steam valve, hot water circulation pump, inlet for hot water in the heating coils and jacket of the melting vat and return water line from those points back to hot water tank.

Note: The quantity of MS pipes and fittings should be decided on a layout to be furnished by the supplier with the quotation.

- All welds should be ground smooth. All corners shall be well radiused and all SS surface coming in contract with butter/butter oil shall have a finish of minimum 120 grits.

- All SS fittings should conform to S.M.S. standard.

- All M.S. outer surfaces should have two coatings of anticorrosive epoxy primer followed by a coating of paint of approved shade.

**TECHNICAL SPECIFICATION OF BUTTER OIL DOSING PUMP**

**Quantity required:** One No.

1.0 **FUNCTIONAL REQUIREMENT:**

1.1 **General description**

The pump shall be used for the dosing of butter oil (melted butter) in milk recombination process at desired rate. The pump should be of sanitary design.
2.0 DESIGN REQUIREMENT:

2.1 The S.S. positive displacement rotary pump should be provided with flanged motor with hygienic sealing arrangement. The motor section of the pump should be S.S. shrouded. The casing should be easily dismountable. The S.S. shroud should have a provision for air circulation and entry of cable. The S.S. used for manufacture of pump should be corrosion resistant like AISI 316 or equivalent.

2.2 The pump should be provided with a metering device, variable speed unit, presetting arrangement etc.

2.3 Pumps inlet and outlet connection should have SMS type union of suitable dia.

2.4 Electrical Design data

The electrical prime mover should be suitable for operation on 400/440 volts, 3phase, 50 Hz AC supply with Class “E” insulation.

2.5 FINISH

All parts coming in contact with butter oil should be S.S. and all S.S. Parts should be smooth having a finish of 120 grits properly applied.

3.0 Technical details of both pump and melting plant (To be provided by bidder)

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Particulars</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Make of pump</td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td>Type of pump</td>
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</tr>
<tr>
<td>(3)</td>
<td>Model</td>
<td></td>
</tr>
<tr>
<td>(4)</td>
<td>Flow rate of pump L/Hour.</td>
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<tr>
<td>(5)</td>
<td>Application for viscous liquid suitable or not</td>
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<tr>
<td>(6)</td>
<td>Viscosity up to</td>
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<tr>
<td>(7)</td>
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<tr>
<td>(8)</td>
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<td>(9)</td>
<td>Working temp.</td>
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<tr>
<td>(10)</td>
<td>Motor HP/RPM Make</td>
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<td>(11)</td>
<td>M.O.C. for casing shaft and rotor/ starter</td>
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<tr>
<td>(12)</td>
<td>Make and type drive whether V.F.D. or some other</td>
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</tr>
<tr>
<td>(13)</td>
<td>Size of suction &amp; discharge</td>
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</tr>
<tr>
<td>(14)</td>
<td>Model of Drive</td>
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</tr>
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<td>(15)</td>
<td>Make type model HP, RPM, of gear and motor</td>
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<td>(16)</td>
<td>Make and model of pump &amp; Motor of circulating pump</td>
<td></td>
</tr>
<tr>
<td>(17)</td>
<td>Make &amp; model of steam regulating valve</td>
<td></td>
</tr>
</tbody>
</table>

Milk Heater

Make: Tetra Pak/APV/Alfa Laval/ Standard Make Only.

Milk manufacturing based on batch process which is accepted well in industry. Heating of Milk shall be achieved in recirculative type PHE heater module. We have assumed a batch of 1000 Litres of milk (as requirement) to be heated to required temperature in 80 Minutes for design. Please note that insulated storage tank is not in supplier scope of supply and the same has to be arranged by union/cooperative. Regarding holding of product, the same tank (Client Scope) can be used for storing of milk up to the desired time. Milk after being heated may be taken in
a Paneer vat (Ranchi dairy Scope) for further process. Specifications of the module are as below:

Type: Plate Heat Exchanger  
Circulation Flow Rate: 5000 LPH  
MOC of plates: SS 316 (0.6 mm thickness)  
Product: Milk  
Batch Process: 1000 Liter  
Composition: 15 % TS  
Temp Program : Heating - 4 - 90 deg c in 80 Minutes  
Sections : Double (Heating & Hot water Generation)  
Holding : May be achieved in the storage Tank (Client Scope)

Utilities

Hot Water @ 93 deg C (10000 LPH)  
Basis of operation:  

Batch size to be heated from 4 to 90 deg in a re-circulative mode by hot water @ 93 deg C in 50 minutes.

Technical specifications and scope of supply

1.0 Plate Heat Exchanger –

Plates: The plates shall be made from stainless steel (SS 316) in sanitary design. All the product contact and exterior surfaces shall be easily accessible or readily removable for cleaning and inspection.

Gaskets: The sealing gaskets must ensure complete sealing and pre-vent any cross - leakage between product and service liquids. Gaskets shall be of sanitary type and shall continuously bonded to the heat transfer surface. The gasket material shall be food grade, non-toxic, fat resistant, non-absorbent and shall have smooth surface. The material shall withstand a water sterilization temp. of 100 Deg. C. and 2% caustic solution at 80 Degree Centigrade. It shall be SNAP IN or LOCK IN type.

Supporting Frame: The supporting frame for the plate pack shall be of a self supporting design made of stainless steel (AISI 304) clad mild steel with a manually operated stainless steel (AISI 304) tightening device. The tightening device shall be able to exert uniform pressure on all the parts of heat transfer plates to prevent any leakages from milk heater. The frame and tightening device shall prevent the plates from deflecting under pressure differential of minimum 4 kg/sq.cm.

Accessories

Inlets/Outlet: The inlets and outlets in each section of the heat exchanger for products as well as services shall be provided with complete stainless steel (AISI 304) unions. The adaptor for ready connection of service connection is also included.

Thermo-wells: SS (AISI 304) pockets for thermometer on required ports for Product and service inlet and outlet connections. Suitable nos. of pockets are included. Each pocket shall be complete with a SS (AISI 304) guard of suitable length for mounting thermometers. However, Thermometers are included from scope of supply.

Ball Feet: The frame shall be provided with adjustable SS ball feet with provision for height adjustment of 50 mm.

2.0 Holding Section: May be achieved in the Paneer vat which will be used for re-circulative type of heating.
3.0 Feed Pump: The Milk Heater stainless steel feed pump shall be of sanitary steel shroud with louvers for air-cooling and suitable design as per dairy standard. Its capacity shall be adequate to facilitate efficient CIP. The TEFC drive motor shall be fitted with stainless arrangement for cable connection. Pump shall be supplied in location close to PHE and the interconnecting piping from Pump discharge to Flow controller & further to inlet of PHE shall be supplied by bidder. Incoming product piping from Paneer vat up to the suction of pump shall be supplied by Bidder scope.

4.0 Flow Controller (mechanical type): Flow Controller for Product: Stainless steel flow control device is required to maintain the required flow rate under varying pressure conditions. The flow controller shall be of a sanitary design.

5.0 Heating Device:

Hot water system shall be PHE based and shall have an expansion chamber and other safety devices to take care of the volume of expansion and increased pressure ensuring the complete operational safety. It will be designed as per duty parameters required for milk heater. It shall consist of PHE (with SS 316 plates and MS frame & SS 304 cladding). The system shall be supplied with steam control valve with bye-pass assembly, expansion chamber, safety valve, water make up valve and a suitable steam trap. Gasket MOC for Hot Water Generation PHE shall be EPDM to withstand high steam temperature.

Hot Water PHE: – Included in the same milk heater.

Safety Device: A safety device shall be provided in the hot water side of heating section to avoid damage to the heat exchanger caused by excessive pressure. It shall be of sanitary design.

Hot water Pump: One number of Hot water pump will be supplied which will be used for hot water circulation for heating of milk up to 90 deg C.

One no of PID Temperature control arrangement for control of heating temperature together with Steam Regulating and control valve is included.

6.0 Instrumentation and control panel:

Automatic controls shall be provided to ensure set temperature of product (for heating only). An audible alarm shall be activated once the batch temperature has been achieved. Then the process is to be manually diverted to forward mode for processing. The instrumentation and control panel shall be made in standard execution built to dust and vermin proof design. The control panel shall be leg supported and house the following components all pre-wired to terminal strip:

6.1 PID/On-Off Controller for temperature of pasteurized Product with display of set temperature and actual Product temperature. The controller has a facility to automatically tune to the requirement of set temperature.

6.2 Audio alarm with hooter and acknowledge and reset push button.

6.3 I/P Convertor for steam control valve operation.

6.4 Air pressure regulator cum moisture separator with isolating valve to ensure proper air supply to the I/P Convertor.

6.5 Incoming on/off switch for control supply.

6.6 Digital temperature indicators for display of milk outlet heating temperature, hot water inlet temperature.
6.7 One set of ‘ON’ and ‘OFF’ push buttons with indicating lamps and suitable inscriptions shall be provided for operation of motors of various modules. (Two numbers spare push buttons are included)

7.0 Pipes and Fittings (SS 304): All inter connecting pipes with necessary fittings for product as well as service shall be supplied within the specified battery limits and exclusions:

7.1 Product: The supply shall include all the necessary SS 304 pipes and fittings from feed pump discharge to the finished heated/cooled product outlet as required to inter-connect the above equipment.

7.2 Hot Water: The supply shall also include necessary SS 304 pipes and fittings for pumping hot water to the heating section of the PHE and return to the hot water set.

8.0 The Module shall be skid mounted

TECHNICAL SPECIFICATION OF WATER TREATMENT PLANT

INTRODUCTION

The dairy handles about 1000000 Ltrs of milk per day

Accordingly treated water requirement of The dairy is estimated to about 10.00 Lacs litres per day out of which 4.00 Lakh is required as IRON FREE SOFT WATER with commercial zero PPM, on per day basis for use in boiler, in hot water mixing battery of milk pasteurizer, Make up water in condenser and chilled water tank, seal cooling of ammonia compressors, can washer, and various seal cooling units etc. Rest of the water shall only be iron removed water required for, Cans, Crates, floor washing and other rough uses.

Quantity of raw water is as follows:

- CaCo3 Hardness- 500 PPM (approx)
- Iron as Fe content- 0.94 PPM
- PH- 7.5
- Turbidity- < 1 (less than one.)
- Calcium as Ca - 85 Mg. Per L.
- Magnesium as Mg. 36 Mg. Per L.
- Chloride as Cl. 8.64 mg. Per L.
- Total hardness 393 PPM.

A complete water treatment plant comprising of following components is required for the dairy.

(A) One Set of MNo2 (Manganese dioxide) chamber
It will directly receive the raw water from bore well/ sump tank through a Pump and feed the same to Sand filter in line. Its capacity should be matching with output of the Pump.

(C) One Set of SAND FILTER:-It shall be in line with Mn02 chamber and suitable to produce 3.0 Lacs Litres of iron removed water per day which shall be collected in existing over head tank (OHT). Its capacity should also make with total water requirement of 3.0 Lacs.

(D) One Set of WATER SOFTENER:- Although soft water requirement is of about 1.0 Lakh Litre per day a water softener of 20M3/ Hour flow rate shall be installed in the line of sand filter.

The existing Pump will feed raw water directly to Mn02 chamber the output of which shall be fed to sand filter for removal of iron content in the raw Water. The iron removed water from Sand filter shall be divided in to two parts through standard make butterfly valves of suitable Pipe size. One lakh litres shall directly pass to softener, the output of which (commercial zero PPM iron free water) shall be fed to different soft water consuming units. The rest 2.0 lacs litres iron removed water shall be directly sent to OHT from where it shall be redistributed to different washing uses. The above component shall be interconnected through suitable dia Pipe lines of Tata or Jindal make G.I “B” class. A line diagram of WTP is given below.
The technical specification of above components of water treatment plant follows.

(B) TECHNICAL SPECIFICATION OF MANGNEESE DIOXIDE CHAMBER

1.0 Functional requirement:
This shall be used in the line of raw water from pump. Manganese dioxide packed in this chamber will act as oxidizing catalyst.

1.1 Quantity-required- One set.

2.0 Design requirement
2.1 Type of oxidizing chamber:- It shall be UP FLOW Type & will receive directly the output of pump
2.2 Capacity:-It should be matchable without put of pump i.e not less than 36M3/ Hour. Mn02 Chamber should be a pressure vessel fabricated out of M.S. sheet of proper thickness. It should conform to standard design suitable and matching with flow rate of pump and in line sand filter. It should be packed with proper quantity of Mn02. The exterior of the vessel shall be painted with two coats of deep blue paint over a coat of red oxide primer. The interior shall be painted with 2 coats of anticorrosive blacks bituminus paint.

3.0 Scope of supply
3.1 Mn02 chamber as specified above – 01 Set
3.2 Frontal valves and pipes- output of Pump shall be connected through proper butterfly valve and its output should also be terminated through butterfly valve – One Lot

3.3 It should be packed with Mn02 required quantity

(C) TECHNICAL SPECIFICATION OF SAND FILTER

1.0 FUNCTIONAL REQUIREMENT:-
The Sand filter shall be used to remove Iron content of the raw water. It will receive water from Mn02 chamber and deliver iron free water to either softener or directly to over head tank.

2.0 DESIGN REQUIREMENT
2.1 Type of Sand filter:- The Sand filter shall be up/Down flow cylindrical & vertical type manual back washing type. It shall be pressure type vessel made up of M.S. plates of proper thickness.

2.2 Water quality: - As given in introduction
2.3 Capacity:- Suitable for flow rate capacity of submersible pump (Not less than 37 m3/H)maximum operating pressure -4.0 kg.cm2 normal operating pressure-2.5kg/m2.
2.4 Media: - Pebbles crushed gravels, quartz filtering Sand, anthracite.

2.5 Back wash frequency and Duration: Once in 24 Hours for minimum 20 minutes

2.6 Size of fontal plates and pipes- 80 mm.

2.7 The Sand filter shall be comprising the following:-

* Mild Steel pressure vessel with inlet and outlet connection, supports, legs frontal diaphragm valves arrangement- 01 No.
* Under bed system of perforated plate with strainer.
* Filter media of suitable quantity- 01 Lot
* Pressure gauges of H guru or stand make- 02 Nos.
* Set of manually operated cast iron diaphragm valves for normal operation and backwashing- 01 Set
* Initial charge of filter media
* Set of internal distribution system- 01 Set
* Manhole and hand holes of suitable size- 01 No. each.
* Air vent of suitable size- 01 Set
* Inlet and outlet sample locks/valves- 01 each
* Water flow meter of KENT make:- to measure iron free water to be collected in OHT - 01 Set
* Operation manual- 01 Set

2.8 Painting: The Sand filter interior shall be painted with two parts anti corrosive bituminous paints while exterior shall be painted with deep blue enamel paint over a coat of red oxide primer.

3.0 SCOPE OF SUPPLY

The Sand filter as specified above complete with accessories.

4.0 Technical details to be furnished by bidder.

<table>
<thead>
<tr>
<th>SL No</th>
<th>Particulars</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Make of Sand filter</td>
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</tr>
<tr>
<td>02</td>
<td>Type of filter (up/Down flow)</td>
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<tr>
<td>03</td>
<td>Size of Filter – Diameter &amp; Height-mm</td>
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<tr>
<td>04</td>
<td>Material of construction</td>
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<td>05</td>
<td>Thickness of M.O.C. Dish end Bed plate &amp; shell mm.</td>
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<tr>
<td>06</td>
<td>Flow rate LPH.</td>
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<tr>
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<td>Maximum operating pressure kg/cm²</td>
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<tr>
<td>08</td>
<td>Normal operating pressure- kg/cm²</td>
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<tr>
<td>09</td>
<td>Backwash cycle Hours</td>
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<tr>
<td>10</td>
<td>Backwash duration</td>
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<tr>
<td>11</td>
<td>Make of pressure gauge (Range)</td>
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<td>12</td>
<td>No. of manhole &amp; hand hole</td>
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<tr>
<td>13</td>
<td>Quantity of filter media</td>
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<td>14</td>
<td>Any other information relevant to filter.</td>
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</tbody>
</table>

(D) WATER SOFTENING PLANT- 20 CUM/HR

1.0 FUNCTION REQUIREMENT

The water softener is required to remove temporary hardness from iron free raw water.

2.0 DESIGN REQUIREMENT AND SCOPE OF SUPPLY:

2.1 Type of softener: The softener shall be of up/ down flow manual regenerating ion exchanged type.

2.2 Water Quality:

Raw water hardness- As specified earlier
Treated water hardness- less than 5 ppm

2.3 Capacity:
Flow rate- 20 Cu. M per hour (240 Cu. M per regeneration)
Maximum pressure at inlet- 3.6 kg/ sq. cm.
Minimum pressure at outlet- 3.0 kg/sq. cm.

2.4. Regeneration: The entire regeneration sequence such as opening and closing of valves, brine injection, should be manual.
Regeneration cycle- after every 24 hours.
Regenerate- Sodium Chloride (common salt).

2.3.1 Water softener shall be comprising of the following:

* Mild steel rubber lined pressure vessel with inlet and outlet connection, resin charging and withdrawal connection and supports, a vessel painted internally and externally, internal painting with anticorrosive paint. - 01 Set.
* Set of internals for the above comprising raw water inlet/ brine distributor and bottom collecting system - 01 Set.
* Brine tank of FRP construction to store and measure salt for regeneration of softener complete with brain level indicator - 01 Set
  - Set of mild steel rubber lined flanged pipe work including regeneration piping - 01 Set.
  - Set of manually operated cast iron diaphragm valves for normal operation and regeneration - 01 Set
  - Hydraulically operated brine ejector - 01 Set
  - Initial charge of ion exchange resin for the softener - 01 Lot
  - Hardness test kit - 01 Set
  - Orifice board for indicating wash and rinse flow rates (to be fitted in drain sump) - 01 No.
  - Inlet and outlet pressure gauges - 01 Set
  - Inlet and outlet sample valves - 01 Set
  - Water flow meter with totalizer (KENT makes) - 01 No.

2.6 PAINTING: The complete mild steel vessel with pipelines shall be coated with two coats of anticorrosive epoxy primer followed with two coats of epoxy paint of deep blue shade.

3.0 TECHNICAL DETAILS TO BE PROVIDED BY THE BIDDER

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<thead>
<tr>
<th>Sl. No</th>
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<th>DETAILS</th>
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<tr>
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<td>Model no/Type up flow/down flow</td>
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<td>Make of diaphragm valves</td>
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<td>Make of pressure gauges</td>
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<td>07</td>
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<td>Size of Frontal valves</td>
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<td>Thickness of M.O.C</td>
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<tr>
<td>11</td>
<td>Quantity of Resin</td>
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<td>Normal flow rate</td>
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<td>Make of frontal valves</td>
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<td>14</td>
<td>Size of inlet &amp; out let.</td>
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<tr>
<td>15</td>
<td>Make of brine injector.</td>
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</table>

LASSI PASTURISER Module

CAPACITY: 2000 LPH
Make: Modules should be Tetra Pak/APV Gaulin only.

FUNCTIONAL REQUIREMENT
**Bihar State Milk Co-Operative Federation Limited**

**DAIRY DEVELOPMENT COMPLEX, P.O. - BIHAR VETERINARY COLLEGE, PATNA-800014 (BIHAR)**

Phone No: 2224083, 2228953, 2228347, 2220387, Fax No: 0612-2228306

E-Mail: engineeringcomfed@gmail.com, Website: www.sudha.coop

<table>
<thead>
<tr>
<th>Type</th>
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<tbody>
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<td>Capacity</td>
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<td>Temp Program</td>
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<td>Sections</td>
<td>Regeneration, Heating I &amp; Heating II</td>
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<td>Gasket</td>
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<td>Homogenization</td>
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<td>Outlet</td>
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<tr>
<td>Pasteurisation Temp</td>
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</table>

**Utilities Required**

- Hot Water @ 93 deg C (4000 LPH) for heating Generated by Steam at 2.0 Bar
- Dry saturated steam @ 2 bars pressure

**Basis of operation:**

Lassi shall be pasteurized at a temperature of 70 deg C. After pasteurization lassi shall be cooled to 4 deg C and left at the outlet of Pasteurizer for onward use.

**Technical specifications and scope of supply**

1.0 **Plate Heat Exchanger - Lassi Pasteurizer (HTST)**

   **Plates:** The plates shall be made from stainless steel (SS 316) in sanitary design. All the product contact and exterior surfaces shall be easily accessible or readily removable for cleaning and inspection.

   **Gaskets:** The sealing gaskets must ensure complete sealing and prevent any cross - leakage between product and service liquids. Gaskets shall be of sanitary type and shall be continuously bonded to the heat transfer surface. The gasket material shall be food grade, non-toxic, fat resistant, non-absorbent and shall have smooth surface. The material shall withstand a water sterilization temp. of 100 Deg. C. and 2% caustic solution at 80 Degree Centigrade.

   **Supporting Frame:** The supporting frame for the plate pack shall be of a self supporting design made of stainless steel (AISI 304) clad mild steel with a manually operated stainless steel (AISI 304) tightening device. The tightening device shall be able to exert uniform pressure on all the parts of heat transfer plates to prevent any leakages from Pasteurizer. The frame and tightening device shall prevent the plates from deflecting under pressure differential of minimum 4 kg/sq.cm.

   **Accessories**

   **Inlets/Outlet:** The inlets and outlets in each section of the heat exchanger for products as well as services shall be provided with complete stainless steel (AISI 304) unions.

   **Thermo-wells:** SS (AISI 304) pockets for thermometer on required ports for Product and service inlet and outlet connections. Suitable nos. of pockets are included. However thermometers are excluded from our scope of supply.

   **Ball Feet:** The frame shall be provided with adjustable SS ball feet with provision for height adjustment of 50 mm.

2.0 **Holding:** It shall be designed for continuous holding of the product for at least the minimum specified holding time of 20 Sec at the Pasteurization temperature of 80 deg C.

3.0 **Float Balance Tank:** The float balance tank of 200 L capacity shall be fabricated from 2 mm thick SS sheet conforming to AISI 304. The tank shall be provided with cover, sanitary type SS (AISI 304) float valve with the Product inlet, cup type outlet, return Product inlet, inlet for water, over flow and adjustable SS ball feet. The float valve shall be designed to give the rated flow rate and withstand an inlet pressure of 1.5 kg/sq.cm.
4.0 Feed Pump & Booster Pump (IDMC Make): The Pasteurizer stainless steel feed pump & Booster Pump shall be of sanitary steel shroud with louvers for air-cooling and suitable design as per dairy standard. Its capacity shall be adequate to facilitate efficient CIP. The TEFC drive motor shall be fitted with stainless arrangement for cable connection.

The feed pump & booster pump shall be of suitable capacity to withstand the flow rates required during product run & CIP.

5.0 Flow Controller (Mechanical Type): Flow Controller for Product: Stainless steel flow control device shall be supplied to maintain the required flow rate. The flow controller shall be of a sanitary design.

6.0 SS Duplex Filter: with accessories shall be provided for pre-filtration of Lassi.

7.0 Heating Device: – PHE Based

Hot water system shall be PHE based and shall have an expansion chamber and other safety devices to take care of the volume of expansion and increased pressure ensuring the complete operational safety. It will be designed as per duty parameters required for pasteurization. It shall consist of PHE (with SS 316 plates and MS painted frame with SS 304 cladding). The system shall be supplied with steam control valve with bye pass assembly, expansion chamber, safety valve.

Safety Device: A safety device shall be provided in the hot water side of heating section to avoid damage to the heat exchanger caused by excessive pressure. It shall be of sanitary design.

Hot water Pump: One number of Hot water pump of suitable capacity will be supplied which will be used for hot water circulation for heating of milk up to 80 deg C.

One no of PID Temperature control arrangement for control of pasteurization temperature together with Steam Regulating and control valve is included.

8.0 Instrumentation and control panel:

Automatic controls shall be provided to ensure pasteurization temperature of product. If the required temperature of product is not reached, the flow of product shall be automatically diverted to the float balance tank with an audible alarm.

The instrumentation and control panel shall be made in standard execution built to dust and vermin proof design. The control panel shall be leg supported and house the following components all pre-wired to terminal strip:

8.1 PID Controller for temperature of pasteurized Product with display of set temperature and actual Product temperature. The controller has a facility to automatically tune to the requirement of set temperature.

8.2 Six point Strip chart recorder with digital display of temperatures of pasteurized product. The temperature recorder has microprocessor based with functional key facility for zero and span calibration.

8.3 Audio alarm with hooter and acknowledge and reset push button.

8.4 Auto manual selection switch and forced forward flow provision

8.5 I/P Convertor for steam control valve operation and electrically operated solenoid valve for air supply to flow diversion valve.

8.6 Air pressure regulator cum moisture separator with isolating valve to ensure proper air supply to the I/P Convertor and solenoid valves.

8.7 Incoming on/off switch for control supply.

One set of `ON` and `OFF` push buttons with indicating lamps and suitable inscriptions shall be provided for operation of motors of various module. (Two numbers spare push buttons are included)
8.7 Indication lamp for showing the position of flow diversion valve (forward/diverted mode)

9.0 Pipes and Fittings (SS 304): All inter connecting pipes with necessary fittings for product as well as service shall be supplied within the specified battery limits and exclusions.

9.1 Product: The supply shall include all the necessary SS 304 pipes and fittings from the outlet of balance tank to the finished Pasteurized Product outlet as required interconnecting the above equipment. However the Piping To & Fro from the Homogenizer is excluded from the scope of Supply.

9.2 Hot Water: The supply shall also include necessary SS 304 pipes and fittings for pumping hot water to the heating section of the Pasteurizer and return to the hot water set.

10.0 The module shall be mounted on SS 304 Skid as per compact layout. However the Pasteuriser plate pack & holding coil shall be floor mounted.
ETP PLANT

- Aerobic & Anaerobic type oxidation ditch
- Screen Bar
- Effluent Pump
- Flow Meter
- Twin Blow air compressor
- Moving Bed bio reactor
- SAFF Media
- Coarse bubble diffuser
- Fine bubble diffuser
- GI Air distribution in MBBR reactor
- GI air Distribution in equalization tank
- Sludge Pump
- Filter feed water pump (for chlorinated water)
- Secondary Clarifier
- All system valves in complete systems as required
- Butterfly valves
- NRV
- Gun Metals Valves & All system piping as required within the plant room with PVC/M/GI pipes as required
- All electrical cabling as required from panel to all respective motors as required.

NOTE- Technical Specifications of Milk/Butter/ Acid/ Ghee/ Tanks/ Vats/Silo etc. is annexed at Annexure -I

Note:

1. Other data of the specification table of APPENDIX – I are to be furnished by the bidder as proposed in the offer.
# TECHNICAL SPECIFICATION OF TANKS

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Item Description</th>
<th>Milk Silo</th>
<th>Process Milk Silo</th>
<th>Cream ripening / Storage Tank</th>
<th>Rinse Milk Storage Tank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Purpose</td>
<td>Store Chilled, Milk, In-Situ CIP</td>
<td>Store Chilled Milk, In-Situ CIP</td>
<td>Store &amp; Ripen chilled cream in Situ CIP</td>
<td>Store Chilled Rinse Milk</td>
</tr>
<tr>
<td>2</td>
<td>Qty</td>
<td>3</td>
<td>3</td>
<td>3</td>
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<td>Capacity</td>
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<td>100 KL</td>
<td>20 KL</td>
<td>5 KL</td>
</tr>
<tr>
<td>4</td>
<td>Location</td>
<td>Outdoor</td>
<td>Outdoor</td>
<td>Outdoor</td>
<td>Outdoor</td>
</tr>
<tr>
<td>5</td>
<td>Construction</td>
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<td>Vertical, double walled, insulated, sanitary design with 1:15 bottom slope, atmospheric pressure</td>
<td>Vertical triple walled having dimple / Corrugated jacket, Reverse conical bottom</td>
<td>Vertical / Double walled / insulated</td>
</tr>
<tr>
<td>6</td>
<td>Material Construction</td>
<td>Inner Shell</td>
<td>Inner Shell Finish</td>
<td>Inner Shell Finish</td>
<td>Outer Shell</td>
</tr>
<tr>
<td>7</td>
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<td>150 Grits</td>
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<td>2 mm, AISI 304</td>
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<td>2 mm, AISI 304</td>
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<td>Mill finish</td>
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<td>1st layer 15 mm PUF 35 kg/cum density , 2 nd &amp; 3 rd layer each of 50 mm EPS 20 kg /cum density</td>
<td>1st layer 15 mm PUF 35 kg/cum density , 2 nd &amp; 3 rd layer each of 50 mm EPS 20 kg /cum density</td>
<td>1st layer 15 mm PUF 35 kg/cum density , 2 nd &amp; 3 rd layer each of 50 mm EPS 20 kg /cum density</td>
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<td>12</td>
<td>Ports</td>
<td>Jacket drain</td>
<td>Inlet</td>
<td>Outlet</td>
<td>Sampling port</td>
</tr>
<tr>
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<td>Common opening of 76 mm SMS union cup type with butterfly stop valve</td>
<td>Common opening of 76 mm SMS union cup type with butterfly stop valve</td>
<td>Sampling cock, sanitary design before stop valve</td>
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<td>Common opening of 76 mm SMS union cup type with butterfly stop valve</td>
<td>Common opening of 76 mm SMS union cup type with butterfly stop valve</td>
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<td>Sampling cock, sanitary design before stop valve</td>
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<td>150 mm dia AISI 304</td>
<td>150 mm dia AISI 304</td>
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<td>Airvent</td>
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<td>460 mm dia AISI 304</td>
<td>460 mm dia AISI 304</td>
<td>460 mm dia AISI 304</td>
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<td>Manway</td>
<td>Ovel shaped 550 x 405 mm with Neoprene/ Nitrile rubber food grade gasket</td>
<td>Ovel shaped 550 x 405 mm with Neoprene/ Nitrile rubber food grade gasket</td>
<td>Suitable front side manhole with Neoprene/ Nitrile rubber food grade gasket</td>
<td>Ovel shaped 550 x 405 mm with Neoprene/ Nitrile rubber food grade gasket</td>
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<td></td>
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<td>Light Port</td>
<td>140 mm dia AISI 304 with toughened glass &amp; fly nuts, 24 V 100 W lamp,</td>
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<tr>
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<td>140 mm dia AISI 304 with toughened glass &amp; fly nuts, 24 V 100 W lamp,</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>140 mm dia AISI 304 with toughened glass &amp; fly nuts, 24 V 100 W lamp</td>
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<td>Sight Port</td>
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<td></td>
<td></td>
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<td>140 mm dia AISI 304 with toughened glass &amp; fly nuts,</td>
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<td></td>
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<td>140 mm dia AISI 304 with toughened glass &amp; fly nuts,</td>
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<td>140 mm dia AISI 304 with toughened glass &amp; fly nuts</td>
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<td></td>
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<td>Vertical sweeping type (AISI 304) Geared motor, 12 rpm Motor shall be as per</td>
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<td>IS 2615- 2004 Eff 2</td>
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<td>26</td>
<td>Level Marks</td>
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<td>Sand blasted with 500 L intervals</td>
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<td>27</td>
<td>Level Transmitter</td>
<td>Diaphragm type with accuracy of +/- 0.25 %</td>
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<td>Level Transmitters</td>
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<td>29</td>
<td>Low level</td>
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<tr>
<td>30</td>
<td>High</td>
<td>Yes</td>
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<tr>
<td>31</td>
<td>Temperature sensor</td>
<td>RTD, Duplex type</td>
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<td>32</td>
<td>Temperature Transmitter</td>
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<td>33</td>
<td>Temperature Display</td>
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<tr>
<td>34</td>
<td>Manhole Sensor</td>
<td>Proximity switch</td>
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<td></td>
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<tr>
<td>35</td>
<td>Alcove</td>
<td>Yes, around 1800 x 1500 mm</td>
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<tr>
<td>36</td>
<td>Approach ladder</td>
<td>Common Plate form with vertical ladder</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>37</td>
<td>Top Railing</td>
<td>900 mm high AISI 304 pipe - with SS kick plates, 901 mm high AISI 304 pipe</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- with SS kick plates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>Lighting lugs</td>
<td>Yes 4 Nos. AISI 304</td>
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<td>39</td>
<td>Test</td>
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<tr>
<td>Sl. No.</td>
<td>Description</td>
<td>Butter Milk Storage Tank</td>
<td>Past Water Storage Tank</td>
<td>Pre-stratification Tank</td>
<td>Ghee Settling Tank</td>
</tr>
<tr>
<td>--------</td>
<td>------------------------------</td>
<td>--------------------------</td>
<td>-------------------------</td>
<td>-------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>1</td>
<td>Purpose</td>
<td>Store Chilled Butter Milk</td>
<td>Pasteurised Chilled water</td>
<td>Store Molten Butter</td>
<td>Store Ghee</td>
</tr>
<tr>
<td>2</td>
<td>Qty</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
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<td>15 KL</td>
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<td>2 KL</td>
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<tr>
<td>4</td>
<td>Location</td>
<td>Butter Making</td>
<td>Butter Making</td>
<td>Ghee Making</td>
<td>Ghee Making</td>
</tr>
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<td>Construction</td>
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<td>Vertical , double walled , insulated</td>
<td>Vertical , double walled , insulated</td>
<td>Vertical / Double walled / insulated</td>
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<td>2,5 mm , AISI 304</td>
<td>2,5 mm , AISI 304, 3 mm conical bottom</td>
<td>2 mm , AISI 304</td>
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<td>Inner Shell Finish</td>
<td>150 Grits</td>
<td>150 Grits</td>
<td>150 Grits</td>
<td>150 Grits</td>
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<tr>
<td>8</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>9</td>
<td>Outer Shell</td>
<td>2 mm , AISI 304</td>
<td>2 mm , AISI 304</td>
<td>2 mm , AISI 304</td>
<td>2 mm , AISI 304</td>
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<td>Outer Shell finish</td>
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<td>Mill finish</td>
<td>Mill finish</td>
<td>Mill finish</td>
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<tr>
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<td>Insulation layers</td>
<td>1st layer 15 mm PUF 35 kg/cum density , 2 nd &amp; 3 rd layer each of 50 mm EPS 20 kg /cum density</td>
<td>1st layer 15 mm PL 35 kg/cum density , 2 nd &amp; 3 rd layer each of 50 mm EP 20 kg /cum density</td>
<td>2 mm , AISI 304</td>
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<tr>
<td>12</td>
<td>Jacket drain</td>
<td>outer shell shall have weep holes at bottom</td>
<td>outer shell shall have weep holes at bottom</td>
<td>SS drain with GM valve at the bottom of jacket</td>
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<tr>
<td>13</td>
<td>Inlet</td>
<td>63. 5 mm SMS union</td>
<td>63. 5 mm SMS union</td>
<td>No foam 63.5 mm Top inlet with SMS union</td>
<td>No foam 38.5 mm Top inlet with SMS union</td>
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<td>63. 5 mm SMS union</td>
<td>63. 5 mm SMS union</td>
<td>No foam 63.5 mm Top inlet with SMS union</td>
<td>No foam 38.5 mm Top inlet with SMS union</td>
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<tr>
<td>15</td>
<td>Sampling port</td>
<td>Sampling cock, sanitary design before stop valve</td>
<td>Sampling cock, sanitary design before stop valve</td>
<td>Sampling cock, sanitary design before stop valve</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Drain</td>
<td>____</td>
<td>____</td>
<td>____</td>
<td>____</td>
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<tr>
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<td>150 mm dia</td>
<td>76 mm dia</td>
<td>38 mm at type top of bottom</td>
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<tr>
<td>19</td>
<td>Manway</td>
<td>Ovel shaped 550 x 405 mm with Neoprene/ Nitrile rubber food grade gasket</td>
<td>Ovel shaped 550 x 405 mm with Neoprene/ Nitrile rubber food grade gasket</td>
<td>Half openable three piece covers of 2 mm thick of AISI 304 at the top</td>
<td>Half openable three piece covers of 2 mm thick of AISI 304 at the top</td>
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<tr>
<td>20</td>
<td>Level probe , sensor, transmitter port</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>21</td>
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<td>Yes, thermowell</td>
<td>Yes, thermowell</td>
<td>Yes, thermowell</td>
<td>Yes, thermowell</td>
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<td>22</td>
<td>CIP Port</td>
<td>Spray ball AISI 304</td>
<td>Spray ball AISI 304</td>
<td>____</td>
<td>____</td>
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<tr>
<td>23</td>
<td>Light Port</td>
<td>140 mm dia AISI 304 with toughened glass &amp; fly nuts, 24 V 100 W lamp</td>
<td>140 mm dia AISI 304 with toughened glass &amp; fly nuts, 24 V 100 W lamp</td>
<td>140 mm dia AISI 304 with toughened glass &amp; fly nuts, 24 V 100 W lamp</td>
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<td>24</td>
<td>Sight Port</td>
<td>140 mm dia AISI 304 with 140 mm dia AISI</td>
<td>140 mm dia AISI</td>
<td>Side window</td>
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<tr>
<td>Sl. No.</td>
<td>Description</td>
<td>Butter Melting Vat</td>
<td>Concentrated Acid</td>
<td>Concentrated Lye Tank</td>
<td>CIP tanks for acid / lye/ hot/water tank</td>
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<td>--------------------</td>
<td>-------------------</td>
<td>-----------------------</td>
<td>-----------------------------------------</td>
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<td>Store concentrated LYE</td>
<td>Store Acid</td>
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<td>15 KL</td>
<td>15 KL</td>
<td>2 KL</td>
</tr>
<tr>
<td>4</td>
<td>Location</td>
<td>Ghee Making</td>
<td>Outdoor</td>
<td>Outdoor</td>
<td>CIP</td>
</tr>
<tr>
<td>5</td>
<td>Construction</td>
<td>Rectangular double walled , insulated with heating pipe network</td>
<td>Vertical uninsulated</td>
<td>Vertical uninsulated</td>
<td>Vertical / Double walled / insulated</td>
</tr>
<tr>
<td>6</td>
<td>Inner Shell</td>
<td>2 mm , AISI 316</td>
<td>3 mm , AISI 316</td>
<td>3 mm , AISI 316</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Inner Shell Finish</td>
<td>150 Grits</td>
<td>150 Grits</td>
<td>150 Grits</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Jacket</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Outer Shell</td>
<td>2 mm , AISI 304</td>
<td>3 mm , AISI 304</td>
<td>3 mm , AISI 304</td>
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</tr>
<tr>
<td>10</td>
<td>Outer Shell finish</td>
<td>Mill finish</td>
<td>Mill finish</td>
<td>Mill finish</td>
<td>Mill finish</td>
</tr>
<tr>
<td>11</td>
<td>Insulation layers</td>
<td>50 mm PUF of 42 KG/ cum density</td>
<td>50 mm thick (each layer)</td>
<td>resin bonded crown 150 bigre glass insulation in 2 layers</td>
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</tr>
<tr>
<td>12</td>
<td>Heating system</td>
<td>Condensate outlet with</td>
<td></td>
<td></td>
<td></td>
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</table>

### TECHNICAL SPECIFICATION OF TANKS

- **Bihar State Milk Co-Operative Federation Limited**
- **DAIRY DEVELOPMENT COMPLEX, P.O. - BIHAR VETERINARY COLLEGE, PATNA-800014(BIHAR)**
- **Phone No: 2224083,2228953,2228347,2220387, Fax No:0612-2228306**
- **E-Mail: engineeringcomfed@gmail.com, Website: www.sudha.coop**
### TECHNICAL SPECIFICATION OF TANKS

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Condensate Collection Tank</th>
<th>FO storage Tank</th>
<th>FO service tank</th>
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<tbody>
<tr>
<td>1</td>
<td>Purpose</td>
<td>Store condensate</td>
<td>Store FO</td>
<td>Store FO</td>
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<tr>
<td>2</td>
<td>Qty</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Capacity</td>
<td>5 KL</td>
<td>50 KL</td>
<td>900 L</td>
</tr>
<tr>
<td>4</td>
<td>Location</td>
<td>Outdoor (underground)</td>
<td>Outdoor</td>
<td>Boiler house</td>
</tr>
<tr>
<td>5</td>
<td>Construction</td>
<td>Horizontal, cylindrical, double walled, insulated</td>
<td>Vertical double walled, insulated with bottom steam heating coil, Height to diameter ratio not exceeding 3:2</td>
<td>Vertical single walled uninsulated with bottom steam heating coil and electric heater of 3 KW with thermostatic control</td>
</tr>
<tr>
<td>6</td>
<td>Inner Shell</td>
<td>2 mm, AISI 304</td>
<td>6.0 mm, MS</td>
<td>3.0 mm, MS</td>
</tr>
<tr>
<td>7</td>
<td>Inner Shell Finish</td>
<td>150 grits</td>
<td>2 coats of heat resistant primer followed by 2 coats of heat resistance bitmen based paint</td>
<td>2 coats of heat resistant primer followed by 2 coats of heat resistance bitmen based paint</td>
</tr>
<tr>
<td>8</td>
<td>Jacket</td>
<td>2 mm, MS</td>
<td>3 mm, MS</td>
<td>3 mm, MS</td>
</tr>
<tr>
<td>9</td>
<td>Outer Shell</td>
<td>2 mm, MS</td>
<td>3 mm, MS</td>
<td>3 mm, MS</td>
</tr>
<tr>
<td>10</td>
<td>Outer Shell finish</td>
<td>2 coats of zinc chromate red oxide primer followed by 2 coats of synthetic enamel paint</td>
<td>2 coats of zinc chromate red oxide primer followed by 2 coats of synthetic enamel paint</td>
<td>3 coats of zinc chromate red oxide primer followed by 2 coats of synthetic enamel paint</td>
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<tr>
<td>11</td>
<td>Insulation layers</td>
<td>50 mm glass wool</td>
<td>75 mm resin bonded crown 150 fibre glass / glass wool</td>
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<tr>
<td>12</td>
<td>Jacket drain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Inlet</td>
<td>51 mm SS x 2 nos.</td>
<td>75 mm NB MS &quot;C&quot;class flanged, vertical short U bend</td>
<td>50 mm NB MS &quot;C&quot;class flanged</td>
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<tr>
<td>14</td>
<td>Outlet</td>
<td>52 mm SS, flanged type</td>
<td>200 mm NB MS &quot;C&quot;class flanged with &quot;T&quot;section 200 mm x 75 mm</td>
<td>150 mm NB MS &quot;C&quot;class flanged with &quot;T&quot;section 200 mm x 50 mm</td>
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<tr>
<td>15</td>
<td>Sampling port</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Drain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Overflow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Airvent</td>
<td>150 mm dia</td>
<td>150 mm dia</td>
<td>150 mm dia</td>
</tr>
<tr>
<td>19</td>
<td>Manway</td>
<td>Ovel shaped 550 x 405 mm with Neoprene/ Nitrile rubber food grade gasket</td>
<td>Ovel shaped 550 x 405 mm with Neoprene/ Nitrile rubber food grade gasket</td>
<td>Ovel shaped 550 x 405 mm with Neoprene/ Nitrile rubber food grade gasket</td>
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<tr>
<td>20</td>
<td>Level probe, sensor, transmitter port</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
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<tr>
<td>21</td>
<td>Temperature</td>
<td>Yes, thermowell</td>
<td>Yes, thermowell</td>
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**TECHNICAL SPECIFICATION OF TANKS**

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Description</th>
<th>Ghee Storage Tank</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>CIP tanks for acid/lye/Hotwater</td>
</tr>
<tr>
<td>1</td>
<td>Purpose</td>
<td>Store Ghee</td>
</tr>
<tr>
<td>2</td>
<td>Qty</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Capacity</td>
<td>2 KL</td>
</tr>
<tr>
<td>4</td>
<td>Location</td>
<td>Ghee making</td>
</tr>
<tr>
<td>5</td>
<td>Construction</td>
<td>Vertical double walled, jacketted with removable sprinkler pipe 25 mm dia hot/chilled water, Ubend 38 mm, stea</td>
</tr>
<tr>
<td>6</td>
<td>Inner Shell</td>
<td>2 mm, AISI 304</td>
</tr>
<tr>
<td>7</td>
<td>Inner Shell Finish</td>
<td>150 grits</td>
</tr>
<tr>
<td>8</td>
<td>Inner mediate shell</td>
<td>–</td>
</tr>
<tr>
<td>9</td>
<td>Outer Shell</td>
<td>2 mm, AISI 304</td>
</tr>
<tr>
<td>10</td>
<td>Outer Shell finish</td>
<td>Mill finish</td>
</tr>
<tr>
<td>11</td>
<td>Insulation layers</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Jacket drain</td>
<td>SS drain with GM valve at the bottom of jacket</td>
</tr>
<tr>
<td>13</td>
<td>Inlet</td>
<td>Nofoam 38.5 mm top inlet with SMS union</td>
</tr>
<tr>
<td>14</td>
<td>Outlet</td>
<td>Side outlet 51 mm</td>
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### TECHNICAL SPECIFICATION OF PUMPS

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Purpose</th>
<th>Milk Pump</th>
<th>CIP return</th>
<th>Milk Transfer Silo to pasteuriser</th>
<th>Past. Feed Pump</th>
<th>Past. Boost Pump</th>
<th>Hot water pump</th>
<th>Cream feed pump</th>
<th>Cream transfer to CBMM</th>
<th>Milk transfer to powder plant</th>
<th>CIP return</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>City</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1 w + 1 S</td>
<td>1 w + 1 S</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Capacity</td>
<td>30000</td>
<td>30000</td>
<td>30000</td>
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<td>30000</td>
<td>30000</td>
<td>30000</td>
<td>20000</td>
<td>20000</td>
<td>20000</td>
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<tr>
<td>4</td>
<td>Type of Pump</td>
<td>Centrifugal</td>
<td>Self priming centrifugal, Centrifugal pump are cheaper and are</td>
<td>Centrifugal</td>
<td>Centrifugal</td>
<td>Centrifugal</td>
<td>Centrifugal</td>
<td>Centrifugal</td>
<td>Screw type positive displacement with Pr. Release valve</td>
<td>Centrifugal</td>
<td>Self priming Centrifugal</td>
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### TECHNICAL SPECIFICATION OF PUMPS

<table>
<thead>
<tr>
<th>Purpose</th>
<th>CIP Return</th>
<th>Ghee Transfer</th>
<th>Chemical unloading</th>
<th>Chemical dosing to each CIP system</th>
<th>CIP Supply pump</th>
<th>FO Transfer Pump</th>
<th>Cooling water circulation</th>
<th>Condensate transfer to Boiler house</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td>CIP Return</td>
<td>Ghee Transfer</td>
<td>Chemical unloading</td>
<td>Chemical dosing to each CIP system</td>
<td>CIP Supply pump</td>
<td>FO Transfer Pump</td>
<td>Cooling water circulation</td>
<td>Condensate transfer to Boiler house</td>
</tr>
<tr>
<td>Purpose</td>
<td>CIP Return</td>
<td>Ghee Transfer</td>
<td>Chemical unloading</td>
<td>Chemical dosing to each CIP system</td>
<td>CIP Supply pump</td>
<td>FO Transfer Pump</td>
<td>Cooling water circulation</td>
<td>Condensate transfer to Boiler house</td>
</tr>
</tbody>
</table>

#### Material of Construction for Pump

<table>
<thead>
<tr>
<th>Material of Construction for Pump</th>
<th>AISI 316</th>
<th>AISI 316</th>
<th>AISI 316</th>
<th>AISI 316</th>
<th>AISI 316</th>
<th>AISI 316</th>
<th>AISI 316</th>
<th>AISI 316</th>
<th>AISI 316</th>
<th>AISI 316</th>
</tr>
</thead>
</table>

#### Make of Pump

<table>
<thead>
<tr>
<th>Make of Pump</th>
<th>AISI 316</th>
<th>AISI 316</th>
<th>AISI 316</th>
<th>AISI 316</th>
<th>AISI 316</th>
<th>AISI 316</th>
<th>AISI 316</th>
<th>AISI 316</th>
<th>AISI 316</th>
<th>AISI 316</th>
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</thead>
</table>

#### Pump Head (MWC)

<table>
<thead>
<tr>
<th>Pump Head (MWC)</th>
<th>Direct</th>
<th>Direct</th>
<th>Direct</th>
<th>Direct</th>
<th>Direct</th>
<th>Direct</th>
<th>Direct</th>
<th>Direct</th>
<th>Direct</th>
<th>Direct</th>
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</table>

#### Drive

<table>
<thead>
<tr>
<th>Drive</th>
<th>Direct</th>
<th>Direct</th>
<th>Direct</th>
<th>Direct</th>
<th>Direct</th>
<th>Direct</th>
<th>Direct</th>
<th>Direct</th>
<th>Direct</th>
<th>Direct</th>
</tr>
</thead>
</table>

#### Pump Efficiency (%)

|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|

#### Inlet/outlet size (mm/mm)

<table>
<thead>
<tr>
<th>Inlet/outlet size (mm/mm)</th>
<th>2 Qty</th>
<th>1 W + 1 S</th>
<th>1 W + 1 S</th>
</tr>
</thead>
</table>

#### Motor Rating (KW)

<table>
<thead>
<tr>
<th>Motor Rating (KW)</th>
<th>2 Qty</th>
<th>1 W + 1 S</th>
<th>1 W + 1 S</th>
</tr>
</thead>
</table>

#### Motor RPM

<table>
<thead>
<tr>
<th>Motor RPM</th>
<th>2 Qty</th>
<th>1 W + 1 S</th>
<th>1 W + 1 S</th>
</tr>
</thead>
</table>

#### Coupling arrangement

<table>
<thead>
<tr>
<th>Coupling arrangement</th>
<th>2 Qty</th>
<th>1 W + 1 S</th>
<th>1 W + 1 S</th>
</tr>
</thead>
</table>

#### Mechanical seal type, material and make

<table>
<thead>
<tr>
<th>Mechanical seal type, material and make</th>
<th>2 Qty</th>
<th>1 W + 1 S</th>
<th>1 W + 1 S</th>
</tr>
</thead>
</table>

Equally good.

