



NAME OF ITEM / WORK	:	<b>DESIGN, SUPPLY, ERECTION, INSTALLATION, TESTING AND COMMISSIONING OF 50 TLPD CAPACITY NEW DAIRY PLANT AT THOOTHUKUDI DCMPU LTD., UNDER DIDF SCHEME</b>
TENDER REFERENCE NO	:	1111/Proj.4/2022, Dated:28.02.2022

**PART - I**  
**TECHNICAL BID**

THE TAMILNADU COOPERATIVE  
MILK PRODUCERS' FEDERATION LTD  
CHENNAI 600 035

Tender document issued to
M/s. _____
Cost of Tender document remitted under
receipt No. _____ Date _____
(or)
Tender downloaded from website on _____
at free of cost

The Dy. General Manager (Engg.).

## TENDER INFORMATION

1. Name and address of the Purchaser	:	The Dy. General Manager (Engg.), Tamilnadu Cooperative Milk Producers' Federation Ltd., Head Office, Aavin Illam, 3-A, Pasumpon Muthuramalinganar Salai, Nandanam, Chennai – 600 035. E-Mail: aavindgmeng@yahoo.co.in
2. Name and address of the User	:	The General Manager, Thoothukudi DCMPU Ltd.,
3. Name of the Item / Work	:	Design, Supply, Erection, Installation, Testing and Commissioning of 50 TLPD Capacity New Dairy Plant at Thoothukudi DCMPU Ltd.,
4. Tender Reference Number	:	1111/Proj.4/2022
5. Source of Fund	:	DIDF Scheme
6. Tender Estimated Value	:	Rs.3485.05 Lakhs
7. Earnest Money Deposit (EMD)	:	Rs.34,85,000.00
8. Cost of Tender Document	:	Rs.2,000/- + 18% GST and Rs.100/- extra by post either by cash or demand draft in favour of TCMPF Ltd. payable at Chennai drawn from any Indian Nationalized Bank / Scheduled Commercial Bank. <b>Alternatively,</b> Tender documents can also be downloaded from the designated website at free of cost (i.e.) <a href="http://www.tenders.tn.gov.in">www.tenders.tn.gov.in</a> and <a href="http://www.aavinmilk.com">www.aavinmilk.com</a> for submission of tender <b>by post (or) courier /</b> <a href="http://www.tntenders.gov.in">www.tntenders.gov.in</a> for <b>e-submission.</b>
9. Sale of tender documents	:	<b>From:</b> 07.04.2022 To 11.05.2022 <b>Time:</b> 11.00 AM To 3.00 PM
10. Date of Pre-Bid meeting	:	<b>Date:</b> 20.04.2022 <b>Time:</b> 11.30 AM
11. Last date and time for submission of the two part tender – both technical and commercial bids.	:	<b>Date:</b> 12.05.2022 <b>Time:</b> 2.00 PM
12. Date and time of opening of Part I Technical Bid Document.	:	<b>Date:</b> 12.05.2022 <b>Time:</b> 2.15 PM
13. Date and time of opening of Part II Financial Bid	:	Financial Bid will be normally opened within 60 days from the date of opening of Part I pre qualifications-technical bid. The date of opening of Financial Bid will be informed to the eligible tenderers who are found and declared as qualified as per Part I technical bid.
14. Place of Sale of Tender Documents, Pre- Bid meeting & Part I Technical Bid and Part II Price Bid opening	:	The Dy. General Manager (Engg.), Head Office Tamilnadu Cooperative Milk Producers' Federation Ltd., Aavin Illam, 3-A, Pasumpon Muthuramalinganar Salai, Nandanam, Chennai – 600 035.

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**1.0. TECHNICAL BID – CHECK LIST**

**PREAMBLE OF TENDER:-**

**1.1.** The Dy. General Manager (Engg.), Head Office, TCMPF Ltd. invites Bids by way of **E-Submission / OFF Line** from eligible bidders on behalf of The General Manager, Thoothukudi DCMPU Ltd., by two cover system for Design, Supply, Erection, Installation, Testing and Commissioning of 50 TLPD Capacity New Dairy Plant at Thoothukudi DCMPU Ltd.,

**1.2. BIDDER TO FILL IN THE CHECK LIST GIVEN BELOW:**

**(State YES / NO for each item)**

Kindly ensure compliance of the under-mentioned requirements, as per Tender Terms and Conditions.