Hence may be used for the molten butter ghee pumping.
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Purpose</th>
<th>CIP Return</th>
<th>Milk packing section / UHT</th>
<th>Rinse Milk transfer VMST</th>
<th>CIP return</th>
<th>Milk transfer to RM Silo</th>
<th>Butter Milk transfer to RM Silo</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2</td>
<td>Qty</td>
<td>2 + 1</td>
<td>1 W + 1 S</td>
<td>1 + 1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Capacity LPH</td>
<td>20000</td>
<td>20000</td>
<td>5000</td>
<td>20000</td>
<td>20000</td>
<td>20000</td>
</tr>
<tr>
<td>4</td>
<td>Location</td>
<td>pouch filling</td>
<td>Process</td>
<td>Process</td>
<td>Process</td>
<td>Rinse Milk Recovery</td>
<td>Butter Making</td>
</tr>
<tr>
<td>5</td>
<td>Type of Pump</td>
<td>Self Priming</td>
<td>Centrifugal</td>
<td>Centrifugal</td>
<td>Self Priming</td>
<td>Centrifugal</td>
<td>Centrifugal</td>
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<tr>
<td>6</td>
<td>Material Construction for Pump</td>
<td>AISI 316</td>
<td>AISI 316</td>
<td>AISI 316</td>
<td>AISI 316</td>
<td>AISI 316</td>
<td>AISI 316</td>
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<tr>
<td>7</td>
<td>Make of Pump</td>
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<td></td>
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<td>Pump Model No.</td>
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<td>Pump Head (MWC)</td>
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<td></td>
</tr>
<tr>
<td>10</td>
<td>The Drive</td>
<td>Direct</td>
<td>Direct</td>
<td>Direct</td>
<td>Direct</td>
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<td>Direct</td>
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<td>Pump Efficiency (%)</td>
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</tr>
<tr>
<td>12</td>
<td>Inlet/ outlet size (mm/mm)</td>
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<tr>
<td>13</td>
<td>Motor Rating (KW)</td>
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<tr>
<td>14</td>
<td>Motor RPM</td>
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<td>Motor Make</td>
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<td>16</td>
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<tr>
<td>17</td>
<td>Coupling arrangement</td>
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<tr>
<td>18</td>
<td>Mechanical seal type, material and make</td>
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**TECHNICAL SPECIFICATION OF CHILLER**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Purpose</th>
<th>Raw Milk Chilling</th>
<th>Rinse Milk Chilling</th>
<th>Reconstitute Milk Chilling</th>
<th>Butter Milk Chiller</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Qty</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Capacity LPH</td>
<td>30000</td>
<td>5000</td>
<td>5000</td>
<td>2000 expandable 3000</td>
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<tr>
<td>4</td>
<td>Location</td>
<td>Process</td>
<td>Rinse Milk Recovery System</td>
<td>Milk Pouch Filling</td>
<td>Butter Making</td>
</tr>
<tr>
<td>5</td>
<td>Make/ PHE model offered</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>No. of Plates</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Total Heat tranter area</td>
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<tr>
<td>8</td>
<td>Heat exchanged (Kcal/hr)</td>
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</tr>
<tr>
<td>9</td>
<td>Material of Plates</td>
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<td>AISI 316</td>
<td>AISI 316</td>
<td>AISI 316</td>
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<tr>
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<td>Material of Frame</td>
<td>MS cladded with AISI 304</td>
<td>MS cladded with AISI 304</td>
<td>MS cladded with AISI 304</td>
<td>MS cladded with AISI 304</td>
</tr>
<tr>
<td>11</td>
<td>Plate Thickness (mm)</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
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<td>Inlet/outlet Connection</td>
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<tr>
<td>13</td>
<td>Frame length (mm)</td>
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</tr>
<tr>
<td>14</td>
<td>Plate pack (mm)</td>
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<tr>
<td>Sl. No.</td>
<td>Purpose</td>
<td>Milk Pasteuriser</td>
<td>Cream Pasteuriser</td>
<td>CIP PHE</td>
<td>CIP PHE</td>
</tr>
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<td>------------------</td>
<td>------------------</td>
<td>-------------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>1</td>
<td>Qty</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Capacity LPH</td>
<td>20000</td>
<td>3000</td>
<td>20000</td>
<td>20000</td>
</tr>
<tr>
<td>3</td>
<td>Location</td>
<td>Process</td>
<td>Process</td>
<td>Process CIP</td>
<td>Tanker CIP</td>
</tr>
<tr>
<td>4</td>
<td>Make</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>PHE model offered</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Frame Length (mm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>No. of Plates</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Total Heat transfer area (SQM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Material of Plates</td>
<td>AISI 316</td>
<td>AISI 316</td>
<td>AISI 316</td>
<td>AISI 316</td>
</tr>
<tr>
<td>12</td>
<td>Materials of Frame</td>
<td>MS Cladded with AISI 304</td>
<td>MS Cladded with AISI 304</td>
<td>MS Cladded with AISI 304</td>
<td>MS Cladded with AISI 304</td>
</tr>
<tr>
<td>13</td>
<td>Plate Thickness (mm)</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>14</td>
<td>Holding time (sec)</td>
<td>2.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Holding tube length</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Product Flow Rate (LPH)</td>
<td>20000</td>
<td>3000</td>
<td>20000 in each circuit</td>
<td>20000 in each circuit</td>
</tr>
<tr>
<td>17</td>
<td>Pressure drop (Kg/ Sq. mm)</td>
<td>1.5 (max)</td>
<td>1.5 (max)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Inlet temperature (Deg C)</td>
<td>6</td>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Product outlet Temperature (Deg C)</td>
<td>4</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Milk take off temp. to Centrifuge</td>
<td>50-55 deg C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Heat regeneration</td>
<td>93% (min)</td>
<td>80 % (min)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Pasteurising temperature (Deg C)</td>
<td>Upto 80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Max. Designed Pressure (Kg / sq. mm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Sp. Gravity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Specific Heat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Thermal Capacity (k cal/hr/m/Deg C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Volume of Liquid in PHE (litres)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Bihar State Milk Co-Operative Federation Limited
DAIRY DEVELOPMENT COMPLEX, P.O. - BIHAR VETERINARY COLLEGE,
PATNA-800014(BIHAR)
Phone No: 2224083,2228953,2228347,2220387, Fax No-0612-2228306
E-Mail: engineeringcomfed@gmail.com, Website: www.sudha.coop

TECHNICAL SPECIFICATION FOR 33 KV /433 V Electric Sub-Station

1.1 The scope of work includes design, fabrication, supply installation, testing and commissioning of all equipment, cabling and earthing etc. of compete etc. of complete substation as per general technical specifications and the schedule of quantities mentioned in this work package. The technical specification for supply and installation of the sub-station has been specified in few sections and brief content of each of these is given under Design Data. Technical specification for electrical erection, testing and commissioning, including specification of accessories has been included in Section IV. Special conditions of contract. Terms and conditions for electrical installation – of the bidding document.

1.2 The bidder shall be responsible for designing and developing the conceptual layout, Power and Control Wiring diagram etc., to ensure that the system is installed with minimum investment and least operating cost to meet all the quality standard as well as to fulfil the design data and technical specifications specified in the bidding document. The work shall be carried out with the best quality materials and in a best workmanship manner, strictly in conformity with the specifications mentioned hereunder.

The system shall be designed, supplied and executed in accordance with prevailing and applicable
- Bureau of Indian Standards
- Indian Electricity Act & Rules
- Fire Insurance Regulations
- Indian Factory Act
- State Statutory Requirement

and any other applicable Indian Act. Wherever Indian Standards are not available / applicable, the bidder shall follow International Standards. In case of non-availability / applicability of both the standards mentioned above, DIN British or American Standards shall be used.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>Inlet, outlet connection (mm)</td>
</tr>
<tr>
<td>29</td>
<td>Chilled water/ Steam Flow rate (LPH)</td>
</tr>
<tr>
<td>30</td>
<td>Pressure drop (Kg/ Sq. mm)</td>
</tr>
<tr>
<td>31</td>
<td>Chilled water inlet temp (Deg C)</td>
</tr>
<tr>
<td>32</td>
<td>Chilled water outlet temp (Deg C)</td>
</tr>
<tr>
<td>33</td>
<td>Sp. Gravity</td>
</tr>
<tr>
<td>34</td>
<td>Specific Heat</td>
</tr>
<tr>
<td>35</td>
<td>Thermal Capacity (k cal/hr/m /Deg C)</td>
</tr>
<tr>
<td>36</td>
<td>Volume of Liquid in PHE (litres)</td>
</tr>
<tr>
<td>37</td>
<td>Inlet, outlet connection (mm)</td>
</tr>
<tr>
<td>38</td>
<td>Max design Heat</td>
</tr>
<tr>
<td>39</td>
<td>Heat</td>
</tr>
<tr>
<td>40</td>
<td>Balance tank 300 L, AISI 304, 2 mm thick</td>
</tr>
<tr>
<td>41</td>
<td>Accessories Flow diversion valve, Flow controller, Duplex filter, hot water generation in plate pack</td>
</tr>
<tr>
<td>42</td>
<td>Automation Fully automated plant, hence valves, controls &amp; instruments as per process logic specified</td>
</tr>
</tbody>
</table>

Intermediate / balance tank min 100 L, AISI 304, 2 mm thick. Flow controller, hot water generation in Plate pack. Fully automated plant, hence valves, controls & instruments as per process logic specified.
1.3 The supplier shall be responsible for arranging approval from various Central and State Statutory Authorities viz. Electrical Inspectorate, etc., for the entire electrical execution carried out by them on behalf of the Purchaser / Owner. Submission of filed-in application and proformas furnishing all the necessary details, drawings, test reports to the appropriate authorities shall be the responsibility of the Supplier. The actual prescribed statutory fees shall, however, be reimbursed by the Purchaser on production of money-receipt.

1.4 Bidder shall ensure performance tests be carried out in the presence of and to the satisfaction of purchaser. Necessary test kits required for performance test shall be arranged by the bidder.

1.5 Bidder shall ensure satisfactory performance and after sales service of bought-out items.

1.6 Bidder shall provide first charge of oil, lubricants and consumables. First charge means that these items shall be replenished till the successful completion of trials.

1.7 Bidder shall operate the plant at full capacity for a period of not less than 30 days from the date of successful commissioning.

1.8 Bidder shall impart necessary training to the plant personnel on operation and maintenance of the equipment.

1.9 Detailed Preventive maintenance schedule as well as operational manuals of equipment shall be provided by the Supplier at the time commissioning:

The manual shall cover the following aspects:
- Plant start up, commissioning, normal operation, emergency operation.
- Trouble shooting chart covering operational status, reasons (causes) and actions to be taken (remedy)
- As-built drawings of the equipment, electrical schematic, controls wiring drawings, etc.

Manuals and drawings and manuals in hard copy.
- 4 Sets of drawings and manuals in hard copy
- 3 Sets of drawings and manuals in CDs (softcopy)

1.10 Note:

Scope of cables includes providing necessary terminating lugs and glands including termination with respective PCC, MCC.

All panel boards are to be fabricated by the fabricator whose sample panel boards have been approved by CPRI. Necessary proof (short circuit test, temperature rise test and ingress protection test reports) to this effect are to be submitted and COMFED’s approval is to be obtained prior to taking up the panel fabrication work.

2.0 SCHEMATIC DIAGRAM & DESCRIPTION

The building plan drawing showing the tentative layout of substation equipment and schematic single line diagram for feeder details of HT and LT power control centre are enclosed. This section provides the conceptual schematic diagram of the complete electrical installation and how the electrical energy shall be received from Local Electricity Supply Authority / State Electricity Board and distributed to the various important sections of the plant. It may be noted that the schematic diagram provided is only for reference and the bidders have to design and develop their own schematic diagram based on major parameters specified in bidding document drawing.

33 KV HT Power shall be received within the project site through overhead line of Local Electricity Supply Authority / State Electricity Board. HT Power shall be taken from two-pole structure to an outdoor HT Panel where it shall be metered as well as fed through cables to the transformers through independent VCB breakers as specified in the design date. Stepped down 415 V Power from each transformer shall be fed to LT Power Control Centre (PCC). PCC shall also receive power from DG sets. Necessary protection through relays and interlocking shall be provided in HT Panel and PCC. LT Power shall be taken from PCC to MCCs & DBs of various sections of the Project through LT armoured cables in cable trays / underground trench. Supply of cable and cable trays are included in scope as detailed in the attached power schematic diagram.
LIST OF TENDER DRAWINGS: The followings drawings are enclosed with tender for guidance of the bidder. However, bidder shall Submit the execution drawings for approval of COMFED before commencing the work.

<table>
<thead>
<tr>
<th>Sl. no.</th>
<th>Description</th>
<th>Drg. NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Substation power schematic diagram</td>
<td>KL.00751.31.01.B.00</td>
</tr>
<tr>
<td>2</td>
<td>Site Plan</td>
<td>KL.00751.09.02.AO.RO</td>
</tr>
</tbody>
</table>

EQUIPMENT SPECIFICATION

This section provides general technical specification of all major equipment required. It may be noted that specification of the equipment mentioned is very brief and the bidder is to design, manufacture, supply and install the complete system to ensure the best performance of the individual equipment as well as the complete system.

IRRESPECTIVE OF WHETHER THE SPECIFICATION OF AN EQUIPMENT OR ACCESSORY IS MENTIONED OR NOT IN THIS SECTION OR SCHEMATIC DIAGRAM, ALL THE EQUIPMENT AND ACCESSORIES REQUIRED TO MEET THE DESIGN DATA WITHIN THE BATTERY LIMITS SHALL BE SUPPLIED INSTALLED AND COMMISSIONED BY THE SUPPLIER.

3.0 DESIGN DATA

This section gives brief design data of the sub-station such as voltages, capacities and special requirements of important equipment.

3.1 General Basic Requirements:

- DESIGN AND LAYOUT SHOULD BE SUITABLE FOR EASY EXPANSION IN FUTURE
- DESIGN, EQUIPMENT AND LAYOUT TO OFFER MAXIMUM EASE OF MAINTENANCE AND OPERATION
- ALL EQUIPMENT PARTS REQUIRING MAINTENANCE SHOULD BE EASILY ACCESSIBLE

3.2 Specific Project Requirement:

Power Supply

<table>
<thead>
<tr>
<th>Description</th>
<th>Voltage, Frequency, Phase, Wire, Grounding System</th>
</tr>
</thead>
<tbody>
<tr>
<td>INCOMING FROM Electricity Board</td>
<td>33 KV +/- 10%, 50 HZ, 3 PHASE, 3 WIRE EARTH SYSTEM</td>
</tr>
<tr>
<td>INCOMING FROM DG SETS</td>
<td>415 V, 50 HZ, 3 PHASE, 4 WIRE</td>
</tr>
<tr>
<td>MOTIVE POWER FOR PROJECT</td>
<td>415 V, 50 HZ, 3 PHASE, 4 WIRE EARTHED SYSTEM</td>
</tr>
<tr>
<td>LIGHTING POWER FOR PROJECT</td>
<td>415 V, 50 HZ, 3 PHASE, 4 WIRE EARTHED SYSTEM</td>
</tr>
</tbody>
</table>

3.3 Equipment Details:

3.3.1 Electric Pole Structure: Two Pole to receive 33 KV power from electricity board.

3.3.2 HT Panel Feeder Details:

The VCB shall be 36 KV, 630 Amps, withstanding short circuit current of 25 KA (3 secs), complete with protective relays as per technical specification.
### 3.3.3 Battery & Battery Chager: 24V / 60 AH – for annunciation panel & emergency lighting only.

### 3.3.4 Distribution Transformer:

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>The transformer rating and type shall be as under:</td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td>1500 KVA</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 C/s</td>
</tr>
<tr>
<td>Voltage HT</td>
<td>33KVolts</td>
</tr>
<tr>
<td>Voltage LT</td>
<td>433 Volts</td>
</tr>
<tr>
<td>Phase</td>
<td>Three</td>
</tr>
<tr>
<td>Installation</td>
<td>Outdoor</td>
</tr>
<tr>
<td>Type</td>
<td>Oil cooled</td>
</tr>
<tr>
<td>HT side</td>
<td>XLPE Cable</td>
</tr>
<tr>
<td>LT side</td>
<td>Bus duct</td>
</tr>
</tbody>
</table>

In case of bus duct connection between Transformer and LT Power Control Centre, the transformer should have a flanged LT side (instead of LT cable box) suitable to receive the TPN bus duct of specified rating.

### 3.3.5 LT Bus Duct:

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous Current Rating</td>
<td>2500 A</td>
</tr>
<tr>
<td>Type</td>
<td>Outdoor</td>
</tr>
<tr>
<td>Degree of Protection</td>
<td>IP 55</td>
</tr>
<tr>
<td>Fault Level</td>
<td>50 KA</td>
</tr>
</tbody>
</table>

### 3.3.6 LT Power Control Centre:

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.C.C. Operation</td>
<td>Only from Front</td>
</tr>
<tr>
<td>Incoming feeder suitable for receiving power through</td>
<td>Cables for DG sets / Bus Ducts for Transformers</td>
</tr>
<tr>
<td>Fault Level</td>
<td>50 KA</td>
</tr>
<tr>
<td>Type</td>
<td>Indoor</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>415 V, 50 Hz., 4 Wire</td>
</tr>
<tr>
<td>Details of Incoming Feeders</td>
<td></td>
</tr>
<tr>
<td>From Transformers</td>
<td>2500 A, 4P ACB x 2 Nos</td>
</tr>
<tr>
<td>From DG Sets</td>
<td>2000 A, 4P ACB x 2 Nos</td>
</tr>
<tr>
<td>Bus Coupler ACB</td>
<td>2500 A, 4P</td>
</tr>
</tbody>
</table>

### 3.3.7 Cables:

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>HT Power cable</td>
<td>33 KV grade, XLPE, Armoured Al, conductor</td>
</tr>
<tr>
<td>Size</td>
<td>3 C x 300mm2</td>
</tr>
<tr>
<td>LT Power Cable</td>
<td>1.1 KV grade, XLPE, Armoured Al, Conductor</td>
</tr>
<tr>
<td>Size &amp; no. of runs</td>
<td>Shall be as per the drawing approved by COMFED</td>
</tr>
<tr>
<td>LT Control Cable</td>
<td>1.1 KV grade, XLPE, Armoured Copper</td>
</tr>
</tbody>
</table>
Conductor

| Size & no. of runs | Shall be as per the drawing approved by COMFED |

3.3.8 D G Set Capacity:

1000 KVA at 415 V, 50 Hz and 0.8 pf - 1Nos (running in parallel)

3.3.9 Power Capacitors & PF Improvement Panel:

<table>
<thead>
<tr>
<th>Power Capacitor rating</th>
<th>50 X 3 &amp; 25 X 6 - 300 KVAR (for both panels)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Capacitor Banks</td>
<td>1 + 1 Nos</td>
</tr>
<tr>
<td>Capacitor Panel incomer switchgear rating</td>
<td>1600 A, ACB in each panel</td>
</tr>
</tbody>
</table>

3.3.10 Boiler Motor Control Centre (MCC)

<table>
<thead>
<tr>
<th>MCC, Operation</th>
<th>Only from Front</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incoming feeder suitable for receiving power through</td>
<td>LT Cable</td>
</tr>
<tr>
<td>Type</td>
<td>Indoor</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>415 V, 50 Hz, 4 wire</td>
</tr>
<tr>
<td>Details of Incoming Feeders</td>
<td></td>
</tr>
<tr>
<td>From PCC</td>
<td>400 A, TPN MCCB</td>
</tr>
<tr>
<td>Details of Outgoing Feeders</td>
<td>Ref. Schematic diagram</td>
</tr>
</tbody>
</table>

3.3.11 Earthing Pits & Earthing strips:

| Plate Earth pits for Body earthing of Sub-station Equipment and Neutral Earthing of Transformers | 8 Nos and 6 Nos |
| Copper Earth conducting strip of cross-section | As per statutory and site requirement |
| G I Earth conducting strip of cross-section | As per statutory and site requirement |

3.3.12 Electrical Grade Neoprene Mats (12 mm thick): As per statutory and site requirement.

3.4 Note:

Cables in shall be laid on suitable cable trays in side the masonry trenches.

3.0 TECHNICAL SPECIFICATIONS OF SUB-STATION EQUIPMENT

4.0 TWO POLE STRUCTURE FOR HIGH VOLTAGE

This is required to receive high voltage 33KV electric supply from Local Electricity Supply Authority / State Electricity Board, control and feed it to HT Circuit Breaker panel. The structure would comprise of:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ISMB 200 x 100 mm, 10 M long each with necessary cross MS channels 75 x 40 mm and 3 M long each (5 nos. minimum) fitted to these for two pole structure</td>
</tr>
<tr>
<td></td>
<td>2 nos</td>
</tr>
<tr>
<td>2</td>
<td>Lightning arrester, pole-mounted type suitable for high voltage, 50 Hz. AC supply with necessary copper strip clamps, bolts etc. for earthing</td>
</tr>
<tr>
<td></td>
<td>3 Nos</td>
</tr>
<tr>
<td>3</td>
<td>HT pin nsulators with metal parts complete</td>
</tr>
<tr>
<td></td>
<td>1 set</td>
</tr>
</tbody>
</table>
| 4 | HT disc insulator with metal parts complete, conforming to IS: 2544-
163 (read with latest revision, if any) and IS: 731 – 1963 (read with latest revision, if any).

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>HT double break, triple pole, gang operated air break switch unit with suitable HT drop out fuses, operating rod of suitable length, conforming to IS: 1818-1972 (read with latest revision, if any) and complete with copper chain for earthing and earthing rod for Two Pole Structure. Suitable arrangement for providing lock to the switch in both ON &amp; ‘OFF’ positions.</td>
</tr>
<tr>
<td>6</td>
<td>Necessary jumpers, aluminium conductors with PG clamps and connectors etc. complete for interconnections up to SEB structure</td>
</tr>
<tr>
<td>7</td>
<td>Cable end box for Two Pole Structure, epoxy type complete with all consumables, suitable for 33 KV HT XLPE cable (size of cable as given in design data).</td>
</tr>
<tr>
<td>8</td>
<td>HT danger plates of required size and anti-climbing device as per prevailing statutory regulations for Two Pole Structure</td>
</tr>
</tbody>
</table>

Remarks: Earthing pits and earthing strips etc. shall be supplied under different items of works mentioned in schedule of quantities and cost of these shall not be included under this item.

4.1 **HT PANEL**

The outdoor kiosk type HT panel is required to receive HT grid power from two-pole structure and to supply it to transformer.

4.1.1 **Design Requirements and Scope of Supply:**

The HT panels shall be connected to each other by common bus bar chamber. One VCB panel out of these shall act as incoming for receiving HT power from the Local Electricity Supply Authority / State Electricity Board and remaining as outgoing for feeding HT power to transformers. The manufacturer of the panel must possess a type test certificate / accreditation from CPRI.

4.1.2 **Vacuum Circuit Breaker (VCB):**

The VCB shall be suitable for the rating specified in the feeder schedule, efficiently earthed neutral system having a fault level and voltage rating as specified in the data sheet and comprising of housing for breaker, mechanical interlocks to prevent insertion or with draw of the circuit breaker in its closed position with automatic safety shutters covering the fixed main contacts when the circuit breaker is withdrawn, with earthing rails for earthing of circuit breaker carriage in service and test position, isolating plugs and VCB trolley with vacuum interrupters and self aligning finger type isolating contacts suitable for horizontal draw out vertical isolation. The vacuum life of 20 years. The breaker feeder trolley shall remain a target value of vacuum life of 20 years. The breaker feeder trolley shall remain inside the cubicle even in the “Test” position. The complete breaker assembly should have their interchangeability with breakers of identical ratings. Suitable interlocking shall be provided to prevent faulty operation such as :

- “Plugging in” or “drawing out” of a closed breaker
- “Plugging in” a breaker with the earthing isolator closed
- “Closing” of the earthing isolator with the breaker “plugged in”
- Pulling out the auxiliary circuit plug with the breaker in the service position
- Pushing in the breaker to the service position, with the auxiliary circuit plug not in position

The VCB shall be complete with:

- Independent spring closing, spring tripping, trip free manual hand operated
With breaker “CLOSE / OPEN” and spring “CHARGED / DISCHARGED” indication and with mechanical operation counter.

- Electrical closing coil suitable for 24 V DC supply
- Each VCB shall have its own mechanism (built-in) to produce 24 V DC for shunt trip
- Shunt trip coil suitable for 24 V DC supply.
- Breaker operated auxiliary switch with 4 NO and 4 NC contacts.

For each outgoing VCB, provision of contacts for the below mentioned faults/alarms should be made for remote annunciation purpose:
- Over load alarm and trip contacts
- Short circuit alarm and trip contacts

- Two numbers single phase 230 V space heaters with switch.
- Three nos. single phase fixed type PT with voltage ratio 33 KV / 110 Volts AC, burden 100 VA, class of accuracy 0.5 and as per IS 3156. Voltage transformer to be dry type, cast resin construction with secondary HRC fuses for protection. It shall be used for metering purpose and would be required for incoming VCB only.
- Single-phase, wound type cast epoxy resin insulated current transformer for each phase as per IS : 2705 with following specifications and STR of 18.4 KA for 2 seconds.

For incoming VCB (Two core type)
CT ratio (Amp) : Suitable as per the rating of VCB
Class of accuracy for core 1 : 1.0 (for panel metering)
Burden : 10 VA
Class of accuracy for core 2 : P 10 (for protection)
Burden : 15 VA

For VCB feeding transformer (Two core type)
CT ratio (Amp) : Suitable for transformer rating
Class of accuracy for core 1 : 1.0 (for panel metering)
Class of accuracy for core 2 : P 10 (for protection)
Burden : 15 VA

However, the panel manufacturer may provide separate CTs for metering and protection as per the accuracies mentioned above.

- Instrument panel fitted with :
  - Digital ammeter of size 144 mm x 144 mm, flush mounted, with 3½ digit LCD or LED display, to be provided to indicate three phase current for incoming as well as outgoing panels
  - Digital voltmeter of size 144 mm x 144 mm, flush mounted, with 3½ digit LCD or LED display, to be provided to indicate three phase current for incoming panel only.
  - Microprocessor based LCD display digital meter for measurement and display of Multifunctional Electrical Parameters such as voltage, current, active power, frequency, power factor, active energy, active power, reactive power, apparent power and MDI etc. for incoming feeder only.
Voltage operated auxiliary relay for Buchholz alarm and trip (VAA-21 of Areva T&D make or its equivalent - Bidder to indicate the section in the offer) – This is to be provided only for each Breaker feeding transformer and not required for incoming VCB.

Three-pole non-directional combined O/C, earth fault and short circuit relay CDG-61 of Areva T&D make or its equivalent (Bidder to indicate the selection in the offer) – This is to be provided for all the Breakers.

Under voltage relay (VDG – 13 of Areva T & D make or its equivalent – Bidder to indicate the selection in the offer). This is required only for incoming Breaker. It should be suitable for two phases and hence two nos. should be provided.

Built-in anti-pumping arrangement

**NOTE**:

Microprocessor based relays for above protection may also be supplied provided specific approval for make and model is obtained from COMFED.

- Trip circuit, healthy indicating lamp with push button suitable for operation on 110 V AC supply.
- Trip push button for emergency trip.
- Single phasing protection. This is required only for incoming VCB.
- Two nos. indicating lamps red and green for ON and OFF suitable for operation on 110 V AC supply.
- Adequate auxiliary contacts and wiring for interlocking circuits, fault annunciation, indications etc.

### 4.1.3 Housing Fabrication Details

The panel shall be fabricated using 14 SWG thick cold rolled cold annealed sheet steel structure, indoor, floor mounted, self supporting, abide type made up of vertical panels of uniform height. Each unit of the switchgear shall have necessary internal sheet metal barriers to form separate compartments for buses, instruments and relays, cable connections etc.

Compartment for XLPE armoured cable connections shall allow cable pulling, termination and connection work with the switchgear energized. Incoming VCB panel shall be provided with two nos. bottom entry type cable boxes suitable for XLPE cables. One of these boxes shall act as stand by. Terminal strips for outgoing control cable connection should be accessible to facilitate working and testing with breaker in test/service condition and while the switchboard is energized.

The panels shall be totally enclosed, dust weather and vermin proof. However, openings for natural ventilation shall be provided, if necessary. These shall be louvered and provided with wire mesh. Wire mesh for bus bar compartments shall be such as to protect against objects of 1 mm and above. The enclosure shall have complete protection against approach to live parts or contacts with internal moving parts as per IS:3427.

The panels shall be extensible at both the ends by addition of vertical sections. Ends of the bus bars shall be suitably drilled for this purpose. Panels at extreme ends shall have openings, which shall be covered with plates screwed to the panel.
4.1.3.1 All hardware shall be zinc plated. All joints and connections shall be made by galvanized zinc passivated or cadmium plated high tensile strength steel bolts & nuts. Spring washers should be provided to secure against loosening.

4.1.3.2 The maximum height of the panel shall be restricted to 2200 mm and maximum length of a shipping action shall be 2500 mm each shipping section shall be provided with suitable lifting hooks. These hooks when removed shall not leave any opening in the board. The maximum and minimum height of operating handles / push buttons of components shall be approximately 1800 and 400 mm respectively.

4.1.3.3 All equipment of a single feeder shall be housed in a separate enclosed compartment. All identical equipment and corresponding parts including chassis of the modules shall be fully interchangeable.

4.1.3.4 Gaskets of durable materials shall be provided all round the perimeter of adjacent panel, panel and base frame, removable covers and doors and cutouts.

4.1.3.5 All components shall be front operated. The panel shall be single front type unless specified otherwise. For draw out modules, only handles of switches, knobs, cutouts for lamps and meters shall be arranged on the front doors to permit operation without opening the doors. Relay of circuit breakers shall be mounted on front doors of the compartments.

4.1.3.6 Painting

All metal surfaces shall be thoroughly cleaned and degreased to remove all scales, rust, grease and dust. Fabricated structures shall be picked and treated to remove any trace of acid. The under surface shall be prepared by applying a coat of phosphate paint and a coat of yellow zinc primer. The under surface shall be made free from all imperfections before undertaking the final cost.

After preparation of the under surface, the panel shall be spray painted with final two coats of powder coated paint. The colour shade of the final paint shall be light grey 631 as per IS: 5 unless otherwise specified. The finished panels shall be dried in stoving ovens in dust free atmosphere. Panel finish shall be free from imperfections like pin holes, orange peels, run off paint etc.

4.1.3.7 Nameplates

Apart from panel nameplate highlighting the operating voltage, the nameplates for all incoming and outgoing feeders shall be provided on front doors as well as on rear side of the panel of each compartment. Nameplates shall be provided for each equipment (lamp, push buttons, switches, relays, auxiliary contractors, etc.) mounted on the switchboard. Special warning plates shall be provided on all removable covers or doors giving access to high voltage bus bars or cables. Nameplates shall be fixed by screws only and not by adhesives. Special danger plates shall be provided as per requirement.

Inside the panels, stickers shall be provided for all components giving identification number as per detailed wiring diagram.

4.1.4 Bus bar Sizing, Connection & Supports:

The bus bars shall be of high conductivity electrolytic aluminium alloy conforming to grade EQIE of IS: 5082. Buses shall have uniform cross section throughout the length of the panel up to the incoming feeder terminal and shall be size continuously the current specified in the material requisition. Bus bars shall be housed in a separate chamber and shall be accessible for inspection. Maximum current density permissible for these bus bars shall be of 0.8 Amps/mm2. Maximum current density
permissible for Copper bus bars shall be 1.5 Amps/mm². A suitable body earth electrode shall be provided on the panel.

The bus bars shall be provided with heat shrinkable PVC insulating sleeve of high dielectric strength, which should be non-inflammable, & self-extinguishing type and in fast colours to indicate phases. The sleeves shall be rated to withstand the system line-to-line voltage for 1 minute. All bus bar joints and all tap-off connections from the main horizontal bus bars shall be suitably shrouded.

The bus bars shall be adequately supported by epoxy compound cast SMC blocks in adequate numbers and size to avoid sag in bus bars and these shall be capable of withstanding stresses due to short circuit currents of the associated switchgear. All bus supports shall be of non-carbonizing material and shall have hygroscopic characteristics.

Minimum clearances should be as per relevant Indian Standard Specifications.

4.1.5 Power connection:

The incoming and outgoing power connections shall be through XLPE cables. Ample space for connection of these cables shall be provided at the rear of the switchboards. The power cable shall enter the switchboard from the bottom. “Cupal” washers or neutral grease shall be used for copper to aluminium joints.

The switchboard shall be supplied complete with supports for clamping outgoing and incoming cables. The head-room available between cable gland plate and terminal lugs shall not be less than 600 mm for switchgear up to 11 KV and 900 mm for 33 KV cables.

In case the standard panel depth cannot accommodate the specified no. of cables, a rear extension panel of uniform height shall be provided. An earth strip shall also be brought to this extension panel.

4.1.6 Auxiliary Wiring:

Wiring for all controls, protection, metering, signaling etc. inside the panel board shall be done using 1100 volts grey colour PVC insulated copper conductors. Minimum size of copper conductor shall be 2.5 mm². The wiring shall preferably be enclosed in plastic / PVC channels. Wiring between HV breakers or cable compartments to relay and metering shall be routed through flexible conduct.

All control wiring should be provided with necessary sockets/lugs at both the ends. Each termination shall be identified at both the ends by PVC ferrules having numbers corresponding to control circuit diagram.

Sufficient terminals shall be provided on each terminal block to ensure that not more than one outgoing wire is connected per terminal. Terminal strips shall preferably be separated from power circuits by metal barriers or enclosures. 10% spare terminals shall be provided on each terminal block.

Control cables shall enter the switchgear from the bottom. Supporting facilities shall be provided for clamping the control cables. All inter-panel wiring shall be taken through PVC sleeves or suitable grommets by the switchgear vendor. For inter-panel wiring between the shipping sections, wires in rolls of the required length, connected at one point, shall be supplied with the panel for connection at site.

Breaker tripping and closing devices shall be fed with direct current. The rated DC voltage shall be as specified in the data sheet.

4.1.7 Earthing connections:
All cubicles shall be connected to an earth bus bar running throughout the length of the switchboard. The earth bus bar size shall be minimum 30 x 6 mm2 copper up to short circuit withstand capacity of 31.5 kA. All doors and movable parts shall be connected to the earth bus with flexible copper connections. Provision shall be made to connect the earthing bus bar to the plant earthing grid at two ends. All non-current carrying metallic parts of the equipment and components shall be earthed.

The earth bus shall be brought back to the cable compartment and earthing bolts shall be provided to ground cable armour. The mating surfaces of all bolted parts shall be zinc-passivated to ensure continuity between them.

4.1.8 Instrument Transformers:

Current Transformers:

Current transformers shall be cast resin type and shall generally conform to IS: 2705. The short time withstanding rating should be that of the breaker or the switchboard. They shall be mounted on the stationary part of the switchgear. Protective CTs shall have an accuracy class of SP and an accuracy limit factor of greater than 10. Low reactance CTs shall be used for protection. CTs for instruments shall have an accuracy class of 1.0 and an accuracy limit factor less than 5.0 one leg of the CTs shall be earthed. VA rating of CTs. Shall be specified by the bidder.

Potential Transformers:

The potential or voltage transformers shall be cast resin type and shall generally conform to IS: 3156. The potential transformers shall be draw out type and shall be provided with fuses on primary side and miniature circuit breakers with auxiliary contacts on secondary side.

The draw out mechanism shall disconnect the PT from the main bus bars. The primary connection shall be disconnected before the PT or its primary fuses become accessible. Neutral point of the star connected PTs both on primary and secondary sides shall be earthed. The PTs shall have an over voltage factor of 1.9 for 30 seconds and an accuracy of class 1.0 from 10% to 120% of normal voltage. If not otherwise specified, the secondary voltage of PTs shall be 110 V.

4.1.9 Protective Relays:

The relays shall be mounted on front door of the compartment and accessible for setting and resetting from the front. Hand reset flag indicator visible from the front shall be provided for mechanical type relays. Details regarding requirement of relays and their type, model etc. shall be as given in the data sheet / feeder details.

4.1.10 Measuring Instruments:

The digital measuring instruments for HT panel shall be of 144 mm x 144 mm, flush mounting type with range as per corresponding feeder. The accuracy class for all instruments shall be 1.0 as per IS: 1248.

4.1.11 Indicating Lamps:

Indicating lamps shall be of LED (cluster of high intensity light emitting diodes) type. These should be provided with translucent covers of red, green and amber colours as required. Bulbs and lenses shall be easily replaceable from the front.

4.1.12 Transformer Protective Devices:

Wherever mentioned in the feeder details, necessary arrangement shall be provided by the bidder in the VCB panel to facilitate connection of the following devices on the transformers.

1. Alarm and trip contacts of Buchholz relay.
2. Alarm contacts of temperature indicator.

4.3 **BATTERY & BATTERY CHARGER**

A suitable battery charger, of rating as specified in the data sheet, house in sheet steel enclosure with adequate ventilation for natural air cooling suitable for indoor operation, floor mounted and provided with 1 no. 2 pole ON/OFF switch at input side, pilot lamp to indicate healthiness of AC supply and 1 no. AC voltmeter.

The battery charger should be complete with trickle and boost charger.

The supply should be complete with SMF (sealed maintenance free) batteries of rating as specified in the data sheet and a wooden stand or the same.

4.3.1 Housing:

The silicon rectifier charger shall be housed in floor standing type sheet steel cabinet. Hinged door shall be provided on the back for easy access of the terminals and the components. The unit will be provided with adequate ventilation for natural air-cooling. Four wheels shall be provided for easy portability.

4.3.2 Design Requirements & Scope of Supply:

The battery charger shall be designed to have

- Input Voltage: 230V AC, 50 Hz, single phase, primary winding of the transformers shall have tapping at 0 – 200 – 230 – 250 volts AC.

- Output Voltage: The output voltage of the battery i.e., 24 V

Current Rating: The charger shall be suitable to float / boost charge 24 V SMF stationery batteries bank (of AH rating as mentioned in the data sheet). 1 no. rotary switch will be provided to select Float / Boost mode of charging 1 no. Variac will be provided to adjust the Trickle / Boost charging current.

The battery charger will be fitted with the followings:

1) 1 no. Double pole, mains ‘ON/OFF’ MCB switch.

2) 2 nos. Fuses, HRC type; one for AC input and one for DC.

3) 1 no. pilot lamp to show the main supply is ON.

4) 1 no. transformer, single phase, double wound, natural air cooled with copper windings. The transformer coil shall be vacuum impregnated.

5) 1 no. Series Transformer to be connected in series with secondary winding of the main transformer

6) 1 no. single phase dimmerstat. The primary winding of the series transformer shall be connected at output of the dimmerstat. By adjusting the dimmerstat, if shall be possible to adjust the output voltage in the range of:

- 2.00 – 2.3 V per cell during float mode and 2.75 volt per cell during boost mode

7) 1 no. Rotary switch to be provided to select float / boost mode
8) 1 no. Rectifier: This shall be of Silicon Diode type full wave bridge. The Silicon Diodes will be individually mounted on heat sinks and protected by R-C surge suppression network.

9) Metering:
   1 no. Moving coil type DC ammeter O-30 A / 0-7.5 A
   1 no. Moving coil type DC voltmeter 0-50 V
   The meter shall be of type SIF-96. Accuracy conforming to IS: 1248

10) 2 nos. Insulated terminals for DC output.
11) 1 no. 3 Core service cord 3 M in length at AC input
12) 2 nos. Earthing terminals shall be provided in the charger.
13) 1 set of control for automatic switching ON the DC supply to Emergency Lights in case of mains failure and switching OFF the DC supply to Emergency Lights when power is restored.

14) Protections
   a) 2 nos. HRC fuses, one at AC input and other at DC output.
   b) Silicon Diode shall be of industrial grade and individually protected R-C surge suppression network.

The battery back up system should be complete with an epoxy painted MS rack for batteries, inter-connecting cables and other accessories required for proper operation of the system.

4.4 HT CABLES

Three core aluminium conductor, screened, XLPE insulated, armoured shielded and PVC sheathed cables of size and voltage as specified in the data sheet, earthed system, conforming to IS: 7098 (Part II) with latest amendment.

4.5 DISTRIBUTION TRANSFORMERS

Distribution transformers are required to receive power at high voltage and step down the voltage to cater to the power requirements of the plant at stepped down voltage.

4.5.1 Design Requirements and Scope of Supply

4.5.2 Statutory Requirements

Transformers are to be manufactured as per BS: 171 & BIS: 2026 (amended as on date) specifications, Indian Electricity Rules, including special requirements of concerned state electrical inspectorate and the detailed specifications mentioned below:

4.5.3 Housing Details

The transformer tanks shall be fabricated of good quality mild steel plates and stiffened with suitable mild steel sections to ensure structural rigidity. CRCA pressed sheet radiators bank provided with the transformer shall be complete with air release plug, drain plug and isolating valves at points of connection with the tank.

4.5.4 Standard Accessories Required

The transformers shall be core type, double wound copper conductor, oil immersed, oil natural cooled, 3 phase, 50 Hz. Having DYN 11 connection. The transformer will have core of Amorphous Metal or CRGO of low loss grade. The transformer shall be complete with the followings:

1. Conservator with oil filling hole and cap, oil level gauge and a drain valve with plug.
2. Double diaphragm explosion vent
3. Air release plug on tank cover.
4. Lifting lugs.
5. On-load tap changing (QLTC) on H.V windings of transformers to take care of percentage voltage variation of -10% to + 10% in steps of 1.25%. The OLTC shall be complete with RTCC (remote tap changing control) and AVR.

The on load tap changing equipment shall be complete with:

- On load tap changing gear mounted on the transformer tank
  - Indoor type Remote tap changing control cubical (RTCC panel), fitted with EMCO make electronic automatic voltage regulating relay (AVR) with all necessary controls & accessories including inter connections.

It shall be suitable for the following tap change operation:

- Local manual tap change operation with cranking handle
- Local electrical tap change operation with raise / lower switches / push button on OLTC panel.
- Remote electrical, non-automatic independent / group simultaneous tap change operation with raise / lower switches / push buttons on RTCC panel.
- Remote electrical automatic tap change operation with AVR. Suitable PT/ PT ratios to be provided on the LV / Secondary to provide a feedback signal to the AVR for comparison to effect automatic changeover.

The details of OLTC controls are as detailed below:

**Manual Mechanical Control**

The cranking device for operation of the OLTC gear shall be removable and located at a height not exceeding 1500mm, above ground level for easy operation. The mechanism shall be complete with normal accessories including at least the following:

- A mechanical tap position indicator (rated tap voltages shall be marked on the diagram plate).
- A mechanical operation counter.
- Mechanical steps to prevent over cranking of the mechanism beyond extreme tap positions.

**Electrical Control**

Control circuit shall incorporate the followings:

a) Local/remote manual electrical operation.

b) Device to ensure a positive and full completion of tap change once it is initiated even if there is loss of power.

c) An interlock to cut-off electrical control automatically upon recourse being taken to manual mechanical control in emergency.

d) Electrical interlock to cut-off a counter impulse for a reverse tap change, being initiated during a progressive tap change and until the mechanism comes to rest and resets circuits for a fresh operation.
All auxiliaries and devices for electrical control of OLTC gear should be housed in a weatherproof cabinet mounted on the transformer and shall include:

- Local tap position indicator
- 5 digit operation counters
- Cubicle lighting
- Thermostatically controlled spare heater
- Miniature circuit breaker with magnetic and thermal overloads devices for controlling the incoming supply to the OLTC motor.
- Pad locking arrangement for the hinged cabinet door
- Removable plate with cable glands
- Inside tap with control scheme indelibly marked

Remote Electrical Control

Remote control panel shall comprise of the following:

- Individual/parallel control on Master follower sequence selector switch
- Raise/lower control switch
- Potentiometer type tap position indicator
- Out of step relay
- Time delay relay
- Indicating lamp for out of step
- Out of step buzzer
- Indicating lamp for tap changer supply available
- Indicating lamp for tap change in progress

RTCC panel shall be dust and vermin proof, floor mounting, and freestanding type. The enclosure shall be of cold rolled sheet of 2.5mm. All doors and opening shall be provided with neoprene gaskets.

Automatic tap changing control shall be provided complete with voltage sensing relay.

OLTC wherever called for shall be suitable for bi-directional power flow.

OLTC shall also be rated for basic insulation level value as specified for the transformer in the data sheet.

6. Two nos. base channels with jacking lugs and bi-directional flat rollers.

7. Two nos. earthing terminals (without lugs).

8. Thermometer pockets and 150 mm dial thermometers with 2 m long capillary, alarm & trip contacts with maximum reading pointer for transformer winding & oil temperature.
9. Top oil filter valve with plug.
10. Bottom oil filter cum drain valve with plug and locking arrangement
11. Silica gel breather with a shut off valve for breather servicing
12. Pressure release valve
13. Rating and diagram plate.
14. 3 nos. HT bushings with cable box for HT cable terminations.
15. 4 nos. LT bushings with bus links and adaptor box for LT bus duct connections.
16. Jacking pads
17. Double float Buchholz relay with alarm & trip contacts including testing & sampling cocks and 2 nos. oil shut off valves.
18. Marshalling box to house dial thermometers & terminals with wiring complete for Buchholz Relay & dial thermometers up to marshalling box.
19. 1 no. neutral terminal brought outside for solid earthing
20. Magnetic Oil level indicator with minimum & oil filling level markings
21. First charge of oil. Oil can be supplied separately filled in sealed drums. Oil dielectric strength should be better than 40 kV.

4.5.5 Remarks

1. The transformer shall be painted as under:
   a) Internally with heat resisting varnish paints.
   b) Externally with 2 coats of Zinc chromate primer followed by two coats of enamel paint of approved shade.

4.5.6 Transformer’s Tests

The transformer shall be tested as per IS: 2026 – 1977 & IS: 1180 (Part II) with latest revision. The following routine tests as per IS shall have to be carried out for each transformer, at manufacturer's works, before its dispatch to the destination and test reports shall be furnished.
- No load loss measurement test
- Full load loss measurement test
- Winding resistance measurement test
- Impedance voltage of transformer
- Insulation resistance test
- Dielectric strength test of transformer oil
- Turns ratio test
- Separate source voltage test
- Induced over voltage test
- Polarity Phase relationship test

4.6 LT BUS DUCT

LT bus ducts are required to connect LT of the three transformers with respective incoming feeder module of LT power control centre.

4.6.1 Design Requirements and Scope of Supply
The design, construction, manufacture, installation of the bus ducts shall be as per the detailed specification hereunder. Bus ducts shall be made as per IS:8623 (Part II) – 1993.

4.6.2 Rating

The bus duct rating shall be of specified continuous current rating as mentioned in the data sheet of the project with fault level of 50 KA. The bus duct shall be suitable to 3 phase, 4 wires (neutral being solidly grounded) system, 415 V ± 10%, 50 Hz, ± 3% AC supply system.

4.6.3 Bus bar Enclosure

Outdoor type enclosure shall be fabricated from minimum 14 gauge CRCA sheet steel, stiffened and reinforced by sturdy angle iron frame to form a rigid structure. The section of bus duct shall be in rectangular box frame. All necessary G.I. hardware shall be supplied along with the bus duct. The terminal enclosures shall be provided with flanged ends to suit flanges of transformer / PCC. The bus duct shall be totally enclosed, dust, weather and vermin proof and shall have the construction to conform to protection class IP 55. The covers shall be of convenient length for easy removal. All joints and covers shall be provided with neoprene gasket. The bus duct shall be adequately supported. Top cover for outside installation shall have slope on both edges for draining of rainwater.

The bus duct MS fabrication shall be pre-treated as per standard practice and then be finished with stove enamel paint. Inside surface of MS fabrication shall be painted with black mat finish, while external surface shall be finished with epoxy paint of shade no. 631 of IS: 5.

4.6.4 Bus bars & Supports

Bus bars shall be of electric grade high conductivity electrolytic aluminium conforming to grade E9 1E of IS: 5082 (read with latest revisions, if any) and their sizes are to be selected on the basis of current density 0.8 Amp. Per mm². Section of buses shall be uniform and rectangular. The main buses of the bus ducts shall be designed to carry continuously the current specified in the design data, while the neutral shall be or at least half the section of phase bus. The temperature rise of buses shall be limited to 40ºC above an ambient of 45ºC.

The bus bars shall be able to withstand short circuit current of 50 KA RMS for 1 second. The bus bars shall also be shrouded with red, yellow and blue colour heat shrinkable sleeves for three phases and black colour for neutral. Suitable size 2 numbers rectangular section Aluminium conductor earth bus shall also be provided to entire length of the bus duct as per the statutory regulation. The minimum cross section of aluminium earth bus shall be 250 mm². The minimum clearance of 25 mm shall be maintained between phase to phase and phase to earth of neutral.

For electrical connections between the bus duct and LT side of the transformer as well as on power control centre’s incoming switchgear, flexible copper bus bars (i.e., braided flexible strips), of the current rating same as that of the aluminium bus bars of the bus duct, shall be provided.

The bus bar supports shall be epoxy cast resin material (SMC or DMC blocks) and should withstand 110 KA peak short circuit current and the mechanical stress between the bus bars.

Galvanized zinc passivated or cadmium plated high tensile strength steel bolts, nuts and washers/spring washers shall be provided for all joints in bus bars and links connections.

4.6.5 Testing

All routine tests as specified in the applicable Standards and Codes shall be conducted and test results of the same shall be submitted along with supply.
4.7 LT POWER CONTROL CENTRE

The indoor type power control centre in sheet steel enclosure is required to supply LT power to various motor control centres and distribution boards at 415 volts, 3 phase, 50 Hz System. The manufacturer of the panel must possess a type test certificate / accreditation from CPRI.

4.7.1 Housing Details

4.7.1.1 The PCC shall be fabricated using pressed and shaped cold rolled sheet steel sections structure of adequate thickness. The sheet steel used for panel shall be min. 14 SWG sheet except that the partition plates and inter-panel barriers may be made of 16 SWG. The PCC shall be indoor, floor mounted, self-supporting, front openable, cubicle type made up of vertical panels of uniform height, dust, weather and vermin proof. The switchboard shall conform to degree of protection not less than IP 44.

Switch Board shall be extensible at both the ends by addition of vertical sections. Ends of the bus bars shall be suitably drilled for this purpose. Panels at extreme ends shall have openings, which shall be covered with plates screwed to the panel. The switchboard shall be provided with integral base frame. The panel base plate/cable gland plate shall be 2.5 mm thick.

4.7.1.2 All hardware shall be zinc plated. All joints and connections shall be made by galvanized zinc passivated or cadmium plated high tensile strength steel bolts, nuts and washers secured against loosening.

4.7.1.3 The maximum height of the panel shall be restricted to 2300 mm and maximum length of a shipping section shall be 2500 mm. Each shipping section shall be provided with suitable lifting hooks. These hooks when removed, shall not leave any opening in the board. The maximum and minimum height of operating handles/push buttons of components shall be 1900 mm and 300 mm respectively.

4.7.1.4 All equipments of a single feeder shall be housed in a separate enclosed compartment. Only ACB modules shall be of draw out type and all identical ACBs and the corresponding parts including chassis of the modules shall be fully interchangeable. All identical equipment and corresponding parts of the modules shall be fully interchangeable.

4.7.1.5 Suitable cable and bus alleys shall be provided. Cable alleys shall be provided with hinged doors. Adequate number of slotted cable supports shall be provided in cable alleys. All doors shall be provided with concealed type hinges and captive screws. Rear doors also shall be openable. Gaskets of durable materials shall be provided all round the perimeter of adjacent panel, panel and base frame, removable covers and doors and cutouts.

4.7.1.6 All components shall be front operated. The PCC shall be single front type unless specified otherwise. For draw out modules, only handles of switches, knobs, cutouts for lamps and meters shall be arranged on the front doors to permit operation without opening the doors. Relays of circuit breakers shall be mounted on front doors of the compartments. Other accessories of ACB shall be mounted on withdraw able chassis.

4.7.2 Painting

All metal surfaces shall be thoroughly cleaned and degreased to remove all scales, rust, grease and dust. Fabricated structures shall be pickled and treated to remove any trace of acid. The under-surface shall be prepared by applying a coat phosphate paint and a coat of yellow zinc primer. The under surface shall be made free from all imperfections before undertaking the final coat.
After preparation of the under surfaces, the panel shall be spray painted with final two coats of approved shade of powder coating paint.

The finished panels shall be dried in stoving ovens in dust free atmosphere. Panel finish shall be free from imperfections like pin holes, orange peels, run off paint etc.

All unpainted steel parts shall be cadmium plated or suitably treated to prevent rust, corrosion, etc.

4.7.3 Nameplates for all incoming and outgoing feeders shall be provided on doors of each compartment. Nameplates shall be fixed by screws only and not by adhesives. Engraved nameplates shall preferably be of 3-ply (Black-White-Black) acrylic sheets or anodized aluminium Special danger plates shall be provided as per requirement.

Inside the panels, stickers should be provided for all components giving identification no. as per detailed wiring diagram.

4.7.4 Busbar Sizing Connection and Supports

The bus bars shall be made of high conductivity electrolytic aluminium alloy conforming to grade E9 iE IS-5082. Buses shall have uniform cross section throughout the length of the panel and up to the incoming feeder terminals. Maximum current density permissible for these bus bars shall be 0.8 Amps/sq. mm for bus bar area above 500 sq. mm and 1.0 Amp/sw. mm for bus bar area below 500 sq. mm. A suitable section earthing bus bar (minimum 300 sq. mm.) shall be provided outside the PCC at back bottom through out the length of the PCC. Provision shall be made to connect the earthing bus bar to the plant earthing grid at two ends. All doors shall be earthed using flexible copper connections to the fixed frame of the switchboard.

Maximum current density permissible for Copper bus bars shall be 1.5 Amps./mm².

The bus bars will be provide with heat shrinkable high dielectric PVC insulating sleeves of 1100V grade. Red, yellow and blue colour shall be used for phase bus bars and black colour shall be used for neutral bus bars. The sleeves should be non-inflammable and self-extinguishing type. Joints shall be shrouded suitably. Supports for bus bars shall be made of suitable size non-hygroscopic and non-inflammable epoxy compound SMC/DMC block and these should be adequate in number so as to avoid any sag in the bus bars.

The bus bars shall be adequately supported by suitable size non-hygroscopic and non-inflammable epoxy compound cast blocks, adequate numbers and size to avoid sags in bus bars and these shall be capable of withstanding stresses due to short circuit currents of the associated switch gear. Main bus bars shall have rupturing capacity of 50 kA.

Minimum clearance between main bus bars phase-to-phase 25 mm and between phase to earth 20 mm.

4.7.5 Power Connection

Interconnections between the main bus bars and individual units shall be made by using copper or aluminium bus bar strips of adequate rating. These interconnections and terminals shall also be shrouded suitably. For current rating 63 Amps and below copper conductor PVC insulated wires of adequate section with sockets at both ends can be used but their minimum size shall be 4 sq. mm.

For all aluminium to copper connections, the copper surface will be silver plated and the aluminium surface will be properly cleaned and supplied with oxide inhibiting grease.

The outgoing power connections from PCC will be through PVC insulated aluminium conductor armoured cables. The cable entry shall be either top or bottom as specified in
feeder details. Removable gland plates of 12 gauge thickness shall be provided on top / bottom of panel, for cable entries. The cable alleys shall also be totally isolated from switchgears by suitable partition plates.

For outgoing feeders, cable termination directly at switchgear terminals shall not be allowed and hence panel builder should make provision by suitable bus link from switchgear terminals so that required no. of cables could be connected to these links.

4.7.5.1 Auxiliary Wiring

Wiring for all controls, protection, metering, signalling etc. inside the switchboard shall be done with 1100 V grey colour PVC insulated copper conductors. Minimum size of control wire shall be 1.5 mm².

All control wiring should be provided with necessary sockets/lugs at both the ends. Each termination shall be identified at both the ends by PVC ferrules having numbers corresponding to control circuit diagram.

4.7.6 Electrical Switchgears

4.7.6.1 Air Circuit Breakers (ACBs)

All air circuit breakers (ACBs) shall be fully draw type, manually operated (unless specified otherwise) and shall have built-in microprocessor based programmable protection and mechanical spring charging stored energy type provided with mechanical indicators to show ‘Open’, ‘Closed’, ‘Service’ & ‘Test’ positions, mechanically operated emergency tripping button etc. Microprocessor based programmable protection unit shall have settings for overload, short circuit, instantaneous and earth fault currents with time delay and LED indicators to show various conditions such as Power ON, Overload, Short-circuit, Instantaneous Earth Fault, Percentage load, Self Diagnostic Test etc.

The control supply shall be 240 V AC. 6 NO + 6 NC auxiliary contacts shall be provided. ‘Red’, ‘Green’ & ‘Amber’ indication lamps shall be incorporated to show ‘Closed’, ‘Open’ & ‘Auto trip’ conditions respectively.

The interlocks shall be as under:

It shall not be possible to plug in a closed circuit breaker or to draw out a circuit breaker in closed position. It shall not be possible to operate a circuit breaker unless it is in fully plugged-in, test or fully isolated position. In test position, the breaker shall be tested without energizing the power circuit. Whenever specified, interlock to prevent paralleling shall be provided. Closing and trip coils shall work under the following voltage variation conditions:

- **Closing coils** - 85 % to 110 % of rated voltage
- **Trip coils** - 50 % to 110 % of rated voltage

For series tripping, overload, short circuit and under voltage/shunt trip release shall be provided.

Stored energy mechanism shall be provided with mechanical indicators to show spring ‘Charged’ or ‘Discharged’ condition.

The earth fault relay to be provided for incoming feeders

Current rating, short circuit current, protection relays etc. shall be as specified in feeder details.
Each incoming feeder ACB of 4 pole design and specified rating shall be provided with single phase preventer and Microprocessor based LCD display digital meter for measurement and display of Multifunctional Electrical Parameters such as voltage, current, active power, frequency, power factor, active energy, active power, reactive power etc.

The bus coupler ACB of 3 pole design and specified rating shall be provided with CT operated digital type Ammeter with selector switch and indication lamps.

Remarks

a) Mechanical as well as electrical interlocking shall be provided between incoming feeders from transformers and DG sets in such way that when DG sets ACBs are ON it should not be possible to put on the ACBs of the main supply from transformers either mechanically or electrically or vice-versa.

b) All incoming feeders from transformers and DG set shall be provided with 240 V under Voltage coil & all outgoing feeders shall be provided with 240 V, AC shunt trip coil only.

c) In case of PCC getting power from DG set as well, all the incoming feeders ACB shall also have neutral isolation to avoid unbalanced supply being fed back to transformer via neutral.

4.7.6.2 Moulded Case Circuit Breakers (MCCBs)

MCCBs shall always be provided with separate operating handle mechanism with door interlocking. The MCCBs for all incoming feeders shall be of four pole construction and those for all outgoing feeders shall be of triple pole construction arranged for simultaneous manual closing or opening of all the poles of the MCCB and automatic instantaneous tripping on short circuits. Closing mechanism shall be quick make, quick break and trip-free type. ‘ON’ ‘OFF’ and ‘Trip’ indications shall be provided on the front cover with door interlocking facility. All feeders having MCCB shall be provided with neutral link complete with isolating link.

MCCBs shall be provided with adjustable type tripping device with inverse time characteristics for over load protection and CT operated Ammeter with selector switch, indication lamps.

The MCCBs shall be rated for continuous maximum duty as specified. The rating of the MCCBs shall be as per the feeder details.

Minimum rated breaking capacities shall be as under:

MCCBs up to 100 Amps 35 KA
Above 100 Amps 45 KA

The control voltage shall be 240 V AC.

4.7.6.3 Fuse Switch Units:

The load break switches shall be suitable for continuous maximum rating, air break type and shall have manual quick make/break mechanism. Switch handle shall be provided with door interlocking arrangement. Also, ‘defeat’ arrangement shall be provided to open the door in switch ‘Close’ position for testing purpose. Live terminals of the switch shall be shrouded. Fuses shall be HRC link type. One set of fuse pullers also shall be provided.
4.7.6.4 Current Transformers (CTs)

Current Transformers shall be cast resin type. CTs shall preferably be mounted on stationery parts. The short time withstand rating of CTs shall be equal to that of the associated switchgear for one second.

The protection CTs shall be minimum 15 VA, accuracy class 5P and an accuracy limit factor of greater than “10.0”. The instrument CTs shall be minimum 10 VA, accuracy class “1.0” and an accuracy limit factor less than “5.0”. Separate CTs to be provided for protection and metering purposes.

4.7.6.5 Protective Relays

Any protective relays, other than the built-in relays provided with the ACBs, shall be mounted on front door of the compartment and accessible for setting and resetting from the front. Hand-reset flag indicators visible from the front shall be provided.

All protective relays, wherever used, shall be back connected, draw out type suitable for flush mounting and fitted with dust tight covers.

Alternatively, plug-in type relays shall also be acceptable. The relay cases shall have provision for installation of test plug at the front for “testing and calibration” using an external power supply without disconnecting permanent wiring. It should be possible to short the CTs through the test plugs.

Auxiliary relays/contractors shall generally be used for interlocking and multiplying contacts. Auxiliary contacts shall be capable of carrying the maximum estimated current. In any case their rating must not be less than 5 A for 240 V, AC at a power factor between 0.3 to 0.1 (inductive load).

Lower voltage contactors with a series resistance will not be acceptable for 220 V DC control supply.

4.7.6.6 Indicating Instruments

These shall be of 96 mm square, flush mounting type digital instruments with LCD or LED DISPLAY. While voltmeters and ammeters shall have 3 ½ digit display, the power factor meter shall have 4 digit display. Energy meter shall be suitable for measuring unbalanced loads of 3 phase, 4 wire system and shall not be mounted on doors of cubicle but permanently inside the cubicle. The accuracy class of KW / KWH meters shall be a minimum of 2.5. The meters shall be provided as given in the feeder requirement.

The incoming feeders shall be provided with Microprocessor based LCD display digital meter for measurement and display of Multifunctional Electrical Parameters such as voltage, current, frequency, power factor, active power, reactive power, apparent power, active energy etc.

4.7.6.7 Indicating Lamps

Indicating lamps shall be of LED (cluster of high intensity light emitting diodes) type, suitable for 240 V AC supply. These shall be provided with translucent covers of red, green and amber colours as required. These lamps shall be of minimum 22.5 mm dia. Indication lamps to be provided for all feeders.

4.7.6.8 Push Buttons

Push buttons shall be of momentary contact type, rated to carry 10 A, 240 V AC with 2 NO + 2 NC contacts. These should be of size 22.5 mm dia and conform to IP 65 protection to prevent any dust and water ingress.
Colour codes shall be as under:

Start, Close: Green
Stop, Open/Emergency: Red

4.7.6.9 Contactors:

All contactors shall be suitable for AC3 duty unless specified otherwise. Contactor coil shall be suitable for 240 Volts, 50 Hz. All contactors shall be supplied with minimum 2 NO + 2 NC auxiliary contacts. Minimum contactor rating for power shall be 16 Amp.

4.7.7 ANNUNCIATION PANEL

The alarm and annunciation system shall be incorporated in a separate cubicle in the Main LT panel suitable to operate on 24 V DC supply to comprehensively indicate the following faults in the system complete with internal wiring and terminals duly identified for various inputs:

<table>
<thead>
<tr>
<th>For each transformer feeder panel:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 For high oil temp.</td>
<td>1 No.</td>
</tr>
<tr>
<td>2 For Buchholz relay</td>
<td>1 No.</td>
</tr>
<tr>
<td>3 For low oil level</td>
<td>1 No.</td>
</tr>
<tr>
<td>4 For restricted earth fault relay</td>
<td>1 No.</td>
</tr>
<tr>
<td>For each 33 KV VCB panel:</td>
<td></td>
</tr>
<tr>
<td>1 Over current trip</td>
<td>1 No.</td>
</tr>
<tr>
<td>2 Short circuit trip</td>
<td>1 No.</td>
</tr>
<tr>
<td>3 Earth fault trip</td>
<td>1 No.</td>
</tr>
<tr>
<td>4 Control circuit healthy</td>
<td>1 No.</td>
</tr>
<tr>
<td>Other annunciation</td>
<td></td>
</tr>
<tr>
<td>1 Power failure</td>
<td>1 No.</td>
</tr>
<tr>
<td>2 Annunciation for restoration of power from SEB</td>
<td>1 No.</td>
</tr>
</tbody>
</table>

The annunciation panel shall have the following:

Hooter for audible alarm suitable for operation on 24 V, DC

Auxiliary relay for hooter cancellation

Push button for hooter cancellation

Auxiliary relay for audible alarm for restoration of power supply

The scope of work also includes providing and laying required armoured copper control cables (2.5 mm² conductor size) for entire field cabling up to the output terminals of various relays, etc. as required.

4.8 CAPACITORS & CAPACITOR PANEL FOR P.F. IMPROVEMENT

4.8.1 POWER FACTOR IMPROVEMENT RELAY PANEL

Power factor improvement capacitors panel is required to continuously measure and monitor the power factor of a system and switch ON/OFF bank of power capacitors to bring the power factor of the system to a preset value.

It would consist of—

- An automatic power factor correction relay, microprocessor based, with arrangement for sensing the power factor of the inductive load and giving signal to feeders of power capacitors as per the setting of P.F. and electronic circuit to ensure that once a capacitor gets cut off, it is
not put on at least for a minute. The relay should automatically manage capacitor banks. The capacitors must be turned “on” and “off” according to the reactive power required to correct the power factor of the load to the power factor set on the relay. The relay should have automatic and manual mode of operation with a LED to indicate the operating mode. The auto/manual function makes it possible to turn the capacitor banks on and off manually regardless of the line value measured.

- For each of capacitor bank one set of suitable rating SF unit contactor, pair of ON/OFF push button and indication lamp shall be provided.
- Flush mounted, 96 mm x 96 mm square, digital Power Factor meter having 4 digits LCD or LED display.
- Selector switch and CT operated digital ammeter of size 96 mm x 96 mm. Selector switch and digital voltmeter of size 96 mm x 96 mm.
- Auto-manual switch and connected circuit to ensure that in manual mode each capacitor can be put on/off manually also.
- One feeder with suitable rating ACB to feed power to switchgears of capacitor banks.
- Suitable 3 phase and neutral bus bars.

Wiring for all above accessories/functions should be complete and ready for use. The details of each capacitor bank rating, no. of capacitor banks and rating of incoming switchgear for power factor improvement cubicle shall be as per details given in the data sheet and schedule of quantities.

4.8.2 POWER CAPACITORS BANKS

The power capacitor banks shall be used to improve the power factor of an electrical system and shall be housed in a separate cubicle on rear side of the panel and shall be approachable from rear side.

4.8.2.1 Design Requirements

Each basic unit is to be built up with a number of elements. These elements shall be two layer dielectric design (non-self healing) using heavy Polypropylene Film, Aluminium Foil and Capacitor Tissue Paper as required; to ensure that total dielectric thickness is more than 14 micron. Capacitor element must be completely sealed with epoxy resins to provide maximum humidity protection and highest insulation. The capacitor elements are to be given adequate outside insulation and should be put in all welded surface treated MS containers. The outer surface shall be provided with a coat of protective primer followed by two coats of synthetic enamel paint of approved shade. These capacitors shall be impregnated with special grade of capacitor oil under high vacuum. The metal case shall be equipped with porcelain bushings to permit connection between power lines and active capacitors. The unit shall have built-in internal individual fuses.

Externally each capacitor unit shall have two separate earthing points, name plate confirming to the requirements of IS-2834 (amended up to date), discharge resistance etc. Each capacitor should be suitable for operation on 440 V, 3 Phase, 50 Hz AC power supply.

4.9 LT POWER & CONTROL CABLES

4.9.1 LT Power Cables

Power cables for use on 415 V system shall be of 1100 volt grade, aluminium conductor, XLPE insulated, PVC sheathed, armoured and overall PVC sheathed, strictly as per IS : 7098 (Part I)/88 for cables of size 50 mm² and above. Power cables of size less that 50 mm² shall
be PVC insulated, PVC sheathed, armoured and overall PVC sheathed as per IS: 1554 (Part I)/88. Unarmoured cable to be used only if specifically mentioned in schedule of quantities.

The size of these cables shall be as specified in schedule of quantities or as per attached drawing. No cable of size less than 4 sq. mm. shall be used.

4.9.2 LT Control Cables

Control cables for use on 415 V system shall be of 1100 volts grade, copper conductor, PVC insulated, PVC sheathed armoured and overall PVC sheathed, strictly as per IS: 1554 (Part I) – 1976. Unarmoured cables to be used only if specifically mentioned in schedule of quantities.

The size and quantity of these cables shall be as per actual requirement. The minimum conductor diameter shall be 2.5 mm².

4.10 EARTHING SYSTEM & LIGHTNING ARRESTOR

The intent of this specification is to define the requirement for the supply, installation, testing and commissioning of the earthing system and lighting arrestor.

4.10.1 Earthing Network

4.10.1.1 The scope of earthing includes complete earthing system for the two pole structure, HT VCB Panel, transformer, PCOS, APFC panel, cable, glands etc complete with suitable earth pits and earth strips as per IS 3043. The entire earthing system shall fully comply with the Indian Electricity Act and Rules framed there under. The contractors shall carry out any changes desired by the Electrical Inspector or the owner in order to make the installation conform to the Indian Electricity Rules at no extra cost. Any changes in the method, routing, size of conductors etc, shall be subject to approval of the owner/engineer-in-charge before execution.

4.10.1.2 Excavating and refilling of earth necessary for laying underground earth bus loops shall be responsibility of the contractor.

4.10.1.3 The resistance between the earthing system and the general mass of earth shall be as per IS code of practice. The earth look impedance to any point in the electrical system shall not be in excess of 1.0 Ohm in order to ensure satisfactory operation of the protective devices.

4.10.1.4 The main earth loop shall be laid at the depth of 500 mm below ground level. Wherever cable trenches are available, the earth lead shall be laid in the trenches and shall be firmly created to the walls when running in concrete lined trenches. The earthing strip shall be protected against mechanical damage.

4.10.1.5 Joints and tapping in the main earth look shall be made in such a way that reliable and good electrical connections are permanently ensured. All joints below ground shall be welded and suitably protected. Joints above ground shall be made by means of connectors/lugs as far as possible. The connectors shall be used for tapping earth leads from the main earth loop wherever it is installed above ground. Where aluminium riser are to be connected to the underground GI earth bus, the aluminium riser shall be taken to the nearest earth pit and terminated through a bolted joint. If this is not practicable then GI riser shall be brought above ground and a bolted joint shall be made between this GI riser and the aluminium riser.

4.10.1.6 Conduits in which cables have been installed shall be effectively bonded and earthed. Cables armouring shall be earthed at both ends.

4.10.2 Earth Electrodes
4.10.2.1 Earthing pit plate electrodes shall be installed in accordance with the standard drawings of reference and latest amendment of IS: 3043. Their location shall be marked to enable accurate location by permanent makers.

4.10.2.2 All earth electrodes shall preferably be driven to a sufficient depth to reach permanent moist soil. Electrodes shall preferably be situated in a soil which has a fine texture and which is packed by watering and ramming as tightly as possible. Wherever practicable the soil shall be dug up, all lumps broken and stones removed from the immediate vicinity of the electrodes.

4.10.2.3 All earth electrodes shall be tested for earth resistance by means of standard earth test meter. The tests shall be take place in dry months preferably after a protected dry spell. If necessary a number of electrodes shall be connected in parallel to reduce the earth resistance. In such a case, the distance between the electrodes shall preferably be not less than twice the length of the electrode.

4.10.2.4 The electrodes shall have a clean surface not covered by paint, enamel, grease or materials of poor conductivity.

4.10.2.5 The exact location and number of earth electrodes required at each location shall be determined in the field in consultation with the owner/engineer-in-charge or his authorized representative, depending upon the soil data and resistivity to meet the ohmic values.

4.10.2.6 Test disconnect facility shall be provided for the earth pits to check their earth resistance periodically.

4.10.3 Connection

4.10.3.1 All electrical equipment is to be doubly earthed by connecting two earth conductor from the frame of the equipment to a main earthing ring. The earthing ring will be connected via links to several earth electrodes. The cable armouring will be earthed through the strips cable glands.

4.10.3.2 In hazardous areas, all major process equipment shall be connected to the earthing ring by means of anti-loosening connections and all pipelines will be bonded and earthed on entering the battery limit of the process area.

4.10.3.3 The following shall be earthed:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformers</td>
<td>Shall have two earth pits with 600 x 600 x 3 mm copper plate electrode. These shall be independent of all other earth pits.</td>
</tr>
<tr>
<td>Housing/body</td>
<td>Shall have earth pits with 1200 x 1200 x 12 mm CI plates electrode. These shall be independent of all earth pits meant for earthing of two pole structure and neutral earthing of DG sets and transformers</td>
</tr>
<tr>
<td>All switchgear panels and their earth buses</td>
<td>Shall have earth pits with 1200 x 1200 x 12 mm CI plate electrode. These shall be independent of all earth pits meant for earthing of two pole structure and neutral earthing of DG sets and transformers</td>
</tr>
<tr>
<td>All fences/enclosures Housing elect. Equip</td>
<td>Shall have earth pits with 1200 x 1200 x12 mm CI plate electrode. These shall be independent of all earth pits meant for earthing of two pole structure and neutral earthing of DG sets and transformers</td>
</tr>
</tbody>
</table>
Number of earth pits and conductor size for connection to various equipment shall be as per the requirement/approval of the purchaser / owner and meet the requirement of local electrical inspectorate.

4.10.3.4 System shall be earthed by two distinct conductors directly connected to independent earth electrodes, which in turn shall be connected to the earth loop.

The earth connection shall be properly made. A small flexible aluminium loop to bridge the top cover of the transformer and the tank shall be provided to avoid earth fault current passing through fastening bolts when there is a lightening surge, high voltage surge or failure of bushings.

4.10.3.5 All paint, scale and enamel shall be removed from the contact surface before the earthing connections are made.

4.10.3.6 Earth connections at the equipment terminals shall be made in a mutually agreed manner. Anchor bolts or fixing bolts shall not be used for earthing.

4.10.3.7 All hardware used for earthing installation shall be hot dipped galvanized or zinc passivated. Spring washers shall be used for all earthing connections of equipment having parts of vibrations.

4.10.3.8 Testing

Earthing systems/connections shall be tested as follows:

I. Resistance of individual electrodes shall be measured after disconnecting it from the grid.

II. Earthing resistance of the grid shall be measured after connecting all the electrodes to the grid and generally the test value shall conform to IS Code of practice unless otherwise specified.

III. The resistance to earth shall be measured at the following:

a) At each electrical system (earth or system neutral earth)

b) At one point on each earthing system used to earth electrical equipment enclosures.

c) At one point on each earthing system used to earth wiring system enclosures such as metal conduits and cable sheaths or armour.

d) At one point on each fence enclosing electrical equipment.

Measurement shall be made before connection is made between the ground and the object to be grounded.

4.11 RUBBER MATS

Neoprene rubber mats of thickness suitable for the applicable voltage grade and conforming to the relevant IS specifications shall be supplied for HT panels, LT Power Control Centre, DG set control Panel etc.

4.12 SAFETY ACCESSORIES & MISCELLANEOUS ITEMS

The supply and installation, wherever applicable, of following sub-station safety accessories and miscellaneous items is included under the scope of work of this contract:

• Fire extinguishers, of type and capacity as approved by the purchaser, for substation building and fire buckets with stand for switch yards – 1 lot
● Hand Gloves suitable for the applicable HT voltage grade – 2 pairs

● VCB breaker operating tools and tackles – 2 sets

● D.O. fuse operating handle suitable for the applicable HT voltage grade – 1 set

● Danger Boards, Shock Treatment Chart, Artificial Resuscitation Unit, First-air box etc., which are required as per statutory regulations – 1 lot

4.13. BOILER MCC

The Boiler MCC shall be in line with standard specification of Motor control centre (sheet steel) given below. The incomer and outgoing feeder details shall be as per enclosed schematic diagram.

The purchaser shall approve the schematic and fabrication drawing before execution of work.

MOTOR CONTROL CENTRE (SHEET STEEL) – TECHNICAL SPECIFICATION

1.0 FUNCTIONAL REQUIREMENTS

To receive, control and distribute electrical power at 440 V, 50 Hz, AC in a sheet steel housing.

2.0 Design Requirement and Scope of Supply

2.1 Statutory Requirements:

Motor control centre is to be manufactured / assembled as per the latest ISI Specification. Indian Electricity Rules, including special requirements of concerned. State Electricity Inspectorate and the detailed specification mentioned below. The manufacturer of the panel must posses a type test certificate / accreditation from CPRI.

2.2 Housing Details:

1 The switchboard shall be fabricated using pressed and shaped cold rolled steel sections structure of adequate thickness. The sheet steel used for panel shall be min. 14 SWG sheet except that the partition plates and inter-panel barriers may be made of 16 SWG. The switchboard shall consist of free standing front openable panels arranged to form a continuous line-up of uniform height. Cold rolled sheets shall be used for doors and front covers. Front doors shall be hinged type and bus bars and cable alleys covers shall be bolted type.

2 Switch Board shall be extensible at both the ends by addition of vertical sections. Ends of the bus bars shall be suitably drilled for this purpose. Panels at extreme ends shall have openings, which shall be covered with plates screwed to the panel. The switchboard shall be provided with integral base frame. The cable gland plate shall be 2.5 mm thick.

3 The switchboard shall be totally enclosed, dust, weather and vermin proof. The switchboard shall conform to degree of protection not less than IP 44. Gaskets of durable material shall be provided for doors and other openings. Suitable hooks shall be provided for lifting the boards. These hooks when removed shall not leave any opening in the board.

4 All hardware shall be corrosion resistant. All joints and connections shall be made by galvanized zinc passivated or cadmium plated high tensile strength steel bolts & nuts. Spring washers shall be provided to secure against loosening.

5 The switchboard shall be in cubicle design (each feeder components are housed in individual cubicle) suitable for indoor installation. The switchboard shall be non draw out type except for ACB cubicles. Suitable cable & bus bar alleys shall be provided. In case plant room dimensions
prohibit provision of cable/bus alleys in front, panel depth may be increased suitably to accommodate cables/buses on back of MCC. All components of the switchboard shall generally be approachable from front. However, MCC can be in double front execution also if specifically asked for. The maximum and minimum operating handle/push button height of any feeder shall not be more than 1900 mm or less than 300 mm with reference to panel bottom. Supporting arrangement for dressing of power and control cables in cable alleys also shall be provided. Maximum shipping length of MCC shall be 2500 mm.

<table>
<thead>
<tr>
<th>Motor HP</th>
<th>Cubicle for DOL Starter</th>
<th>Cubicle for Star-Delta Starter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Width x Height x Depth</td>
<td>Width x Height x Depth</td>
</tr>
<tr>
<td>Up to 10 HP</td>
<td>450 x 275 x 350</td>
<td>450 x 275 x 350</td>
</tr>
<tr>
<td>10 to 30 HP</td>
<td>450 x 550 x 350</td>
<td>450 x 550 x 350</td>
</tr>
<tr>
<td>40 to 75 HP</td>
<td>450 x 825 x 350</td>
<td></td>
</tr>
<tr>
<td>100 to 150 HP</td>
<td></td>
<td>450 x 1100 x 350</td>
</tr>
</tbody>
</table>

Approximate Size of Cubicles for SFU / MCCB Feeders

<table>
<thead>
<tr>
<th>Current Rating</th>
<th>Cubicle for SFU &amp; MCCB Width x Height x Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mm    mm             mm</td>
</tr>
<tr>
<td>Up to 63 A</td>
<td>450   x 275         x 350</td>
</tr>
<tr>
<td>100 A to 250 A</td>
<td>450   x 550         x 350</td>
</tr>
<tr>
<td>400 A &amp; above</td>
<td>450   x 825         x 350</td>
</tr>
</tbody>
</table>

Minimum depth of cubicle for ACB Feeder shall be 1000 mm
Minimum width of cable and bus bar alleys shall be 300 mm

6 Painting:

All metal surfaces shall be thoroughly cleaned and degreased to remove all scales, rust, grease and dirt. Fabricated structures shall be pickled and treated to remove any trace of acid. The under-surface shall be prepared by applying a coat of phosphate paint and a coat of yellow zinc chromate primer. The under surface shall be made free from all imperfections before undertaking the final coat.

After preparation of the under surfaces, the panel shall be painted with approved shade of powder coating.

The finished panels shall be dried in stoving ovens in dust free atmosphere. Panel finish shall be free from imperfections like pin holes, orange peels, run-off paint, etc.

All unpainted steel parts shall be cadmium plated or suitably treated to prevent rust, corrosion, etc.

7 Nameplates:

Apart from panel nameplate highlighting the operating voltage, the nameplates for all incoming and outgoing feeders shall be provided on doors of each compartment. Nameplates shall be fixed by screws only and not by adhesives. Engraved nameplates shall preferably be of 3-ply (Black-White-Black) acrylic sheets or anodized aluminium. Special danger plates shall be provided as per requirement.

Inside the panels, stickers should be provided for all components giving identification no. as per detailed wiring diagram.

2.3 Bus bar Sizing Connection and Supports:

1 The bus bars shall be made from high conductivity electrolytic aluminium conforming to grade E9 1E of IS 5082. The bus bars and supports shall be capable of withstanding the rated and short circuit-current stated in the single line diagram/feeder details. Minimum size of power
bus bars shall be 200 Amps rating. Maximum current density permissible for Aluminium bus bars shall be 0.8 Amps/mm² for bus bar area above 500 mm² & 1.0 Amp/mm² for bus bar area below 500 mm². An earthing bus bar of minimum 150 mm² section aluminium shall be provided outside panel at bottom throughout the length of the panel. Provision shall be made to connect the earthing bus bar to the plant earthing grid at two ends. All doors shall be earthed using flexible copper connections to the fixed frame of the switchboard.

Maximum current density permissible for Copper bus bars shall be 1.5 Amps/mm²

2 The bus bars shall be provided with heat shrinkable PVC insulating sleeves of 1100V grade, Red, Yellow and blue colour shall be used for phase bus bars and black colour shall be used for neutral bus bars. Joints shall be shrouded suitably. Supports for bus bars shall be made of suitable size non-hygroscopic and non-inflammable epoxy compound SMC/DMC blocks and these should be adequate in number so as to avoid any sag in the bus bars.

3 Minimum clearance between phase to phase shall be 25 mm and that between phase to neutral / earth shall be 20 mm.

2.4 Power Connection:

1 For power interconnection within the panel board:

Copper conductor PVC insulated cables of adequate cross section shall be used. FOR CURRENT RATING ABOVE 63 AMPS ALUMINIUM BUSBAR STRIPS OF ADEQUATE RATING SHALL BE USED. MINIMUM SIZE OF COPPER CONDUCTOR TO BE USED SHALL BE 4.0 mm². Cable lugs /sockets of suitable size and type shall be used for all interconnections.

4.0 For all aluminium to copper connections: The copper surface will be silver-plated and the aluminium surface will be properly cleaned and supplied with oxide inhibiting grease.

5.0 For all outgoing motor feeders, the suitable size terminal blocks shall be provided in cable alleys and wiring up to these from contactors shall be done by panel supplier. These terminal blocks shall be heavy-duty type to withstand high starting currents.

6.0 For incoming & outgoing feeders of the MCC, aluminium conductor cable will be used and hence the panel is to be designed for receiving these and wherever required cable boxes with bus bar extensions for receiving more no. of cables, shall be provided in panel by supplier. Removable gland plates of 12 SWG thickness shall be provided on top / bottom of panel, for cable entries.

7.0 To prevent accidental contacts, all interconnecting cables / bus bars and all terminals also shall be shrouded.

8.0 Standard colour code of red, yellow and blue for phases and black for Neutral to be followed for all bus bars/conductors.

2.4 Auxiliary wiring and Terminals :

1 Wiring for all controls, protection, metering, signalling etc. inside the switchboard shall be done with 1100 volts grey colour PVC insulated FRLS copper conductors. Minimum size of these conductors shall be 1.5 mm². However, CT circuit wiring shall be done with 2.5 mm². Control wiring to components fixed on doors shall be flexible type.

2 The complete panel would be subdivided into different sections by supplier and each section shall have its own control circuit with fuse and indication. Terminal block (Minimum 3 ways) for
control wiring shall be provided for each outgoing Motor feeder in its cubical. 10% spare terminals shall always be available in each terminal block. Control wiring up to these terminal blocks shall be done by supplier.

3 All control wiring should be provided with necessary cable sockets / lugs at both ends.

4 Conductors shall be terminated using compression type lugs. Each termination shall be identified at both the ends by PVC ferrules. The identification termination numbers should match with those on drawings.

5 Control wiring for motor feeders should be such that the “green”light of motor feeder is “ON” only when control as well as power circuit of feeders is “ON” and it shall have its own fuse.

6 For all motor starter feeders, provision for control wiring to remote ON/OFF control is to be made. The auxiliary wiring for the same shall be brought up to terminal block in the feeder’s cubicle.

2.6 Switchgears:

1 Air Circuit Breakers (ACBs):

These shall be manually operated, fully draw out type with built-in microprocessor based programmable protection, and suitable for 415 V, 50 Hz. Supply. Microprocessor based programmable protection unit shall have settings for overload, short circuit, instantaneous and earth fault currents with time delay and LED indicators to show various conditions such as Power ON, Overload, Short-circuit, Instantaneous Earth fault, Percentage load, Self Diagnostic Test etc. Mechanical indicators to show “Open”, ‘Closed’, ‘Service’ & Test positions. The circuit breaker shall be provided with mechanically operated emergency tripping device. This device shall be available on the front of the panel.

The control supply shall be 240 V AC,. 6 NO + 6 NC auxiliary contacts shall be provided. The interlocks shall be as under:

It shall not be possible to plug in a closed circuit breaker or to draw out a circuit breaker in closed position. It shall not be possible to operate a circuit breaker unless it is in fully plugged-in, test or fully isolated position. In test position, the breaker shall be tested without energizing the power circuit. The ACB feeder cubical door cannot be opened when ACB is “ON”. However, it shall be possible to defeat this interlock for inspection purpose. Closing and trip coils shall work under the following voltage variation conditions:

- Closing coils - 85 % to 110 % of rated voltage
- Trip coils - 50 % to 130 % of rated voltage

For series tripping, overload, short circuit and under voltage/shunt trip release shall be provided. While incoming feeder ACB shall be provided with under voltage coil, the outgoing feeders ACBs shall be provided with shunt trip.

The built-in earth fault relay shall be provided for incoming feeders ACB. Current rating, short circuit current, protection relays etc. shall be as specified in feeder details. The circuit breaker position shall be indicated electrically. The following indicating colours shall be used:

- BREAKER ‘CLOSE’ - RED
- BREAKER ‘OPEN’ - GREEN
- BREAKER AUTO TRIP’ - AMBER

The circuit breaker shall be provided with mechanically operated emergency tripping device. This device shall be available on the front of the panel.

Note: The air circuit breaker for incoming feeder shall be of 4 pole construction, unless stated otherwise.
2 Moulded Case Circuit Breakers (MCCB):

MCCBs shall always be provided with separate operating handle mechanism with door interlocking. The MCCBs shall be of triple/four pole construction (as required in the feeder details) arranged for simultaneous three/four pole manual closing or opening and automatic instantaneous tripping on short circuits. MCCBs shall be provided with adjustable type tripping device with inverse time characteristics for over load protection. All MCCBs are to be provided with operating handles interlocked with cubicle doors.

Closing mechanism shall be quick make, quick break and trip free type. Operating handle shall give a clear ‘ON’, ‘OFF’ & ‘TRIP’ indication. Control voltage for MCCB shall be 240 volts. The MCCBs shall be rated for continuous maximum duty as specified. The rating of the MCCBs shall be as per the feeder details.

Minimum rated breaking capacities shall be as under:

<table>
<thead>
<tr>
<th>MCCBs up to 100 Amps</th>
<th>35 KA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above 100 Amps</td>
<td>50 KA</td>
</tr>
</tbody>
</table>

Note: All feeders having 3 pole MCCB shall be provided with neutral link complete with isolating link. However, the MCCBs for incoming and non-motor feeders shall be of 4 pole construction, unless stated otherwise.