**1.3.** The tender is offered for:

S.N.	Name of the work		Remarks
1	Whether two covers for each item have been was sealed separately as "Technical bid" & "Commercial bid" (whichever is applicable) and both the covers enclosed in a common overall envelope duly superscribed as "Tender for Design, Supply, Erection, Installation, Testing and Commissioning of 50 TLPD Capacity New Dairy Plant at Thoothukudi DCMPU Ltd.,		Yes / No
2.	Whether the EMD amount as detailed below is enclosed in the technical bid		
Item No.	Name	EMD amount	
1.	Design, Supply, Erection, Installation, Testing and Commissioning of 50 TLPD Capacity New Dairy Plant at Thoothukudi DCMPU Ltd.,	Rs.34,85,000.00	Yes / No
3.	If so, whether D.D. or Bank Guarantee is attached with the Tender offer - Part I / Tech.Bid		Yes / No
4.	If so, Details of D.D. or Bank Guarantee No. date, Bank on which drawn etc. may be furnished D.D./BG No(s)..... Dated..... For Rs..... Bank Name and Branch ..... in favour of The Managing Director, TCMPF Ltd. payable at Chennai For E-submission the Earnest Money Deposit specified above may also be paid through online in TN e-Procurement Portal and scanned copy of proof for payment of EMD (ie. e-payment receipt) has to be uploaded.		Yes/No
5.	If EMD exemption is sought for, whether necessary documentary proof/evidence such as EM Part – II as per MSMED Act 2006 for SSI Certificate / Udyog Aadhar enclosed in the technical bid for tenderers from the state and if from outside the state (Tamilnadu) whether NSIC certificate enclosed		Yes / No

SIGNATURE OF THE TENDERER WITH SEAL

6.	Whether details of infrastructural facilities such as equipment / man-power / financial statement (FY – 2018-19, 2019-20 & 2020-21) details etc., are enclosed.	Yes/No
7.	Whether details of past experience (i.e) Purchase order copy(s) for same capacity (or) above of Dairy Plant	Yes/No
8.	Whether satisfactory performance certificate from client(s) for the above such supply with features mentioned in the technical specification tendered are enclosed	Yes/No
9.	If so, whether necessary supportive documents such as attested copies of Supply Order / Work order, delivery challans, enclosed.	Yes / No
10.	Whether copies of attested GST Registration certificates enclosed	Yes / No
11.	Whether copy of attested PAN card enclosed	Yes / No
12.	Whether the Minutes of Pre-Bid meeting duly signed and sealed has been enclosed along with Technical Bid Part-I	Yes/No
13.	Whether all the pages in the tender documents – Part I (Tech. Bid) and Part II (Commercial Bid) have been duly signed by authorized signatory	Yes / No
14.	Whether the Commercial bid is filled in detail in the prescribed format for break-up, equipment-wise and for abstract	Yes/No
15.	Whether these two sealed covers for Part - I “Technical Bid” and Part II – “Commercial Bid” – put in a larger cover duly superscribed, addressed and wax sealed at appropriate places.	Yes/No

**Note:** Please ensure that all the relevant boxes are marked YES / NO against each column.

**Important Note:** Bidders must ensure that all the required documents indicated in the tender document are submitted without fail. Bids received without supporting documents for the various requirements mentioned in the tender document are liable to be rejected at the initial stage itself.

SIGNATURE OF THE TENDERER WITH SEAL

## **2. TWO PART TENDER APPLICATION**

### **TECHNICAL (PRE-QUALIFICATION) BID & PRICE BID APPLICATION**

**From**

M/s.

**To**

The Dy. General Manager (Engg.),  
TCMPF Ltd.,  
Head Office, Aavin Illam, 3-A,  
Pasumpon Muthuramalinganar Salai,  
Nandanam, Chennai – 600 035.

Sir,

Sub: Two Part tender – Design, Supply, Erection, Installation, Testing and Commissioning of 50 TLPD Capacity New Dairy Plant at Thoothukudi DCMPU Ltd., – Submission of Documents – Regarding.

<><><>

Having examined the two part tender documents consisting of Part I technical bid pertaining to pre-qualification and part II commercial bid with price quote, I/We hereby submit all the necessary documents and relevant information for bidding the above mentioned tender.

The application is made by me/us on behalf of ..... in the capacity of ..... duly authorized to submit this two part tender offer.

Necessary evidence admissible in law in respect of authority assigned to me on behalf of the bidding firm is herewith attached.

I submit the documents herewith taking into consideration of all the instructions, terms and conditions in the detailed two part tender notice.

I/We understand that The Dy. General Manager (Engg.), TCMPF Ltd., Chennai reserves the right to reject any tender offer fully or partly without assigning any reasons thereof.

I/We hereby agree to hold the tender offer valid for acceptance for a period of 120 days from the date of opening of Part – I – Technical bid.

Signature of the Applicant  
Including title capacity

(NAME IN BLOCK LETTERS)

Enclosures:

1. Evidence of authority to sign
2. Latest brochures if any
3. Part I pre-qualification – Technical bid in separate sealed cover
4. Part II commercial bid with price quote in separate sealed cover.