3 Switches & fuse switches:

Switches or fuse switches shall be load break, heavy duty, air break having continuous maximum rating type with manual quick make / break mechanism. Mechanical interlock shall be provided to prevent opening of door in switch ‘closed’ position and prevent closing of switch in door ‘open’ position. However, it should be possible to defeat this arrangement for testing purpose.

4 Fuses:

These shall be non-deteriorating HRC cartridge link type with operation indicator which will be visible without removing fuses for the service. These shall be complete with moulded phenolic fuse base and cover. Wherever required fuse pullers shall be provided. The fuse base shall be so located in modules to permit insertion of fuse pullers and removal of fuse links without any problem. One set of fuse pullers also shall be provided.

5 Contactors:

The rating of the power contactors shall be as required depending upon the feeder rating indicated in the specifications and as per the feeder details table provided in this specification below. Contactors coil shall be suitable for 240 volts, 50 Hz. Unless otherwise specified. All contactors shall be supplied with minimum 2 NO + 2 NC auxiliary contacts. Additional contacts if required for interlocking etc. shall also be provided. Minimum contactor rating for power shall be 16 Amp and all contactors of Star Delta Starter to be of same rating. Rating of contactor shall be based on feeder rating.

All contactors of motor starters shall be suitable for AC 3 duty unless specified otherwise.

6 Protective Devices:

Bimetal overload relays with inbuilt single phase protection shall be provided for all motor feeders. The relays shall be adjustable and self reset type.

Heavy duty starters shall be provided with saturable type current transformer operated overload relays only, which shall be suitable for motor starting time of 15-60 seconds.
Any other relays, if required for incoming & outgoing feeders shall be specified in the feeder details.

7 Timers:

The timers shall be continuously adjustable and electronic type, suitable for 240 V, 50 Hz. Supply. The timers for Star Delta automatic starters shall have time delay of 0 to 60 seconds between change over of contacts.

8 Push Buttons (PBs):

Push buttons shall be complete with actuator and contact block and shall be generally mounted on doors of the cubicles. Colours shall be as follow:

- Stop/open/emergency: Red
- Start/close: Green

It should have minimum 1 No + 1 NC contacts. Push buttons shall conform to IP-65 protection against dust and water ingress.

9 Indication Lamps:

All outgoing & incoming feeders shall be provided with ‘ON’ indication lamps.

Colours shall be as under:

- Phases: Red, Yellow & Blue
- ON: Red
- OFF: Green
- TRIPPED: Yellow

Indication lamps shall be in the form of cluster of high intensity light emitting diodes (LED) TO GIVE BRIGHT INDICATION. These lamps shall be of 22.5 mm dia and having operating voltage of 240 V, AC.

10 Current Transformers (CTs):

CTs shall be cast resin insulated type. Primary and secondary terminals shall be marked indelibly. CTs shall preferably be mounted on stationery parts. These shall be capable of withstanding momentary short circuit and symmetrical short circuit current for 1 second and shall have a minimum rating of 10 VA. Neutral side of CTs shall be earthed.

Protection CTs shall be of low reactance, accuracy class “SP” and an accuracy limit factor greater than “10”. Instrument CTs shall be of accuracy class “1.0” and accuracy limit factor less than “5.0”.

Separate CT’s to be provided for protection and metering purpose.

11 Measuring Instruments:

These shall be square pattern having approximate dimensions 96 mm x 96 mm, flush mounting type. Necessary auxiliary instruments like CTs etc. are also included in the scope of supply.

All AC meters shall be of Digital type for displaying three phases reading. Suitable selector switch shall be provided if the digital meter does not have provision for simultaneous display of three phase readings.
Voltmeter shall be suitable for direct line connection. Voltmeters shall be connected through fuses only.

Intelligent Panel Meter shall be provided with incoming feeder of the MCC for the measurement and digital display of Multifunctional Electrical Parameters such as voltage, current, active power, reactive power, frequency, power factor, active energy, reactive energy, etc.

All motor feeders of 15 HP and above shall be provided with ammeter. Ammeter shall also be provided for all incoming & outgoing switches / MCCB / ACB of rating 100 A & above.

Ammeters shall always be CT operated.

2.7 Special Requirements:

1. All motor feeders of 15 HP and above shall have automatic Star-Delta Starters and upto 10 HP shall have DOL starters unless specified otherwise.

2. All motor feeders upto 20 HP shall be provided with switch fuse unit or MPCB as specified in the feeder details and motor feeders above 20 HP shall be provided with MCCB having a minimum breaking capacity of 50 KA.

3. All the power contactors of Star-Delta starters shall have same current rating.

4. The following selection table shall be followed for switches & contactors of motor feeders unless otherwise specified:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0 to 10 HP</td>
<td>16</td>
<td>63</td>
</tr>
<tr>
<td>2</td>
<td>12.5 to 15 HP</td>
<td>25</td>
<td>63</td>
</tr>
<tr>
<td>3</td>
<td>20 to 25 HP</td>
<td>32</td>
<td>63</td>
</tr>
<tr>
<td>4</td>
<td>30 HP</td>
<td>32</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>40 to 45 HP</td>
<td>40</td>
<td>100</td>
</tr>
<tr>
<td>6</td>
<td>50 to 60 HP</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>7</td>
<td>65 to 70 HP</td>
<td>70</td>
<td>200</td>
</tr>
<tr>
<td>8</td>
<td>75 to 90 HP</td>
<td>110</td>
<td>200</td>
</tr>
<tr>
<td>9</td>
<td>100 to 125 HP</td>
<td>110</td>
<td>250</td>
</tr>
<tr>
<td>10</td>
<td>150 to 180 HP</td>
<td>160</td>
<td>400</td>
</tr>
</tbody>
</table>

For motors of smaller ratings, MPCB with suitable thermal release may also be provided as per the requirement given in the feeder details. The following selection table shall be followed for MPCB of motor feeders unless otherwise specified:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.5 to 1</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>1.5</td>
<td>16</td>
<td>3.2</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>16</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>16</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td>7.5</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>7</td>
<td>10</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>8</td>
<td>12.5</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>9</td>
<td>15</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td>17.5</td>
<td>16</td>
<td>25</td>
</tr>
</tbody>
</table>

For capacitors, rating of contactors/switch shall be double of rated current of capacitor.
5 For incoming feeder of rating higher than 600 A, ACB shall be provided unless otherwise stated in the feeder details.

6 If the outgoing feeder rating is higher than 63 Amps, MCCB shall be provided unless stated otherwise and preferably these shall be located at the lower portion of the panel. These feeders shall also have isolating link for neutral in case 3 pole MCCBs are to be supplied as per the requirement given in feeder details.

7 Electrical interlocking shall be provided between various feeders as required by the process and specified in feeder details.

8 If the total operating load on MCC is more than 600 kW, MCC shall be provided with two incoming feeders with a bus coupler unless specified otherwise. Each incoming feeder shall have independent instrumentation and protection.

9 Induction motors (above 15 HP) having 3000 RPM shall require higher rating for fuses, contactors and electronic timers due to very high starting current. MCC supplier has to specially check this requirement from purchaser.

10 Supplier has to submit GA & power circuit drawing for approval to purchaser before starting manufacturing of MCC.

All the major components of an MCC shall be of same “Make”.

6.14 **D G SETS WITH ACOUSTIC ENCLOSURE, AMF CUM SYNCHRONISING PANEL AND AUTO LOAD SHARING FACILITY:**

The diesel generating sets of capacity specified in the data sheet and schedule of quantities would be used to generate three phase AC electricity at 415 volts and 50 Hz. The generating sets would be used in the plant to operate certain essential motors and lighting load in case there is electric shut down / failure from the main source.

6.14.1 Design Requirements:

6.14.1.1 Each diesel generating set shall comprise of diesel engine, alternator, control panel, acoustic enclosure and accessories complete.

The diesel engine of the DG set should be water-cooled and capable of developing required BHP when running at 1500 rpm under NTP conditions. The engine should be built to BSS specification 649 (1958) and rated for continuous running for 24 hours with an overload capacity of 10 % for a period not exceeding 1 hour in any 12 hours running.

The diesel engine should be complete with the following:

- Flywheel
- Engine water-cooling system with cooling fan & radiator up
- Air intake, Fuel and lubricating oil filters
- Fuel tank, fuel oil pump, fuel injectors & fuel hoses
- Oil bath air cleaner
- Standard fuel tank
- Flexible coupling
- Exhaust silencer (to be insulated and taken out of the building as per statutory requirement)
- Holding down bolts & MS combination base frame.
- 12 V self-starting arrangement with suitable rated Lead Acid accumulator type battery with suitable battery charging arrangement and cables
- Standard set of tools
- Lubricating oil cooler
• Lubricating oil pressure gauge
• Control panel for engine with engine safety against over speed.
• Acoustic enclosure

6.14.1.2 The engine should be flexible/close coupled to one suitable self excited, self regulated alternator developing required KVA at 0.8 power factor, 3 phase, 50 cycle/sec., 415 volts AC power supply under NTP conditions when running at 1500 RPM. The alternator should be screen protected and fitted with end shield and ball roller bearings. The alternator shall conform to BS: 1613 or IS: 4722 amended as on date. The alternator shall be supplied with automatic voltage regulator. Alternator of rating 500 KVA and above shall be provided with thermistor winding for protection against overheating. The temperature sensor of thermistor winding shall be connected to DG set control panel.

6.14.2 **ACOUSTIC ENCLOSURE**:

The Acoustic Enclosure with other accessories for DG Set of given capacity should be suitably designed to enable reduction in noise level such that it should not be more than 75 dBa when measured at 1 meter distance under free field condition.

The Acoustic Enclosure generally comprises / incorporates following:

→ The Structure / Profile shall be made out of a good quality 14 SWG CRCA Sheet Steel.

→ The roof, sidewalls, integral partition and doors shall be sandwich design made out of superior quality CRCA Sheet Steel.

→ The Acoustic Enclosure shall be natural cooled & shall maintain Δt (Temp. difference with Air ambient) of 7-10°C. If necessary articulated ventilation may also be considered.

→ The sound absorption material shall be selected from either mineral wool / non-igniting foam of relevant thickness and density to meet the performance.

→ The enclosure construction shall provide sufficient access for maintenance work.

→ The control Panel shall be suitably mounted inside the enclosure and the enclosure door is provided with Panel Viewing Window made from glass / Acrylic and sealed with Neoprene Rubber Gasket

→ **The Enclosure shall be complete with**:

→ Arrangement for Power Cable connection for supply to load
→ Residential Exhaust Silencer as per Pollution Control Board norms
→ Hi temperature rise safety for Accoustic Enclosures
→ Suction Louvers
→ Discharge Louvers - Openable and lockable doors with airtight neoprene rubber gasket.
→ Lamps with ON/OFF Switch on Control Panel for Illumination inside the Accoustic Enclosure
→ Lifting Arrangement

6.14.3 **AMF CUM AUTO/MANUAL SYNCRONISING PANEL WITH AUTO LOAD SHARING FACILITY**

The DG Control Panel suitable for AMF, Auto/Manual Synchronizing & Auto load-sharing facility shall be designed, manufactured and shall be supplied as per the specification mentioned below.

The controller shall also have AMF / Manual / Test Load dependent Start / Stop, Auto / Manual Synchronizing, Auto active & reactive Load Sharing and Soft load transfer capability.

6.14.3.1 SEQUENCE OF OPERATION FOR AMF:

**IN CASE OF MAINS POWER FAILURE:**

→ “NO” voltage relay shall send command to start the engine. The transformer breaker in the PCC will be open and the DG Set breakers shall be closed thus giving the supply to the plant through the DG set.

**IN CASE OF RESTORATION OF MAINS POWER:**

→ Relay will sense the voltage and give the command to the transformer breaker in PCC, however, the engine will remain in running position. Synchronizing relay shall sense the phase, voltage, and the frequency of the mains power and DG set. On confirming the required values, shall send the command of load transfer on mains. During this period both the breaker (DG breaker as well as transformer breaker) will remain in ON position and Reverse Power Relay shall not allow flow of the current in reverse direction.

→ During this process the load will be transferred from the DG to mains without any break and stops the DG Set after cooling down time and remains ready as standby.

6.14.3.2 MANUAL CONTROL:

In manual mode, the starting and stopping of DG Set shall be manual with involvement of operator. Similarly, the transfer of load shall be also manual.

6.14.3.3 TEST FACILITY:

The Panel shall have manual test facility. The DG Set shall be tested manually with the help of Test Push Button.

6.14.3.4 SYNCHRONIZING:

The Controller shall have manual & Auto Synchronizing facility comprising of Phase, Frequency and Voltage Matching with other DG Set with built-in sync check relay. In Auto synchronizing mode controller matches above parameters and after successful matching of these parameters it issue the breaker-closing signal.

In manual mode the above parameters, shall be matched with the help of speed & Voltage raise/lower switch/pushbutton and after successful matching of these parameters controller allow the breaker closing.

6.14.3.5 AUTO LOAD SHARING:

The controller shall have Isochronous Active (KW) and reactive (KVAR) Load Control facility to share the equal percentage load on the DG Sets operating in synchronizing.

6.14.4 SCOPE OF SUPPLY:

The Panel/s shall be totally enclosed dust tight, vermin-proof, floor mounted, free standing, floor mounted, cubical, compartmentalized type with hinged doors, fabricated from 14 gauge CRCA Sheet Metal having separate compartment.
Panel shall be Powder coated with light Siemens gray shade after the seven-tank process and shall have gland plate at bottom/top for input and out going cable terminations. The panel/compartment shall be fitted with following instruments and pre-wired with colour coded flexible copper cable with ferrule numbers for easy identification & maintenance.

The panel shall be mounted in the PCC room.

**The Panel / Controller shall have following facility:**

**Operator Interface & Display**

- Keypad for scrolling display data, configuration & control with key for Up-Down, Enter, Escape etc.
- LCD window display for monitoring various parameters & faults as detailed bellow against each control function

**Electrical (Generator) Parameter Monitoring (Digital):**

- Voltage R, Y, B
- Ampere R, Y, B
- Frequency
- KW
- KWh
- PF

**Electrical (Generator) Protection (Digital):**

- Under Voltage Trip, with adjustable range of Voltage & Time to Trip the generator for persistent under voltage.
- Over Voltage Trip, with adjustable range of Voltage & Time to Trip the generator for persistent over voltage.
- Under Frequency Trip, to Trip the generator for persistent under frequency.
- Over frequency Trip, to Trip the generator for persistent over frequency.
- Reverse Power Trip, to trip the generator for persistent Reverse Power.
- 3 Pole Over Current Trip, with IDMT characteristic to trip the generator for Over Current.
- Loss Excitation
- Synchronizing Check Relay

**Synchronizing:**

The controller shall have Auto Synchronizing facility comprising of following:

- Auto sequencing
  - Phase, Frequency and Voltage Matching
  - Built-in sync check relay
- Relay Output for breaker closing
- Manual voltage & speed adjustment for manual synchronizing

The Microprocessor unit shall have in-built Synchroscope for Manual Synchronizing. The Panel shall also be fitted with separate Synchroscope with PT.

**Load Sharing & Load Control (Digital):**

The controller shall have Auto load sharing facility comprising of following:

- Adjustable Governor Speed Set
- Built-in Paralleling Relay


√ Real (KW) Load Control
√ Isochronous Reactive (KVAR) Load Control
√ Isochronous Active (KW) Load-Sharing
√ Adjustable Droop for Manual Synchronizing
√ Load Ramping
√ Load depended Start/Stop with Auto Synchronizing.

INCOMER DG BREAKER (FOR EACH DG SET):

1 No. 4 Pole, 1000 Amps EDO Type ACB with standard accessories like cradle, shutter assembly, auxiliary switch, Low Voltage disconnector, AC Shunt/Under Voltage Release with Micro Processor Release having EMC for Over Current/Short Circuit and Earth Fault Protection.

STATIC BATTERY CHARGER:

The Panel shall also be fitted with Manual & Automatic (Constant Voltage type) Static Battery Charger Comprising of:

√ Selector Switch of Auto/Trickle/Boost/Off
√ Transformer / Rectifier
√ Auto Voltage Control Card
√ DC Ammeter (Analog type – 72 sq. mm.)
√ DC Voltmeter (Analog type – 72 sq. mm.)
√ Annunciations / Indications :
   - Set of Indicating Lamps for :
     - Mains ON
     - Mains ACB Close
     - Bus ON
     - The fault annunciation for each Engine & Electrical fault shall be displayed in the LCD window of controller.
     - 1 No. Hooter with accept & Reset Push Button.

√ Set Of Push Buttons and Selector Switch :
   - Emergency trip (Mushroom – lockable type)
   - D. G. ACB Close
   - D.G. ACB Trip
   - Engine Start
   - Engine Stop
   - Speed Raise / Lower
   - Voltage Raise / Lower
   - Auto / Test / Manual / Off Selector Switch

Miscellaneous:

√ Set of Control Fuses
√ Set of control relay / aux. connectors.
√ Indicating & Rating Name Plates
√ Mounting Base Channel
√ Set of Control Cable connectors

Starting the DG set from within the enclosure:

There shall be a provision to start & stop the DG set from within the enclosure, by-passing the auto sequence of operation.
6.14.5  GENERAL REQUIREMENT

6.14.5.1  The diesel engine and alternator should be mounted in an acoustic enclosure and on specially designed combination base plate and MS structure of extremely rigid fabrication. The base frame should be suitable for mounting the set on AVM pads over the RCC foundation.

6.14.5.2  The foundation details with relevant drawings should also be submitted.

6.14.5.3  Bidders are requested to quote separate price for set of spares required for 2 years normal operation specifying the quantity, name of spare part and its unit price.

6.14.5.4  The bidders should quote only for assembled sets. The assembled sets, if required, shall be inspected at the works of supplier at the discretion of the Dairy Board/Client. In case of over dimensions assemblies, the same may be permitted for transportation in knocked down conditions, otherwise the set should be despatched in assembled conditions only.

6.14.6  TECHNICAL DATA:
Technical data of the offered DG set and associated equipment shall be provided as per the following details:

6.14.6.1  ENGINE :

Manufacturer : -------------------
Model : -------------------
Deration at site : -------------------
BHP at full speed : -------------------
Engine speed (RPM) : -------------------
Type of governor : -------------------
Specific fuel consumption at max, continuous Rating Kg/KWH
- Do at 50% load : ------------------- Kg/KWH
- Do at 25% load : ------------------- Kg/KWH
Tolerance for fuel consumption : +/- ------------------- %
Lubricating Oil consumption at full load : ------------------- Kg/Hr
Noise level : ------------------- Db at5M
Exhaust temperature at full load : ------------------- Deg. C above

Lubricating oil change period : ------------------- Hrs.
Lubricating oil filter change period : ------------------- Hrs.
Air cleaner replacement period : ------------------- Hrs.
Replacement of gaskets, 'O' rings etc. : ------------------- Hrs.
Top overhauling period : ------------------- Hrs.
Major overhauling period : ------------------- Hrs.

6.14.6.2  ALTERNATOR :

Manufacturer : -------------------
Rated capacity at 0.8 PF : ------------------- KVA
Deration at site : -------------------
No. of poles : -------------------
Degree of protection : IP -------------------
Alternator Voltage regulation (max.) : +/- ------------------- %
Bihar State Milk Co-Operative Federation Limited

DAIRY DEVELOPMENT COMPLEX, P.O. - BIHAR VETERINARY COLLEGE,
PATNA-800014(BIHAR)
Phone No: 2224083,2228953,2228347,2220387, Fax No-0612-2228306
E-Mail: engineeringcomfed@gmail.com, Website: www.sudha.coop

Class of insulation for stator: ----------------------
Class of insulation for rotor: ----------------------

6.14.6.3 D G Set

Overall dimensions (mm): (L)x(W)x(H)
Size of foundation (mm): (L)x(W)x(H)
Weight: Kgs
Battery make: -------------------
Battery type: ------------------
Rating of battery: Amp-hr.

7.0 APPROVED MAKES OF EQUIPMENT & ACCESSORIES

This specifies the approved makes of various important equipment and accessories.

<table>
<thead>
<tr>
<th>Name of Items</th>
<th>Approved Makes</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.T. vacuum circuit breaker</td>
<td>Siemens/ABB/Areva</td>
</tr>
<tr>
<td></td>
<td>T&amp;D/Schneider/Crompton Greaves</td>
</tr>
<tr>
<td>Transformers</td>
<td>Bharat Bijlee/NEGF /Kirloskar /Areva T &amp; D/ Voltamp</td>
</tr>
<tr>
<td></td>
<td>/Crompton Greaves</td>
</tr>
<tr>
<td>DG Set</td>
<td>Cummins/Caterpillar/Starling &amp; Wilson</td>
</tr>
<tr>
<td>Alternator</td>
<td>Stamford/Kirloskar/AVKC</td>
</tr>
<tr>
<td>L.T. ACBs</td>
<td>L&amp;T /Siemens/ABB/Schneider</td>
</tr>
<tr>
<td>Protection relays</td>
<td>L&amp;T/Siemens/ABB/Areva T&amp;D/Schneider/ Havel's</td>
</tr>
<tr>
<td>MCCBs</td>
<td>L&amp;T /ABB / Merlin Gerin / Siemens /GE /MDS-LeGrand</td>
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<tr>
<td></td>
<td>/Crompton Greaves/ Havel's</td>
</tr>
<tr>
<td>Measuring instruments</td>
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</tr>
<tr>
<td>Energy meters</td>
<td>GEC/Universal/IMP/AE/HPL Socomec /Enercon / Cadel</td>
</tr>
<tr>
<td>Electronic Load Manager</td>
<td>Enercon / Krykard / L &amp; T</td>
</tr>
<tr>
<td>PF Improvement Capacitor</td>
<td>Khatau Junker / EPCOS / Siemens/ Meher / Momaya/</td>
</tr>
<tr>
<td></td>
<td>Havel's</td>
</tr>
<tr>
<td>Power Factor Correction Relay</td>
<td>L&amp;T/Beluk / Phasitron / EPCOS / Meco</td>
</tr>
<tr>
<td>H T XLPE Power Cables</td>
<td>CCI / Gloster / RPG-Asian / Universal / Incab/ Havel's</td>
</tr>
<tr>
<td>LT Power Cables</td>
<td>CCI / Gloster / RPG-Asian / Finolex / Universal / Incab/</td>
</tr>
<tr>
<td></td>
<td>Nicco/ Havel's</td>
</tr>
<tr>
<td>LT Control Cables</td>
<td>CCI / Gloster / RPG-Asian / Finolex /Gloster / Lapp Kabel</td>
</tr>
<tr>
<td></td>
<td>/ RR Kabels (Unilay)/Havel's</td>
</tr>
<tr>
<td>HRC fuses</td>
<td>L&amp;T/Siemens/EE/C&amp;S/ Havel's</td>
</tr>
<tr>
<td>Current transformers</td>
<td>AE/KAPPA/MECO/IMP/Indocoil</td>
</tr>
<tr>
<td>Push buttons</td>
<td>ESBEE/Siemens/Vaishno/Technic/GE</td>
</tr>
<tr>
<td>Indicating lamps</td>
<td>L&amp;T/Siemens/Vaishno/Technic/Binay</td>
</tr>
<tr>
<td>Switches (TP &amp; TPN)</td>
<td>L&amp;T/Siemens/ABB/Schneider/ Havel's</td>
</tr>
<tr>
<td>Selector switches</td>
<td>L&amp;T/Kaycee/Sulzer/ Havel's</td>
</tr>
<tr>
<td>Cable glands</td>
<td>Comet/Ex-Protecta/Dowels/Lapp Kabel/Bracko</td>
</tr>
<tr>
<td>Cable lugs</td>
<td>Dowels/Comet/Lapp Kabel</td>
</tr>
<tr>
<td>Terminal blocks</td>
<td>Elmex/Connect Well/Wago/Lapp India</td>
</tr>
<tr>
<td>Fuse switch units</td>
<td>L&amp;T/Siemens/ABB/Schneider/C&amp;S/GE</td>
</tr>
<tr>
<td>Potential transformer (P.T.)</td>
<td>AE/Kappa/IMP/Ashmore</td>
</tr>
<tr>
<td>HT XLPE cable jointing/</td>
<td>Raychem / M-Seal</td>
</tr>
<tr>
<td>Termination kit</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: BIDDERS HAVE TO CLEARLY INDICATE THE MAKE OF ITEMS / EQUIPMENT CONSIDERED BY THEM IN THEIR OFFER.
9.0 INFORMATION TO BE PROVIDED BY THE BIDDER

The bidder shall have to provide the following technical data and information

a) Equipment Layout drawing of sub-station
b) Single Line Drawing
c) Cable scheduling and route
d) Earthing System layout
e) HT panel critical technical data

<table>
<thead>
<tr>
<th>f) Transformers critical technical data</th>
</tr>
</thead>
<tbody>
<tr>
<td>No load losses at rated voltage &amp; frequency</td>
</tr>
<tr>
<td>Full load losses at rated current at 75 Deg. C.</td>
</tr>
<tr>
<td>Impedance at rated current &amp; frequency at 75 Deg. C.</td>
</tr>
<tr>
<td>Efficiency at full load 0.8 P.F. lagging at 75 Deg. C</td>
</tr>
<tr>
<td>Approximate quantity of oil required for first filling</td>
</tr>
<tr>
<td>Max. rise in winding temperature (above ambient temp.)</td>
</tr>
<tr>
<td>Max. rise in oil temperature (above ambient temp.)</td>
</tr>
<tr>
<td>Duration and percentage overloading : As per IS 6600</td>
</tr>
</tbody>
</table>

g) Technical data of DG set as specified in DG set detailed specifications

h) Makes of major items selected by them

STRUCTURAL

1.0 These shall be provided for fabricating platforms, pipe support service bridges.

2.0 These shall include M/s “C” class pipe, ISMS, angles, flats, bars, MS plates, chequered plate, hand rails of minimum 900 mm height, toe guard ets. The platforms shall have frame underneath and bracing members of suitable section. Acess ladders and structural supports of ‘C’ class pipe/ISMC channel shall be provided within the scope of the works for structural works quoted.

3.0 MS 5mm thick chequered plate for the trenches shall be included in the scope of work.
### List of Approved Makes

<table>
<thead>
<tr>
<th>Description</th>
<th>Makes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MILK RECEPTION, PROCESSING &amp; PACKAGING</strong></td>
<td></td>
</tr>
<tr>
<td>Crate Washer &amp; Crate conveyor</td>
<td>SHREE VISHWAKARMA / SWASTIK (Rajahmundry) / UNICORY / CHENGALVA</td>
</tr>
<tr>
<td>Electronic Weighing Machine Platform Type</td>
<td>SARTORIUS / ESSAETEROAKE / AVERY</td>
</tr>
<tr>
<td>Electronic Weigh Bridge (Pit less)</td>
<td>METTLER TOLEDO / SARTORIUS / AVERY / ESSAE-DIGITRONIX</td>
</tr>
<tr>
<td>SS Milk Pump</td>
<td>APV / LKM / GEA TUCHENHAGEN / FRISTAN</td>
</tr>
<tr>
<td>Cream Pump (screw type)</td>
<td>ROTO PUMP / ROTOMAC</td>
</tr>
<tr>
<td>PHE Type Milk Chiller/ Pasteurizer</td>
<td>APV / ALFA LAVAL / TETRA PAK / GEA - ECOFLEX</td>
</tr>
<tr>
<td>Milk &amp; CIP Houses</td>
<td>PEARL / B/LAUDIECK / GAYATRI / SAINATH RUBBER / INDUSTRIAL EQUIPMENT Co.</td>
</tr>
<tr>
<td>CIP Return Pump</td>
<td>APV / LKM / GEA TUCHENHAGEN / FRISTAM</td>
</tr>
<tr>
<td>Tri-purpose Centrifuge (manual/ self cleaning), Ghee clarifier, Serum separator</td>
<td>TETRA PACK WESTFALIA</td>
</tr>
<tr>
<td>CBMM for white butter</td>
<td>HMT</td>
</tr>
<tr>
<td>Mechanical Pouch Filling Machine</td>
<td>SAMAPRAN / NICHROME / VIJAYAPAC</td>
</tr>
<tr>
<td>Pneumatic Pouch Filling Machine</td>
<td>SAMAPRAN / NICHROME</td>
</tr>
<tr>
<td>CIP System (Automatic)</td>
<td>GEA PROCESS / APV / TETRA PAK / CHENGALVA</td>
</tr>
<tr>
<td>EPS/ PUF Insulation Materials</td>
<td>LLOYDS / BEARDSSELL / FRICK</td>
</tr>
<tr>
<td>Pre-fabricated PUF Insulating</td>
<td>LLOYDS / BLUE STAR / FRICK / CARRIER / RINAC / BERDSELL</td>
</tr>
<tr>
<td>Panels (Insulation)</td>
<td></td>
</tr>
<tr>
<td>Saddles for Cold Insulation</td>
<td>SUPERTHERM (LLOYD) / BEARDSSELL</td>
</tr>
<tr>
<td>Water Chilled Water Pumps</td>
<td>GRUNDFOS / MATHER &amp; PLATT / BEACON / KIRLOSKR / KSB</td>
</tr>
<tr>
<td>Programmable Protection relay</td>
<td>MINILEC</td>
</tr>
<tr>
<td><strong>INSTRUMENTATION, CONTROLS &amp; AUTOMATION</strong></td>
<td></td>
</tr>
<tr>
<td>VFD</td>
<td>SIEMENS / ALLEN BRADLEY /</td>
</tr>
<tr>
<td>Frequency converter</td>
<td>SIEMENS / ALLEN BRADLEY</td>
</tr>
<tr>
<td>Level Transmitter &amp; indicator</td>
<td>E &amp; h / ROEMOUNT</td>
</tr>
<tr>
<td>Temperature / Pressure Transmitter</td>
<td>E &amp; h ROEMOUNT</td>
</tr>
<tr>
<td>Conductivity &amp; pH Transmitter</td>
<td>E &amp; h ROEMOUNT / YOKAGAWA / POLYMETRON</td>
</tr>
<tr>
<td>Density transmitter</td>
<td>E &amp; a / ROEMOUNT / YOKAGAWA / KROHNE MARSHALL</td>
</tr>
<tr>
<td>RTD</td>
<td>PYROELECTRIC / ALLOT / GIC / TOSHNIWAL / RADIX</td>
</tr>
<tr>
<td>PID controller</td>
<td>YOKAGAWA / CHINO / FOXBORO / RADIIX / TATA HONEYWELL / SIEMENS / ROEMOUNT</td>
</tr>
<tr>
<td>Flow Switch</td>
<td>DANFOSS / SWITZER / IFB, Gmbh / HONEYWELL / JOHNSON</td>
</tr>
<tr>
<td>Level Switch (float type for liquid &amp; vibrati fork type for powder)</td>
<td>E &amp; H / ROEMOUNT / P &amp; F / HONEYWELL / TECHROL / SB ELECTRONICS</td>
</tr>
<tr>
<td>Vortex / Magnetic Flow meter</td>
<td>E &amp; H / ROEMOUNT / YOKAGAWA / FORBES MARSHALL</td>
</tr>
<tr>
<td><strong>Mass Flow meter</strong></td>
<td>E &amp; H / ROEAMOUNT</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td><strong>Control Valve</strong></td>
<td>DANFOSS / DEMBLA / SAMSON / AVCON /</td>
</tr>
<tr>
<td></td>
<td>TOSBRO / FISHER XOMOX / MASONELAN</td>
</tr>
<tr>
<td><strong>Pressure switch temp switch / Pressure transmitter</strong></td>
<td>DANFOSS / ALCO / HANSEN / PARKER / E &amp; H / SWITZER / CHINO / PYROTECH/</td>
</tr>
<tr>
<td><strong>Temperature transmitter / Thermostat</strong></td>
<td>ALTOP / GIC / WIKA / AMERICAN SPECIALITIES, USA</td>
</tr>
<tr>
<td><strong>Pressure &amp; Temperature Gauge</strong></td>
<td>FIEBIG / H GURU / PRICOL / WARREE / WIKA</td>
</tr>
<tr>
<td><strong>Dual type Pressure / temp gauges</strong></td>
<td>FIEBIG / H GURU / PRICOL / WARREE</td>
</tr>
<tr>
<td><strong>Temperature sensors / digital indicator / controller / recorder</strong></td>
<td>YOKOGAWA / CHINO / TATA HONEYWELL / RADOX / PYROTECH</td>
</tr>
<tr>
<td><strong>Energy Monitor</strong></td>
<td>ALLEN BRADLEY / SIEMENS / ABB / L &amp; T</td>
</tr>
<tr>
<td><strong>Voltage / Current Energy / power factor Transducer</strong></td>
<td>RISHABH / ENERCON</td>
</tr>
<tr>
<td><strong>PC ( Personal Computer)</strong></td>
<td>COMPAQ / HEWLETT- PACKARD / IBM / WIPRO</td>
</tr>
<tr>
<td><strong>PLC / DCS System</strong></td>
<td>SIEMENS / ALLEN BRADLEY / L &amp; T QUANTUM / EMERSION</td>
</tr>
<tr>
<td><strong>Automation System</strong></td>
<td>SIEMENS / ROCKWELL / TATA HONEYWELL/</td>
</tr>
<tr>
<td><strong>ELECTRICALS</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Electric Motors</strong></td>
<td>BHARAT BIJLEE / SIEMENS / ABB / NGEF / KIRLOSKAR / CROMPTION GREAVES</td>
</tr>
<tr>
<td><strong>Air Circuit Breaker</strong></td>
<td>L &amp; T SIEMENS /</td>
</tr>
<tr>
<td><strong>MCCB</strong></td>
<td>L &amp; T / SIEMENS/</td>
</tr>
<tr>
<td><strong>MPCB</strong></td>
<td>L &amp; T / SIEMENS</td>
</tr>
<tr>
<td><strong>Contactors</strong></td>
<td>L &amp; T / SIEMENS</td>
</tr>
<tr>
<td><strong>Starte Overload Relays</strong></td>
<td>L &amp; T / SIEMENS</td>
</tr>
<tr>
<td><strong>Timers Electronic</strong></td>
<td>L &amp; T / SIEMENS</td>
</tr>
<tr>
<td><strong>Switch Fuse Units</strong></td>
<td>L &amp; T / SIEMENS</td>
</tr>
<tr>
<td><strong>MCBs</strong></td>
<td>SIEMENS / L &amp; T - HAGER</td>
</tr>
<tr>
<td><strong>Push Buttons</strong></td>
<td>ESBEE / SIEMENS / GE / VAISHNO / TEKNIC</td>
</tr>
<tr>
<td><strong>Indicating Lamps</strong></td>
<td>L &amp; T / SIEMENS / VAISHNO / TEKNIC / BINAY</td>
</tr>
<tr>
<td><strong>Digital Ammeter &amp; Voltmeter</strong></td>
<td>ANERCON / CONZERV / MECO / L&amp;T / HPL SOCOMEC / CABLE</td>
</tr>
<tr>
<td><strong>Analog Ammeter &amp; Voltmeter</strong></td>
<td>RISHABH / IMP / MECO / AE</td>
</tr>
<tr>
<td><strong>Digital Energy Meter</strong></td>
<td>ENERCON / L&amp;T / HPL SOCOMEC / CADEL / AE / INDIAMETER / CONZERV</td>
</tr>
<tr>
<td><strong>Analog Energy Meter</strong></td>
<td>GEC / UNIVERSAL / HAVEL / JAIPUR METERS</td>
</tr>
<tr>
<td><strong>PVC Conduit &amp; accessories</strong></td>
<td>PRECISION / CLIPSAL / P-PLAST</td>
</tr>
<tr>
<td><strong>Power Factor Meter</strong></td>
<td>RISHABH / IMP / MECO / AE</td>
</tr>
<tr>
<td><strong>Current Transformer</strong></td>
<td>KAPPA / MECO / AE / IMP / INDCOIL / KALPA</td>
</tr>
<tr>
<td><strong>LT Power Cables</strong></td>
<td>CCI / FORT GLOSTER / RPG ASIAN / INCAB / FINOLEX / UNIVERSAL / NICCO / POLYCB</td>
</tr>
<tr>
<td><strong>LT Copper Control Cable</strong></td>
<td>CCI / RPG ASIAN / FINOLEX / RR KABELS (UNILAY) / FORT GLOSTER / LAPP KABEL</td>
</tr>
<tr>
<td><strong>Signal &amp; Instrument cable</strong></td>
<td>LAPP KABEL / POLYCB / THERMOPAD</td>
</tr>
<tr>
<td><strong>Power Capacitors</strong></td>
<td>EPCOS / MEHER / KHATAU JANKAR / SIEMENS / UNISTAR / MOMAYA</td>
</tr>
<tr>
<td><strong>APFC Relay</strong></td>
<td>L&amp;T / BELUKE / EPCOS / PHASITRON / MECO</td>
</tr>
<tr>
<td><strong>Cable Tray</strong></td>
<td>INDIANA / MEK / SUNRISE / SUPER / PILOCO / ELCON / METALICA PRESSINGS / POWER CONTROLS</td>
</tr>
<tr>
<td><strong>Isolating Switches</strong></td>
<td>SIEMENS / L &amp; T / ABB SCHNEIDER</td>
</tr>
<tr>
<td><strong>HRC fuses</strong></td>
<td>L &amp; T / SIEMENS / EE / C&amp;s / BUSMAN / GE POWER</td>
</tr>
<tr>
<td><strong>IP 55 boxes for motor isolators, push buttons, junction boxes etc.</strong></td>
<td>HENSEL / RITTAL / HANSU</td>
</tr>
<tr>
<td><strong>Plug &amp; Socket</strong></td>
<td>B;CH / LEGRAND / CLIPSAL</td>
</tr>
</tbody>
</table>
### Terminal Blocks
- WAGO
- LAPP INDIA
- CONNECT WELL
- ELMEX

### Electronic Load Manager
- ENERCON
- KRYKARD
- L&T

### Rotary Selector Switch
- KAYCEE
- SALZER
- L&T
- SIEMENS
- TEKNIC

### Cable Glands
- COMET EX-PROTECTA
- DOWELS
- LAPP KABEL
- BRACKO

### Cable Lugs
- DOWELS
- COMET
- LAPP KABEL

### Mechanical Interlock
- L&T
- SCHNEIDER
- ABB

### Electronic Soft Starter
- SIEMENS
- L&T

### Programmable Protection Relay
- MINILEC

### Servo Voltage Stabilizer
- SUVIK
- APLAB
- NEEL
- CRYCARD

### UPS
- NUMERIC
- EMERSON-LIEBERT
- AP
- HIREL
- DB ELECTRONICS
- APLAB

### SMF Battery
- EXIDE

### VALVES & PIPES (MS & GI)

#### Water Valves (Butterfly / Ball)
- SAUNDERS
- AUDCO
- INTERVALVE
- BDK
- CRESCENT
- LEADER

#### Water Valves (Diaphragm)
- SAUNDERS
- BDK

#### Non-return Valve for water
- AUDCO
- INTERVALVE
- BDK

#### Water Foot Valve
- KIRLOSKAR
- GG
- LEADER

#### GI Pipes for water
- TATA
- JINDAL

#### MS Pipes for air, steam & condensate
- TATA
- INDAL

#### NRV for air / Oil Line
- INTERVALVE
- AUDCO

#### Solenoid Valve for Water line
- AVCON

#### Water Flow Meter
- DASHMESH
- ANAND ASAHI
- KENT

#### FO flow meter
- TOSHNIWAL
- KENT
- GHEMTROL

#### HP/ LP Steam / condensate Valves
- AUDCO
- CRESCENT
- LEADER
- THERMAX
- BDK

#### Steam relief valve, traps &
- SPIRAX
- MAZDA
- SAMSON
- THERMAX

#### Strainers

#### Expansion bend for steam line
- JN MARSHALL
- MAZDA

#### Steam Pressure Reducing Valve
- SPIRAX
- MAZDA

#### Steam Pressure Reducing Station
- JN MARSHALL
- SPIRAX
- MAZDA

### SS PIPES & VALVES

#### SS Pipes
- RATNAMANI
- BHANDARI FOILS & TUBES
- NEEKA TUBES
- DECORA
- APEX TUBES

#### SS seat type Pneumatic Valves
- LKM
- APV
- GEA TUCHENHAGEN

#### Ss B:utterfly/ Ball type pneumatic valves
- LKM
- IDMC
- RECOTON (Howrah)
- KPSAR (Delhi)
- INDUSTRIAL AIDERS (Delhi)
- INDUSTRIAL AIDERS (Chennai)

### SS Manual Valves & Fittings
- LKM
- IDMC
- RECOTON (Howrah)
- KPSAR (Delhi)
- INDUSTRIAL AIDERS (Delhi)
- dairy engineering (Chennai)

### Refrigeration & AIR COMPRESSORES & AIR LINE FITTINGS

#### Ammonia Compressor (Hi Speed)
- Frick
- Kirloskar

#### PHE
- GEA
- Alta Level

#### Cooling System

#### Air Compressor (Screw)
- ATLAS COPCO
- INGERSOLL RAND
- ELGI
- KIRLOSKAR

#### Air Compressor (Reciprocating)
- INGERSOLL RAND
- ELGI
- KIRLOSKAR
- KHOSLA

#### Refrigerated Air Dryer
- ELGI
- SABROE
- CHICAGO PHEUMATIC
- HIRAS

#### Air lines accessories
- SHAVO NORGEN
- FESTO
- AIRMATIC
- LEGRIS
- NUCON

#### Auto Drain Valve
- ULTRA FILTER
- ZANDER

#### Fuel Oil Pumps
- ROTODEL
- DELTA
- TUSHACO

#### Resin bonded mineral wool
- LLOYD
- UP TWIGA
- MINWOOL
- ROCKWOOL
<table>
<thead>
<tr>
<th>LABORATORY EQUIPMENT</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Softening Plant</td>
<td>ION EXCHANGE / THERMAX</td>
<td></td>
</tr>
<tr>
<td>RO Plant</td>
<td>ION EXCHANGE / THERMAX</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LABORATORY EQUIPMENT</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Acidometer</td>
<td>METROHM / FOSS ELECTRIC / RADIOMETER</td>
<td></td>
</tr>
<tr>
<td>pH Meter</td>
<td>METROHM / FOSS ELECTRIC / RADIOMETER</td>
<td></td>
</tr>
<tr>
<td>Milk- O- Scanner</td>
<td>FOSS ELECTRIC / FUNKE GERBER / REIL</td>
<td></td>
</tr>
<tr>
<td>Auto Sampler</td>
<td>FOSS ELECTRIC</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MISCELLANEOUS ITEMS</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Geared Motor / Gear Box</td>
<td>[BL / POWER MASTER / ELECON / RADDICON / SHANTHI GEARS / IC BAUER / BON FIGOLIC / EURO DRIVES</td>
<td></td>
</tr>
<tr>
<td>Steam- Water Mixing Battery</td>
<td>SPIRAX SHREE VISHWAKARMA / SWASTIK (Rajahmundry) / CHENGALVA / UNICORN</td>
<td></td>
</tr>
<tr>
<td>Structural steel</td>
<td>SAIL / TISCO / RINL / LISCO / ESSAR</td>
<td></td>
</tr>
<tr>
<td>Plastic Crates for Milk Pouch</td>
<td>SUPREME / NEELKAMALS</td>
<td></td>
</tr>
<tr>
<td>Ammonia Compressor</td>
<td>Kirloskar / Frick</td>
<td></td>
</tr>
<tr>
<td>PHE for IBT.</td>
<td>GEA / Tetra pack / Any Standard make</td>
<td></td>
</tr>
<tr>
<td>Burner for Boiler (duel type)</td>
<td>Weishipt make only</td>
<td></td>
</tr>
</tbody>
</table>
Technical Specification of Powder Plant

**GENERAL DESCRIPTION**

The Milk Powder Plant will be of 30 MTPD capacity on 20 hours continuous operation and will be designed to produce agglomerated SMP, Whole Milk Powder (lecithinated or non-lecithinated) & dairy whitener. The Powder Plant will be designed to concentrate the milk and produce Skimmed Milk Powder / Whole Milk Powder / Dairy Whitener and then either to be machine packed in 25- kg bags or consumer packing in semi automated machine by transferring the powder manually from bag to machine hopper. The consumer packing will be done in 250 g & 500 g lined carton packaging on a semiautomatic machine with nitrogen flushing arrangement. The plant offered will be of high efficiency and based on the latest technology while operating on the main product i.e. SMP, facilitating the following:

- Optimum utilities consumption and thereby lower operating cost in evaporation & drying plants.
- Multiple effect falling film evaporation plant with thermo vapour recompresses
- Minimum stack losses
- General design of Three Stage Dryer
- Powder quality will comply with Indian and international standards. The product will confirm to EEC standards 2248/ 86 dated 17-07-86 (L196/27) as amended up- to date and ADMI extra grade quality standards when packed.

The product quality, energy consumption, utility & chemical consumption along with product losses on SMP, WMP & dairy whitener operations will be furnished by the powder plant supplier. The mass flow data related to evaporation and drying required will be as follows:

The plant will produce agglomerated SMP, WMP (lecithinated), and Dairy Whitener.

**Evaporation Plant Capacity :**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial TS</td>
<td>8.5%</td>
</tr>
<tr>
<td>Total skim milk handled per Day</td>
<td>340600 kg</td>
</tr>
<tr>
<td>Milk flow rate</td>
<td>17030kg/hr</td>
</tr>
<tr>
<td>Water evaporation</td>
<td>14014kg/hr</td>
</tr>
<tr>
<td>Concentrate at 48% TS</td>
<td>3016 kg/hr</td>
</tr>
</tbody>
</table>

**Drying plant capacity :**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMP 3.5% moisture</td>
<td>1500 kg/hr</td>
</tr>
<tr>
<td>Water evaporation</td>
<td>1516kg/hr</td>
</tr>
</tbody>
</table>

The Milk from process section of the Dairy will be transferred to the inlet header of two 30 KL milk silo of evaporating plant for storage, blending and transfer to feed balance tank in the powder plant. The skimmed Milk of 8.5% TS or the desired TS in case of WMP / Dairy Whitener from process section will be fed to inlet header of the milk silos and then fed to the balance tank of Evaporator. In the Evaporator, milk will be concentrated to 45% TS minimum. This concentrate will be fed to the Spray Dryer and will be discharged as milk powder with desired residual moisture as stated above. The powder will be packed in either 25 Kg bags in a bag filling machine at the outlet of the sifter or stored in powder silo (in future as powder silos & powder conveying are not part of this contract) for bagging/consumer packing. Bagged powder will be conveyed to the powder store located at the ground by suitable mechanized conveyor. Powder dispatch will be from store at ground floor. The plant will have the facility for consumer packing of WMP/ dairy whitener in 250 gms & 500 gms with nitrogen gas.
flushing system ink semiautomatic lined carton packing machine. Nitrogen bottle bank will be in the scope of Purchaser and only Nitrogen manifold with necessary valves, pressure reducing and distribution arrangement are included in the scope of this contract. The plant will be operated through DCS system.

The CIP of milk silos for evaporation plant, balance tank, evaporating plant, concentrate handling system and the spray drying plant will be carried out by an independent CIP system. CIP of the milk line from dairy to powder plant milk silos will be in the scope of Purchaser. Concentrated solutions to acid and lye buffer tank will be fed from the bulk acid & lye storage tanks as per the requirements and level controls of the buffer tank.

Evaporation plant will be of falling film design for concentration of Skimmed Milk / Whole milk / Dairy Whitener from initial concentration to final concentration of 48%. The evaporating plant, in order to achieve the designed concentrate parameter, will be provided with a multi pass main calandria attached to TVR as per supplier’s design. The design details of the evaporation plant and consumption of services and utilities as submitted by the powder plant supplier are attached.

From the balance tank milk will be pumped to a shell & tube pre-heater where it will get preheated by vapour from last effect to a desired temperature and then in a hemophilic vessel. In hemophilic vessel, the heating would be by vapour & steam with the help of thermo compressor. The thermo compressor will suck the vapour from appropriate location depending on the design. Milk from hemophilic vessel will pass through two stages Flash Heating, DSI, Holding Tube, Flow Plates and filter / Hydro cyclone to the top of the first calandria, where it will be distributed into the tubes that run from the top to bottom. The product will form a film on the inside of the tubes as it falls down the length of the tubes. On the outside of the tubes, the steam / vapours condense & give the necessary heat required for water evaporation in the tubes. The product is collected at the bottom of the calandria and is progressively concentrated to the desired level of solids in the subsequent passes using thermo vapour re-compressor system.

The condensate from the pant will be continuously monitored and controlled. The steam condensate from air heater (steam radiator type) and the first effect condensate will be sent to the boiler feed water tank and that from the remaining effects to 15KL condensate water storage tank. The condensate from this tank will be used for restarting of the plant, CIP purpose and floor washing etc. The excess water will be pumped from condensate recovery tank to main underground raw water sump tank of premiers.

The seal cooling water and the vacuum pump water will be collected at one place and put it to cooling water basin/ tank as make up water. The Evaporator will operate for 20 continuous hours without requiring CIP and with no re-circulation. The CIP operations of evaporating plant will be carried out through the CIP system dedicated for the powder plant.

The concentrated milk collected in the concentrate tank will be pre heated and pumped to dryer through high- pressure pump and homogenizer. The drying section will be a Multi Stage Nozzle atomizer type Spray Drying plant along with fines return, integrated fluid bed and Vibro Fluidizer to achieve the required product quality. This System will consist of a suitable Spray Dryer and all the necessary product and air handling equipment to produce milk powder of desired quality. The powder will be packed in 25 Kg Kraft Paper bags in a bag filling machine through a powder surge bin provided at the outlet of the Sifter.

The plant will have facility to place the dense phase conveying system in future. In building layout provision will be made for the milk powder storage silos and the subsequent down conveying (to be installed in future) up to 25 kg bagging line or the flexi pouch / lined carton packing with conveyors.

The CIP of the Concentrate Feed section and the Spray Drying Section will be carried out through dedicated CIP system provided for the powder plant. The Purchaser will provide steam and Water at one point in the Evaporator section. The powder plant supplier will supply suitable rating powder cable including termination from PCC to the MCC in the Evaporation /Spray Drying plant. Termination in Dryer MCC and further distribution is also to be done by the powder plant supplier.
The control automation system for the milk powder plant should be distributed control system (DCS) based. All the operations from skimmed milk pump in the process section through evaporation and drying sections till product outlet including CIP operations will be fully automated and will be controlled from Powder Plant control room. However, the automatic operation through DCS will take place after necessary process connections are set manually for configuration of evaporator, Dryer and the CIP recirculation system.

The control system will include starting operation, operation on product, normal shut down, emergency shut down and CIP. Necessary controls & Instrumentation will be provided accordingly.

The automation system will be capable of operating continuously and will be able to record and report necessary production parameters. It will comprise of a DCS with digital input/output to plant. It will be have one operation station/graphics terminals for evaporation drying, with picture in picture facility for various sub-sections. Necessary inkjet and dot matrix printers for printing out MIS & alarm reports will be provided. The automation system will include an adequate rating true online UPS system having minimum backup time to 30 minutes.

The operator console will display the mimics, the trend curves, bar graph indication, alarm, history, maintenance schedule etc. PID controllers will be implemented through software. A small air diffuser of chilled water with re-circulation fan or decorative type split air conditioner (included in powder plant supplier scope) will be provided for cooling the Control Room.

The powder plant supplier will be responsible for the supply and erection of all equipment, pipe work, process valves and fittings, access ladders and maintenance platforms, railings, instrumentation, electrical equipment, power and control cables, earthing network, switchgears, controls electronic systems and automation.

All parts coming in contact with product will be in stainless steel AISI 304 and concentrated CIP solution in AISI 316. Acid buffer and solution tanks and interconnecting piping will be AISI 316.

Compressed air generation, transmission & distribution including air dryer ad receiver for valves and controls in the plant are included in the scope of powder plant supplier. Chilled water supply & return lines will be provided by Purchaser at one point in the Evaporator section. The Purchaser will provide the service bridge between the Liquid Milk Plant & the Powder Plant as per requirement.

**Basis of Design**

The proposed milk powder Plant will be designed to manufacture agglomerated skim milk powder at 30 MTPD capacity. The plant will also be able to produce the agglomerated whole Milk powder (lecithinated), Dairy Whitener (DW) & IMF at 20 hour continuous operation.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Powder Specification for Agglomerated Powder</th>
<th>SMP</th>
<th>WMP (Lecithinated)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fat</td>
<td>&lt; 1 %</td>
<td>&lt; 22 %</td>
</tr>
<tr>
<td>2</td>
<td>SNF</td>
<td>&lt; 96 %</td>
<td>75.2 %</td>
</tr>
<tr>
<td>3</td>
<td>Moisture</td>
<td>&lt; 3.5 %</td>
<td>&lt; 2.8 %</td>
</tr>
<tr>
<td>4</td>
<td>Sugar</td>
<td>NIL</td>
<td>NIL</td>
</tr>
<tr>
<td>5</td>
<td>Insolubility Index</td>
<td>0.1 ML</td>
<td>0.3 ML</td>
</tr>
<tr>
<td>6</td>
<td>Bulk Density (gm/cc)</td>
<td>0.42-0.50</td>
<td>0.42-0.50</td>
</tr>
<tr>
<td>7</td>
<td>Scorched Particle</td>
<td>Disc A</td>
<td>Disc A</td>
</tr>
<tr>
<td>8</td>
<td>Wettability at 49º C</td>
<td>&lt; 30 sec</td>
<td>&lt; 30 sec</td>
</tr>
<tr>
<td>9</td>
<td>Dispensability (min) %</td>
<td>85 %</td>
<td>85 %</td>
</tr>
<tr>
<td>10</td>
<td>Stack Losses</td>
<td>Upto</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Free Fat (without lecithination)</td>
<td>&lt; 1 %</td>
<td>&lt; 1 %</td>
</tr>
</tbody>
</table>
- Insolubility index for final spray dried powder will be the rise over to feed insolubility index (feed to Evaporation plant) i.e. the above insolubility index figure is differential 
  value contributed by Evaporation & the spray dryer.
- The insolubility index figures are based on protein content- max 38 % on solids non-fat.
- Fat and SNF percentage in the powder will depend of initial milk composition made available by the purchaser.
- The above powder specification is for the measurement of property at Ex-vibro fluidizer.

The scope of supply for the powder plant mainly will comprise of the sections.

<table>
<thead>
<tr>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 Milk Formulation</td>
</tr>
<tr>
<td>2.0 Evaporation Plant</td>
</tr>
<tr>
<td>3.0 Multiple effect, multiple pass falling film evaporation plant using suitable TVR System</td>
</tr>
<tr>
<td>4.0 Condensate recovery system</td>
</tr>
<tr>
<td>5.0 Concentrate Recovery and dilution system</td>
</tr>
<tr>
<td>6.0 Spray Drying Plant</td>
</tr>
<tr>
<td>7.0 Three stage Draying Plant</td>
</tr>
<tr>
<td>8.0 Air Heating System</td>
</tr>
<tr>
<td>9.0 Lecithination System</td>
</tr>
<tr>
<td>10.0 Bulk Packing, Storage and conveying System</td>
</tr>
<tr>
<td>11.0 CIP System</td>
</tr>
<tr>
<td>12.0 Compressed Air System</td>
</tr>
<tr>
<td>13.0 Instrumentation &amp; Automation</td>
</tr>
<tr>
<td>14.0 Electrical Distribution System</td>
</tr>
<tr>
<td>15.0 Services &amp; Utilities</td>
</tr>
</tbody>
</table>

**Milk Formulation**

This section comprise of milk intake silo, sugar handling & syrup preparation including vitamins / minerals blending unit.

Milk will be made available at the inlet of two nos. 30 KL level controlled milk silo of evaporating plant for storage, blending and transfer to evaporation balance tank. Suitable valve battery will be provided for filling and emptying of the silos. The CIP for milk supply line will be done by the dairy plant CIP system.

Sugar bags will be made available in the storage room by the purchaser. The sugar handling scheme will comprise of transfer of sugar bags, syrup preparation in vats, filtration of syrup and bending of sugar syrup with the milk in storage silos. Sugar arriving in the storage room will be transferred by the means of overhead electric hoist and taken to the sugar hopper, where the sack can be cut open manually for uploading the sugar into the hopper for the preparation of sugar syrup in the sugar vat. The sugar will be dissolved and stored in two sugar solution vats. After proper dissolving of sugar the syrup is forwarded to milk silo through duplex filter (bucket type) as per requirement. Arrangements will be made for blending of ingredients viz vitamins & minerals with milk in silos of evaporation section as per requirement. Two nos. of metering pump for dosing of vitamin in each silo together with water push arrangement will be provided.
**Evaporation Plant**

Multiple effects, multiple pass falling film evaporation plant using suitable TVR system.

General Design Parameters of Evaporation Plant Will be as follows.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Parameter</th>
<th>Units</th>
<th>SMP Design</th>
<th>WMP Indicative</th>
<th>IMF Indicative</th>
<th>D.W Indicative</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Feed rate</td>
<td>Kgs/h</td>
<td>17030</td>
<td>12628</td>
<td>6342</td>
<td>6342</td>
</tr>
<tr>
<td>2.</td>
<td>Feed concentration</td>
<td>% TS</td>
<td>8.5</td>
<td>12.0</td>
<td>14.0</td>
<td>14.0</td>
</tr>
<tr>
<td>3.</td>
<td>Feed temperature</td>
<td>Deg C</td>
<td>4-10</td>
<td>4-10</td>
<td>4-10</td>
<td>4-10</td>
</tr>
<tr>
<td>4.</td>
<td>Water evaporation</td>
<td>Kgs/h</td>
<td>14014</td>
<td>9471</td>
<td>4492</td>
<td>4492</td>
</tr>
<tr>
<td>5.</td>
<td>Concentration flow rate</td>
<td>Kgs/h</td>
<td>3016</td>
<td>3157</td>
<td>1850</td>
<td>1850</td>
</tr>
<tr>
<td>6.</td>
<td>Product conc.</td>
<td>% TS</td>
<td>48</td>
<td>48</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>7.</td>
<td>Product temp.</td>
<td>Deg C</td>
<td>54</td>
<td>49</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>8.</td>
<td>Pasteurizing temp.</td>
<td>Deg C</td>
<td>90</td>
<td>120</td>
<td>120</td>
<td>90</td>
</tr>
<tr>
<td>9.</td>
<td>Condenser</td>
<td>As per design</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Water inlet temp. to condenser</td>
<td>Deg C</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Cooling system</td>
<td></td>
<td></td>
<td>Cooling tower</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Cont. operation without CIP</td>
<td></td>
<td>20 hrs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>Pre heater</td>
<td></td>
<td>Shell &amp; tube type and direct contact type for</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Boiling temp.</td>
<td>Deg C</td>
<td></td>
<td>First effect temperature will not exceed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Cleaning system</td>
<td></td>
<td>Through DCS / high end PLC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Design will be based on the following products & utilities to be provided by the purchaser:

- **Milk quantity**: Milk passing Clot-on-bolt test, 60 % (min) alcohol test
- **Steam**: Min 98 % dry, free from foreign matter/ Chemicals
- **Water**: Soft water only
- **Electricity**: 415 V ± 5 %, 50 ± 3 % Hz AC supply

All parts coming in contact with product & CIP solution will be in Stainless steel AISI 304. All internal weld joints coming in contact with the product and for uninsulated external surfaces will be left un-ground. External and internal surface finish will be retained as original mill finish up to extent possible. All welds for the process lines and equipments will be TIG welding only.

**CONDENSATE RECOVERY AND DILUTION SYSTEM**

A suitable Condensate recovery system will be provided with suitable capacity insulated tank with partitions, pumps, valves etc. to receive condensate from all sections. The clean condensate from the first effect will be pumped. Boiler feed water tank and condensate from other effects will be stored in the second compartment and will be used as CIP make up water or during plant start up water or for floor
cleaning. In addition to above, condensate from steam radiators will also be recovered and returned to Boiler Feed Water Tank.

**CONCENTRATED RECOVERY AND DILUTION SYSTEM**

In order to recover the solids from evaporation & dryer emergency and water flushing, 2 Nos concentrate recovery tank of 5000 L capacity will be provided along with pumps & piping. A mixing valve for online mixing will be provided to enable dilution of the concentrate before returning it to liquid milk processing section.

**Spray Drying Plant**

**Three Stage Drying Plant**

The General Design Parameters of Spray Drier (Three Stage – Drying chamber, integrated Static Fluid Bed, Vibro Fluidizer) will be as follows:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Parameter</th>
<th>Units</th>
<th>SMP Design</th>
<th>WMP Indicative</th>
<th>IMF Indicative</th>
<th>D.W. Indicative</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Feed Rate</td>
<td>Kgs/Hr</td>
<td>3016</td>
<td>3157</td>
<td>1850</td>
<td>1850</td>
</tr>
<tr>
<td>2</td>
<td>Feed concentration</td>
<td>% TS</td>
<td>48</td>
<td>48</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>3</td>
<td>Product rate (Ex-VF)</td>
<td>Kgs/Hr</td>
<td>1500</td>
<td>1559</td>
<td>913</td>
<td>913</td>
</tr>
<tr>
<td>4</td>
<td>Product moisture</td>
<td>%</td>
<td>&lt; 3.5</td>
<td>&lt; 2.8</td>
<td>&lt; 2.8</td>
<td>&lt; 2.8</td>
</tr>
<tr>
<td>5</td>
<td>Evaporation Rate</td>
<td>Kgs/hr</td>
<td>1516</td>
<td>1598</td>
<td>937</td>
<td>937</td>
</tr>
<tr>
<td>6</td>
<td>Product temp ex-VF</td>
<td>Deg C</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>7</td>
<td>Inlet Air Temp to Dryer</td>
<td>Deg C</td>
<td>190</td>
<td>185</td>
<td>185</td>
<td>185</td>
</tr>
<tr>
<td>8</td>
<td>Ambient air Temp.</td>
<td>Deg C</td>
<td>30 Deg C</td>
<td>10 Deg C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Air Heating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Safety Features</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Fines return</td>
<td>Gm/cc</td>
<td>For Proper agglomeration maintaining B.D. 0.42-0.50 outlet of sifter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Cyclone</td>
<td></td>
<td>Efficiency of Cyclone system to be maintain stack loss less than 1.0 %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Integrated fluid bed</td>
<td></td>
<td>As per design</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Design will be based on the following site condition & utilities to be provided by the purchaser.

- **Air** Ambient air temp 30 Deg C & humidity 18 g/Kg of Dry air
- **Steam** Min 98 % dry, free from foreign matter/chemicals at pressure of 15 Kg/sqcm
- **Water** Soft water only
- **Electricity** 415 V± 5 % 50 ± 3 % Hz AC supply

All parts in contact with the product, except for gaskets, shall be stainless steel AISI 304, internal surfaces in contact with product shall be of finish 2B/2D. The welds shall be ground to 150 grit. External surfaces shall be of 2B / 2D finish and the welds shall be left ungrounded.

**3.2 AIR HEATING SECTION**

**Steam Radiator type Air Heater**

A steam radiator shall be provided for supplying required temperature hot air to the spray drying chamber.
For this steam @ 15kg/ sq cm (g) shall be made available at one point outside the powder plant building as per the battery limit. Steam radiator shall have two heating sections preheating of air by condensate and then final heating by steam.

Location of steam radiator shall be spray drying plant area at a suitable level to minimize the heat losses.

3.3 **LECITHINATION SYSTEM**

The lecithination system shall be suitable to lecithin ate fat containing whole milk / other milk powders to improve their instant properties. The system shall comprise of lecithin mixing tank, transfer pumps, lecithin dosing unit, pipes & fittings instrumentation and control system.

3.4 **BULK PACKING STORAGE AND CONVEYING SYSTEM**

Milk powder as discharged at vibratory shifter of powder plant shall be sent through a surge bin to either powder packing in 25 kg bag or consumer packing with nitrogen flushing arrangement.

The bag filling system shall consist of electronic gross weighed for accurate filling, weighing & bag holding, impulse heat sealing machine and stitching machine. The detail scope of supply is mentioned in subsequent sections.

The equipment layout shall have provision for future installation of powder storage silos on load cells complete with bin activators, SS 303 rotary valves, high & low level switches and dust collectors, dense phase conveying of powder with air dehumidifier of suitable rating and down conveying of milk powder from powder silos to either bag filling machine, or consumer pack filling machine.

4.0 **CIP SYSTEM**

A WELL-DESIGNED TYPICAL DAIRY STANDARD AUTOMATED Clean- In-Place System shall be provided for entire evaporation & drying plant. CIP station shall have minimum two numbers of circuits. All the pipe lines and storage equipments shall be cleaned on each emptying if the gap is more than one hour before handling of next product. Each route shall have different flow, temperature and time duration act point and operator can change this recipe configuration from man-machine interface with use of password facility.

It shall be designed for maximum recovery of CIP solution, milk and water using conductivity transmitter on CIP return lines. CIP chemicals shall be dosed in CIP tanks automatically as per set points given by operator. All CIP operations shall be carried out from control station. Status of each program for particular route is available on Human-Machine Interface. All the drains from CIP system shall be taken outside the room and terminated in the drain/ manhole chamber.

CIP station shall have CIP tanks, plate heat exchangers, filters, pumps, valves and fittings etc. The system shall be operated and controlled from control station. The details of the on-
going CIP program shall be displayed in the control station. The system shall be totally secured against the mixing of cleaning solutions with the products in case of malfunction in the system or power failure. The system shall be fully automatic and pre-programmed. However, it shall be possible to select/modify the cleaning sequence and duration from the control station.

High and low level probes shall automatically control levels of chemicals in the service tanks. Necessary please & fittings with pneumatic seat valves shall be provided.

**CLEANING PROGRAM:**

The CIP system shall generally have the cleaning program/sequence detailed below:

- Water Pre-rinse
- Hot Detergent circulation
- Hot/cold water rinse
- Hot Acid circulation
- Hot/cold water rinse
- Hot water Sterilization
- Mains soft water rinse

The system shall facilitate bypass of any operation from the above sequence of programs. At the end of detergent and acid cleaning, the solution shall be recovered with the help of sensor provided in the return line and substandard solutions shall be automatically diverted to the drain. The concentration of detergent and acid shall be maintained with the help of an automatic dosing system equipped with conductivity problems. Chemical dosing shall not be done during the CIP cleaning process. Between each successive cleaning cycle the conductivity meter installed on the tanks shall measure the strength of the cleaning solution. If the strength is found less, dosing shall be done automatically. Suitable numbers of conductivity meters, pneumatic seat valves and other necessary fittings/instruments shall be provided for guiding CIP solutions to the respective tanks or drain. Intermediate rinse shall be plain hot/cold water. This should be recovered and reused after acid recirculation. The alkaline/acidic traces shall be removed with the help of cold/hot water. Hot water rinse shall ensure satisfactory cleaning of the lines and equipment. Final rinse water shall be recovered in the pre rinse/recuperation tank. The completion of CIP of every circuit shall be recalled on the screen on demand. The temperature and concentration of cleaning solutions shall be continuously monitored and corrected automatically. In case of non-compliance of any of the parameters, the sequence shall remain suspended for such time and resume to "NORMAL" when corrected. The route for CIP circulation shall be pre-programmed. The solution spray shall be through spray balls. CIP return pumps at each circuit. If the program execution stops at any particular step due to power failure or fault, then commencement of program execution shall be from the same step where the program was terminated after restoration of power/rectification of fault with the help of reset switch.

Arrangements shall be made to ensure that adequate quantity of the cleaning solutions at the desired temperature and pressure reach the equipment to be cleaned. Each CIP unit return lines from each CIP circuit shall be equipped with a conductivity probe and a temperature transmitter. The conductivity probes shall detect the interface between detergent/acid solution and inset water, and shall be used to control various routing valves in each circuit return line. These probes shall also detect substandard solutions and divert them to drains. The temperature transmitter shall monitor temperature of water returning during hot water sterilization cycle.

Within each CIP unit, appropriate valve manifolds shall be provided for the CIP circuit to operate independently and for routing of various cleaning fluids to the required section of the process plant. Additional manifolds shall be provided to allow cleaning fluids to be recovered re-circulated or drained.
The equipment/ pipelines/ tanks being cleaned under each circuit and the number of circuits being used in each system shall be indicated.

Pneumatically operated drain valves shall be provided in all low points of the system pipe work to ensure the lines are fully drained. The cleaning programs shall have safety interlocks to ensure isolation of the relevant circuit in a section before a cleaning cycle starts. Operation of each CIP unit shall be fully automatic and shall be controlled from the DCS. The operator shall select individual cycles/ circuit and cleaning initiated from the main control room.

5.0 COMPRESSED AIR SYSTEM

It shall be packaged type, non-lubricating air compressor of reciprocating type to generate dry, clean and oil free compressed air at required pressure in requisite quantity. The air compressor system shall be designed to meet the peak demand. The system shall be provided with 100% standby capacity (One working and one standby). The system also shall be supplied with necessary controls and instruments, air drier, filter, air receiver and with all other accessories. The capacity of air compressor, selected by the powder plant supplier, shall meet the peak requirement of compressed air for the entire pneumatic and instrumentation operation of evaporation, drying and packing system of the powder plant under scope of this contract.

6.0 INSTRUMENTATION & AUTOMATION

The entire Control & Automation (C&A) system shall be designed, supplied and commissioned to enable the operator to operate the Powder Plant in a safe, efficient and reliable manner, without exceeding plant operational limits and ensuring the overall performance guarantee conditions. The C&A System shall be designed utilizing state-of –the- art technology to ensure:

- High degree of System availability and reliability.
- Extensive diagnostic capability to pinpoint failure areas.
- Low downtime and high meantime between failures.
- System flexibility and modular expansion capability.
- Safety of the main equipment, system and operating personnel.
- Consistent product quality
- Open connectivity using OPC (Client Server architecture)
- Hot swappable system modules.

The C & I System shall be configured to perform the following basic functions:

- Start-up and shutdown of major equipment of the plant maintaining the operating conditions.
- Regulation functions for various valves to achieve guaranteed performance.
- Acquisition, display and archiving of plant data and generation of reports.

The entire operation and monitoring under all regimes of operation i.e., start-up, normal operation, shutdown etc., shall be possible through operator’s consoles in Control Room. HMI (Human Machine Interface) panel shall be used for control & monitoring of milk reception/ processing activity and shall be connected to the main control network for interfacing with the main DCS system.

Communication of all field instruments (like Process Transmitters, Flow meters, Process Switches, Control Valves, Actuated Valves & Solenoid Valves) with DCS shall be through hard wired (4- 20 mA) signal output and all instruments connection between local junction box to DCS RIO panel shall be through hard wire. RIO panel to DCS CPU connection shall be through Field bus. All Control valves & Actuated Valves are Hard wired type connected through local junction boxes to RIO panel. Instruments shall be Smart type. All process operations are considered as automatic with DCS operation.
The system should be provided with regulating and control system loops consisting of Transmitter, Electronic controller and control valve—Instrumentation and control scheme of the evaporator plant should essentially comprise of following:

- Steam pressure monitoring & Control
- Temperature monitoring at various location.
- Vacuum indication & Control.
- Feed flow monitoring & control
- Final concentrate density monitoring & control.
- Condensate conductivity monitoring.
- Utility measurement, monitoring and recording.
- Audio visual Alarms.

7.0 ELECTRICAL DISTRIBUTION SYSTEM

The powder plant supplier shall arrange and lay power cable of suitable rating & no. of runs from outgoing feeder of PCC to incoming feeder of the evaporation & drying sections MCCs through XLPE aluminum conductor armored cables and terminate at incoming feeders. From thereon it shall be responsibility of the powder plant supplier to design a suitable electrical System as per the latest IS specification, Indian electricity rule, including special requirements of concerned state electricity Inspectorate. The system shall be designed to receive, control & distribute electrical power at 415V, 50 Hz AC in sheet steel housing powder coated finished in Siemens grey. The acceptable variation in voltage is ±3%.

The scope would consist of design, supply, installation, testing and commissioning of Motor Control Centers and ancillary panels with complete switchgears & electrical for the entire plant.

Required quantity of armored cable, copper control cable, instrument cable, SS cage / perforated type cable trays, GI drop conduit pipe, Plate type earth pit, earthing conductors, load break Isolators / PB station near motors for emergency isolation, rubber mats for panels etc. shall be provided. Power cable shall be suitable for use on 415V system, shall be of 1100 V grade, Aluminum conductor, XLPE insulated, armored and overall PVC sheathed strictly as per IS; 7098 (Part 1)/88 amended up to date). The specification for control cable shall be same as described for power cable but with Copper conductor in place of Aluminum.

The electrical installation shall be carried out as per respective clause of the tender (Chapter Electrical Installation of the tender – Part IV). The detailed specification of the required Electrical System is provided in subsequent sections.

Motors below 10 HP shall have DOL starter whereas that of 10 HP & above rating shall be provided with soft starter. All the MCC feeders shall have 2 nos. digital input & 1 no. digital outputs.

Providing & laying power cables of suitable rating and no. of runs (considering load of future expansion) from PCC in new electric substation to each MCC under this package is included in the scope of this tender. These cables would be laid underground / over pipe bridge between service block to Powder Plant building.

The maximum size of armored aluminum power cable between PCC to MCCs under this pack shall not exceed 3 ½ x sq mm. The powder plant supplier shall accordingly provide suitable runs of cables & terminate them at both ends with suitable lugs and glands.

The MCCs shall have power monitoring system to be hooked up with automation system through field bus/ hard wire for online monitoring of power from operating station.
In view of no. of soft starters & VFDs, the system should have safeguards against all harmonics. The total harmonic distortion produced / generated in the plant shall be analyzed and suitable harmonic filter shall be provided as required to limit the THD.

Plug in type isolators with emergency stop push button in SS-304 water tight enclosure should be provided for all motors below 10 KW. For motors of 10 KW & above SS- 304 water tight junction box with emergency stop push button shall be provided.

7.1 ELECTRICAL ACCESSORIES

Cable trays from PCC to MCCs shall be of GI, if laid over pipe bridge, * than for further distribution inside the plant shall be of SS 304 cage / perforated type Each pits & earth strips shall be of GI Earthing for power system and copper earthing for automation and instrumentation. Earthing of automation and instrumentation shall be independent of power earthing. Earthing of individual motors shall be provided with PVC insulated copper wire. For higher rating motors, GI earth strip of suitable cross- section shall be provided.

All JBs/ DBs etc. shall be in SS-304 construction. The cable drops (power, control & instrument cables) from the overhead cable trays shall be through SS-304 conduit pipe. Flexible SS conduit shall be provided at all motor terminations. Necessary rubber mats should be provided for all MCCs. Sub-powder panels.

8.0 SERVICES & UTILITIES

A WELL-DESIGNED Powder Plant proposed by the Powder plant supplier shall be acceptable to the Purchaser, which apart from being price competitive, conforms to the product process parameters stated earlier and has the lowest consumption of utilities & services.

8.1 Service Requirement

- If measured demand of services in the plant is less than 103% of the consumption declared by the powder plant supplier, the buyer will accept that the services requirements have been achieved.
- If the requirement of any of the services in the plant is between 103% and 105% of the declared demand, a penalty will be charged at 0.33% of value of contract for every 1% rise in consumption for each of the services which fails in the category of excessive demand. For the purpose of this calculation, only the main services, steam, power and chilled water will be considered.
- If the measured demand for services and energy is above 105%, the powder plant supplier will be required to upgrade the plant to comply with the declared performance criteria. Otherwise the plant will be deemed unacceptable.

IV DETAILED TECHNICAL SPECIFICATIONS

1.0 MILK FORMULATION

1.1 Milk Silo

To receive milk from the liquid milk process plant and to deliver milk to the feed balance tank of evaporation plant.

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>30,000 Ltrs</td>
<td>2 Nos.</td>
</tr>
</tbody>
</table>
Type: Outdoor type with alcove

MOC: AISI 304 (inner & outer shells)

Agitation: Single mechanical agitator

Insulation: Dual insulation consisting of 15 mm. of PUF and two layers (each of 50 mm) of EPS

Cladding: SS 304 cladding in welded construction

Sheet thickness: Inner shall 3 mm thick & outer cladding 2 mm thick

Ports & fittings: Common inlet/outlet, sampling cock, sugar syrup inlet, CIP spray ball/probes, level & temperature transmitters with local indicator, man way, alcove, light & sight glasses, etched level marks, common platform with SS top railing and suitable staircase with steps of MS in hot dipped galvanized construction.

1.2 **Milk transfer pump**

To pump milk from milk silos in powder plant to feed balance tank of evaporation plant.

**Capacity**

To suit evaporator feed rate

**Quantity**

1 no.

**MOC**

AISI 316 working parts with AISI 304 body, gasket of food grade nitrite rubber

**Type**

Centrifugal with quick opening sanitary fitting, Monoblock, free standing with adjustable ball feet with single mechanical seal

1.3 **CIP Return Pump**

For pumping the CIP solution from milk silos to CIP system of powder plant

**Capacity**

To suit CIP feed rate

**Quantity**

1 no.

**MOC**

AISI 316 working parts with AISI 304 body, gasket of food grade nitrite rubber

**Type**

Water ring type self priming centrifugal with quick opening sanitary fitting, monolock, free standing with adjustable ball feet with single mechanical seal.
1.4 SUGAR HANDLING AND SYRUP PREPARATION SYSTEM

1.4.1 Sugar Dissolving vats

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>2,000 Ltrs</td>
</tr>
<tr>
<td>Quantity</td>
<td>2 nos.</td>
</tr>
<tr>
<td>Type</td>
<td>Indoor, steam jacketed and insulated</td>
</tr>
<tr>
<td>MOC</td>
<td>AISI 304 (inner, intermediate &amp; outer shells)</td>
</tr>
<tr>
<td>Agitation</td>
<td>Single mechanical agitator to ensure thorough mixing of sugar</td>
</tr>
<tr>
<td>Insulation</td>
<td>Mineral wool of 50 mm thick</td>
</tr>
<tr>
<td>Sheet thickness</td>
<td>Top cover thickness :2 mm</td>
</tr>
<tr>
<td></td>
<td>Top shell thickness: 3 mm</td>
</tr>
<tr>
<td></td>
<td>Bottom shell thickness: 6 mm</td>
</tr>
<tr>
<td></td>
<td>Jacket shell : 4-5 mm</td>
</tr>
<tr>
<td></td>
<td>Cladding shell : 2 mm</td>
</tr>
<tr>
<td></td>
<td>Cladding bottom: 2 mm</td>
</tr>
<tr>
<td></td>
<td>Tor spherical disc end for main shell: 6-8 mm</td>
</tr>
<tr>
<td></td>
<td>Tor spherical disc end for jacket shell : 6 mm</td>
</tr>
<tr>
<td>Ports &amp; fittings</td>
<td>Inlet/outlet, cover, breather, high &amp; low level switches temp. sensor, and other standard accessories.</td>
</tr>
</tbody>
</table>

These vats are steam jacketed for heating soft water. These vats are to be installed in a pit approximately 1.0 m below ground level.

1.4.2 Service Platform

For access and operation of sugar dissolving vats consisting of chequered plates, channels, angles etc. in IS 2062 material.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>1 lot</td>
</tr>
<tr>
<td>MOC</td>
<td>Hot dipped galvanized 6 mm thick chequered plate</td>
</tr>
</tbody>
</table>

1.4.3 Electric Hoist with mono rail

For transfer of sugar bags within sugar room area to the place near to sugar dissolving vats at ground floor level.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>500 kgs, lift 4.0 m</td>
</tr>
</tbody>
</table>
1.4.4 Sugar hoppers with chute

These are to be used for transfer of sugar from sugar bags to sugar dissolving vats.

- **Capacity**: 100 kgs
- **Quantity**: 2 nos.
- **MOC**: SS 304

1.4.5 Vapour extraction System

It is required for extracting and exhausting vapour from sugar dissolving vats. The vapour shall be discharged outside of the building. It shall be common for both sugar dissolving vats.

The exhaust system shall comprise of vapour hood with removable and cleanable filter element, vapour ducting, blower made of SS AISI 304 etc. complete.

- **Capacity**: Suitable
- **Quantity**: 1 set

1.4.6 Duplex Filter

For filtration and removal of jute bag pieces and other fibrous foreign material from sugar syrup.

- **Capacity**: Suitable
- **Quantity**: 1 set
- **Type**: Duplex (bucket type) including filter bag & fittings
- **MOC**: AISI 304

1.4.7 Centrifugal pump for sugar syrup transfer

For transferring sugar syrup from vats to 30,000 liter Milk silos through online filter.

- **Capacity**: Suitable
- **Quantity**: 1 set
- **MOC**: 1 no.
- **Type**: AISI 316 working parts with AISI 304 body, gasket of food
grade nitrite rubble.

Type  Centrifugal with quick opening sanitary fitting, monoblock, free standing with adjustable ball feet with single mechanical seal

1.5  VITAMIN / INGREDIENT BLENDING TANK

1.51  Blending tanks

| Capacity | : | 5 litrs. |
| Quantity | : | 2 nos. |
| MOC      | : | AISI 304 |

Tanks with hand plunger shall be provided for blending of water soluble as well as fat soluble vitamins. Two nos. metering pump with water push arrangement for dosing of vitamins from top of each silo shall also be included in the system.

2.0  EVAPORATION PLANT

2.1  Feed Balance tank

It shall receive milk from the milk silos in powder plant through the milk pump placed at Powder plant at adequate flow rate and head. The tank shall be provided with necessary connections for water & CIP lines. The tank is equipped with level controls and float valve for milk inlet and level transmitter with automatic soft water supply at low level, draw-off funnel, and sight glass. Duplex filter pipe-in-pipe type with pneumatically operated changeover valves shall be provided before the feed pump for removing any solid particles from the feed.

| Capacity | : | 1000 litrs. |
| Quantity | : | 1 nos. |
| MOC      | : | AISI 304 |
| Type     | : | Closed type, un insulated feed tank of free standing design |

2.2  Feed Pump

This pump shall be used for pumping milk from feed balance tank to evaporator Calendrias through the Pre-heaters. The pump shall be provided with frequency drive to take care of additional duty during CIP operation of evaporators.

| Capacity | : | To suit evaporator feed rate |
| Quantity | : | 1 nos. |
2.3 Pre-heater

a) Dead Vapour Pre heater

The milk from feed balance tank shall be pre heated in the pre heater by vapour from the last effect vapour separator.

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Suitable, temp. range 4deg. to 45 deg. C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>1 Set</td>
</tr>
<tr>
<td>MOC</td>
<td>AISI 316</td>
</tr>
<tr>
<td>Type</td>
<td>Shell &amp; tube type pre heater suitably insulated and cladded in AISI 304 SS sheet</td>
</tr>
</tbody>
</table>

b) Pre heater for Low Thermophillic bacterial count (LTP)

This shall be used to heat milk coming from pre-heater with the steam/ vapour recompressed by the thermo compressor. The plant shall be designed in such a way that the product contact with metal surface at the thermophilic bacterial zone shall be avoided and design shall ensure steam economy by using thermo compressor. The design of thermophillic heater should be suitable to guarantee low thermophilic count in the product over 20 hours of run without any intermediate CIP. The direct injected steam shall be filtered with culinary grade steam filters.

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Suitable, temp. range 45deg. to 70 deg. C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>1 Set</td>
</tr>
<tr>
<td>MOC</td>
<td>AISI 304</td>
</tr>
<tr>
<td>Type</td>
<td>Direct Contact type suitably insulated and cladded in AISI 304 SS sheet</td>
</tr>
</tbody>
</table>

2.4 Direct Contact Regenerative heater

This shall be used to heat the milk coming from the pre-heater & thermophillic heater by the vapour generated from flash vessel. The heater shall be integrated in the heating section on the top of the flash vessel. It is also used for flash cooling of the pasteurized product provided with specially constructed tangential inlet connected to the regenerative heater of the heating section, inclusive of CIP ring. The flash vessels shall be suitably insulated and cladded in AISI 304 SS sheet.
2.5 **Milk Pasteurizer- Direct Steam Tangential Swirl Heaters**

It shall be used to heat the milk to the required pasteurization temperature by tangential injection of steam in an on-line piping system. Equipped with de-superheating equipment & protected against over pressure by a pressure relief valve. The DSI, suitably insulated and cladded in AISI 304 SS sheet, shall be designed to produce low, medium and high heat powder. The direct injected steam shall be filtered with culinary grade steam filters.

- **Capacity**: Suitable, Pasteurization temp. 90/110/120 deg. C
- **Quantity**: 1 No.
- **MOC**: SS 304
- **Type**: Direct steam injection

2.6 **Holder Temperature treatment**

It shall be used to hold the milk for a required holding time of 30, 60, & 120 seconds and executed as holding tube of required length. Selection of required holding time based on type of powder to be produced and as per the design requirement shall be done with flow plate and swing bends. This shall be provided with necessary mineral wool insulation and AISI 304 SS cladding.

- **Holding time**: 30, 60 & 120 seconds as per the requirement
- **Quantity**: 1 No.
- **MOC**: AISI 304

The powder plant supplier shall specify the holding times for various type of milk powder.

2.7 **Filter**

It is to be used for removing any solid particles from the concentrate. One would be installed before the first effect calandria and the other would be installed before the concentrate storage tanks. These filters shall have timer based purging arrangement for draining.

- **Quantity**: 1 Set
- **MOC**: AISI 304

2.8 **Calandrias**
The Calandrias shall be of the vertical shell and tube type, specially designed for falling film evaporation, supported by a stainless steel skirt. The Calandrias are equipped with:

- Specially designed liquid distribution system at the top
- Removable top cover, fixed with swing bolts
- Light & Sight glass on shell to observe condensate flow and hand hole on skirt
- The jacket of manhole at bottom
- First & third effect Calandrias shall be insulated with 50 m thick glass wool and cladded with 1.6 mm thick AISI 304 sheet in welded construction.
- Suitable arrangement for proper CIP of calandrias

| Quantity | 5 No. |
| MOC      | AISI 304 |
| Type     | Self supported Shell & tube type Falling film |

### 2.9 Vapour Separators

Vapour separators connected with the calandrias shall be in an all welded construction. The separator is vertical cyclone type self-supporting and is equipped with sight and light glasses and arrangement for CIP.

| Quantity | 5 Nos. |
| MOC      | AISI 304 |
| Type     | Self supported |

### 2.10 Product Transfer Pumps

| Capacity | Suitable |
| Quantity | 1 Lot |
| MOC      | AISI 316 working parts with AISI 304 body, gasket of food grade nitrile rubber |
|          | Open impeller centrifugal with quick opening sanitary fitting, free standing with adjustable ball feet with dual mechanical seal box & seal water cooling arrangement. |

These centrifugal product pumps shall be used for transferring product to the pasteurizer & through each pass in the main and finisher clandaria of evaporation plant.

### 2.11 Concentrate Discharge Pump

| Quantity | 1 No. |
| Capacity | Suitable |
MOC : All contact parts of AISI 316
Type : Open impeller centrifugal type with quick opening & sanitary fitting, free standing with adjustable ball feet and dual mechanical seal box with seal water cooling arrangement.

It shall be used for pumping milk concentrate from the last effect of evaporation plant to the concentrate feed tanks.

2.12 Condensate Pumps

<table>
<thead>
<tr>
<th>Quantity</th>
<th>1 Lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>Suitable</td>
</tr>
<tr>
<td>MOC</td>
<td>All contact parts of AISI 316</td>
</tr>
<tr>
<td>Type</td>
<td>Open impeller centrifugal type with quick opening &amp; sanitary fitting, free standing with adjustable ball feet and dual mechanical seal box with seal water cooling arrangement</td>
</tr>
</tbody>
</table>

The pumps shall be used for pumping condensate from first and last effect calandrias to the condensate tank and from condensate tank to the feed water tank of the boiler.

VAPOUR COMPRESSORS

2.13 Thermo Vapour Re-compressors (TVR)

<table>
<thead>
<tr>
<th>* Quantity:</th>
<th>1 Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>* MOC:</td>
<td>AISI 304</td>
</tr>
</tbody>
</table>

It shall be used to compress the vapour to a high temperature level by means of live steam. The compressor sucks the vapour from third effect vapour separator and discharges in to the first effect calendria. The thermo vapour re-compressors can be operated in combination for various duty conditions. The thermo vapour re-compressors shall be provided with mineral wool insulation and 1.6 mm thick AISI 304 cladding suitable for thermal and acoustic insulation.

Suitable nos. of TVR is provided for flexibility in turn down capacity required on different products.

2.14 Vacuum Pumps

<table>
<thead>
<tr>
<th>Quantity</th>
<th>2 Nos</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>Suitable</td>
</tr>
<tr>
<td>Type</td>
<td>Water ring type with mechanical seal</td>
</tr>
</tbody>
</table>
Its housing will be executed in cast iron, impeller & shaft in stainless steel, equipped with mechanical seals, floor mounted base frame with directly coupled motor and cast iron non-return valve in suction line. Common Silencer in SS shall be provided.

During start up both pumps shall work and during normal plant operation only one pump shall be in use.

2.15 **Surface Condenser**

* Quantity: 1 No.
* MOC: AISI 304

It shall be used for condensing of discharge vapour from last effect vapour separator using cooling water from cooling tower. Powder plant supplier shall furnish the details of condensing system in their offer.

2.16 **Vapour Ducting**

- Quantity: 1 Set
- MOC: AISI 304

It shall be used to connect the vapour separators to the calandrias and the condenser, in welded construction.

2.17 **Pumps Seal Water System**

a) **Seal Water Tank**

Quantity: 1 Nos.
Capacity: 200 L
MOC: AISI 304

b) **Seal Water Collection Tank**

Quantity: 1 Nos.
Capacity: 200 L
MOC: AISI 304

The tank shall be used for the soft water supply to the pump seals, equipped with low-level switch, solenoid valve for water supply and drain valve. The seal water shall be collected in an underground sump, cooled through a PHE and pumped back to the seal water tank.

c) **Seal Water Transfer Pump**

Quantity: 1 No.
Capacity: Minimum 5 KLPH
MOC: All contact parts of AISI 316
Type: Centrifugal type monoblock with quick opening & sanitary fitting, free standing with adjustable ball feet and single mechanical seal.
d) Seal Water-cooler PHE Type

| Quantity  | 1 No. |
| Capacity  | Minimum 5 KLPH |
| MOC       | Plates of AISI 316, other parts AISI 304 |
| Type      | PHE type. |

2.18 Water circulation tank for Vacuum pump

- Capacity: suitable
- Quantity: 1 Set
- MOC: AISI 304

It is a water circulation tank for the vacuum pump equipped with water overflow arrangement. The overflowing water shall be collected in the underground sump. Water shall be fed from the cooling water circuit.

2.19 Cooling Tower

- Capacity: Suitable
- Quantity: 1 No.

Type: Induced draught cooling tower made in FRP casing with water distribution system, fan & electric motor.

Cooling tower is generally in FRP construction, having fixed spray nozzles; water distribution system and Poly Propylene fill pack for heat transfer. The cooling tower if fitted with a statically balanced axial flow fan having adjustable type non-corrosion FRP blades. The cooling tower has air inlet louvers and supporting hardware / MS structures are galvanized for long life and to withstand wind load. motor.

2.20 Cooling Water Pumps in circuit

- Quantity: 4 Nos.
- Capacity: Suitable
- Type: Centrifugal type in CI construction with SS/Bronze impeller.

2 Nos. (1W + IS) pumps for supply of water to surface condenser
2 Nos. (1 W + IS) pumps for recirculation at cooling tower

2.21 Condensate Recovery Tank

- Quantity: 1 No
- Capacity: 15000 Ltrs
- MOC: MS
- Insulation: 50 mm thick glass wool and cladding with 22 g Al sheet.