### **3. INSTRUCTIONS TO THE TENDERERS**

This two part tender document consists of:

Part I – Technical Bid for Pre-Qualifying

Part II – Commercial bid for price-quote schedule.

- 3.1 Read all the terms and conditions of the two part tender before to start filling up.
- 3.2 The tenderers are to submit the **original set** of the two part tender (both Part – I – Technical Bid and Part II Commercial Bid) duly filled in, attach necessary documents and are advised to retain the duplicate set of documents for records.
- 3.3 The part I – Technical Bid for Pre-qualification consisting of pages.....and the Part II – Commercial bid for price-quote schedule consisting of pages..... should be submitted in two different covers duly superscribed as "Tender for the Design, Supply, Erection, Installation, Testing and Commissioning of 50 TLPD Capacity New Dairy Plant at Thoothukudi DCMPU Ltd.," and again put both the sealed technical bid cover and commercial bid cover in a larger wax sealed cover duly superscribed as "Design, Supply, Erection, Installation, Testing and Commissioning of 50 TLPD Capacity New Dairy Plant at Thoothukudi DCMPU Ltd.," and addressed to "The Dy. General Manager (Engg.), TCMPF Ltd, Head Office, Aavin Illam, 3-A, Pasumpon Muthuramalinganar Salai, Nandanam, Chennai – 600 035." either in person or by post so as to reach on or before the time and date specified. Tenders received after the specified date and time shall be summarily rejected.
- 3.4 The tenderer shall submit tenders in person or by post or courier or by electronic submission through the designated website [www.tntenders.gov.in](http://www.tntenders.gov.in) as provided in the TTT Rule 18 (1) and 18 (3).
- 3.5 a). If the envelope is not sealed and super-scribed as instructed, no responsibility will be assumed for any misplacement of tender or premature opening of the envelope or parcel.  
b). Telegraphic / FAX Tenders will not be accepted.  
c). E-Tendering facility is available for this tender.
- 3.6 The quantities mentioned in the tender document are approximate. The tender accepting authority shall be permitted to vary the quantities finally ordered and execute the work through the contractor to the extent of 25% (Twenty five percent) either way of the requirements.
- 3.7 **Go through the check slip given and ensure compliance of the terms and conditions.**

I agree to abide by the above instructions

SIGNATURE OF THE TENDERER

- 3.8 The tenderer is specifically informed that all the pages in both Part I – Technical Bid and part II – Commercial Bid should be signed at the bottom of each page without any omission by the authorized signatory with name and seal of the firm.
- 3.9 The signatory of the tender should indicate his/their status in which he/they have signed and submit necessary documentary proof admissible in law in respect of such authority assigned to him/them by the firm.
- 3.10 If the Qualification application is made by a FIRM in partnership, it shall be signed by all the partners of the firm with their full names and current address or by a partner authorized by the firm (either as per Articles of the Deed of Partnership / by power of attorney)- for signing in Tenders, Agreements etc. In which case, certified copy of the registered deed of Partnership along with the current address of all the partners and a certified photocopy of the Registered Power of Attorney issued in favour of the Signatory, should be produced.
- 3.11 If the Qualification Application is made by a Limited Company or a Limited Corporation, it shall be signed by a duly authorized person holding the Power of attorney for signing the application, in which case, the certified copy of the power of attorney shall accompany the qualification application. Such limited company or corporation shall also furnish satisfactory evidence of its' existence along with the Qualification schedule.
- 3.12 **The tenderer who are downloading the document from the web site are instructed to check the web site for corrigendum after the date of pre-bid meeting, for any amendments (pre-bid – minutes) (if any issued) They are instructed to down load the above amendments and enclose it along with the technical bid document duly authenticating while submitting without fail. Failure to submit the pre-bid minutes will lead to rejection of the tender offer.**
- 3.13 The tenderer shall provide Raw material test certificates, Manufacturer Test Certificates and also arrange to provide instrument for identification of material to conform as per technical specification during the inspection.
- 3.14 Detailed evaluation done on the basis of the Documents / Records / Evidences / Certificates produced by the Applicant in the Technical Bid.

I agree to abide by the above instructions

SIGNATURE OF THE TENDERER



#### **4.0.GENERAL TERMS & CONDITIONS**

- 4.1. Tender under sealed **two part tender system** (i.e.) Technical Bid (Prequalification) & Price Bid (item rate tenders) are invited for and on behalf of The General Manager, Thoothukudi DCMPU Ltd., by The Dy. General Manager (Engg.), Head Office, TCMPF Ltd. for the Design, Supply, Erection, Installation, Testing and Commissioning of 50 TLPD Capacity New Dairy Plant at Thoothukudi DCMPU Ltd.,
- 4.2
- 4.2.1.The tenderer should be a sole bidder / lead bidder or consortium partner (maximum two consortium partner is allowed )
- 4.2.2.The term tenderer / bidder in this document refers to sole bidder / lead bidder or consortium partner
- 4.2.3.The tenderer should be manufacturer / supplier of Dairy Plant
- 4.2.4. The tenderer should have previous experience in having designed, supplied, installed and commissioned same capacity (or) above of Dairy Plant , in India either to any cooperative institution or reputed dairies / firms.
- 4.2.5. The tenderer should have designed, supplied, installed and commissioned same capacity (or) above of Dairy Plant, for which tender called for, and enclose copies of purchase order / supply order within a period of 5 years.
- 4.2.6.The performance certificate for above such supply for which Purchase Order / Supply order furnished as per 4.2.5 from the reputed purchaser shall be enclosed in the technical bid part – I. The performance certificate received from purchaser / client should be of within a period of 3 years.
- 4.2.7.The Tenderer should have minimum experience of 5 Years in the manufacturing, designed, supplied, installed and commissioned of Dairy Plant. Copies of Registration of firms with list of activities/GST registration certificate etc. should be enclosed as supporting document.
- 4.2.8.If the tenderer is an authorized dealer / supplier of original equipment manufacturer (OEM), the tenderer shall furnish the authorization letter from the original equipment manufacturer (OEM) for supply of Dairy Plant. The original equipment manufacturer (OEM) can authorize only one dealer / supplier
- 4.2.9.If the tenderer is an authorized dealer / supplier for Dairy Plant then the experience of the manufacturer for supply of Dairy Plant, their performance and sales turnover shall be taken for evaluation of technical bids, even if

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the supply has been made either by the manufacturer directly or through other agencies.

4.3.

4.3.1 PART I TECHNICAL BID, wherein the pre-qualification, based on various factors such as supply, capacity etc., suitability and eligibility of the tenderer will be evaluated, considered and decided prior to opening of commercial Bids under PART II of the tender.

4.3.2. THE PART I technical bid shall be opened on **12.05.2022 at 02.15 PM.** in the presence of the tenderers or their authorized representative who opt to be present during the opening.

4.4.

4.4.1. The PART II Commercial Bid of the tenderers who do not satisfy any/all the terms and conditions specifically so mentioned under PART I technical, shall not be considered and shall not be opened as non responsive.

4.4.2. PART II Commercial Bid, wherein the rates tendered by those who qualify for and are selected as per the terms and conditions prescribed in PART I TECHNICAL BID only will be considered and decided for the award of the contract for the Design, Supply, Erection, Installation, Testing and Commissioning of 50 TLPD Capacity New Dairy Plant at Thoothukudi DCMPU Ltd.,

4.5. The Part II commercial bids shall normally be opened within 60 days from the date of opening of the Part I pre-qualification/ technical bid in the presence of tenderers or their authorized representatives who opt to be present. The date of such opening of commercial bid will be informed separately to those who qualify in the PART I technical bid.

4.6. The tenderer is specifically informed that all the pages in both Part I – Technical Bid and Part II – Commercial Bid should be signed at the bottom of each page without any omission by the authorized signatory with name and seal of the firm.

4.7. The tender forms are not transferable or assignable.

4.8. The signatory of the tender should indicate his/their status in which he/they have signed and submit necessary documentary proof admissible in law in respect of such authority assigned to him/them by the firm. If the tender opening day is declared as a holiday, the tenders shall be received and opened immediately on the next working day at the same time and place.

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SIGNATURE OF THE TENDERER

**4.9 E.M.D. PAYABLE:**

4.9.1 Tender must be accompanied with the prescribed amount of EMD along with tender, **if e-tender, the EMD DD should be dropped in the tender box before closure time or may be paid through online in TN e-Procurement Portal and scanned copy of proof for payment of EMD (ie. e-payment receipt) has to be uploaded.**

4.9.2 EMD Payable is as detailed below:-

Sl. No.	Name of equipment	Qty.	EMD amount
1	Design, Supply, Erection, Installation, Testing and Commissioning of 50 TLPD Capacity New Dairy Plant at Thoothukudi DCMPU Ltd.,	1 Job	<b>Rs.34,85,000.00</b>

The EMD amount to be drawn by means of the **Demand Draft or it shall be submitted by means of Bank Guarantee for the period of 12 months and extendable as and when required** from any Indian Nationalised Bank or Scheduled Bank drawn in favour of the "Managing Director, TCMPF Limited," Payable at Chennai. **IT SHALL BE ENCLOSED WITH THE PART I TECHNICAL BID ONLY.** For e-Submission the EMD amount paid through online in the **TN e-Procurement Portal. No other form of remittance shall be accepted.**

**4.9.3.**SSI Units claiming exemption from the payment of EMD,

1. Shall enclose a copy of EM Part II as per MSMED Act 2006 for SSI Certificate obtained from the General Manager, District Industries Centre / Udyog Aadhar, in respect of items manufactured by them for which tenders have been called for alone will be granted exemption from payment of EMD.
2. In respect of SSI units located outside the state (Tamilnadu), such of these units registered with NSIC in respect of items manufactured by them for which tenders have been called for alone will be granted exemption from payment of EMD.