This tank shall be partitioned in two sections. The first section shall be used as a collection of condensate from the first effect calandria, steam heaters and CIP PHE. The other section will receive condensate from the remaining calandrias. The clean condensate from both sections shall be pumped to the boiler feed water tank and excess will be used as CIP make up water or during plant start-up or diverted to underground sump for floor cleaning etc.
2.22 Condensate Transfer Pump

For transfer of condensate from condensate tank to the above mentioned duties.

- Quantity: 1 Lot.
- Capacity: Suitable
- MOC: All contact parts of AISI 316
- Type: Centrifugal type monoblock with quick opening & sanitary fittings, free standing with adjustable ball feet and single mechanical seal

2.23 Electric Hoist and Monorail

- Quantity: 1 Set

The electric hoist and monorail for main calandrias & finisher top cover removal shall be provided.

2.24 Working / Service Platform For Access & Maintenance

- Quantity: 1 Set
- MOC: Galvanized MS

Consisting of chequered plates, channels, beams, angles etc. in IS 2062 Material

Working MS Platforms with suitable staircase shall be provided a teach operating levels (minimum 3 levels) by the supplier of the powder plant.

The supports for all platforms, stairs etc. shall be taken from the RCC building.

2.25 Concentrate Recovery Tanks

Concentrate recovery tanks shall be provided to recover solids from both evaporating and drying plant under emergency and water flushing. In case of spray drying being inoperative, the concentrate from evaporating plant can also be recovered in these tanks.

- Quantity: 2 Nos.
- Capacity: 5000 Litres.
- Type: Indoor un-insulated
- MOC: AISI 304
- Ports and fittings: Inlet, outlet, agitator, CIP spray ball, breather, Thermo-well, man-way, access ladder, interconnecting pipes & fittings etc. and other standard accessories.

2.26 It shall be used for transferring milk concentrate from the concentrate storage tanks to liquid milk processing section after on line dilution.

- Quantity: 1 No.
- Capacity: 3500 LPH
MOC : All contact parts of AISI 316
Type : Centrifugal type monoblock with quick opening &
      sanitary fittings, free standing with adjustable ball
      feet
      and single mechanical seal.

2.27 Mixing Valve

It shall be used for on line dilution of concentrate with soft water.

  Quantity : 1 No.
  Capacity : 3500 LPH
  MOC : AISI 304

2.28 Plate Heat Exchanger

It shall be used for chilling the diluted concentrate when taking it to processing plant, Chilling media shall
be Chilled water.

  Quantity : 1 No.
  Capacity : Suitable
  MOC : Plates of AISi 316, frame, blocks & other parts of AISI 304

2.29 High Pressure Hot Water Pump

High pressure pump with flexible hose shall be provided for calandria tube cleaning. Pumps shall be
free standing, equipped with necessary safety valve, starter, nozzles for spray cleaning and other
accessories as required. The pump shall also be used for cleaning of drying chamber and cyclones.

The spray drying plant is 3 stage drying mainly consists of the drying chamber, air disperser, static fluid
bed, cyclones, fibro fluidizer for agglomeration & gentle drying, hot air generation system, nozzle
atomizer, fines return system, fans and inter connecting ducting, lecithination system. The entire drying
plant shall be supported on RCC Building with service platforms in structural steel for hammers on drying
chamber.

The concentrate from the evaporator section is preheated, homogenized and atomized in to the drying
chamber. Hot air is distributed around the feed spray and instant drying take place, which brings down
the air temperature. The semi dry product is further conditioned in the Static bed and the Vibro fluidizer
and passed to the vibro sieve and further to the conveying section.

The air from the chamber is passed through the cyclones and the fines are retrieved here and passed to
the fines returns system. The fines can be returned either to the chamber or to the vibro.

The exhaust fan dispenses the air to the atmosphere.

The general specifications of the Spray Drying Plant are as follows:

System : Three stage Dryer with Nozzle Atomization

Heating arrangement :

First stage drying shall be done with air heated by steam air heater.

Second and third stage drying shall be done with air heated by dedicated steam radiator.

Technical Data for Three stage Dryer (indicative) :

<table>
<thead>
<tr>
<th>Sr.</th>
<th>Parameter</th>
<th>Units</th>
<th>Skim Milk</th>
<th>WMP</th>
<th>IMF</th>
<th>Dairy</th>
</tr>
</thead>
</table>

COMFED                         Page 344 of 410                           Tender, Dehri-on-Sone
<table>
<thead>
<tr>
<th></th>
<th>Feed Rate Kgs/hr</th>
<th>Feed concentration % TS</th>
<th>Product rate (Ex-VF) Kgs/hr</th>
<th>Product moisture (Ex-VF) %</th>
<th>Evaporation rate Kg./hr</th>
<th>Product temp. ex-VF) Deg C</th>
<th>Inlet Air temp. To Deg C</th>
<th>Ambient air temp. Deg C</th>
<th>Whitener</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.016</td>
<td>48</td>
<td>1,500</td>
<td>&lt; 3.5</td>
<td>1516</td>
<td>30</td>
<td>190</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3157</td>
<td>48</td>
<td>1559</td>
<td>&lt;2.8</td>
<td>1598</td>
<td>30</td>
<td>185</td>
<td>30</td>
<td>1850</td>
</tr>
<tr>
<td>3</td>
<td>1850</td>
<td>48</td>
<td>913</td>
<td>&lt;2.8</td>
<td>937</td>
<td>30</td>
<td>185</td>
<td>30</td>
<td>1850</td>
</tr>
<tr>
<td>4</td>
<td>1850</td>
<td>48</td>
<td>913</td>
<td>&lt;2.8</td>
<td>937</td>
<td>30</td>
<td>185</td>
<td>30</td>
<td>1850</td>
</tr>
</tbody>
</table>

**Steam Radiator type air heater.**

**Basis:** Ambient air temperature & humidity of the region to be taken considering that the plant will be operated throughout the year. Powder plant supplier is requested to specify the temperature & humidity considered by them and furnish the design details.

**Steam:** Minimum 98% dry, free from foreign matter/Chemicals

**Water:** Soft water only.

**Electricity:** 415 V +/- 10%, 50+/- 3% Hz A.C. Supply

**Material and Surface Finish:**

All parts in contact with the product, except for gaskets, shall be made in stainless steel AISI 304 Internal surfaces in contact with product shall be of a sheet finish 2B/2D. The welds shall be ground to 150 grit (where accessible). External surfaces shall be 2B/2D, and the welds left ungrounded.

### 3.1 FEED SYSTEM

#### 3.1.1 Feed Concentrate Tanks

- **Quantity:** 2 Nos.
- **Capacity:** 2000 liters
- **Construction:** As per powder plant supplier’s design
- **MOC:** AISI 304
- **Agitator:** Mechanical low speed agitator
- **Type:** Free standing cylindrical un-insulated vessel

It is with closed top for receiving the concentrate from the evaporation plant. Necessary CIP spray nozzle, sanitary level switches, feed nozzle, inspection & cleaning door, ventilation stud, foamless inlet, butterfly type employing valve and pneumatic valve for emergency water control etc. shall be provided.

#### 3.1.2 Water Balance Tank

- **Quantity:** 1 No.
- **Capacity:** 200 liters
- **MOC:** AISI 304
It shall be used for feeding water to plant during starting/stopping and emergency operation like interruption in feed supply etc. The tank shall be provided with cover, level switches and solenoid valve for maintaining the water level.

3.1.3 Booster Feed Pump

It shall be used for pumping concentrate from the concentrate tank (feed tank) to the high pressure pump through feed filter & Concentrate heater.

<table>
<thead>
<tr>
<th>Capacity</th>
<th>To match with dryer feed rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>1 No.</td>
</tr>
<tr>
<td>MOC</td>
<td>AISI 316 working parts with AISI 304 body, gasket of food grade nitrile rubber</td>
</tr>
<tr>
<td>Type</td>
<td>Open impeller centrifugal with quick opening sanitary fitting, mechanical seal, free standing with adjustable ball feet</td>
</tr>
</tbody>
</table>

3.1.4 Concentrate Pre Heater

It shall be of tube in tube construction with corrugated tubes and shall be used for preheating the concentrate prior to drying. The concentrate shall be heated to necessary inlet feed temperature by hot water. The unit shall be designed with counter current double heating media flow with the product in the middle.

The concentrate Pre Heater shall be suitable for continuous operation of 20 hours without any intermediate CIP. The heater is provided with a PHE type hot water generating set using steam and steam valves. The whole assembly shall be suitably mounted on a stand.

- Quantity: 1 No.
- Capacity: To match with dryer feed rate.
- MOC: AISI 304 / contact parts AISI 316

3.1.5 Feed Filter

It shall be duplex pipe- in pipe type filter of sufficient volume inclusive of 3 way diverter valves to be selected for change over from SCADA and piping for connecting with feed tanks and feed pump.

- Quantity: 1 Set
- Capacity: To match with dryer feed rate
- MOC: AISI 304

3.1.6 High Pressure Feed Pump cum Homogenizer

It shall be used for homogenizing the concentrate / ingredients & pumping the same at high pressure to nozzle atomization. It shall be multi piston type. The compression block shall be made up of a special high strength SS alloy and the pistons of high grade tungsten carbide Detonated coated stainless steel A lubrication system to secure that the homogenizer/ high pressure pump can operate from 10- 100% of maximum capacity. The homogenizer high pressure pump shall be further provided with a water cooling / lubrication system with flow switch for the pistons, safety device as well as local pressure gauge. High pressure feed pump with suitable capacity and pressure, coupled with motor & provided with necessary safety & control system VFD shall control the Speed of the High Pressure Pump.
• Quantity: 1 No.
• Capacity: To match with dryer feed rate
• Operating temp: 70-80 Deg C
  • Maximum Operating Pressure: 400 Bar
  • MOC; All milk contact parts: AISI 316.
  • Frame: CS with cladding of AISI 304
  • Execution: Sanitary
  • Homogenizing stage: Two Stage
  • Homogenizing valve head: Tungsten carbide.
  • Pressure control & selection: Through SCADA

3.1.7 Feed Piping Network

It shall be used for the concentrate leading from feed pump to atomizer complete with necessary bends and fittings. Piping and fittings shall be suitable for high pressure of 400 Bar.

• Quantity: 1 Set
• MOC: AISI 304

3.2. ATOMIZER ASSEMBLY

3.2.1 Nozzle Atomizer

• Quantity: 1 Set

It shall be used for atomizing feed into fine droplets of a controllable & uniform size for obtaining optimum dryer performance & product characteristics.

Consisting of a distributing manifold, remote controlled high-pressure on/off valves, high-pressure flexible hoses, and nozzle rods with nozzles supported on a base plate. Each rod with nozzle shall be exchangeable during plant operation. Height and angle adjustment shall be provided to allow for optimum positioning of the nozzles in the nozzle/air disperser configuration. The unit shall be suitable to fit with the air disperser.

An overflow sensor shall be fitted to the tray underneath the valves to register liquid spills from leaks. Another sensor shall be fitted to the base plate to register liquid spills from leaks in connections between nozzle rods and flexible houses.

The design of the unit shall allow return of fine particles for optimal agglomeration.

The supply shall comprises of an assortment of nozzle inserts in varied sizes for selection of the correct nozzle combination, as well as a tool box containing necessary tools for servicing the unit and changing the nozzle orifice inserts.

A stand for the unit, mounted on wheels, shall be also supplied for maintenance and storage.

3.2.2 Tools for Atomizer

• Quantity: 1 set

These shall be special tools for assembly of the nozzle atomizer, & changing the nozzle orifice inserts.

3.2.3 Electric Hoist with trolley

• Quantity: 1 set
An electric hoist with push pull trolley for transportation of the atomization unit between the stand and location in air disperser inclusive of 1-beam.

3.2.4 Nozzle rods CIP stand and nozzle stand

- Quantity: 1 set

Mounted on the air disperser housing & used during cleaning of nozzles, 1 no. CIP stand made of AISI 304 mounted on the chamber to for holding the nozzle atomizer during CIP of the chamber.

3.2.5 Cooling System

- Quantity: 1 set

It shall be for cooling the air disperser body and nozzle. The system shall consists of:

- Air filter of dry cell type
- Centrifugal fan with suitable drive unit.
- Heater
- Connecting duct work of GI between filter, fan & heater and SS after heater.

3.3 HOT AIR SYSTEM

The powder plant supplier shall inform the operating conditions of the dryer and estimated steam consumption in steam radiator type air heater for the manufacturing of 1500 kg/hr SMP. The supplier shall submit the calculation details of the process air heating, steam consumption and power requirement to establish efficient operation of the drying plant including heat balance sheet. The drying operation shall be energy efficient.

Some basic requirements have been outlined hereunder. However, the powder plant supplier shall be responsible for the design, supply and installation of the most efficient and reliable system.

3.3.1 Supply air Filter

- Quantity: 1 No.
- Capacity: Suitable for supply air fan capacity
- MOC: GI housing and AISI 304 for frame & filter

It shall be for cleaning of the drying air prior to the heating. The filter is of the dry cell type, and is provided with a panel having number of cells arranged for easy access and removal for cleaning. The item shall be inclusive of filter mats.

3.3.2 Spray Drying Supply Air Fan (MS)

- Quantity: 1 No.

It shall be centrifugal type, for intake of air and injection of it through the air heater to the drying chamber. The fan is made of reinforced steel construction covered with rust protective painting inclusive of electric motor, pulleys & V-belts etc.

The supply fan shall be provided with frequency drive to maintain/ control flow rate of hot air supply I the drying chamber. The speed of the fan shall be controlled based on the Air Flow quantity.

The powder plant supplier shall inform the quantity of the mass flow of the air required for drying.

3.3.3 Air Ducting
3.3.4 SPRAY DRYER SUPPLY AIR HEATER

Steam Radiator type air heater for generating hot air for spray drying chamber:

Steam Radiator shall be used for generation of process hot air required for drying of condensed milk into milk powder in the Spray Drying Plant. The supplier shall inform the heating capacity and design data of the steam radiator.

The proposed hot air system shall be coupled with independent steam generating plant. The purchaser shall provide the steam at constant pressure. However, hot air temperature monitoring and steam flow regulation system for steam radiator is in the scope of the supplier. The supplier shall install a condensate temperature measuring and recording system and condensate flow meter for measurement and recording of flow rate along with a bypass arrangement so that during trials / validation time only the flow measurement system can be used. The measurement system shall provide the information at the instrument control panel for storing in Recorder.

Steam shall be provided at one point at the entry of the powder plant building as indicated in the battery limit of steam. However, the supplier shall be responsible to bring back the condensate up to the entrance of the powder plant building for purchaser to take back to the feed water tank of the boiler.

To heat the supply air, the heater shall be made of blocks, consisting of SS 304 casing and rows of aluminum finned SS 304 tubes welded to headers. The heater shall be divided into two sections, one for steam and the other for preheating the drying air by means of condensate.

The heater shall be complete with all intermediate steam and condensate piping, steam stop valve, pressure gauge, float ball type steam trap with strainer, bypass valves and condensate cock.

The heater shave have outer casing of AISI 304 sheet with suitable wool insulation. Removable sections shall be provided to allow access to heater blocks.

3.3.12 Supply (Hot) Air Duct (AISI304)

- **Quantity:** 1 Set.
- **MOC:** AISI 304
- **Accessories:** Expansion bellows/ joints

For supplying dry air from hot air generator to air disperser complete with necessary bends, expansion joint, insulation in mineral wool and Al cladding. The duct shall join the plenum before hot air duct is connected to Dryer.

3.4 HOT AIR SYSTEM FOR STATIC FLUID BED (SFB)

The hot air system is for filtering and heating of the air for the secondary drying process, as well as for conveying the air to the static fluid bed at a constant rate. The system consists of as follows:

3.4.1 Air filter & duct for SFB

Each fan shall have dedicated dry cell type hih efficiency air filter at intake. Duct shall be for connecting the fan with the air filter, air heater and SFB inclusive of necessary flexible connections as per
requirement. MOC of duct between filter and fan shall be of GI where as it shall be of AISI 304 from heater onward.

- Quantity: 1 set
- MOC : GI AISI 304

3.4.2 Supply air fan for SFB

- Quantity : 1 No.
- MOC ; ms
- Capacity : Suitable as per requirement

The centrifugal fan complete with required electric motor shall be direct driven or with pulleys and V-belts and shall be provided with variable frequency drive (VFD)

3.4.5 Steam Radiator for SFB

To heat the SFB Air with necessary controls. The heater shall be made for blocks, consisting of SS 304 casing and rows of aluminum finned SS 304 tubes welded to headers. The Heater shall be divided in to two sections, one for steam and the other for pre heating the drying air by means of condensate.

The heater shall be complete with all intermediate steam and condensate piping, steam stop valve, pressure gauge, steam trap with strainer, by pass valves and condensate CCK.

The heater shall have suitable wool insulation. Removable sections shall be provided to allow access to heater blocks.

- Quantity: 1 Set
- MOC : SS 304 casing & AISI 304 tubes with aluminum fines.

3.5 DRYING CHAMBER ASSEMBLY

For mixing and establishing contact between the spray of atomized droplets and the drying air to secure optimum conditions for rapid and controllable water evaporation and lenient drying, comprising:

3.5.1 Air Disperser

- Quantity: 1 No.
- MOC : AISI 304 with insulation & cladding.

Air disperser is required for introduction of the drying air from the ceiling in to the drying chamber, It shall be complete with set of perforated sheets, fines return pipe, etc.

3.5.2 Air Disperser Cooling system

It is for cooling the air disperse body and nozzle. The system consists of:

(i) Air filter of dry cell type
(ii) Centrifugal fan with motor
(iii) Steam /condensate air heater
(iv) Connecting duct : MOC of duct between filter of fan and inlet of heater shall be of GI whereas it shall be of AISI 304 from heater onward.

- Quantity: 1No.

3.5.3 Three stage Drying Chamber
• Quantity: 1 No.

This shall consist of cylindrical part with ceiling to support the air disperser and a conical bottom, designed to include a built-in stationary fluid bed. The air exhaust ducts shall be placed in the ceiling. The AISI 304 drying chamber is a cylindrical vessel (4 mm thick) with a conical bottom (3 mm thick) and top roof (5 mm thick) made of AISI 304 constructed on a framework of AISI 304 stiffeners for uninsulated portion and MS stiffeners for insulated portion. The ceiling supports the air disperser. Ceiling shall have MS structural (cladding support) with insulation embedded in it and covered with 2 mm thick AISI 304 plate in welded construction.

The cylindrical portion of the chamber shall be fabricated at site or shop based on logistics and project schedule and the conical sections shall be sent in prefabricated sections to be assembled at site. Static bed and air disperser shall be shop fabricated and to be assembled at site. All internal weld joints shall be ground smooth to 150 grit.

The chamber to be designed as a stainless steel construction with MS stiffening rings wherever it is covered under insulation, otherwise it shall be AISI 304.

The ceiling shall be insulated with mineral wool and covered with stiffeners, provided with a kick plate at the edge. The cylindrical and conical parts of the chamber shall have provision for insulation and cladding. However, the supplier shall decide the type of insulation & cladding in view of the functional requirement. The exterior cladding shall be SS construction. Platform with ladder shall be provided to approach nozzle atomizer.

The chamber assembly shall be further provided with:

• Inspection / cleaning door
• Light & sight glasses
• Insulation & Cladding
• Light mounted on a swivel arm.
• Switches for preventing critical vacuum & pressure in the chamber. Vacuum switch shall automatically shut-off exhaust fan in case of excessive vacuum.
• Safety emptying vent.
• Fire extinguishing nozzles
• Cleaning turbine with hose and winch
• Rupturing disc on drying chamber with AISI 304 duct for venting out explosion out of the building

**Insulation of Drying Chamber**

Quantity: 1 Set

The drying chamber shall be insulated with suitable thickness of insulation & cover with 0.6 mm thick AISI 304 sheet cladding in riveted construction wherever required to prevent heat loss and for conducive working environment.

The powder plant supplier shall decide the type of insulation of the drying chamber with respect to the functional requirement. The exterior cladding shall be SS.

**Integrated Static Fluid bed**

It shall be for secondary drying of the product, designed and mounted on the conical part of the drying chamber.
The fluid bed shall consist of a housing divided in two parts, an upper product part and a lower air plenum by a special flex/bubble perforated sheet. The dividing sheet shall be self-supporting & provided with inclined perforations providing an even powder flow and a fluidized powder layer.

The fluid bed shall be made of stainless steel, prepared for the installation as specified above and furnished with inspection and cleaning doors, cleaning nozzles and a specially designed powder outlet arrangement. Transparent inspection window shall be provided for viewing the powder fluidization.

Quantity: 1 Set

**Rotary Valve**

Rotary valve for forming an air lock with passage of powder shall consist of housing made of stainless steel, rotor and a motor with gear box. The clearance between housing and rotor shall be finely adjusted, and the rotor shall be easily removable for inspection and cleaning.

Quantity – 1 no.

**Product Discharge Duct**

It shall be for product discharge from the drying chamber.

- Quantity
- MOC: AISI 304

**Electromagnetic Hammers**

- Quantity : 1 Set
- Type : Electromagnetic

These shall be provided on the outside of the drying chamber for minimizing deposits on the drying chamber wall.

**AIR EXHAUST SYSTEM**

**Ducting**

Quantity: 1 Set
MOC: AISI 304

It is required between drying chamber and main cyclone. Complete with necessary bends transition pieces.

**Main Cyclone**

- Quantity: 1 Set
- MOC : AISI 304

This shall be used for efficient separation of powder carried from the drying chamber by the outgoing air. The cyclone shall be in welded construction with facility for CIP. Local PDIs
shall be provided across each cyclone. A pressure differential transmitter shall be provided across the cyclones.

Electromagnetic Hammer on cyclone

Quantity : 1 Set

These shall be provided on the outside of the Cyclone for minimizing deposits on its wall.

**Ducting**

Quantity: 1 set  
MOC: AISI 304

Between Main Cyclone and air exhaust fan.

**Exhaust Fan**

- MOC : M.S.  
- Quantity : 1 No.  
- Type : Centrifugal  
- Capacity : Suitable

This shall be used for the transportation of air from drying chamber through cyclones and to exhaust hood. The fan is similar to the supply fan as described earlier.

The exhaust fan complete with the motor shall be provided with frequency drive to maintain the required vacuum in the drying chamber. Speed of the exhaust fan should be controlled by the pressure transmitter on the drying chamber through frequency drive.

**Air Exhaust Ducting**

MOC: GI  
Quantity: 1 Set

It shall connect the cyclones from exhaust fan to the exhaust hood- 2 m above the building height, complete with necessary bends, transition pieces, and flexible joints and exhaust hood.

Supplier shall provide an outlet duct from the powder recovery room.

**Fines Return System**

It shall be for continuous transportation of fines from the cyclone into the drying chamber/ Vibro fluidizer for agglomeration. The fines return system shall comprise of:

**Fines return filter**

Quantity: 1 No.

It shall be used for cleaning of fines return conveying air. The filter is of dry cell type and shall be a part of roots blower.

**Roots air blower**

Quantity : 1 No
It shall be used for supplying fines return conveying air under pressure. This is a roots type blower complete with safety valve, non-return valve, silencer & pressure gauge, including suitable electric motor.

**Air Dehumidifier**

**Quantity** : 1 No  
**MOC** : AISI 304 casing and aluminium finned AISI 304 tubes

It shall be used for dehumidifying and cooling fines return conveying air. This is fines tube heat exchanger, inclusive of necessary valves and piping.

**Blow through Valve**

- **Quantity**: 1 Set

It shall be used for feeding the powder to the fines return duct from the cyclone bottom. Each cyclone shall have one blow through valve. Housing of the valve shall be of AISI 304 casting & rotor of AISI 304. it shall be complete with gear motor & solenoid valves for compressed air for clean-blowing of air.

**Conveying Piping**

- **Quantity**: 1 set  
- **MOC**: AISI 304

It shall be used for returning the fines to the drying chamber. It shall be complete with necessary bends & fittings.

**Diverter Valves**

- **Quantity**: 1 No.  
- **MOC**: AISI 304

It shall be used for diverting the powder either to the drying chamber or to the discharge end of the vibro fluidizer. This valve is operated with pneumatic actuator. Housing of the valve is of SS casting and internals of SS. Complete with necessary solenoid valve, actuating cylinder and pneumatic and electrical connection.

**VIBRO FLUIDIZER ASSEMBLY**

**Vibro Fluidizer Air Filter**

- **Quantity**: 3 Nos.  
- **MOC**: AISI 304 housing and frame for filter mats.

It shall be used for filtering drying air and cooling air to the vibro fluidizer. It shall be of the high efficiency dry cell type. The filters shall be mounted on a frame of SS 304. Individual mats shall be removable for inspection and cleaning.

**Vibro Fluidizer Supply Air Fan**

- **Quantity**: 3 Nos.  
- **MOC**: MS  
- **Capacity**: Suitable
It shall be used for supplying air to the vibro fluidizer. The fans shall be of the centrifugal type, statically and dynamically balanced. The reinforced fan casing and the frame with ball bearing support shall be mounted on a base frame. The fans shall be made of painted mild steel. Supply includes V-belt drive with safety guard, flexible connections to ducts and electrical motor.

**Vibro Fluidizer Steam Air Heater**

- **Quantity:** 2 Nos.
- **MOC:** GI casing and AISI 304 tubes with Aluminum fins

It shall be used for heating the drying air by means of dry saturated steam. The heater shall be made of blocks, consisting of rows of finned tubes welded to headers. The heater shall be divided into two sections, one for steam and the other for pre-heating the drying air by means of condensate.

The heater shall be complete with all intermediate steam and condensate piping, steam stop valve, pressure gauge, steam trap with strainer, by-pass valves and condensate cock.

The heater shall have outer casing of GI sheet with suitable wool insulation. Removable sections shall be provided to allow access to heater blocks.

**Vibro Fluidizer Air Dehumidifier**

- **Quantity:** 1 Set.
- **MOC:** GI casing and AISI 304 tubes with Aluminum fins

It shall be used for dehumidifying the cooling air. This is a finned tube heat exchanger comprising of two sections. In the first section, air is cooled by chilled water/brine, which passes through finned tube. In the 2\textsuperscript{nd} section, this air is reheated by steam passing through tubes. The supply is inclusive of necessary valves and piping, suitably insulated with mineral wool and cladded with GI sheet.

**Air Ducting**

- **Quantity:** 2 Set (1 set in GI and 1 set in SS)

For connecting supply fan to filter and dehumidifier / air heater (in GI construction) and further to vibro fluidizer (in SS construction) with necessary bends, transition pieces and a damper.

**Vibro Fluidizer**

- **Quantity:** 1 No.
- **MOC:** AISI 304

It shall consist of drying section, conditioning section & cooling section. Vibro fluidizer consists of vibrating tubular housing divided into an upper and a lower part by specially designed flex plate. Vibrio fluidizer shall be made as per sanitary standards.

All parts in contact with product shall be made of stainless steel AISI 304 finish 2B. All internal welded seams and all external butt-welding shall be polished.

Air is blown in to the lower part (Plenum chamber) for fluidizing & drying of the product, which flows though the upper part. A vibrator element mounted in the lower part of the housing shall generate the vibrations. Motor is included in the scope. To prevent vibrations being transferred to the surroundings the vibro-fluidizer shall be mounted on spiral springs on a mild steel frame.

The upper part of the vibro-fluidizer shall be provided with inspection doors and sight glasses. The lower part shall be furnished with a pipe stub for drainage of water or cleaning liquid.
The supply shall also include safety equipment consisting of fire water spray nozzles for spraying water in case of emergency / fire. When temp goes high, the flow of water will be started by a solenoid valve either automatically or manually by a switch in the Fire control panel.

**Ducting**

- Quantity: 1 Set.
- MOC: AISI 304

It shall be used for connecting air discharge from vibro fluidizer to the cyclone. Complete with necessary bends transition and branching pieces and flexible connections.

**Powder Sifter**

- Quantity: 1 No.
- Capacity: 2000 kg/hr
- MOC: AISI 304
- Type: Vibrating

It shall be used for screening the powder and separating out the lumps from final product. This is a vibrating screen with powder contact parts made of AISI 304 and other parts of painted MS complete with top cover and flexible connections inclusive of motor. Two outlets shall be provided one for removal of lumps & another for automatic powder bagging.

**Fire Extinguishing system**

- Quantity: 1 Set.

The Fire Extinguishing System (Water jet operation in dryer) shall be initiated automatically. For this purpose, necessary alarm and PID control for temperature monitoring in the dryer along with control valve operation shall be used.

It shall comprise of a set of fire extinguishing retractable nozzle provided at suitable locations in the drying chamber, VF and necessary controls as per design requirements. In order to supply pressurized water at the ring main of the drying plant, the pumping station shall be designed and supplied by the powder plant supplier.

The **purchaser** shall provide a UG sump of 40 KL capacity at about 7 to 10 meters away from the plant building and one overhead water tank of 15 KL capacity at the top of drying building.

The pumping station shall consist of the following:

- Water pump: 4 Nos. (2 W + 2 S)
- Capacity: Suitable
- Suction & delivery piping: Suitable sized GI “B” Pipes, valves and controls (up to ring main at top of the dryer)

**Supplier of powder plant has to submit justification for the size of pump selected.**

One set of pump (1W + 1 S) shall be used to pump the water from UG sump to OHT and another set of pump (1 W + 1 S) is to pressure the headers.

The powder plant shall be put in operation mode only when 40 KL UG sump and 15 KL over head tank are filled with water. The system shall receive the signal from the powder plant control panel in case the plant is subjected to temperature beyond the set valve, and the pumps shall start immediately. The ring main shall always remain under set limit of pressure valves and it shall maintain the pressure throughout the operation of the powder plant.
Service Platform for Access & Maintenance

- Quantity: 1 set
- MOC: GI

It shall be used for access to the hammers on the drying chamber, disperser etc.

LECITHNATION SYSTEM

LECITHIN COATING EQUIPMENT

For coating of the powder with lecithin

Lecithin Preparation Assembly

For controlled mixing and supply of the lecithin solution to the two-fluid nozzle arrangement. All equipment shall be mounted on two steel frames supported by adjustable legs. One frame supports the mixing tank and transport pump and the other frame supports all other equipment. The assembly, for easy operation and cleaning, comprises of:

**Mixing Tank**

- Quantity: 1 No.
- Capacity: 250 L (Min.)
- MOC: AISI 304

The tank shall be provided with lid, heating jacket for hot water, RTD, local thermometer and agitator with motor. However, Lecithin powder & butter oil carrier shall be added manually.

**Transfer Pump**

Quantity: 1 no.
Capacity: Suitable

It shall be positive displacement type, made of SS and provided with suitable motor and shall be used for pumping lecithin in to the feed tank.

**Vegetable Oil Tank**

Quantity: 1 No.
Capacity: 20 L (Min.)
MOC: AISI 304

This is for feeding butter oil in to the feed tank and shall be provided with all standard accessories.

**Feed Tank**

Quantity: 1 No.
Capacity: 20 L (Min.)
MOC: AISI 304

This will be used for holding lecithin with butter oil before spraying on to the milk powder. The tank shall be provided with lid, heating jacket for hot water, local thermometers, local gauges and a filter basket for the solution inlet.

**Dosing Pump**

Quantity: 1 no.
Capacity: Suitable

The pump made of SS shall be for feeding the lecithin solution and shall be provided with motor and speed aviator for infinite variation of the speed to control lecithin dosing rate.

Two-Fluid Nozzles

For atomized spraying of the lecithin solution. Nozzles shall be of SS. The position of the nozzles can be adjusted to give a uniform coating of the powder. The solution is atomized by means of hot compressed air Compressed air electric heater.

Quantity: 1 No.

To heat the compressed air for atomizing lecithin solution and shall be provided with necessary instruments.

Piping & Fittings

Quantity: 1 Lotr

Internal piping for liquids and compressed air, partly made as tube- in tube for hot water heating made of SS. It shall be provided with necessary valves and 3-way cocks.

Hot water circulation system

Quantity: 1 Set.
Capacity: Suitable
MOC: AISI 30

Hot water system to circulate hot water for heating of tanks and pipes, provided with circulating pump, piping, armature & instruments.

Lecithination control panel

Quantity: 1 no.
MOC: AISI 304

Complete with all instrumentation, frequency drive & micro processor suitable for the application. The panel shall be hooked up with the main PLC/ DCS module of the powder plant.

The instrumentation scheme for the Lecithination plant shall essentially comprise of the following control systems:

- Flow meter with indicator for the lecithin solution with push bottom regulation and connections for indication and recording in the main instrument panel
- Indicating thermometers for lecithin and compressed air.
- Pressure gauge for compressed air
- Alarm system for low lecithin flow / temperature and low compressed air temperature / pressure.
- Compressed air on / off regulating valves
- Four-way cock for directing the lecithin and air flow.
• Compressed air electric heater thermostatically controlled. Start-stop push buttons for all motors and heater with light indicators.

POWDER BULK PACKING AND CONVEYING SYSTEM

The system shall consist of one set of electronic gross weighed for accurate filling, weighing and bag holding, an online heat sealing machine and stitching machine. Provision shall be kept in the filling machine for adding decarmonization system in the future. The following operations shall be automatic.

• Powder conveying duct from sifter to filling machine. Milk powder as discharged at vibratory sifter, shall be conveyed to an intermediate powder bin with rotary valve at its outlet before feeding to bag filling machine.

• Positioning the empty bag manually to the bag holder of filling machine.

• Lowering the filled bag without toppling.

• Transferring the bag on the conveyor

• Forming the bag before sealing.

• Conveying and guiding the bag on the heat sealer for proper sealing

• Conveying and guiding the bag to stitching machine.

Electronic gross weigher

The gross weighed accurately and continuously weighs pre selected quantities of bulk material. The weighing cycle shall commence with the material flowing into the bag at the main feed rate as soon as the preset full flow weight is reached (approximately 95% of total weight) the feed changes to a dribble flow. When the selected nominal weight is obtained, the dribble feed stops. The Module compares the selected nominal valve and the actual valve derived from the local cells to control the automatic weighing cycle. In addition to manual zero, compensation and dribble quantity adjustment, the module can be selected to automatically monitor and make corrections to the zero and compensation settings. A bag holder is specially provided for use with electronic gross weighed for all type of open mouth bags. Bag holder securely holds the bag, thereby reducing dust emission and then with a hand feeler limit switch or foot operated switch, pneumatic actuator provides quick and easy clamping. The bag release shall be automatic when set weight of powder is filled. Dust collection system supplied with the bagging machine is to be provided. Dust collection & air dehumidifying system for the room is not required.

Quantity: 1 Set.

This shall comprise of

• Screw feeder

• Gross weigher having a sousing, load cell, bag spout suspension load cells inter face unit and the electronics measuring and control modules.

• Micro processor controller.

• Touch sensitive membrane keypad supplied with the machine.

• Display preset programs for different materials/ weightments

• Alarms

• Bag holder with two pneumatically operated rubber clamp jaws

• Supporting structure in MS with epoxy painting.
Conveying system

Quantity: 1 set.

Wooden slat conveyor with drive unit and sensors etc. of suitable length shall be provided for following functions:

01) For conveying bag from filling station to stitching station.
02) For stitching station to powder store at ground floor.

Impulse heating machine

Quantity : 01 Set.

Comprising of:

- Single sealing element
- Foot pedal for operation
- 1.0 m idler.

The impulse sealer is a 700 mm (min.) long single element impulse sealing unit operated though a foot pedals. The unit shall comprise the following controls:

- Timer for adjusting the duration of the heat cycle
- Indication for sealing period
- Indication for sealing period
- Power on/off switch.

Stitching Machine

The filled bag is placed manually on the feeding end of the conveyor and when it approaches the stitching head of the stitching machine the stitching head starts working. The bag is guided manually though the stitching head starts working. The bag is guided manually though the stitching head and after the bag is stitched, the thread chain is pushed into the nibbler knife, which cuts it after which only the sewing head is stopped. The conveyor continues running. Advancing the subsequent bags for stitching.

- Quantity : 01 Set.

Comprising of pillar sewing unit with sewing head, nibbler knife, motor driven by V belt drive and starter.

POWDER CONVEYING & STORAGE SYSTEM

Provision shall be kept in the equipment layout of the powder plant to add in future the facility for powder storage in 2x15 MT powder silos and pressure dense phase conveying from vibro fluidizer to powder silos. Provision shall also be kept for installation of the equipment for consumer filling & packaging of dairy whitener from powder silos and conveying of consumer packs up to the store.

POWDER CONSUMER PACKING:

Semi-automatic Powder consumer pack filling machine.

A two way diverter valve with controller is provided after the intermediate powder storage bin equipped with level switches. Normally the intermediate bin will be feeding to 25 kg. bag filling machine and the diverter valve will automatically divert the product to manual bagging whenever high level is sensed in intermediate bin.
After rotary sifter, the powder shall be packed in 25 kg bags through intermediate bin. The bag shall be manually transferred to the hopper of the lined carton packing machine for consumer packing of dairy whitener.

The packing line comprises of:

Semiautomatic machine for packaging in lined carton consumer packs, along with Servo Auger Nitrogen Flushing System suitable for the packing of ‘MILK POWDER’ (skim milk, whole milk, dairy whitener etc.) The machine will consist of the following attachments:

- Servo Controlled Auger Filler.
- Nitrogen Flushing System
- PID Temperature Controller.
- All contact part would be made of SS – 316/304
- Speed: 45 Packs per minute for 250 gm./500 gm (minimum)
- Voltage stabilizer of suitable rating.
- Code & date inkjet printing device.

The following details shall be provided by the powder plant supplier:

<table>
<thead>
<tr>
<th>Capacity of machine packs/hr of size</th>
<th>Capacity in 250g size – Up to 40 PPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>250 gm &amp; 500 gm.</td>
<td>Capacity in 250g size – Up to 40 PPM</td>
</tr>
</tbody>
</table>

| Accuracy of filling at 250 gm & 500 gm. | The same shall be furnished by the supplier during detail engineering. |

<table>
<thead>
<tr>
<th>Weight &amp; dimensions of the machine.</th>
<th>Utility consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor space requirement (min.)</td>
<td>a) Electrical Power (kw)</td>
</tr>
<tr>
<td></td>
<td>i) Connected</td>
</tr>
<tr>
<td></td>
<td>ii) During operation</td>
</tr>
<tr>
<td></td>
<td>b) Compressed air.</td>
</tr>
</tbody>
</table>

3.12.2 Nitrogen Bottle Bank Manifold

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Quantity</th>
<th>MOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>For connecting 18 Cylinders</td>
<td>1 Set.</td>
<td>IS 2062</td>
</tr>
</tbody>
</table>

Manifold for connecting 18 bottles of nitrogen with at least 99.9% purity, manifold shall be complete with pressure regulator, isolating automatic lined carton consumer pack filling machine.

PACKED LINED CARTON CONVEYOR.

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Suitable for the machine output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>1 Set.</td>
</tr>
<tr>
<td>MOC</td>
<td>Shall be suitable for the site location (Approx length is 5 M)</td>
</tr>
</tbody>
</table>

The conveyor shall deliver the packed cartons in a turn table and from there shall be manually picked and placed in carton box and sealed.

CIP SYSTM

The CIP system offered shall be an automatic system for sequencing operations of the valves in each CIP circuit, control of CIP solution concentration and CIP return circuit. The CIP system shall have two Circuits with both circuits operating simultaneously and independently with its own set of CIP tanks, PHEs, filters, pumps, valves and fittings, instruments etc. The first circuit shall be for Evaporator CIP including milk formulation tanks, piping network etc. and second for Dryer CIP.
After 20 hrs of operation, the plant can be taken on CIP for evaporator.

Concentrate feed tanks and the dryer feed line & nozzles. The concentrate recovery tanks shall be CIP cleaned only when used.

Suitable nozzles shall be provided at strategic location in the cyclone, vibro and ducting to ensure in place wet cleaning. Also, cleaning turbine shall be provided for effective cleaning of the drying chamber. The CIP of drying chamber, Vibro, cyclone and ducting shall be carried out once in every 15 to 20 days. CIP nozzles are strategically located in the cyclone, vibro and ducting to ensure complete in place wet cleaning without any external cleaning bridge. The drying chamber shall be cleaned by means of a cleaning turbine. During dryer CIP, necessary interlock shall be provided for the nozzle atomizer and cleaning turbine introduced into the chamber.

It shall be ensured that the daily with lye solution shall be completed in 4 hours for evaporator, milk silos/tanks and dryer feed line. Extended CIP using acid solution shall be done once or twice a week for the evaporator. Also, dryer cleaning shall be done in sequence i.e., chamber, each cyclone, vibro and ducting one after another.

**Acid / lye solution preparation:**

Concentrated acid and lye solution shall be pumped to buffer tanks from the bulk storage system. Bulk storage system including CIP transfer pumps and line upto powder plant buffer tanks are included in the Liquid Milk Processing Plant contractors' scope. However, inter locking of buffer tanks levels of powder plant including necessary controls are included in the scope of powder plant contractors scope.

Acid / lye with 50% concentration shall be dosed from buffer tanks to the solution tanks by means of metering pumps. The conductivity transmitter mounted on the tank shall control the dosing in order to maintain the desired concentration. The CIP solution shall be heated to the required temperature through an external PHE by means of steam.

A conductivity transmitter located in the CIP return header shall check the strength of the CIP solution for possible reuse. In each return circuit suitable PIP type filter (duplex, heavy duty with auto changeover facility from HMI) should be provided to filter out the solids.

**CIP PROGRAMMES (indicative)**

**PRODUCT PIPES AND STORAGE EQUIPMENT (COLD MILK CIRCUITS).**

<table>
<thead>
<tr>
<th>Sl.</th>
<th>Sequence</th>
<th>Time</th>
<th>Temp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Flush with fresh water</td>
<td>2 min.</td>
<td>Normal</td>
</tr>
<tr>
<td>02</td>
<td>Rinse with water.</td>
<td>3 min.</td>
<td>Normal</td>
</tr>
<tr>
<td>03</td>
<td>Lay circulation</td>
<td>10 min.</td>
<td>70°C</td>
</tr>
<tr>
<td>04</td>
<td>Rinse with water.</td>
<td>05 min.</td>
<td>Normal</td>
</tr>
<tr>
<td>05</td>
<td>Acid circulation</td>
<td>10 min.</td>
<td>65°C</td>
</tr>
<tr>
<td>06</td>
<td>Rinse with water.</td>
<td>05 min.</td>
<td>Normal</td>
</tr>
<tr>
<td>07</td>
<td>Hot water sterilization</td>
<td>10 min.</td>
<td>85°C</td>
</tr>
<tr>
<td></td>
<td>Total CIP program</td>
<td>45 Min.</td>
<td></td>
</tr>
</tbody>
</table>

For evaporator powder plant supplier has to submit the CIP program for four hours.

**SCOPE OF SUPPLY:**

4.1 **Acid Buffer Tank**

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Quantity</th>
<th>MOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 no.</td>
<td>1000 Litres</td>
<td>AISI 316</td>
</tr>
</tbody>
</table>
The tank is complete with inlet, outlet, overflow, drain, air vent, manhole with cover and level switches. However, if tank cover is designed in two halves – one fixed and other open-able, then manhole is not required. Air vent shall be provided with water lock.

4.2 Acid Buffer Tank

| Capacity   | 01 no. |
| Quantity   | 1000 Litres |
| MOC        | AISI 316 |

The tank is complete with inlet, outlet, overflow, drain, air vent, manhole with cover and level switches. However, if tank cover is designed in two halves – one fixed and other open-able, then manhole is not required.

4.3 Metering pumps.

| Capacity       | As required. |
| Quantity       | 02. Nos. |
| MOC            | AISI 316 |

One each shall be used for dosing of acid/lye concentrated solution from buffer tanks to the Acid/Lye solution tank respectively.

4.4 Acid Solution Tank

| Capacity       | 8000 Litres |
| Quantity       | 1 no. |
| MOC            | 3 mm thick AISI 316 |
| Construction    | Vertical, closed top |

Insulation: Two layers, each of 50 mm thick, resin bonded crown 150 fiber glass insulation.
Cladding: 2 mm thick AISI 304

It shall be self supporting, insulated vertical tank in conical bottom construction and complete with air vent, inlet & outlet, overflow, drain, perforated tube, manhole with hinged cover, level switches and temp sensors & transmitters along with re-circulation pump for agitation.

4.5 Lye solution tank

| Capacity       | 8000 Litres |
| Quantity       | 1 no. |
| MOC            | 3 mm thick AISI 316 |
| Construction    | Vertical, closed top |
| Insulation      | Two layers, each of 50 mm thick, resin bonded crown 150 fiber glass insulation. |
| Cladding        | 2 mm thick AISI 304 |

It shall be self supporting, insulated vertical tank in conical bottom construction and complete with air vent, inlet & outlet, overflow, drain, perforated tube, manhole with hinged cover, level switches and temp sensors & transmitters along with re-circulation pump for agitation.

4.6 Hot water tank

| Capacity       | 8000 Litres |
| Quantity       | 1 no. |
| MOC            | 3 mm thick AISI 316 |
| Construction    | Vertical, closed top |
| Insulation      | Two layers, each of 50 mm thick, resin bonded crown |
4.7 Recuperation / Rinse water tank

<table>
<thead>
<tr>
<th>Capacity</th>
<th>8000 Litres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>1 no.</td>
</tr>
<tr>
<td>MOC</td>
<td>3 mm thick AISI 304</td>
</tr>
<tr>
<td>Construction</td>
<td>Vertical, closed top</td>
</tr>
</tbody>
</table>

It shall be self supporting, insulated vertical tank in conical bottom construction and complete with air vent, inlet & outlet, overflow, drain, perforated tube, manhole with hinged cover, level switches and temp sensors & transmitters.

4.8 Plate Heat Exchanger

Application: To maintain temperature of CIP solutions/ Water at the required levels.

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Suitable for 2 circuits.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating medium</td>
<td>Steam at suitable pressure.</td>
</tr>
<tr>
<td>MOC</td>
<td>Plates of AISI 316, frame in MS with AISI 306 cladding &amp; both side SNAP-ON type Viton gasket.</td>
</tr>
</tbody>
</table>

Necessary instruments and controls for steam heating shall be provided, as per requirement.