**4.9.4.Tenders not accompanied with Demand Draft or Bank Guarantee or Online Payment towards the prescribed EMD or the relevant documentary proof for the exemption thereon shall be summarily rejected.**

4.9.5. The EMD remitted by the tenderer shall be forfeited in full.

- 1).If the tenderer submit fresh offer / revises offer in case of any omission subsequently after opening.

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2).If withdraws his tender or backs at before the expiry of validity period or after acceptance.

3).If revises any of the terms quoted during validity period.

#### **4.9.6. MODIFICATION AND WITHDRAWAL OF BIDS**

4.9.6.1. No Tenderer shall be allowed to withdraw the tenders after submitting the tender.

4.9.6.2 A Tenderer may submit a modified Tender before the last date for receipt of tender: Provided that where more than one Tender is submitted by the same Tenderer, the lowest eligible financial tender shall be considered for evaluation.

4.9.6.3 Each bidder's modification notice shall be prepared, sealed, marked and delivered with the outer and inner envelopes additionally marked MODIFICATION as appropriate.

4.9.6.4 No bid may be modified after the deadline for submission of Bids.

4.9.7 Bidders shall submit offers that comply with the requirements of the bidding documents, as indicated in the technical specifications.

**"Alternatives will not be considered".**

4.9.8 Communication to the unsuccessful Bidders will be sent after the communication sent to the successful Bidder. Within 90 (Ninety) days from the date of the receipt of refund vouchers duly stamped and signed from the unsuccessful Bidder, refund of Earnest Money Deposit will be made.

#### **4.10.PAN/GST REGISTRATION/CLEARANCE CERTIFICATE:**

4.10.1.Tenderers shall furnish attested Photostat copies of valid GST Registration Certificates along with the tender technical bid Part-I.

4.10.2.Tenderers shall furnish attested Photostat copy of PAN Registration Certificates along with the tender technical bid Part-I.

4.10.3.Tenderers have to furnish the latest valid S.T. Clearance Certificate before issuance of final orders.

**4.11. ENCLOSURES:** The tenderer should submit the following documents **duly attested by Notary Public** along with the Part – I technical bid.

1). Purchase orders as supportive documents to show the past supply having supplied to any of the reputed dairies / firm(s) /coop(s) in India.

2). Satisfactory performance certificate from client(s) for the above equipments tendered.

Noted and agreed to the above

SIGNATURE OF THE TENDERER

- 3). If the tenderer is an authorized suppliers of a manufacturer, the tenderer shall furnish the authorization letter from the manufacturer for supply of Dairy Plant
- 4). Photostat copies of valid GST Registration Certificate, PAN Certificate.
- 5). Infrastructure facilities – Capacity of Firm / Supplier:-
  - (i). Structure and Organization with details of Technical Personnel etc. – Annexure – A
  - (ii). Financial Capability Statement – Annexure – B
  - (iii). Building, Plant and Equipments
  - (iv). Details of Abandonment of work Litigation / debarring done – Annexure – C
  - (v). Affidavit – Annexure – D
  - (vi). Credit Facilities – Bank Certificate – Annexure – E

#### **4.12. SECURITY DEPOSIT**

The successful tenderers would be required to sign an agreement and furnish a Security Deposit of 5% of the order value, drawn by means of Demand Draft or it shall be submitted by means of Bank Guarantee for the period of 18 months and extendable as and when required from any Indian Nationalised Bank or Scheduled Bank drawn in favour of “Managing Director, TCMPF Ltd” payable at Chennai within 15 days of notifying them. The EMD already paid along with tender shall be adjusted against SD to be paid by the successful tenderer.

No exemption will be given from payment of Security deposit under any circumstances as per TTTT Act and the same should be remitted by above means. Any other form of remittance will not be accepted..

- 4.12.1. The security deposit will be refunded only after the expiry of 6 months from the date of satisfactory completion of the contract satisfactorily complying to the specification of the equipment to take care of the workmanship of the agency.

#### **4.13. AGREEMENT:**

The successful tenderer has to execute an agreement on Rs.100/- non-judicial stamp paper incorporating the terms and conditions of the contract and the specification within 15 days from the date of intimation of the acceptance of the tender. In case of default of either of the conditions (i.e) remitting the security deposit or execution of the agreement within the time allowed, the EMD paid is likely to be forfeited by the Federation.

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- 4.13.1. If the contractor fails to execute the contract satisfactorily at the tendered rate, the security deposit will be forfeited by the Federation.
- 4.13.2. If the Federation incurs any loss / additional expenditure due to the negligence of the contractor in connection with the work during the period of contract, the same shall be recovered together with all charges and expenses from the contractor.
- 4.13.3. The breakages or damages, if any, caused by the contractor to the property of the Federation, the cost will be recovered from the contractor.
- 4.13.4. **RATES AND PRICE:** This is a fixed price contract. Price adjustment clause (to account for raise or fall in the money value / statutory taxes during the contract period) is not operatable for this contract. However any variation in the statutory levies and Taxes by State Government / Central Government shall be effected on the end price to the benefit of either the contractor or Federation as the case it may be.
- 4.13.5. No interest shall be paid on Earnest Money Deposit/Security Deposit.
- 4.13.6. The Agreement in Rs.100/- non-judicial stamp paper shall be signed and returned within 15 days of receipt of the Design, Supply, Erection, Installation, Testing and Commissioning order along with the D.D. for Security Deposit.

#### **4.14. DELIVERY SCHEDULE:-**

- |   |   |  |
|---|---|--|
| 4.14.1. Supply  | : | 5 – 6 months from the date of receipt of purchase order (or) 1 month from the readiness of site whichever is later |
| 4.14.2. Erection, Installation, Testing and Commissioning | : | 4 – 6 months from the readiness of site (or) receipt of Materials at site whichever is later.                      |

#### **4.15. PAYMENT TERMS:**

##### **4.15.1. SUPPLY:**

- a). If the single order of any successful tenderers is over Rs.1 crore., an advance payment of 10% of the basic value of the order will be considered against irrevocable bank guarantee for a period till completion of entire supply of Dairy Plant Machinery / Equipments and such advance shall be recovered with interest applicable at the time of recovery from the bills payable at the time of release of 70% basic price + taxes and other charges.

**(OR)**

Noted and agreed to the above

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70% of basic price + taxes and other charges shall be released on receipt of the Dairy Plant Machinery/Equipments wise in good condition at site.

- b). The remaining 30% payment shall be released after the Erection and satisfactory commissioning of the Dairy Plant Machinery/Equipments wise at site.

**(OR)**

If the site is not ready due to unavoidable circumstances for carrying out the Erection, Installation, Testing and Commissioning of the equipments within 3 months period, then the balance 30% payment on supply will be considered for release on submission of irrevocable Bank Guarantee for a value equal to 30% of supply order value, for one year and extendable for another one more year with an agreement on a non-judicial stamp paper to a value of Rs.100/- (Rupees hundred only) for execution of project subsequently without altering the Erection, Installation, Testing and Commissioning charges.

**4.15.2. ERECTION, INSTALLATION, TESTING AND COMMISSIONING:**

- a). 70% of the Erection, Installation, Testing and Commissioning charges shall be released on satisfactory completion of the Erection, Installation, Testing and Commissioning of the Dairy Plant
- b). Balance 30% of Erection, Installation, Testing and Commissioning charges shall be released after 3 months from the date of satisfactory commissioning and performance of the Dairy Plant.

**N.B: NO OTHER TERMS OF PAYMENT WILL BE ENTERTAINED.**

**PENALTY CLAUSE:**

4.15.3. If the tenderer / Contractor fails in his due performance of the contract within the time fixed in the schedule accompanying the order or extension of time granted:-

- (a) Liquidated damages will be levied at 1% per month for the number of days that the supply / work has been delayed for the contract value less than Rs.50,00,000/- (Rupees fifty lakhs) as below subject to:-
- (i). The Liquidated Damages be imposed on the value of undelivered / delayed supply of materials / machineries instead of total value of contract, if the tender is for the Design, Supply, Erection, Installation, Testing and Commissioning of two or more number

Noted and agreed to the above

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of machineries and where the materials / machineries can be put into use separately.

**(OR)**

(ii). The Liquidated Damages be imposed on the total value of the contract for delayed supply / completion of material / work as per the milestone fixed in the tender (i.e) turnkey job inclusive of Civil work, supply of Mechanical/Electrical item, Erection etc., since the machineries partly supplied could not be put into operation and affect the functioning of system and other accessories as per plan.

(b). The Liquidated Damages be imposed for the delayed supply / Erection, Installation, Testing and commissioning at 0.5% per month, if the contract value is more than Rs.50.00 Lakhs (Rupees fifty lakhs). The maximum deduction is limited to 5% on LD.

4.15.4. Time being the essence of contract no variation shall be permitted in the delivery time as prescribed in the delivery schedule. If the tenderer fails to supply and execute the work in full or part of the order as per the delivery schedule, the Federation shall reserve the right to cancel the order besides forfeiture of Security Deposit.

4.15.5. Notwithstanding anything contained in the tender schedule, no obligation rests on the Federation to accept the lowest tender and the Federation shall also have the right to accept or reject any or all the tenders fully or partly without assigning any reasons.