4.9 CIP Forward Pumps

<table>
<thead>
<tr>
<th>Capacity</th>
<th>As required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head</td>
<td>As required</td>
</tr>
<tr>
<td>Quantity</td>
<td>02 nos.</td>
</tr>
<tr>
<td>MOC</td>
<td>AISI 316 working parts with AISI 304 body, gasket of food grade nitrile rubber.</td>
</tr>
<tr>
<td>Type</td>
<td>Centrifugal with open impeller, quick opening sanitary fitting, mono block with single mechanical seal, free standing with adjustable ball feet</td>
</tr>
</tbody>
</table>

4.10 CIP Return Pumps

<table>
<thead>
<tr>
<th>Capacity</th>
<th>To suit CIP feed rate.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head</td>
<td>As required.</td>
</tr>
<tr>
<td>Quantity</td>
<td>02 nos. minimum</td>
</tr>
<tr>
<td>MOC</td>
<td>AISI 316 working parts with AISI 304 body, gasket of food grade nitrile rubber.</td>
</tr>
<tr>
<td>Type</td>
<td>Self priming centrifugal with open impeller, quick opening sanitary fitting, mono block with single mechanical seal, free standing with adjustable ball feet.</td>
</tr>
</tbody>
</table>

Note: The number of pumps indicated above is minimum, incase more number of pumps are required as per supplier’s design the same has be to be provided during detail engineering without any cost implication.

CIP return ump at the outlet of pig tank shall be of non self priming type as it will be flooded suction. Other CIP return pumps shall be self priming type in liquid ring design.
4.10 Cleaning Turbine.

- Quantity: 1 Set
- Application: For CIP of Drying Chamber
- MOC: AISI 304
- Type: Rotary type with hose and manual winch (Retractable)

4.12 CIP Nozzles for Cyclones, Vibro and ducting (Retractable type)

- Quantity: 1 Set
- MOC: AISI 304

4.13 Re-circulation Pump for Acid & Lye Solution tanks.

- Quantity: 1 Set

4.14 Re-circulation Pump for Acid & Lye Solution tanks.

- Capacity: As required
- Quantity: 02 nos.
- MOC: AISI 316 working parts with AISI 304 body, gasket of food grade nitrile rubber.
- Type: Centrifugal with open impeller, quick opening sanitary fitting, mono block with single mechanical seal, free standing with adjustable ball feet.

4.15 Pig tanks for Drying chamber, Cyclones and vibro.

- Capacity: 1000 Litres
- Quantity: 1 no.
- MOC: AISI 304
- Accessories: As per requirement.

It shall be used for collection of CIP solution from Drying Chamber, cyclones and vibro fludizer and returning to CIP tanks/drain depending upon the contamination level.

4.16 Service Platform

- Quantity: 1 Lot
- MOC: Hot dipped galvanized MS structure & Chequered plate platform

It shall be used for access & maintenance of CIP tank area.

4.17 CIP Filter

- Capacity: As required.
- Quantity: 1 Lot.
- MOC: AISI 304
- Strainer: Perforated screen type

Duplex type inclusive of pneumatically operated changeover valve at inlet and outlet shall be installed. One set of filter shall be provided for each circuit in the CIP supply line for filtration of CIP solution.

5.0 INSTRUMENT AIR.

Compressed Air generation for instrumentation & Control
It shall be a non-lubricating air compressor of reciprocating type to generate dry, and oil-free compressed air at required pressure in requisite quantity. The air compressor system shall be designed to meet hourly peak demand. The system shall be provided with 100% standby capacity (one working and one standby). The system also shall be supplied with necessary controls and instruments, control panel, air drier, filter, air receiver, and all other accessories. The compressor capacity shall be suitable to meet the compressed air requirement of instrumentation & controls, pneumatic valves, etc.

5.1 Non-lubricating type air compressor with accessories.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>As required at 7 bar g.</td>
</tr>
<tr>
<td>Quantity</td>
<td>2 nos. (1W + IS)</td>
</tr>
<tr>
<td>Type</td>
<td>Air / water – cooled design</td>
</tr>
<tr>
<td>Accessories</td>
<td>Motor, Suction air filter, air cooled after cooler and control panel.</td>
</tr>
</tbody>
</table>

The supplier shall submit working sheet for deciding capacity and inform type of the air compressor.

5.1.1 Air Receiver with accessories.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>As per requirement</td>
</tr>
<tr>
<td>Material</td>
<td>Mild steel.</td>
</tr>
<tr>
<td>Type</td>
<td>Vertical Cylindrical.</td>
</tr>
<tr>
<td>Mounting</td>
<td>Self - supporting</td>
</tr>
<tr>
<td>Quantity</td>
<td>1 no.</td>
</tr>
</tbody>
</table>

The receiver shall be common for both the air compressor with automatic moisture separator and drain valve.

5.1.2 Air Drier.

* Quantity : 2 no.
* Capacity: As required (Quality for instrument requirement)

It shall be refrigerated type with max dew point of 20 deg C. The system shall be complete with necessary filters & auto-drain moisture separators, with minimum pressure drop during operation.

It shall be suitable external refrigerated Air Dryer and filters with max dew point of -20 deg. C for ensuring the quality of air suitable for instrumentation. It shall be complete with auto-drain moisture separator with minimum pressure drop during operation.

6.0 INSTRUMENTATION AND AUTOMATION

6.1 AUTOMATION

Automatic Control of Milk Storage, Evaporation and Spray Dryer.

This specification is intended to cover design, project engineering, control philosophy, software development, supply at site, unloading at site and loading the system, site testing & pre-commissioning, commissioning, initial & successful operation and performance testing of the entire Control & Instrumentation package of the powder plant of turn-key basis.

Automation Description:

The C&A system shall be designed utilizing state-of-the-art technology to ensure:
• High degree of system availability and reliability with necessary spare viz, 15% spare 1/0 cards, 35% spare memory for main DCS/ High end PLC having advanced features of DCS CPU, 35% Spare SCADA tags in the main CPU, back plane, switches, network components etc. for future expansion/ up gradation. The 12/24 V DC power supply system for the CPU as well as field 1/0 station, shall have dual/twin channel power inputs. However, only rack would be provided for adding another/ upgraded CPU in case of future exigency.

• Extensive diagnostic capability to pinpoint failure areas quickly.

• Low downtime and high meantime between failures.

• System flexibility and modular up-gradation/ expansion capability.

• Safety of the control system (hardware & software) with related equipment and operating personnel. The control system should be tamper proof & immune from external unwarranted influence of any kind.

• Consistent product quality

• Open connectivity using OPC (Ole for Process Control) through open protocol for third party/ system connectivity including MIS.

• Hot swappable (online replaceable) including logging of all operator actions on equipment & set point changes) for 7 days.
<table>
<thead>
<tr>
<th>Item nos.</th>
<th>ITEM DESCRIPTION</th>
<th>Qty.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MILK FORMULATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Milk Silo</td>
<td>2</td>
<td>Nos.</td>
</tr>
<tr>
<td>1.2</td>
<td>Milk Transfer Pump</td>
<td>1</td>
<td>No.</td>
</tr>
<tr>
<td>1.3</td>
<td>CIP return pump</td>
<td>1</td>
<td>No.</td>
</tr>
<tr>
<td>1.4</td>
<td>SUGAR HANDLING &amp; SYRUP PREPARATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4.1</td>
<td>Sugar Dissolving Vats</td>
<td>2</td>
<td>No.</td>
</tr>
<tr>
<td>1.4.2</td>
<td>Service platform</td>
<td>1</td>
<td>No.</td>
</tr>
<tr>
<td>1.4.3</td>
<td>Electric Hoist with mono rail</td>
<td>1</td>
<td>No.</td>
</tr>
<tr>
<td>1.4.4</td>
<td>Sugar Hoppers with Chute</td>
<td>2</td>
<td>No.</td>
</tr>
<tr>
<td>1.4.5</td>
<td>Vapour Extraction System</td>
<td>1</td>
<td>No.</td>
</tr>
<tr>
<td>1.4.6</td>
<td>Duplex Filter</td>
<td>1</td>
<td>No.</td>
</tr>
<tr>
<td>1.4.7</td>
<td>Centrifugal Pump</td>
<td>1</td>
<td>No.</td>
</tr>
<tr>
<td>1.4.8</td>
<td>Volumetric flow meter</td>
<td>1</td>
<td>No.</td>
</tr>
<tr>
<td>1.5</td>
<td>VITAMIN/ INGREDIENT BLENDING TANK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5.1</td>
<td>Blending Tanks with dosing arrangement.</td>
<td>2</td>
<td>Nos.</td>
</tr>
<tr>
<td>1</td>
<td>EVAPORATION PLANT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Feed Balance Tank</td>
<td>1</td>
<td>No.</td>
</tr>
<tr>
<td>2.1.1</td>
<td>Duplex Filter</td>
<td>1</td>
<td>No.</td>
</tr>
<tr>
<td>2.2</td>
<td>Feed Pump</td>
<td>1</td>
<td>No.</td>
</tr>
<tr>
<td>2.3</td>
<td>Preheater</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.4</td>
<td>Direct Contact Regenerative heater</td>
<td>2</td>
<td>Nos.</td>
</tr>
<tr>
<td>2.5</td>
<td>Milk Pasteurizer – Direct steam tangential swirl Heaters</td>
<td>1</td>
<td>No.</td>
</tr>
<tr>
<td>2.6</td>
<td>Temperature treatment holder</td>
<td>1</td>
<td>No.</td>
</tr>
<tr>
<td>2.7</td>
<td>Hydro Cyclone/ Filter</td>
<td>1</td>
<td>set.</td>
</tr>
<tr>
<td>2.8</td>
<td>Calandrias – Falling Film Types (5 Nos.)</td>
<td>1</td>
<td>set.</td>
</tr>
<tr>
<td>2.9</td>
<td>Vapour Separators (5Nos.)</td>
<td>1</td>
<td>Set</td>
</tr>
<tr>
<td>2.1</td>
<td>Products Transfer Pumps</td>
<td>1</td>
<td>Lot</td>
</tr>
</tbody>
</table>

TOTAL ESTIMATED COST FOR MILK FORMULATION
| 2.11  | Concentrate Discharge Pump       | 1 | No |
| 2.12  | Condensate Pumps                 | 1 | Lot |
| 2.13  | Thermo vapour re-compressors (TVR) | 1 | Set |
| 2.14  | Vacuum Pumps                     | 2 | Nos |
| 2.15  | Surface Condenser                | 1 | No |
| 2.16  | Vapour Ducting                   | 1 | Set |
| 2.17  | Pumps seal water system.         | 1 | Set |
|       | a) Seal water tank               | 1 | No. |
|       | b) Seal water collection tank (insulated) | 1 | No. |
|       | c) Seal water transfer pump      | 1 | No. |
|       | d) Seal water cooler PHE Type    | 1 | No. |

### 3.1 POWDER BULK PACKING & CONVEYING

- Intermediate Surge bin for bag filling line. 1 No.
- Rotary Valve below Storage Bin 1 No.
- **Electronic gross weigher with conveyor.** 1 Set
- Powder bag & Corton Coveyng system 1 Set
- **Impulse heating machine** 1 Set
- Bag stiching machine 1 Set

### 3.11 POWDER CONSUMER PACKING

- Semi-automated machine for packing of DW in lined carton. 1 No.
- **Nitrogen Bottle Bank Manifold with valves & piping for 1.8 cylinders.** 1 Set
- Packed lined Carton Conveyor. 1 Set

### TOTAL ESTIMATED COST FOR POWDER PACKING

### 4 CIP SYSTEM

#### 4.1 Acid Buffer Tank

- Lye Buffer Tank 1 No.
- Metering Pumps 1 No.
- **Acid Solution Tank** 1 No.
- Lye Solution tank 1 No.
- Hot Water tank 1 No.
- **Recuperation/ Rinse Water Tank** 1 No.
- **Plate Heat Exchanger** 1 Set
- **CIP Forward Pumps** 1 No.
- **CIP Return Pumps w/o self-priming type.** 1 No.
- **CIP Return Pumps with liquid ring self-priming type** 1 No.
- **Cleaning Turbine** 1 No.
| 4.12 | CIP Nozzles for cyclones, vibro and ducting (Retractable type) | 1 | Set |
| 4.13 | Safety shower/ face wash | 1 | No. |
| 4.14 | Re-circulation pump for Acid & Lye Solution tanks. | 2 | Nos. |
| 4.15 | Pig Tanks for Drying Chamber, Cyclones and Vibor. | 1 | No. |
| 4.16 | Service Platform | 1 | Lot |
| 4.17 | CIP Filter | 1 | Lot |

**TOTAL ESTIMATED COST FOR CIP SYSTEM**

<table>
<thead>
<tr>
<th>5</th>
<th>Compressed air</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td>Non-lubricating type air compressor with accessories</td>
</tr>
<tr>
<td>5.1.1</td>
<td>Air receiver with all accessories.</td>
</tr>
<tr>
<td>5.2</td>
<td>Air Drier (refrigerated)</td>
</tr>
</tbody>
</table>

**TOTAL ESTIMATED COST FOR COMPRESSED AIR**

<table>
<thead>
<tr>
<th>6</th>
<th>INSTRUMENTATION AND AUTOMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>AUTOMATION</td>
</tr>
<tr>
<td>6.1.1</td>
<td>Distributed Control System</td>
</tr>
<tr>
<td>6.1.2</td>
<td>Server</td>
</tr>
<tr>
<td>6.1.3</td>
<td>Human Machine Interface (HMI) Operator Station.</td>
</tr>
<tr>
<td>6.1.4</td>
<td>Powder Dispatch PC</td>
</tr>
<tr>
<td>6.1.5</td>
<td>Printers</td>
</tr>
<tr>
<td>6.1.6</td>
<td>Network Hardware</td>
</tr>
<tr>
<td>6.1.7</td>
<td>System Software</td>
</tr>
<tr>
<td>6.1.8</td>
<td>MIS Software</td>
</tr>
<tr>
<td>6.1.9</td>
<td>Control Desk / Cabinet &amp; Chairs</td>
</tr>
<tr>
<td>6.2</td>
<td>INSTRUMENTATION</td>
</tr>
<tr>
<td>6.2.1</td>
<td>Process Transmitters</td>
</tr>
<tr>
<td>6.2.2</td>
<td>Process Gauges</td>
</tr>
<tr>
<td>6.2.3</td>
<td>Temperature Elements</td>
</tr>
<tr>
<td>6.2.4</td>
<td>Process Switches</td>
</tr>
<tr>
<td>6.2.5</td>
<td>Flow Elements</td>
</tr>
<tr>
<td>6.2.6</td>
<td>Magnetic Flow Meter</td>
</tr>
<tr>
<td>6.2.7</td>
<td>Mass/ Density Flow Meter</td>
</tr>
<tr>
<td>6.2.8</td>
<td>Vortex Flow Meters</td>
</tr>
<tr>
<td>6.2.9</td>
<td>Level Instruments</td>
</tr>
<tr>
<td>6.2.10</td>
<td>Conductivity Analyzer</td>
</tr>
<tr>
<td>6.2.11</td>
<td>Control Valves</td>
</tr>
<tr>
<td>6.2.12</td>
<td>Variable Frequency Drives</td>
</tr>
<tr>
<td>7</td>
<td>TOTAL ESTIMATED COST FOR AUTOMATION &amp; INSTRUMENTATION</td>
</tr>
<tr>
<td>---</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>7.1.1</td>
<td>MCC I – for drying section</td>
</tr>
<tr>
<td>7.1.2</td>
<td>MCC-II – for evaporation plant &amp; CIP section</td>
</tr>
<tr>
<td>7.1</td>
<td>Electric motors</td>
</tr>
<tr>
<td>7.2</td>
<td>Power cables (LT)</td>
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<tr>
<td>7.3</td>
<td>Power cables</td>
</tr>
<tr>
<td>7.4</td>
<td>Control &amp; instrumentation cables</td>
</tr>
<tr>
<td>7.4</td>
<td>Cable trays</td>
</tr>
<tr>
<td>7.5</td>
<td>Cable glands</td>
</tr>
<tr>
<td>7.6</td>
<td>Cable connectors</td>
</tr>
<tr>
<td>7.7</td>
<td>Cable route makers</td>
</tr>
<tr>
<td>7.8</td>
<td>Cable indicators</td>
</tr>
<tr>
<td>7.9</td>
<td>Conduits</td>
</tr>
<tr>
<td>7.1</td>
<td>Motor isolators</td>
</tr>
<tr>
<td>7.11</td>
<td>UPS</td>
</tr>
<tr>
<td>7.12</td>
<td>Rubber mats</td>
</tr>
<tr>
<td>7.13</td>
<td>Fire extinguisher for MCCs &amp; control room fire alarm system</td>
</tr>
<tr>
<td></td>
<td>Frequency drives &amp; other panels</td>
</tr>
<tr>
<td></td>
<td>Earthing for electrical power &amp; automation system</td>
</tr>
<tr>
<td>8</td>
<td>TOTAL ESTIMATED COST FOR ELECTRICAL DIST. SYSTEM</td>
</tr>
<tr>
<td>8.1</td>
<td>SS piping, valves &amp; fitting</td>
</tr>
<tr>
<td>8.2</td>
<td>Steam piping (HP &amp; LP steam)</td>
</tr>
<tr>
<td>8.3</td>
<td>Piping for chilled water, raw water, cooling water</td>
</tr>
<tr>
<td>8.4</td>
<td>Condensate piping</td>
</tr>
<tr>
<td>8.5</td>
<td>Compressed air piping</td>
</tr>
<tr>
<td>8.6</td>
<td>Strainers for raw/soft waters &amp; LP/HP steam</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9</th>
<th>TOTAL ESTIMATED COST FOR PIPING</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.1</td>
<td>Steam &amp; water mixing batteries</td>
</tr>
<tr>
<td>9.2</td>
<td>S.S. shrouds for motors – in wet area</td>
</tr>
<tr>
<td>9.3</td>
<td>Steam pressure reducing station</td>
</tr>
<tr>
<td>9.4</td>
<td>Decorative type AC/ fan coil unit</td>
</tr>
<tr>
<td>9.5</td>
<td>Jet cleaning equipment</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>10</th>
<th>TOTAL-MISCHELLOUS EQUIPMENT</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>10</th>
<th>SUPPORTING STRUCTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1 Lot</td>
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</tbody>
</table>
### LIST OF PREPARED MAKES OF MAJOR BOUGHT OUT ITEMS

<table>
<thead>
<tr>
<th>Description</th>
<th>Makes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MILKEVPORATION 7 DRYING (POWDER) PLANT</strong></td>
<td></td>
</tr>
<tr>
<td>Calendria &amp; Vapour Separator</td>
<td>GEA PROCESS DESIGN/ TETRA PACK/ ALFALAVAL</td>
</tr>
<tr>
<td>SS pumps for evaporation plant</td>
<td>ALFA LAVAL/ FRISTAM</td>
</tr>
<tr>
<td>CIP Return Pump (Liquid Ring Self priming)</td>
<td>ALFA LAVAL / FRISTAM</td>
</tr>
<tr>
<td>Vacuum Pump</td>
<td>MAZDA / PPI / ROBUSCH (India)</td>
</tr>
<tr>
<td>Thermo Vapour Recompressor Nozzles</td>
<td>GEA JET PUMPS</td>
</tr>
<tr>
<td>CIP System (Automatic)</td>
<td></td>
</tr>
<tr>
<td>PHE Type Milk Chiller / Heater/ Pasteurizer</td>
<td>GEA - ECOFLEX / IDMC- SONDEX / TETRA PACK/ ALFALAVAL</td>
</tr>
<tr>
<td>Concentrated Milk Pre Heater</td>
<td>HIPEX</td>
</tr>
<tr>
<td>High Pressure homogenizer (imported)</td>
<td>NIRO SOAVI / be ITALID</td>
</tr>
<tr>
<td>Two Fluid Nozzle for Lecithination</td>
<td>DELWAN/ SPREYSYSTEM</td>
</tr>
<tr>
<td>Vibro Sieve</td>
<td>PENWALT / SWECO</td>
</tr>
<tr>
<td>Steam Air Nozzle / Dehumidifier</td>
<td>VIRTEX / SRM / PAT / C DOCTOR</td>
</tr>
<tr>
<td>Nozzle Atomizer</td>
<td>DELWAN/ SPREYSYSTEM</td>
</tr>
<tr>
<td>Roots Blower</td>
<td>KAY / SWAM / MDI- USA</td>
</tr>
<tr>
<td>Rotary Valves</td>
<td>DMN WESTINGHOUSE / COPERION</td>
</tr>
<tr>
<td>Centrifugal fans</td>
<td>FLAKT WOODS/ NADI</td>
</tr>
<tr>
<td>Blow Through Valves</td>
<td>DMN WESTINGHOUSE/ COPERION</td>
</tr>
<tr>
<td>Diverter valves &amp; Rotary valves,</td>
<td>DMN WESTINGHOUSE / COPERION</td>
</tr>
<tr>
<td>Draft Gauge</td>
<td>WIKA / SWITZER / WAREE</td>
</tr>
<tr>
<td>Electromagnetic Hammers</td>
<td>NEC EEC</td>
</tr>
<tr>
<td>Gill Plate for Vibro Fluidizer</td>
<td>GEA NIRO / LEHMAN</td>
</tr>
<tr>
<td>Vibrator of vibro fluidizer</td>
<td>GEA NIRO / SINEX</td>
</tr>
<tr>
<td>Bag Filling &amp; Weighing Machine</td>
<td>CHRONAS RICHARDSON / CONCETTI / TECHNO WAY</td>
</tr>
<tr>
<td>Semi-automatic Lined Carton packing Machine</td>
<td>ROLATAINER / CEKA CHIRAG</td>
</tr>
<tr>
<td>Conveyor for Packed cartons</td>
<td>WEGA / FENNER INDIANA</td>
</tr>
<tr>
<td>Electronic Weighing Machine Platform Type</td>
<td>METTLER TOLEDO / SARTORIUS/ ESSAGE- TERAOKE</td>
</tr>
<tr>
<td>Cooling Tower (FRP)</td>
<td>PAHARPUR / MIHIR / ADVANCE</td>
</tr>
<tr>
<td>Decorative type Split AC</td>
<td>HITACHI/ CARRIER/ VOLTAS / BLUE STAR</td>
</tr>
<tr>
<td>EPS / PUF Insulation Materials</td>
<td>LLOYDS / BEARDSSELL</td>
</tr>
<tr>
<td>Sodiddles for Cold Insulation</td>
<td>SUPERTHERM (LLOYD) / BEARDSSELL</td>
</tr>
<tr>
<td>Water / Chilled Water Pumps</td>
<td>GRUNDFOS / WILO / KSB</td>
</tr>
<tr>
<td><strong>INSTRUMENTATION, CONTROLS &amp; AUTOMATION</strong></td>
<td></td>
</tr>
<tr>
<td>VFD</td>
<td>SIEMENS / ALLEN BRADLEY / DANFOSS</td>
</tr>
<tr>
<td>Component</td>
<td>Manufacturer</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>Electronic Soft Starter</td>
<td>SIEMENS / ALLEN BRADLEY / DANFOSS</td>
</tr>
<tr>
<td>Air Flow Sensor</td>
<td>STARMECH CONTROLS / E &amp; H</td>
</tr>
<tr>
<td>Level Transmitter &amp; indicator</td>
<td>E &amp; H / EMERSON</td>
</tr>
<tr>
<td>Temperature / Pressure Transmitter</td>
<td>E &amp; H / EMERSON</td>
</tr>
<tr>
<td>Conductivity &amp; pH Transmitter</td>
<td>E &amp; H / EMERSON</td>
</tr>
<tr>
<td>Density transmitter</td>
<td>E &amp; H EMERSON</td>
</tr>
<tr>
<td>RTD</td>
<td>WIKA / GIC / ALTOR</td>
</tr>
<tr>
<td>PID Controller</td>
<td>YOKOGAWA / TATA HONEYWELL / RADIX</td>
</tr>
<tr>
<td>Flow Switch</td>
<td>IFB, Gmbh/DANFOSS / SWITZER</td>
</tr>
<tr>
<td>Level Switch (float type for liquid &amp; birating fork type for powder)</td>
<td>E &amp; H / EMERSON (Vibrating Fork) PUNE TECTROL (Float Type)</td>
</tr>
<tr>
<td>Vortex/ Magnetic Flow meter</td>
<td>E &amp; H EMERSON</td>
</tr>
<tr>
<td>Mass Flow meter</td>
<td>E &amp; H EMERSON</td>
</tr>
<tr>
<td>Control Valve</td>
<td>DANFOSS / SAMSON / DEMBLA / ARCA</td>
</tr>
<tr>
<td>Pressure switch / temp switch</td>
<td>DANFOSS / SWITZER</td>
</tr>
<tr>
<td>Pressure &amp; Temperature Gauge</td>
<td>WIKA / WAREEE / GIIC</td>
</tr>
<tr>
<td>Temperature digital indicator / controller</td>
<td>YOKOGAWA / RADIX / HONEYWELL</td>
</tr>
<tr>
<td>Powder/ Energy Monitor</td>
<td>SIEMENS / ALLEN BRADLEY / CONZERV</td>
</tr>
<tr>
<td>PC (Personal computer)</td>
<td>HEWLETT-PACKARD / DELL / IBM LENOVA</td>
</tr>
<tr>
<td>DCS/High End PLC System</td>
<td>SIEMENS / ALLEN BRADLEY</td>
</tr>
<tr>
<td>Automation System</td>
<td>SIEMENS / ROCKWELL</td>
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</tbody>
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**ELECTRICALS**

<table>
<thead>
<tr>
<th>Component</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric Motors</td>
<td>BHARAT BIJLEE / SIEMENS / ABB</td>
</tr>
<tr>
<td>Air Circuits B:reaker</td>
<td>KIRLOSKAR / CROMPTON GREAVES</td>
</tr>
<tr>
<td>MCCB</td>
<td>L &amp; T / SIEMENS</td>
</tr>
<tr>
<td>MPCB</td>
<td>L &amp; T / SIEMENS</td>
</tr>
<tr>
<td>Contactor</td>
<td>L &amp; T / SIEMENS</td>
</tr>
<tr>
<td>Starter Overload Relay</td>
<td>L &amp; T / SIEMENS</td>
</tr>
<tr>
<td>Timer Electronic</td>
<td>L &amp; T / SIEMENS</td>
</tr>
<tr>
<td>MCB</td>
<td>SIEMENS / HAGER / MDS- LEGRAND</td>
</tr>
<tr>
<td>Push Button</td>
<td>ESBEE / SIEMENS / GE</td>
</tr>
<tr>
<td>Indicating Lamps</td>
<td>ESBEE / SIEMENS / ABB / SCHNEIDER</td>
</tr>
<tr>
<td>Digital Ammeter, Voltmeter &amp; Power Factor meter</td>
<td>CONZERY / L&amp;T / SIEMENS</td>
</tr>
<tr>
<td>Analog Ammeter, Voltmeter &amp; Power factor meter</td>
<td>RISHABH / IMP / MECO / AE / CONZERY</td>
</tr>
<tr>
<td>Digital Energy Meter</td>
<td>CONZERV / L&amp;T / HPL SOCOMEC</td>
</tr>
<tr>
<td>Current Transformer</td>
<td>KAPPA / BHARATI / AE</td>
</tr>
<tr>
<td>LT Power Cables</td>
<td>RPG ASIAN / FINOLEX / POLYCAB</td>
</tr>
<tr>
<td>LT Copper Control Cables</td>
<td>RPG ASIAN / FINOLEX / POLYCAB</td>
</tr>
<tr>
<td>Signal &amp; Instrument cable</td>
<td>LAPP KABEL / BELDON</td>
</tr>
<tr>
<td>App Power Capacitors</td>
<td>EPCONS / NEPTUNE - DUCATI / SCHNEIDER</td>
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<tr>
<td>Appc Relay</td>
<td>BELUKE / EPCOS / L&amp;T</td>
</tr>
<tr>
<td>Cable Tray</td>
<td>INDIANA / MEK / SUNRISE / SUPER / PILOC / ELCON / METRLICA</td>
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<tr>
<td>Isolating Switches</td>
<td>SIEMENS / L&amp;T</td>
</tr>
<tr>
<td>HRC fuses</td>
<td>L&amp;T / SIEMENS / EE / C&amp;s / GE POWER</td>
</tr>
<tr>
<td>IP SS b:oxes for motor isolators, push buttons, junction boxes etc.</td>
<td>HENSEL / RITTAL / HANSU</td>
</tr>
<tr>
<td>Plug &amp; Socket</td>
<td>LEGRAND / CLIPSAL / HENSEL</td>
</tr>
<tr>
<td>Potential Transformers</td>
<td>KAPPA / BHARTI / AE</td>
</tr>
<tr>
<td>Pressings/ Power Controls</td>
<td></td>
</tr>
</tbody>
</table>

**REFERENCES**
**Terminal Blocks**
- WAGO / LAPP INDIA / CONNECTWELL

**Electronic Load Manager**
- CONZERV / SIEMENS / ROCKWELL

**Rotary Selector Switch**
- L&T SALZER / SIEMENS / SCHNEIDER

**Cable Glands**
- COMET / DOWELS / LAPP KABEL

**Cable Luge**
- DOWELS / COMET / LAPP KABLE

**Programmable Protection Relay**
- MINILEC

**Servo Voltage Stabilizer**
- SUVIK / DB / CRYCARD

**Ups**
- EMERSON - LIEBENT / DB ELECTRONICS / APC

**SMF Battery**
- YUASA - ROCKET / PANASONIC / EXIDE

### VALVES & PIPES (MS & GI)

<table>
<thead>
<tr>
<th>Type</th>
<th>Make</th>
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</thead>
<tbody>
<tr>
<td>Acturated Water Valves (Ball / butterfly)</td>
<td>SAUNDERS/ AUDCO / INTERVALVE / FESTO</td>
</tr>
<tr>
<td>Water Valves Manual (Ball/ Butterfly)</td>
<td>SAUNDERS/ AUDCO / INTERVALVE</td>
</tr>
<tr>
<td>Non-return Valve for water</td>
<td>AUDCO / INTERVALVE</td>
</tr>
<tr>
<td>Water Foot Valve</td>
<td>KIRLOSKAR / LEADER</td>
</tr>
<tr>
<td>GI Pipes for water</td>
<td>TATA / KINDAL / TISMETUL (KALYANI)</td>
</tr>
<tr>
<td>MS Pipes for air, steam &amp; condensate</td>
<td>TATA / KINDAL / TISMETUL (KALYANI)</td>
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<tr>
<td>NRV for Air</td>
<td>INTERVALVE / AUDCO / LEADER</td>
</tr>
<tr>
<td>Solenoid Valve for Water line</td>
<td>DANFOSS/ AVCON</td>
</tr>
<tr>
<td>Vortex Water Flow Meter</td>
<td>E&amp;h / EMERSON</td>
</tr>
<tr>
<td>HP / LP Steam / condensate Valves</td>
<td>AUDCO/ SPIRAX/ ARMSTRONG, USA / THERMAX</td>
</tr>
<tr>
<td>Resin bonded mineral wool</td>
<td>LLOYD / UP TWIGA/ MINWOOL</td>
</tr>
<tr>
<td>Steam relief valve, traps &amp; strainers</td>
<td>SPIRAK / ARM STRONG, USA / THERMAX</td>
</tr>
<tr>
<td>Steam Pressure Reducing Valve</td>
<td>SPIBAX/ ARM STRONG, USA / THERMAX / MAZDA</td>
</tr>
<tr>
<td>Steam Pressure Reducing Station</td>
<td>JN MARSHALL (SPIRAK) / ARM STRONG, USA</td>
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### SS PIPES & VALVES

<table>
<thead>
<tr>
<th>Type</th>
<th>Make</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS Pipes</td>
<td>RATNAMANI / BHANDARI FOILS &amp; TUBES / NEEKA TUBES</td>
</tr>
<tr>
<td>SS seat type Pneumatic Valves</td>
<td>GEA TUCHENHAGEN</td>
</tr>
<tr>
<td>SS Butterfly / Ball type pneumatic valves</td>
<td>GEA TUCHENHAGEN</td>
</tr>
<tr>
<td>SS Manual Valves &amp; Fittings</td>
<td>ALFA LAVAL / IDMC / CIPRIANI</td>
</tr>
</tbody>
</table>

### AIR COMPRESSORS & AIR LINE FITTINGS

<table>
<thead>
<tr>
<th>Type</th>
<th>Make</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Comp (Reciprocating)</td>
<td>INGERSOLL RAND / KIRLOSKAR / KHOSLA</td>
</tr>
<tr>
<td>Refrigerated Air Dryer</td>
<td>ELGI / CHICAGO PNEUMATIC / HIRAS</td>
</tr>
<tr>
<td>Air lines accessories</td>
<td>SHAVO NORGEN / FESTO / AIRMATIC / NUCON</td>
</tr>
<tr>
<td>Auto Drain Valve</td>
<td>ULTRA FILTER / ZANDER</td>
</tr>
</tbody>
</table>

### MISCELLANEOUS ITEMS

<table>
<thead>
<tr>
<th>Type</th>
<th>Make</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geared Motor / Gear Box</td>
<td>POWER MASTER (PBL) / IC BAUER</td>
</tr>
<tr>
<td>Steam Water Mixing Battery</td>
<td>ARMSTRONG, USA / SPIRAX</td>
</tr>
<tr>
<td>Structural Steel</td>
<td>SAIL / TISCO / RINL / IISCO / ESAR</td>
</tr>
</tbody>
</table>

Note: In case the make of specific items/ equipment quoted by the Bidder is not available in the above list, the powder plant supplier may indicate the same in their bids. However, the acceptance of the make of specific items / equipment is discretion of the purchaser.
Technical Specifications

Civil Works
1) Specification for the civil works to be followed as per PWD, Bihar.

2) The following specifications are subject to any change during drawing & design.

Civil work will consist of:-

a) **Dairy Block**
   - Raw milk reception dock - 21m x 21m x 4.5m
   - Process Hall with C.I.P. - 63m x 16.5m x 7.1m
   - Product packing and cold store - 42 m x 42 m x 4.5 m with mezzanine floor for Keeping 5x10 KL capacity milk tank
   - Laboratory on 1st floor (15m x 6m)

b) **Utility Block**: (Size of Room/Block/Store)
   - Boiler house (Roofing will be corrugated galvanized sheet) - 21m x 21m x 7.1 m
   - Electrical panel room with refrigeration - 49 m x 28 m x 6.0 m
   - General Store (RCC Roof) - 13m x 10m x 6m
   - Workers Amenity - 200 Sq Mtr Area
   - Admn. Block (Double Story) - 500 m2 Area With Water Supply, Sanitary, Electrification all complete.

   - RCC overhead water tank in two compartments with pumping station and pump room. In size (4mx3m) with electrification work - 50 KL Capacity.

   - Civil work for machine foundation for IBT condenser tank, and all other required machines (all work in RCC foundation).

h) **Hard park & tanker Bay** – 2500 sq m

This will include
   i. RCC Road - 300 sqm
   ii. Main Road - 9.00 m wide.
   iii. Other Roads - 6.00 m wide.

This work will consist of:
   i. Earthwork in excavation
   ii. Sandfilling
iii. Brick on edge soling  
iv. 150 mm thick stone metal laying with compaction by roller  
v. 100 mm thick PCC (1:4:8) with stone metal  
vi. 200 mm thick RCC M 20 in panel  
vii. Joint Filling with hot Bitumen & mixed with sand  

i) E.T.P. of suitable capacity to treat 8.00 lakhs ltr. per day dairy effluent.  

Note:- There should be provision for the expansion of R.M.R.D processing section & Product section & utility etc.  

**SPECIFICATION OF WORK:-** *(Subject to change during Design/Drawing)*  

**Brick work:** All brick work will be of Ist class bricks in cement worker (1:6).  

**RCC Work/PCC work:** All concrete Work will be in M 20 mix  

**Plaster work:** All internal plaster will be 12mm thick (1:6) in wall and 600m thick in C.M.(1:4) in ceiling External plaster will be in two layers 15mm thick with cement motor (1:6) and top layer spatter dash plaster in cement motor (1:3) mixed With stone grits.  

**Glazed tiles:** White glazed tiles in walls of dairy building in process hall, product/ packing/ corridor etc. upto 7 ft height.  

**Flooring work:** Red Mandana Stone tiles over 5” thick RCC M 20 concrete over brick flat soling in dairy building and kota stone flooring in office/workers amenity building.  

In utility section the flooring will 5” thick RCC M 20 with 20 mm thick IPS mixed with iron dust.  

**Roofing work:** All roofs will be RCC M 20 Except boiler House including waterproofing course.  

**Doors/ Windows:** All doors & windows will be of Aluminum frame and glass panes of suitable thickness.  

**Finishing /Painting Work:** Weather coat painting on external plastered surface and Emulsion paint on internal surface.  

**Road & Hard Park:** 0’8” Thick RCC M 20 road over 6” thick stone metal duly compacted with roller over and one brick on edge soling and sand filling for all blocks separately.  

Note:- Rate will be quoted on plinth area basis. A rough layout plan of dairy building may be seen in our office for reference. Based on this, bidder has to submit the plan and elevation of all buildings along with the bid.  

For Road/ Hard Park the rate should be quoted in m². For RCC overhead water tank, the rate may be quoted in per litre of tank capacity.  

Note:-1 Rate will be quoted on plinth area basis. A rough layout plan of dairy building may be seen in our office for reference. Based on this, bidder has to submit the complete design/ plan and elevation of all buildings along with the bid.  

Note:-2 For Road/ Hard Park the rate should be quoted in M². For RCC overhead water tank, the rate may be quoted in per litre of tank capacity.  

Note:-3 Civil Work specifications to be carried out as per Bihar Schedule of Rate Building/Roads & Code.
Painting- To be done over Wall Putty.
Cement used to be Birla/Lafarge/ ACC
Water Proofing on Roof - APP (Ataetic Polypropylene)
Make of Tiles- Kajaria/ Johnson/Somani

Civil Works for Powder Plant: - Steel Struture for Powder Plant Production block ( Steel Frame including Staircase, Railing, Purling, Runners etc. Chequred Plate Flooring for steel Struture (5 mm Thick)
SECTION – VII

Bill of Quantity
Civil Works

To be supplied by the Bidder after finalization of Tender
SECTION – VII

Bill of Quantity
# Bill of Quantity for Dairy Plant Equipments

## Brief Schedule of Requirement

<table>
<thead>
<tr>
<th>S.N.</th>
<th>DESCRIPTION</th>
<th>CAPACITY</th>
<th>QTY</th>
<th>UNIT</th>
<th>Rate (Rs)</th>
<th>Amount (Rs)</th>
<th>Rate (Rs)</th>
<th>Amount (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>Reception &amp; Chilling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1.01</td>
<td>Milk unloading hose with fitting two reception lines and one despatch line</td>
<td>75mm x 10m long</td>
<td>3</td>
<td>Set</td>
<td></td>
<td></td>
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<tr>
<td>1.02</td>
<td>Milk pump</td>
<td>30 KLPH</td>
<td>2</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1.03</td>
<td>Disc type in-line strainer</td>
<td>30 KLPH</td>
<td>2</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1.04</td>
<td>SS de aeration vessel</td>
<td>SUITABLE</td>
<td>2</td>
<td>No</td>
<td></td>
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<td></td>
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<tr>
<td>1.05</td>
<td>SS Folding type platform with SS Railing on RCC walk way for tanker man way approach</td>
<td>As per requirement. Each bay length is approx 20m</td>
<td>4</td>
<td>Nos</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1.06</td>
<td>Milk duplex on line strainer (vertical)</td>
<td>30 KLPH</td>
<td>2</td>
<td>No</td>
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<td></td>
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<tr>
<td>1.07</td>
<td>Raw milk chiller</td>
<td>30 KLPH</td>
<td>2</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1.08</td>
<td>Raw Milk silo with accessories</td>
<td>100 KL</td>
<td>4</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1.09</td>
<td>CIP Return pump for tankers</td>
<td>20 KLPH</td>
<td>2</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1.10</td>
<td>SS control panel for one reception lines and one tanker CIP lines and one dispatch line</td>
<td></td>
<td>2</td>
<td>Set</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.11</td>
<td>Dummy man hole cover with CIP spray ball, gaskets and end connections, flexible hose complete for tanker CIP</td>
<td>Suitable Universal size</td>
<td>2</td>
<td>Set</td>
<td></td>
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<tr>
<td>1.12</td>
<td>Lifting mechanism for manhole covers for tanker CIP</td>
<td></td>
<td>2</td>
<td>Set</td>
<td></td>
<td></td>
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<tr>
<td>1.13</td>
<td>Rapid raw milk samples testing system suitable for communication with Lab PC</td>
<td>For measurement of % Fat, % SNF, pH, temperature</td>
<td>1</td>
<td>Set</td>
<td></td>
<td></td>
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</tbody>
</table>

## Brief Schedule of Requirement

<table>
<thead>
<tr>
<th>S.N.</th>
<th>DESCRIPTION</th>
<th>CAPACITY</th>
<th>QTY</th>
<th>UNIT</th>
<th>Rate (Rs)</th>
<th>Amount (Rs)</th>
<th>Rate (Rs)</th>
<th>Amount (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.00</td>
<td>PROCESSING</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>2.01</td>
<td>Milk transfer pump from RM silo to pasteurizer</td>
<td>20 KLPH</td>
<td>2</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.02</td>
<td>Milk pasteurization plant with accessories</td>
<td>20 KLPH</td>
<td>2</td>
<td>Set</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.03</td>
<td>Processed Milk silo with accessories</td>
<td>100 KL</td>
<td>4</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2.04</td>
<td>Self cleaning tri purpose centrifuge with all accessories including static head water tank, without stand at 2.05</td>
<td>20 KLPH</td>
<td>2</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2.05</td>
<td>Electrchoist with monorail structure common for 3 separators.</td>
<td>2 T</td>
<td>1</td>
<td>Set</td>
<td></td>
<td></td>
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<tr>
<td>2.06</td>
<td>Cream pasteurization plant with intermediate/ balance tank, accessories and feed pump</td>
<td>3 KLPH</td>
<td>2</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.07</td>
<td>Induced draft cross flow type FRP cooling tower</td>
<td>Suitable for 2 Nos of</td>
<td>1</td>
<td>Set</td>
<td></td>
<td></td>
<td></td>
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### BRIEF SCHEDULE OF REQUIREMENT

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<tr>
<th>S.N.</th>
<th>DESCRIPTION</th>
<th>CAPACITY</th>
<th>QTY</th>
<th>UNIT</th>
<th>Rate (Rs)</th>
<th>Amount (Rs)</th>
<th>Part – A</th>
<th>Part – B</th>
</tr>
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<tbody>
<tr>
<td>2.11</td>
<td>CIP Return pump for RM Silo and PM silo</td>
<td>20 KLP</td>
<td>2</td>
<td>No</td>
<td>2.00</td>
<td>4.00</td>
<td></td>
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<tr>
<td>2.12</td>
<td>CIP Return pump for Cream ripening tank</td>
<td>20 KLP</td>
<td>1</td>
<td>No</td>
<td>3.00</td>
<td>6.00</td>
<td></td>
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</tr>
<tr>
<td>3.00</td>
<td>RINSE MILK RECOVERY SYSTEM</td>
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<tr>
<td>3.01</td>
<td>SS Balance tank</td>
<td>2000 Litres</td>
<td>1</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3.02</td>
<td>Rinse milk transfer pump</td>
<td>5 KLP</td>
<td>1</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.03</td>
<td>Rinse milk chiller</td>
<td>5 KLP</td>
<td>1</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.04</td>
<td>Insulated vertical storage tank for rinse milk</td>
<td>5 KL</td>
<td>2</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.05</td>
<td>CIP Return pump</td>
<td>20 KLP</td>
<td>1</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.06</td>
<td>Milk transfer pump to Raw milk silo</td>
<td>20 KLP</td>
<td>1</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.00</td>
<td>BUTTER MAKING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.01</td>
<td>Continuous butter making m/c complete with all accessories</td>
<td>800 Kg/ hr</td>
<td>2</td>
<td>Set</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4.02</td>
<td>Butter milk chiller</td>
<td>2 KLP expandable to 3 KLP</td>
<td>1</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.03</td>
<td>Insulated vertical butter milk storage tank</td>
<td>15 KLP</td>
<td>1</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.04</td>
<td>Insulated vertical pasteurized water storage tank</td>
<td>15 KLP</td>
<td>1</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.05</td>
<td>Butter milk transfer pump to raw milk silo</td>
<td>20 KLP</td>
<td>1</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
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### BRIEF SCHEDULE OF REQUIREMENT

<table>
<thead>
<tr>
<th>S.N.</th>
<th>DESCRIPTION</th>
<th>CAPACITY</th>
<th>QTY</th>
<th>UNIT</th>
<th>Rate (Rs)</th>
<th>Amount (Rs)</th>
<th>Rate (Rs)</th>
<th>Amount (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.06</td>
<td>CIP return pump</td>
<td>20 KLPH</td>
<td>1</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4.07</td>
<td>SS Butter trolley</td>
<td>600 Kg.</td>
<td>4</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4.08</td>
<td>Butter carton trolley</td>
<td>850 mm (L) x 650 mm (B) x 1250 mm (H)</td>
<td>2</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>4.09</td>
<td>Butter trolley fitted with auger and butter pump</td>
<td>Suitable for 2000 LPH</td>
<td>1</td>
<td>Set</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4.10</td>
<td>Bulk butter filling machine</td>
<td>20 cartons/ hr.</td>
<td>2</td>
<td>No</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>5.00</td>
<td><strong>GHEE MAKING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>5.01</td>
<td>Butter oil melting vat</td>
<td>2 KL</td>
<td>2</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.02</td>
<td>Ghee/ Butter oil pump</td>
<td>2 KLPH</td>
<td>5</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>5.03</td>
<td>Pre stratification tank</td>
<td>2 KL</td>
<td>2</td>
<td>No</td>
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<tr>
<td>5.04</td>
<td>Ghee boiler</td>
<td>2 KL</td>
<td>2</td>
<td>No</td>
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<td>5.05</td>
<td>Ghee balance tank</td>
<td>500 L</td>
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<td>5.06</td>
<td>Ghee settling tank</td>
<td>2 KL</td>
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<td>5.07</td>
<td>Ghee clarifier</td>
<td>2 KLPH</td>
<td>1</td>
<td>No</td>
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<tr>
<td>5.08</td>
<td>Ghee storage tank</td>
<td>2 KL</td>
<td>2</td>
<td>No</td>
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<td></td>
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<tr>
<td>5.09</td>
<td>Ghee pouch filling</td>
<td>800 PPH</td>
<td>1</td>
<td>No</td>
<td></td>
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<tr>
<td>5.10</td>
<td>Servo voltage stabilizer for Ghee filling m/c</td>
<td>Suitable</td>
<td>1</td>
<td>No</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>5.11</td>
<td>Fume extraction system for ghee making section</td>
<td>SS ducting and Hood with industrial fan</td>
<td>1</td>
<td>Set</td>
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### BRIEF SCHEDULE OF REQUIREMENT