4.15.6. For violation of any of the terms and conditions of the contract, the Federation reserves the right to terminate the contract, with or without notice as applicable.

4.15.7. On termination of contract, the Security Deposit is liable to be forfeited and any of the resultant loss beyond Security Deposit will be recovered from the contractor by legal means apart from forfeiture of any amount due to the contractor.

4.15.8. (a). If the tenderer defaulted in any of the previous tenders to execute agreement or to pay Security Deposit or to supply ordered quantity either in part or full will not be eligible from participating in this tender.

(b). If the successful tenderer either in federation TCMPF or in the DCMPU defaulted to execute agreement or to pay Security Deposit or

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to supply ordered quantity either in part or full shall be debarred from participating in the subsequent tenders for a period of 3 years.

**4.16. WARRANTY:**

A warranty certificate shall be furnished on the workmanship, parts and performance of the Dairy Plant for a period of 18 months from the date of supply or 12 months from the date of satisfactory commissioning whichever is later. If any defects are noticed in the equipments during the warranty period the same should be rectified at site at free of cost and charges.

**4.17. FORCE MAJEURE:**

Failure or delay in the part of tenderer for supply due to force majeure causes enumerated here under shall be considered, provided the supplier produces documentary evidence.

- a. Any cause which is beyond the reasonable control of the tenderer.
- b. Natural phenomena, such as floods, drought, earthquakes and epidemics.
- c. Act of any Govt. Authority, domestic or foreign, such as wars declared or undeclared quarantines, embargoes licensing control on production or distribution restrictions.
- d. Accident and disruptions such as fire, explosion, increase in power cut with respect to date of tender opening etc.,
- e. Strikes, slow down and lockouts.

The cause of force majeure condition will be taken into consideration only if the supplier notifies within 30 days from the occurrence of such eventualities. The purchaser shall verify the facts and grant such extension as the facts justify. For extension due to force majeure conditions, the supplier shall submit his representation with documentary evidence for scrutiny by the purchaser and decision of the purchaser shall be binding on the time.

**4.18. DISPUTES AND ARBITRATION:**

In case of disputes arising out of this tender, an arbitrator as mutually acceptable to the tenderer and Federation will be appointed by the Managing Director, TCMF Limited. The arbitrator's decision shall be final, conclusive and binding on both the parties.

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#### **4.19. LEGAL JURISDICTION**

In case if either party to the tender is aggrieved by the award of the arbitrator so appointed as per clause 4.18 or otherwise, they can appeal to Court of Deputy Registrar (Dairying), Thiruvallur. The legal jurisdiction will be only Deputy Registrar (Dairying), Thiruvallur Court.

#### **4.20. PERFORMANCE GUARANTEE:**

If the value of supply order is Rs.50 lakhs or more, the contractor shall provide a performance guarantee at the time of getting 70% payment for the 10% of the supply order value of the Dairy Plant ordered as Bank Guarantee from a Nationalized Bank / Scheduled Banks for a period of one year and extendable to one more year if needed.

#### **4.21. INSPECTION:**

After issue of purchase order to L1 Firm, the material inspection will be conducted at Supplier's site and Purchaser's by TCMPF Ltd., / Third Party agency as the case it may be.

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## **5.0. PRE QUALIFICATION CRITERIA – TECHNICAL BID (PART-I)**

The pre-qualification tender/PART-I technical bid will contain the under mentioned aspects pertaining to the prospective suppliers about their suitability, capacity, financial status, antecedents, past performance etc. The conditions are:-

### **5.1. Tenders not accompanied with Demand Draft or Bank Guarantee or Online Payment towards the prescribed EMD or the relevant documentary proof for the exemption thereon shall be summarily rejected**

- 5.1.1. The tenderer should be manufacturer / supplier of Dairy Plant
- 5.2. The tenderer should have previous experience in having designed, supplied, installed and commissioned same capacity (or) above of Dairy Plant, in India either to any cooperative institution or reputed dairies / firms.
- 5.3. The tenderer should have designed, supplied, installed and commissioned same capacity (or) above of Dairy Plant, for which tender called for, and enclose copies of purchase order / supply order within a period of 5 years.
- 5.4. The performance certificate for above such supply for which Purchase Order / Supply order furnished as per 5.3 from the reputed purchaser shall be enclosed in the technical bid part – I. The performance certificate received from purchaser / client should be of within a period of 3 years.
- 5.5. The Tenderer should have minimum experience of 5 Years in the manufacturing, designed, supplied, installed and commissioned of Dairy Plant. Copies of Registration of firms with list of activities/GST registration certificate etc. should be enclosed as supporting document
- 5.6. If the tenderer is an authorized dealer / supplier of original equipment manufacturer (OEM), the tenderer shall furnish the authorization letter from the original equipment manufacturer (OEM) for supply of Dairy Plant. The original equipment manufacturer (OEM) can authorize only one dealer / supplier.
- 5.7. If the tenderer is an authorized dealer / supplier for Dairy Plant, then the experience of the manufacturer for supply of Dairy Plant, their performance and sales turnover shall be taken for evaluation of technical bids, even if the supply has been made either by the manufacturer directly or through other agencies.
- 5.8. The tenderer who are downloading the document from the web site are instructed to check the web site for corrigendum after the date of pre-bid meeting, for any amendments (pre-bid – minutes) (if any issued) They are instructed to down load the above**  
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**amendments and enclose it along with the technical bid document duly authenticating while submitting without fail. Failure to submit the pre-bid minutes will lead to rejection of the tender offer.**