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<th>Amount (Rs)</th>
<th>Rate (Rs)</th>
<th>Amount (Rs)</th>
</tr>
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<tbody>
<tr>
<td>6.01</td>
<td>Funnel &amp; Ventury unit with pump for reconstitution unit complete</td>
<td>5000 LPH</td>
<td>1</td>
<td>Set</td>
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<tr>
<td>6.1.1</td>
<td>Uninsulated tank for reconstituted milk</td>
<td>5 KL</td>
<td>2</td>
<td>No</td>
<td></td>
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<td>6.1.2</td>
<td>SS milk pump for recirculation and transfer to pasteurizer balance tank</td>
<td>5 KLPH</td>
<td>1</td>
<td>No</td>
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<td>6.1.3</td>
<td>CIP return pump</td>
<td>20 KLPH</td>
<td>1</td>
<td>No</td>
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<tr>
<td>6.02</td>
<td>Insulated vertical milk storage tank with accessories for milk marketing</td>
<td>20 KL</td>
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<td>No</td>
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<td>6.2.1</td>
<td>CIP Return pump for VMST/ Leaky Pouch Tank</td>
<td>20 KLPH</td>
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<td>No</td>
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<tr>
<td>6.03</td>
<td>Straight through Crate washer with drier</td>
<td>800 CPH</td>
<td>1</td>
<td>No</td>
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</table>
### 6.04 Crate conveyors (chain link Type as well as roller type) for empty and filled milk pouch crate

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
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<td>6.04</td>
<td>Crate conveyors</td>
<td>1</td>
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### 6.05 Milk storage tank (horizontal type) for pouch filling machines

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
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</tr>
</thead>
<tbody>
<tr>
<td>6.05</td>
<td>Milk storage tank</td>
<td>10 KL</td>
<td>2 No</td>
</tr>
</tbody>
</table>

### 6.06 Milk pouch filling machine mechanical type with coding machine & voltage stabilizer

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
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</thead>
<tbody>
<tr>
<td>6.06</td>
<td>Milk pouch filling machine</td>
<td>8000 PPH</td>
<td>3 No</td>
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</table>
## Brief Schedule of Requirement

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Description</th>
<th>Capacity</th>
<th>QTY</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Amount (Rs)</th>
<th>Rate (Rs)</th>
<th>Amount (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.6.1</td>
<td>System consisting of a PHE, SS balance tank and a SS centrifugal pump of suitable capacity for generating cold water at temp 18-20 deg C for head cooling of Mechanical Pouch Filling machine</td>
<td>Suitable capacity</td>
<td>1</td>
<td>Set</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>6.07</td>
<td>Leaky pouch milk collection tank</td>
<td>200 L</td>
<td>1</td>
<td>No</td>
<td></td>
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<tr>
<td>6.7.1</td>
<td>Leakage milk transfer pump</td>
<td>5000 LPH</td>
<td>1</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>6.7.2</td>
<td>CIP return pump for HMST</td>
<td>20 KLPH</td>
<td>1</td>
<td>No</td>
<td></td>
<td></td>
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<tr>
<td>6.08</td>
<td>Chiller for reconstituted milk</td>
<td>5000 LPH</td>
<td>1</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>6.8.1</td>
<td>SS Duplex Strainer for reconstituted milk</td>
<td>5 KLPH (min)</td>
<td>1</td>
<td>Set</td>
<td></td>
<td></td>
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<tr>
<td>6.9</td>
<td>Crate trolley</td>
<td>5</td>
<td>No.</td>
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</table>

### 7.00 CIP System

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Description</th>
<th>Capacity</th>
<th>QTY</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Amount (Rs)</th>
<th>Rate (Rs)</th>
<th>Amount (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.01</td>
<td>Bulk storage system for Acid and Lye</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>7.1.1</td>
<td>Concentrated lye tank</td>
<td>15 KL</td>
<td>1</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>7.1.2</td>
<td>Concentrated acid tank</td>
<td>15 KL</td>
<td>1</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>7.1.3</td>
<td>Chemical un loading pumps</td>
<td>10 KLPH</td>
<td>2</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>7.1.4</td>
<td>Metering Pump for Chemical transfer for Dairy plant CIP system</td>
<td>1 KLPH (min)</td>
<td>2</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.02</td>
<td>Two circuits Automatic cleaning in place units for tankers – two routes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>7.2.1</td>
<td>Acid / Lye / hot water tank with accessories</td>
<td>3 KL (each)</td>
<td>3</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Phone No- 2224083,2228953,2228347,2220387, Fax No-0612-2228306
E-Mail: engineeringcomfed@gmail.com, Website: www.sudha.coop
## BRIEF SCHEDULE OF REQUIREMENT

<table>
<thead>
<tr>
<th>S.N.</th>
<th>DESCRIPTION</th>
<th>CAPACITY</th>
<th>QTY</th>
<th>UNIT</th>
<th>Rate (Rs)</th>
<th>Amount (Rs)</th>
<th>Rate (Rs)</th>
<th>Amount (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.2.2</td>
<td>Recuperation tank with accessories</td>
<td>4 KL</td>
<td>1</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>7.2.3</td>
<td>SS Duplex strainer</td>
<td>20 KLPH</td>
<td>2</td>
<td>No</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>7.2.4</td>
<td>Plate heat exchanger</td>
<td>20 KLPH</td>
<td>2</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>7.2.5</td>
<td>CIP supply pump</td>
<td>20 KLPH @35 MWC</td>
<td>2</td>
<td>No</td>
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<td></td>
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<tr>
<td>7.03</td>
<td>Three circuits Automatic cleaning in place units for process – six routes</td>
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<td></td>
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</tr>
<tr>
<td>7.3.1</td>
<td>Acid / Lye/ hot water tank with accessories</td>
<td>5 KL (each)</td>
<td>3</td>
<td>No</td>
<td></td>
<td></td>
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<tr>
<td>7.3.2</td>
<td>Recuperation tank with accessories</td>
<td>8 KL</td>
<td>1</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>7.3.3</td>
<td>SS Duplex strainer</td>
<td>20 KLPH</td>
<td>3</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>7.3.4</td>
<td>Plate heat exchanger</td>
<td>20 KLPH each</td>
<td>3</td>
<td>No</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>7.3.5</td>
<td>CIP supply pump</td>
<td></td>
<td>3</td>
<td>No</td>
<td></td>
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<tr>
<td>7.04</td>
<td>Platform for CIP tanks</td>
<td></td>
<td>1</td>
<td>Lot</td>
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<tr>
<td>7.05</td>
<td>Safety shower/ face wash</td>
<td></td>
<td>1</td>
<td>Set</td>
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</tbody>
</table>

### 8.00 SS PIPES, FITTINGS AND VALVES

<table>
<thead>
<tr>
<th>S.N.</th>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>Lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.01</td>
<td>Stainless steel tubes and support pipes</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>8.02</td>
<td>Stainless steel fittings (of SMS standard) viz valves, non return valve, unions, bend, clamps, Tee, elbow, in line site glass etc.</td>
<td></td>
<td>1</td>
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<tr>
<td>8.03</td>
<td>Two way/ three way pneumatically operated sanitary valves of mix-proof (safe flow), ON-OFF seat valves, flow diversion valves etc.</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

### 9.00 SERVICE EQUIPMENT AIR HANDLING SYSTEM

<table>
<thead>
<tr>
<th>S.N.</th>
<th>DESCRIPTION</th>
<th>Suitable (1w+1s)</th>
<th>Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.01</td>
<td>Screw type air Compressor with integrated refrigerated air dryer with receiver and allied accessories</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.02</td>
<td>Air distribution pipes, fitting, valves and filters etc. complete</td>
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<td></td>
</tr>
<tr>
<td>S.N.</td>
<td>DESCRIPTION</td>
<td>CAPACITY</td>
<td>QTY</td>
</tr>
<tr>
<td>------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------------</td>
<td>-----</td>
</tr>
<tr>
<td>10.00</td>
<td>WATER HANDLING SYSTEM</td>
<td></td>
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<tr>
<td>10.01</td>
<td>Hydro flow system comprising of 3 nos of vertical inline pumps of 15 KLPH each (2w+1s) and diaphragm tank (FRP), fitted with pressure transmitter and controls for softwater.</td>
<td>Suitable head for water requirement of dairy, refgn. Plant and powder plant</td>
<td>1</td>
</tr>
<tr>
<td>10.02</td>
<td>Hydro flow system comprising of 2 nos of 20 KLPH each vertical inline pumps (1w+1s) and diaphragm tank (FRP), fitted with pressure transmitter and controls for raw water</td>
<td>Suitable head</td>
<td>1</td>
</tr>
<tr>
<td>10.03</td>
<td>Automatic Duplex type water softening plant and ancillaries</td>
<td>30 cum/hr output between regeneration 300 cum</td>
<td>1</td>
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<tr>
<td>10.04</td>
<td>Raw and soft water pipes, fittings and valves</td>
<td></td>
<td>1</td>
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<tr>
<td>10.05</td>
<td>Chilled water pipes, fittings and valves including necessary insulation and cladding</td>
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<td>1</td>
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<tr>
<td>11.00</td>
<td>STEAM DISTRIBUTION SYSTEM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.01</td>
<td>Pipes, fitting and valves including insulation and cladding for steam and condensate</td>
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<td>1</td>
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<tr>
<td>11.02</td>
<td>Condensate recovery system</td>
<td></td>
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<tr>
<td>11.2.1</td>
<td>Condensate collection tank</td>
<td>5 KL</td>
<td>1</td>
</tr>
<tr>
<td>11.2.2</td>
<td>Condensate return pump</td>
<td>5 KLPH (1W+1S)</td>
<td>2</td>
</tr>
<tr>
<td>11.2.3</td>
<td>Condensate recovery line from powder plant condensate collection tank upto raw water sump inlet</td>
<td>Gravity flow</td>
<td>1</td>
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<tr>
<td>12.00</td>
<td>FUEL HANDLING SYSTEM</td>
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<tr>
<td>12.01</td>
<td>FO storage tank</td>
<td>50 KL</td>
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<td>12.02</td>
<td>FO service tank</td>
<td>900 L</td>
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<tr>
<td>12.03</td>
<td>FO transfer pump</td>
<td>20 KLPH</td>
<td>2</td>
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<tr>
<td>12.04</td>
<td>Feed water cum condensate tank</td>
<td>5 KL</td>
<td>1</td>
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<tr>
<td>12.05</td>
<td>Pipes, fittings, strainers and valves etc. including necessary insulation and cladding for FO line.</td>
<td></td>
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</tbody>
</table>
### Brief Schedule of Requirement

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Description</th>
<th>Capacity</th>
<th>QTY</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Amount (Rs)</th>
<th>Rate (Rs)</th>
<th>Amount (Rs)</th>
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<tbody>
<tr>
<td>13.00</td>
<td><strong>GENERAL EQUIPMENT</strong></td>
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<tr>
<td>13.01</td>
<td>Pitless type electronic road weigh bridge</td>
<td>60 MT</td>
<td>1</td>
<td>Set</td>
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<tr>
<td>13.02</td>
<td>Steam water mixing battery with 10m HD rubber hose and spray gun</td>
<td>12 No</td>
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<tr>
<td>13.03</td>
<td>SS pipes supports and SS working tables</td>
<td>1 Lot</td>
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<tr>
<td>13.04</td>
<td>MS structural platforms, pipe supports, pipe bridge, MS gratings etc.</td>
<td>1 Lot</td>
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<td>14.00</td>
<td><strong>ELECTRICALS</strong></td>
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<td>14.01</td>
<td>Motor control centre</td>
<td>1 Lot</td>
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<tr>
<td>14.02</td>
<td>Remote push button station</td>
<td>1 Lot</td>
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<td>14.03</td>
<td>LT power cables</td>
<td>1 Lot</td>
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<tr>
<td>14.04</td>
<td>LT control &amp; instrumentation cables</td>
<td>1 Lot</td>
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<tr>
<td>14.05</td>
<td>Plug and socket type motor isolators, Cable trays, cable glands, cable connectors, cable route markers, cable indicators, conduits, earthing, rubber mats etc. complete</td>
<td>1 Lot</td>
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<tr>
<td>15.00</td>
<td><strong>INSTRUMENTATION &amp; AUTOMATION</strong></td>
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<tr>
<td>15.01</td>
<td>Microprocessor based Distributed Control System (DCS) and other PLCs</td>
<td>1 Set</td>
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<tr>
<td>15.02</td>
<td>MIS server</td>
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<td>15.03</td>
<td>HMI operator stations PC, other PCs and printers as per specification and requirement</td>
<td>1 Lot</td>
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<td>Network hardware</td>
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<td>15.05</td>
<td>System software and MIS software</td>
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<tr>
<td>15.06</td>
<td>Control desk and furniture’s</td>
<td>1 Lot</td>
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<tr>
<td>15.07</td>
<td>Field instrument, control valve and accessories</td>
<td>1 Lot</td>
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</tbody>
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### Brief Schedule of Requirement

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Description</th>
<th>Part – A</th>
<th>Part – B</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Rate(Rs)</td>
<td>Rate(Rs)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Amount(Rs)</td>
<td>Amount(Rs)</td>
</tr>
<tr>
<td>15.08</td>
<td>Smoke detection system for central control room</td>
<td>2 Nos</td>
<td></td>
</tr>
<tr>
<td>15.09</td>
<td>Earthing for electrical and automation system</td>
<td>1 Lot</td>
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<tr>
<td>16.00</td>
<td><strong>SPARES</strong></td>
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<tr>
<td>16.01</td>
<td>Spares for two year operation of the entire plant as per the list with price break up to be furnished by the bidder</td>
<td>1 Lot</td>
<td></td>
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</table>
### MILK RECEIPTION SECTION (5.00 LLPD)

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Equipments</th>
<th>Capacity</th>
<th>Quantity</th>
<th>Unit</th>
</tr>
</thead>
</table>
| 1.0   | Milk Homogenizer  
Product: Milk /Skim milk/reconstituted milk  
Viscosity: Max 50 cPs  
Maximum Particle Size: Up to 500 micron  
Operating Temperature < 90 °C  
Execution Sanitary Version: ENERGY  
Homogenizing Stage: Two  
Maximum Working Pressure: 180 Bar  
Max Back Pressure: 5 bar  
Min in Feed Pressure Range: 2 ÷ 3 bar  
Electrical Supply: 3ph/415V/50Hz  
Auxiliary Circuits: 24V DC  
Water Supply minimum: 2 bar  
Air Supply (Pneumatic) minimum: 6 bar  
Cleaning Temperature: <90°C  
Cleaning Time: 30 min  
Sterilization Temperature: 140°C  
Sterilization Time: 30 min  
It includes: Compression Block with:  
- chrome coated stainless steel pumping pistons –  
Stellite pump valves suitable for the product  
- sanitary design analog pressure gauge  
safety overpressure relief valve  
Homogenizing valve with: pneumatic adjustment of the pressure  
Special heavy duty cast - iron body housing transmission parts.  
Lubrication System forced type with electro pump, including  
pressure switch Transmission Drive with AC motor Frame with  
stainless steel removable panels Set of special tools.  
| 20 KLPH | 1 | No. |

| 2.0   | Milk transfer pump  
MOC: SS 304  
Construction - Type centrifugal in sanitary design & construction.  | 20 KLPH | 1 | No. |

### MILK RECONSTITUTION SECTION

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Equipments</th>
<th>Capacity</th>
<th>Quantity</th>
<th>Unit</th>
</tr>
</thead>
</table>
| 1     | Soft water storage tank  
Made up of 2.5 mm thk SS 304  
Complete with  
• Outlet connection with manual butterfly valve  
• Manhole  
• Light and sight glass  
• Legs with SS ball feet  | 5,000 lit | 1 | No. |

| 2.0   | Soft water transfer pump  
MOC: SS 304  
Construction - Type centrifugal in sanitary design & construction.  | 5 KLPH | 1 | No. |

| 3.0   | Soft water PHE heater  
MOC: SS 304  
To heat the water up to 50 deg C  | 5 KLPH | 1 | No. |

| 4.0   | Reconstitution system  |  |  |  |

| 4.01  | Shear Blender  
MOC: SS 304  | Suitable | 1 | Set |
### 4.02 High Speed Mixing Tank
- Single shell 2.0 mm thick with 2.5 mm Bottom & 2.5 mm top Ends SS 304. The storage tank shall have Half openable cover, thermo well, lifting lugs, Agitator with high speed 960 rpm motor, outlet with 2 way SS valve
- Capacity: 2 KL
- Quantity: 1

### 4.03 Self priming pump
- MOC: SS 304
- Construction – Type centrifugal in sanitary design & construction.
- Capacity: 5 KLPH
- Quantity: 1

### 4.04 Duplex filter
- MOC: SS 304
- Capacity: 5 KLPH
- Quantity: 1

### 5.0 Reconstituted Milk Chiller (Double section)
- MOC: SS 304
- Duty: 45 to 4°C using cooling water and chilled water Plate Heat Exchanger in SS construction with clip on gaskets. The heat exchanger frame is SS cladded. The cooling surface consists of a number of corrugated channel plates clamped together in a frame and sealed at the edges by means of gaskets.
- Capacity: 5 KLPH
- Quantity: 1

### SS PIPES, VALVES AND FITTINGS

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Equipments</th>
<th>Capacity</th>
<th>Quantity</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SS 304 Pipes, Pneumatic Valves and all necessary fittings</td>
<td></td>
<td>1</td>
<td>lot</td>
</tr>
<tr>
<td></td>
<td>Only for Milk Reception and Milk Processing Section</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>SS Pipes, manual Valves and all necessary fittings</td>
<td></td>
<td>1</td>
<td>lot</td>
</tr>
<tr>
<td></td>
<td>• For Cream Processing And Butter Section</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ghee Section</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>• Milk Reconstitution And Polypack Section</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Curd/Misti dahi/Lassi/Chhach Section</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Paneer Section</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Paneer whey pasteurization and storage section</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>• Whey vit section</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Nanofiltration section</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Double effects falling film evaporator for whey</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Single stage dryer for whey powder</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Sterilized Flavor Milk section</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Khoa and Peda Section</td>
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</table>
**UTILITY SECTION**

<table>
<thead>
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<th>Equipments</th>
<th>Capacity</th>
<th>Quantity</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Refrigeration Plant</td>
<td>600 TR</td>
<td>1</td>
<td>No.</td>
</tr>
<tr>
<td></td>
<td>It shall Consists of:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Refrigeration Compressor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Electric Motor Compressor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• PHE Condenser</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• PHE Chiller</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Cooling Tower</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Cooling water Pump</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Hot well &amp; cold well Tank ( MOC:MS )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Liquid Ammonia receiver</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Surge drum separator with float valve</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Glycol/Chilled water Transfer Pump</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Refrigeration Control Panel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• MCC Panel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Cables, cable trays and cabling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ammonia Pipes, valves &amp; Fittings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Glycol Water Pipe, valves &amp; Fittings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Cooling Water Pipe &amp; Fittings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Compressor oil for first charge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• First charge of Glycol food grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Structure material</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Insulation of Chilled water Tank and Cladding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>Steam generation Equipments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Steam boiler</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Type: Husk/Petcoke /Coal fired Boiler/ Oil Fired</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Consist of shell, smoke tubes, plates, conforming to latest Indian boiler regulation fully welded construction using boiler quality steel plates and complete with water wall arrangement, 2 Nos. feed water pumps, their driving motors, all mounting and fittings, automatic water level controller, ID fan and its driving motor etc.</td>
<td>10,000 Kg/hr steam at 19.5 Kg/cm²</td>
<td>1</td>
<td>Set</td>
</tr>
<tr>
<td>1</td>
<td>Steam Boiler Accessories</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Chimney and Flue Gas Ductin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Steam, water &amp; drain piping</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Refractory and Insulation material</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Fire doors, ash removal doors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Power Wiring up-to terminal points of Motors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Feed Water Storage Tank &amp; Piping up-to Pumps</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Fuel Preparation, Handling and Firing System</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ash Collection &amp; Disposal System</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Fuel Preparation, Handling and Firing System</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Accessories for coal crushing /conveyor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Accessories for petcoke crushing /conveyor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.3</td>
<td>Steam Boiler</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Type: Husk /Coal fired Boiler /Oil Fired</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Consist of shell, smoke tubes, plates, conforming to latest Indian boiler regulation fully welded construction using boiler quality steel plates and complete with water wall arrangement, 2 Nos. feed water pumps, their driving motors, all mounting and fittings, automatic water level controller, ID fan and its driving motor etc.</td>
<td>5,000 Kg/hr steam at 10.0 Kg/cm²</td>
<td>1</td>
<td>Set</td>
</tr>
</tbody>
</table>
### 2.4 Steam Boiler Accessories
- Chimney and Flue Gas Ducting
- Steam, water & drain piping.
- Refractory and Insulation material
- Fire doors, ash removal doors
- Power Wiring up-to terminal points of Motors
- Feed Water Storage Tank & Piping up-to Pumps
- Fuel Preparation, Handling and Firing System
- Ash Collection & Disposal System
- Accessories for coal crushing /conveyor
- Accessories for pet coke crushing /conveyor

<table>
<thead>
<tr>
<th>Description</th>
<th>Capacity</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,000 Kg/hr steam at 10.0 Kg/cm²</td>
<td>1 Set</td>
<td></td>
</tr>
</tbody>
</table>

### 3.0 Water softening plant for boiler (ion exchange based)
- Pressure vessel for softener, Top Distribution system, of valves, cation Exchange resin media, Bottom butor system, Pressure gauges, ICPW, Joining material, Hardness testing kit, Bottom Strainer kit

<table>
<thead>
<tr>
<th>Description</th>
<th>Capacity</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 KLPH</td>
<td>1 No.</td>
<td></td>
</tr>
</tbody>
</table>

### 4.0 Reverse Osmosis Water Softening plant
- Raw water pump, Dual media filter, Activated carbon filter, Dosing system, Micron filter, High Pressure Pump, RO Membrane, RO Pressure Tube, Ro cleaning system, Electrical Panel, Instrumentation, pH Dosing System.

<table>
<thead>
<tr>
<th>Description</th>
<th>Capacity</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 KLPH</td>
<td>1 Set</td>
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</table>

### 5.0 Electrical Section
Details are as per Annexure-3

<table>
<thead>
<tr>
<th>Description</th>
<th>Capacity</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Details are as per Annexure-3</td>
<td>1 Set</td>
<td></td>
</tr>
</tbody>
</table>

### 6.0 Diesel Generator set
Consist of Engine coupled to alternator both mounted on common base frame With other standard accessories. Control panel, fuel tank, batteries with leads.

<table>
<thead>
<tr>
<th>Description</th>
<th>Capacity</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000 KVA</td>
<td>1 No.</td>
<td></td>
</tr>
</tbody>
</table>

### 7.0 Effluent treatment plant
- Screening
- Screen Bar
- Effluent Pump
- Water meter
- Dosing tank & Pump
- Twin Blow air compressor
- Moving Bed bio reactor
- SAFF Media
- Coarse bubble diffuser
- Fine Bubble diffuser
- GI Air distribution in MBBR reactor
- GI air Distribution in equalization tank
- Sludge Pump
- Filter feed water pump
- Secondary Clarifier(Tube clarifier)
- Pressure Sand filters
- Activated Carbon Filter
- All system valves
- All system piping

<table>
<thead>
<tr>
<th>Description</th>
<th>Capacity</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,250,000 LPD</td>
<td>1 Set</td>
<td></td>
</tr>
</tbody>
</table>
### 8.0 Screw Type air compressor

It shall consist of:
- Drive
- Motor
- Intake valve
- Air inlet
- Air oil separation
- Cooler
- Oil fill
- Air outlet
- Moisture Separator
- Control panel

#### Air Receiver with accessories

- Material: Mild steel.
- The receiver shall be common for both the air compressors.

<table>
<thead>
<tr>
<th>8.0</th>
<th>Screw Type air compressor</th>
<th>15 kw at 7.5 bar (g)</th>
<th>2 W+ 1S</th>
<th>Set</th>
</tr>
</thead>
</table>

### 9.0 Laboratory equipment

<table>
<thead>
<tr>
<th>9.0</th>
<th>Laboratory equipment</th>
<th>-</th>
<th>1</th>
<th>Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.01</td>
<td>Gerber Centrifuge machine (Local Indian Make)</td>
<td>-</td>
<td>2</td>
<td>Nos.</td>
</tr>
<tr>
<td>9.02</td>
<td>Digital Temperature Controlled water bath</td>
<td>-</td>
<td>1</td>
<td>No.</td>
</tr>
<tr>
<td>9.03</td>
<td>Water Bath Rectangular</td>
<td>-</td>
<td>1</td>
<td>No.</td>
</tr>
<tr>
<td>9.04</td>
<td>Distilled water unit</td>
<td>-</td>
<td>1</td>
<td>No.</td>
</tr>
<tr>
<td>9.05</td>
<td>Butyro Refractometer</td>
<td>-</td>
<td>1</td>
<td>No.</td>
</tr>
<tr>
<td>9.06</td>
<td>Circulating Water bath for BR</td>
<td>-</td>
<td>1</td>
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<tr>
<td>9.07</td>
<td>Pocket Refractometer with Peltier System</td>
<td>-</td>
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<tr>
<td>9.08</td>
<td>Sodium Analyzer</td>
<td>-</td>
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<tr>
<td>9.09</td>
<td>Automatic Kjeldhal Assembly</td>
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<tr>
<td>9.10</td>
<td>Weighing Balance - Model No - ML1602</td>
<td>-</td>
<td>4</td>
<td>Nos.</td>
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<tr>
<td>9.11</td>
<td>Weighing Balance , Model No - ML3002</td>
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<td>2</td>
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<tr>
<td>9.12</td>
<td>High Precision Weighing Balance, Model No - ML204</td>
<td>-</td>
<td>3</td>
<td>Nos.</td>
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<tr>
<td>9.15</td>
<td>Portable pH Tester</td>
<td>-</td>
<td>4</td>
<td>Nos.</td>
</tr>
<tr>
<td>9.16</td>
<td>Deep Freezer</td>
<td>-</td>
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<td>No.</td>
</tr>
<tr>
<td>9.17</td>
<td>Spectrophotometer</td>
<td>-</td>
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</tr>
<tr>
<td>9.18</td>
<td>Bursting Strength Tester Digital</td>
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<tr>
<td>9.19</td>
<td>Dial Thickness Gauge</td>
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</tr>
<tr>
<td>9.20</td>
<td>Digital Thermometer</td>
<td>-</td>
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</tr>
<tr>
<td>9.21</td>
<td>Bench Top Centrifuge</td>
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</tr>
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<td>9.22</td>
<td>Filler Gage Set</td>
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<td>9.23</td>
<td>Electronic Hot Centrifuge</td>
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<td>9.24</td>
<td>Hot Air Oven (Small)</td>
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<td>9.25</td>
<td>Milkcoscan - Major</td>
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<tr>
<td>9.26</td>
<td>Milkcoscan - Minor</td>
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<tr>
<td>9.27</td>
<td>Digimatic Caliper</td>
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<tr>
<td>9.28</td>
<td>Bar Code Scanner</td>
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<tr>
<td>9.29</td>
<td>Sediment Tester</td>
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<tr>
<td>9.30</td>
<td>Portable TDS meter</td>
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<td>9.31</td>
<td>Lab Stirrer</td>
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<tr>
<td>9.32</td>
<td>Acidometer (Titrator)</td>
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<tr>
<td>9.33</td>
<td>ELISA Reader Kit</td>
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</tr>
<tr>
<td>9.34</td>
<td>Lovibond Comparator</td>
<td>-</td>
<td>2</td>
<td>Nos.</td>
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</table>
### MICROBIOLOGICAL TESTING EQUIPMENT

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Equipments</th>
<th>Quantity</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.35</td>
<td>Portable Autoclave</td>
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<tr>
<td>9.36</td>
<td>Autoclave Vertical</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>9.37</td>
<td>BOD Incubator</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>9.38</td>
<td>Microscope</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>9.40</td>
<td>Incubator Digital (Small)</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>9.41</td>
<td>Incubator Digital (Big)</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>9.43</td>
<td>Hot Air Oven</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>9.44</td>
<td>Micro Hi-pette auto pipette</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>9.45</td>
<td>Hi-petted auto pipette stand</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>9.46</td>
<td>Microwave Oven</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>9.47</td>
<td>Digital Colony Counter</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>9.48</td>
<td>Distilled water unit</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>9.49</td>
<td>Control Desk/Cabinet (Furniture)</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>10.0</td>
<td><strong>Online Fat and SNF standardization unit</strong></td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>11.0</td>
<td><strong>Raw water system</strong></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Tube well, Water ring man of medium duty galvanized Mild steel. The fittings shall include manual valves, non Return valve, 1 No. Flow meter and supporting structural.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.0</td>
<td><strong>Utility Pipes, Valves and Fittings</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.01</td>
<td>PRS station with Steam Pipes, valves and fittings IBR/Non IBR Piping MS heavy duty scheduled 40 pipes with insulation and cladding. All valves &amp; fittings shall be CSI/SGI body with SS working parts.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12.02</td>
<td>Chilled water pipes, valves and fittings with insulation and cladding</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pipes : GI 'B' Class</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Valves : CI butterfly / ball valves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.03</td>
<td>Compressed air pipes, valves and fittings</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Material : GI / MS 'C' Class</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Valves : CS valves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.04</td>
<td>Raw water/ Sot water pipes, valves and fittings Material : GI 'B' Class</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Valves : CI butterfly / ball valves</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### MISCELLANEOUS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Equipments</th>
<th>Quantity</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Steam &amp; water mixing battery</td>
<td>10</td>
<td>Nos.</td>
</tr>
<tr>
<td>2.0</td>
<td>Misc Items Including Smoke Detection &amp; Fire Extinguishers etc</td>
<td>1</td>
<td>Lot</td>
</tr>
<tr>
<td>3.0</td>
<td>Dry Type Fire Extinguisher Size 4.5 Kg CO2</td>
<td>4</td>
<td>No.</td>
</tr>
<tr>
<td>4.0</td>
<td>Mechanical Foam type Size 9L</td>
<td>4</td>
<td>No.</td>
</tr>
<tr>
<td>5.0</td>
<td>ABC Stored Pressure Type Size 10 Kg</td>
<td>1</td>
<td>No.</td>
</tr>
<tr>
<td>6.0</td>
<td>Manual Call appoints - Break Glass Type</td>
<td>2</td>
<td>No.</td>
</tr>
<tr>
<td>7.0</td>
<td>Photo Optical Type Smoke detectors</td>
<td>12</td>
<td>No.</td>
</tr>
<tr>
<td>8.0</td>
<td>Sounder and Hooters</td>
<td>2</td>
<td>Sets</td>
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</tbody>
</table>
## 9.0 Jet Cleaning equipment

<table>
<thead>
<tr>
<th>W. SPARE PARTS</th>
<th>Equipments</th>
<th>Quantity</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Spares for One years of normal operation (mechanical/electrical/Instrumentation and automation)</td>
<td>1</td>
<td>lot</td>
</tr>
</tbody>
</table>
SECTION- VIII
SECURITIES & OTHER FORM

(To be filled by the Bidder)
SECURITIES AND OTHER FORMS

(to be filled by Bidder/Employer)

BID SECURITY (BANK GUARANTEE)

WHEREAS, ___________________________________[name of Bidder] (hereinafter called "the Bidder") has submitted his Bid dated _______________[date] for the construction of _______________________________[name of Contract hereinafter called "the Bid"].

KNOW ALL PEOPLE by these presents that We ________________________________[name of Bank] of ___________________________[name of country] having our registered office at _______________________________________________ (hereinafter called "the Bank") are bound unto ___________________________[name of Employer] (hereinafter called "the Employer") in the sum of _____________________________*for which payment well and truly to be made to the said Employer the Bank itself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this __________ day of __________,20____.

THE CONDITIONS of this obligation are:

(1) If after Bid opening the Bidder withdraws his bid during the period of Bid validity specified in the Form of Bid;

OR

(2) If the Bidder having been notified to the acceptance of his bid by the Employer during the period of Bid validity:

(a) fails or refuses to execute the Form of Agreement in accordance with the Instructions to Bidders, if required; or

(b) fails or refuses to furnish the Performance Security, in accordance with the Instruction to Bidders; or

(c) does not accept the correction of the Bid Price pursuant to Clause 27.

We undertake to pay to the Employer up to the above amount upon receipt of his first written demand, without the Employer having to substantiate his demand, provided that in his demand the Employer will note that the amount claimed by him is due to his owing to the occurrence of one or any of the three conditions, specifying the occurred condition or conditions.
This Guarantee will remain in force up to and including the date _____________________** days after the deadline for submission of Bids as such deadline is stated in the Instructions to Bidders or as it may be extended by the Employer, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this guarantee should reach the Bank not later than the above date.

DATE____________________________ SIGNATURE ____________________________

WITNESS_________________________ SEAL ________________________________

___________________________________________________ __________________________

[Signature, name and address]

* The Bidder should insert the amount of the guarantee in words and figures denominated in Indian Rupees. This figure should be the same as shown in Clause 16.1 of the Instructions to Bidders.

** 45 days after the end of the validity period of the Bid. Date should be inserted by the Employer before the Bidding documents are issued.
PERFORMANCE BANK GUARANTEE

To

_____________________________________ [name of Employer]
_____________________________________ [address of Employer]

WHEREAS ___________________________________ [name and address of Contractor] (hereafter called “the Contractor”) has undertaken, in pursuance of Contract No. _______________ dated _____________ to execute _______________________________ [name of Contract and brief description of Works] (hereinafter called “the Contract”).

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his obligation in accordance with the Contract;

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee:

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you on behalf of the Contractor, up to a total of _______________________________ [amount of guarantee] in words, such sum being payable in the types and proportions of currencies in which the Contract Price is payable, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of _______________________________ [amount of guarantee] as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed there under or of any of the Contract documents which may be made between your and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee shall be valid until 28 days from the date of expiry of the Defect Liability Period.

Signature and Seal of the guarantor:________________________
Name of Bank:__________________________________________
Address:________________________________________________
Date:____________________________________________________

* An amount shall be inserted by the Guarantor, representing the percentage the Contract Price specified in the Contract including additional security for unbalanced Bids, if any and denominated in Indian Rupees.
BANK GUARANTEE FOR ADVANCE PAYMENT

To

______________________________________ [name of Employer]

______________________________________ [address of Employer]

______________________________________ [name of Contractor]

Gentlemen:

In accordance with the provisions of the Conditions of Contract, sub-clause 51.1 (“Advance payment”) of the above-mentioned Contract, __________________ ________________________ [name and address of Contractor] (hereinafter called “the Contractor”) shall deposit with __________________ ________________________ [name of Employer] a bank guarantee to guarantee his proper and faithful performance under the said Clause of the Contract in an amount of __________________ [amount of Guarantee]* __________________ [in words].

We, the ____________________________ [bank of financial institution], as instructed by the Contractor, agree unconditionally and irrevocably to guarantee as primary obligator and not as Surely merely, the payment to __________________ ________________________ [name of Employer] on his first demand without whatsoever right of obligation on our part and without his first claim to the Contractor, in the amount not exceeding __________________ [amount of guarantee]* __________________ [in words].

We further agree that no change or addition to or other modification of the terms of the Contractor or Works to be performed there under or any of the Contract documents which may be made between __________________ [name of Employer] and the Contractor, shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee shall remain valid and in full effect from the date of the advance payment under the Contract until __________________ [name of Employer] receives full repayment of the same amount from the Contractor.

Yours truly,

Signature and Seal: _________________________________

Name of Bank /Financial Institution: _________________________________

Address: _________________________________

Date: _________________________________

* An amount shall be inserted by the Bank or Financial Institution representing the amount of the Advance Payment, and denominated in Indian Rupees.
INDENTURE FOR SECURED ADVANCES
FORM 31

(for use in case in which the contract is for finished work and the contractor has entered into an agreement for the execution of a certain specified quantity of work in a given time)

This indenture made the ______________________ day of _______________, 20_____ BETWEEN
___________________________ (hereinafter called the contractor which expression shall where the context so admits or implies be deemed to include his executors, administrators and assigns) or the one part and the Employer of the other part.

Whereas by an agreement dated _____________________ ______ (hereinafter called the said agreement) the contractor has agreed.

AND WHEREAS the contractor has applied to the Employer that he may be allowed advanced on the security of materials absolutely belonging to him and brought by him to the site of the works the subject of the said agreement for use in the construction of such of the works as he has undertaken to execute at rates fixed for the finished work (inclusive of the cost of materials and labour and other charges)

AND WHEREAS the Employer has agreed to advance to the Contractor the sum of Rupees_____________________________________________ _______________ on the security of materials the quantities and other particulars of which are detailed in Accounts of Secured Advances attached to the Running Account bill for the said works signed by the Contractor on__________ and the Employer has reserved to himself the option of making any further advance or advances on the security of other materials brought by the Contractor to the site of the said works.

Now THIS INDENTURE WITNESSETH that in pursuance of the said agreement and in consideration of the sum of Rupees __________________________ on or before the execution of these presents paid to the Contractor by the Employer (the receipt where of the Contractor doth hereby acknowledge) and of such further advances (if any) as may be made to him as a for said the Contractor doth hereby covenant and agree with the President and declare as follows :

(1) That the said sum of Rupees __________________________ so advanced by the Employer to the Contractor as aforesaid and all or any further sum of sums advanced as aforesaid shall be employed by the Contractor in or towards expending the execution of the said works and for no other purpose whatsoever.

(2) That the materials details in the said Account of Secured Advances which have been offered to and accepted by the Employer as security are absolutely the Contractor's own propriety and free from encumbrances of any kind and the contractor will not make any application for or receive a further advance on the security of materials which are not absolutely his own property and free from encumbrances of any kind and the Contractor indemnified the Employer against all claims to any materials in respect of which an advance has be made to him as aforesaid.

(3) That the materials detailed in the said account of Secured Advances and all other materials on the security of which any further advance or advances may hereafter be made as
aforesaid (hereafter called the said materials) shall be used by the Contractor solely in the Execution of the said works in accordance with the directions of the Engineer.

(4) That the Contractor shall make at his own cost all necessary and adequate arrangements for the proper watch, safe custody and protection against all risks of the said materials and that until used in construction as aforesaid the said materials shall remain at the site of the said works in the Contractor's custody and on his own responsibility and shall at all times be open to inspection by the Engineer or any officer authorized by him. In the event of the said materials or any part thereof being stolen, destroyed or damaged or becoming deteriorated in a greater degree than is due to reasonable use and wear thereof the Contractor will forthwith replace the same with other materials of like quality or repair and make good the same required by the Engineer.

(5) That the said materials shall not be any account be removed from the site of the said works except with the written permission of the Engineer or an officer authorized by him on that behalf.

(6) That the advances shall be repayable in full when or before the Contractor receives payment from the Employer of the price payable to him for the said works under the terms and provisions of the said agreement. Provided that if any intermediate payments are made to the Contractor on account of work done than on the occasion of each such payment the Employer will be at liberty to made recovery from the Contractor's bill for such payment by deducting there from the value of the said materials that actually used in the construction and in respect of which recovery has not been made previously, the value for this purpose being determined in respect of each description of materials at the rates at which the amounts of the advances made under these presents were calculated.

(7) That if the Contractor shall at any time make any default in the performance or observance in any respect of any of the terms and provisions of the said agreement or of these presents the total amount of the advance or advances that may still be owing of the Employer shall immediately on the happening of such default be repayable by the Contractor to be the Employer together with interest thereon at twelve per cent per annum from the date or respective dates of such advance or advances to the date of repayment and with all costs, charges, damages and expenses incurred by the Employer in or for the recovery thereof or the enforcement of this security or otherwise by reason of the default of the Contractor and the Contractor hereby covenants and agrees with the Employer to reply and pay the same respectively to him accordingly.

(8) That the Contractor hereby charges all the said materials with the repayment to the Employer of the said sum of Rupees ______________________ and any further sum of sums advanced as aforesaid and all costs, charges, damages and expenses payable under these presents PROVIDED ALWAYS and it is hereby agreed and declared that notwithstanding anything in the said agreement and without prejudice to the power contained therein if and whenever the covenant for payment and repayment here in before contained shall become enforceable and the money owing shall not be paid in accordance there with the Employer may at by time thereafter adopt all or any of the following courses as he may deem best:

(a) Seize and utilise the said materials or any part thereof in the completion of the said works on behalf of the contractor in accordance with the provisions in that behalf.
contained in the said agreement debiting the contractor with the actual cost of effecting such completion and the amount due to the contractor with the value of work done as if he has carried it out in accordance with the said agreement and at the rests thereby provided. If the balance is against the contractor, he is to pay same to the Employer on demand.

(b) Remove and sell by public auction the seized materials or any part there of and out of the moneys arising from the sale retain all the sums aforesaid repayable or payable to the Employer under these presents and pay over the surplus (if any) to the Contractor.

(c) Deduct all or any part of the moneys owing out of the security deposit or any sum due to the Contractor under the said agreement.

(9) That except in the event of such default on the part of the contractor as aforesaid interest on the said advance shall not be payable.

(10) That in the event of any conflict between the provisions of these present and the said agreement the provisions of these presents shall prevail and in the event of any dispute or difference arising over the construction or effect of these presents the settlement of which has not been here-in-before expressly provided for the same shall be referred to the Employer whose decision shall be final and the provision of the Indian Arbitration Act for the time being in force shall apply to any such reference.
Letter of Acceptance

(Letterhead paper of the Employer)

__________________________(Date)

To

______________________________________ (Name and address of the Contractor)

______________________________________

Dear Sirs,

This is to notify you that your Bid dated ______________ for execution of the ___________________________ (name of the contract and identification number, as given in the Instructions to Bidders) for the Contract Price of Rupees ______________ (____________________) (amount in words and figures), as corrected and modified in accordance with the Instructions to Bidders is hereby accepted by our agency.

We accept/ do not accept that _____________________ be appointed as the Adjudicator. Your are hereby requested to furnish Performance Security, in the form detailed in Para 34.1 of ITB for an amount equivalent to Rs. ____________ within 21 days of the receipt of this letter of acceptance valid up to 28 days from the date of expiry of defects Liability Period i.e. up to _____________________ and sign the contract, failing which action as stated in Para 34.3 of ITB will be taken.

Yours faithfully,

Authorized Signature

Name and title of Signatory

Name of Agency

___________________________________________________ __________________________

1 Delete "corrected and" or "and modified" if only one of these actions applies. Delete as corrected and modified in accordance with the Instructions to Bidders, if corrections or modifications have not been affected.

2 To be used only if the Contractor disagrees in his Bid with the Adjudicator proposed by the Employer in the "Instructions to Bidders".
Issue of Notice to proceed with the work

(Letterhead of the Employer)

_________________________(Date)

To

________________________________________
(Name and address of the Contractor)

Dear Sirs,

Pursuant to your furnishing the requisite security as stipulated in ITB Clause 34.1 and signing of the Contract for the construction of __________________________

___________________________________________________ ______________________________

___________________________________________________ ____________at a Bid Price of Rs.________________________________________________ _________.

You are hereby instructed to proceed with the execution of the said works in accordance with the contract documents.

Yours faithfully,

(Signature, name and title of signatory authorized to sign on behalf of Employer)
Agreement Form

This agreement, made the __________ day of __________ between __________________________(name and address of Employer) [hereinafter called "the Employer"] and __________________________(name and address of contractor) hereinafter called "the Contractor" of the other part.

Whereas the Employer is desirous that the Contractor execute

(name and identification number of Contract) hereinafter called "the Works") and the Employer has accepted the Bid by the Contractor for the execution and completion of such works and the remedying of any defects therein, at a cost of Rs. ____________________________

NOW THIS AGREEMENT WITNESSETH as follows:

1. In this Agreement, words and expression shall have the same meanings as are respectively assigned to them in the conditions of contract hereinafter referred to and they shall be deemed to form and be read and construed as part of this Agreement.

2. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein in conformity in all aspects with the provisions of the contract.

3. The Employer hereby covenants to pay the Contractor in consideration of the Execution and completion of the Works and the remedying the defects wherein Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

4. The following documents shall be deemed to form and be ready and construed as part of this Agreement viz.

   (i) Letter of Acceptance
   (ii) Notice to proceed with the works;
   (iii) Contractor's Bid
   (iv) Condition of Contract : General and Special
   (v) Contract Data
   (vi) Additional condition
   (vii) Drawings
   (viii) Bill of Quantities and
   (ix) Any other documents listed in the Contract Data as forming part of the Contract.
In witnessed whereof the parties there to have caused this Agreement to be executed the
day and year first before written.

The Common Seal of ____________________________________________ was
hereunto affixed in the presence of :

Signed, Sealed and Delivered by the said ______________________________

______________________________________________________________

in the presence of :

Binding Signature of Employer ______________________________________

Binding Signature of Contractor _____________________________________
UNDERTAKING

I, the undersigned do hereby undertake that our firm M/s _______________________________ agree to abide by this bid for a period _______ days for the date fixed for receiving the same and it shall be binding on us and may be accepted at any time before the expiration of that period.

__________________________
(Signed by an Authorised Officer of the Firm)

__________________________
Title of Officer

__________________________
Name of Firm