- 5.9. **FINANCIAL:** The tenderer shall have ***average annual sales turn-over for the last three financial years (2018-19, 2019-20 & 2020-21) equal to the tender estimated value and minimum annual sales turn-over in each of the last three financial years (2018-19, 2019-20 & 2020-21) shall not be less than 50% of the tender estimated value.***

**5.10. VALIDITY OF PRICE TENDER:**

- a). The tender offer shall be kept for acceptance for a period of 120 days from the date of opening of Part – I Technical bid. The offers with lower validity period are liable for rejection.
- b). Further the tenderer shall agree to extend the validity of the bids without altering the substance and prices of their bid for further period, if any required by Federation (i.e) The Price Bid shall be valid for a period of at least 90 days (Ninety Days) from the date, notified for opening of Price Bid.

**5.11. DEVIATION:**

- a). The offers of the tenderers with deviations on technical / commercial terms of the tender will be rejected.
- b). No alternate offer will be accepted.

- 5.12. Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have:

- a). Made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements; and/or
- b). 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
- c). Participated in the previous bidding for the same work and had quoted unreasonably high bid prices and could not furnish rational justification to the employer.

- 5.13. The bidder should submit the proposed tentative P and I drawing, General plan for the above Dairy Plant in the Technical bid.

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**Annexure – A**  
**STRUCTURE AND ORGANISATION**

1	Name of the Applicant	:	
2	Status	:	
	Individual contractor	:	
	Sole Proprietary Firm	:	
	Firm in Partnership	:	
	Private Limited Company	:	
	Public Limited Company	:	
3	Head Office/Registered office address with phone / Telex / Fax Number	:	
4	Contact Person Name Address Mobile No Email Address	:	
5	Regional Office address with Phone / Telex / Fax Number	:	
6	Local office (if any) address with Phone / Telex / Fax Number	:	
7	Field of activity of the Applicant as per deed of Partnership / Memorandum of Association / Articles of associates (Civil) Engineering Contractor / General Engineering Contractor / Electrical Items - Engineering Contractor etc, should be specified.)	:	
8	Country and year of incorporation	:	
9	Main line of Business	:	
10	Name, position, status, capacity etc, of the Key personnel/ directors of the company (Attach organization chart showing the structure of the company / firm)	:	
11	Name, capacity and address of the signatory who has Signed the Qualification Application. Attested copy of authorization issued (either by power of attorney or as per articles of Partnership Deed / Memorandum of Association) in favour of the signatory to sign the qualification Application price Tender/ Agreement should be appended.	:	

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**Annexure – B**  
**FINANCIAL CAPABILITY**  
**(Please Annex self attested copies)**

1	Name and address of the Applicant	:				
2	Income Tax Permanent Account No. C.I. H. No.	:				
3	GST Registration No.	:				
4	Annual turn over as per audited statement of account duly certified by the Chartered Accountant during the preceding Three years (Attach attested copy of balance sheets)	:	TAX Year	Figures	Words	
		:	2018-19			
		:	2019-20			
		:	2020-21			
5	Financial Position	:				
	I. Cash in hand	:				
	II. Cash in Bank	:				
	III. Current Assets	:				
	IV. Current Liabilities	:				
	V. Working Capital	:				
6	VI. Net worth	:				
	Outstanding value of works already committed and in progress and time left for completion. (Details for each work to be furnished separately)	:				
	7	Amount available in capital Account	:			
		I. Paid up share capital of (Partners or Share holders)	:			
		II. Called up and subscribed share capital	:			
		III. Reserves under capital account	:			
	IV. Surplus under capital account	:				

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8	Net profit before tax during the proceeding three years	:	TAX Year	Figures	Words
		:	2018-19		
		:	2019-20		
		:	2020-21		
9	Applicant's financial arrangements.	:			
	(a) Own resources	:			
	(b) Bank credits/ Over Draft	:			
	(c) Other source (Specify the source)	:			

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**Annexure – C**  
**INFORMATION REGARDING CURRENT LITIGATION / DEBARRING /**  
**EXPELLING OF APPLICANT OR ABANDONMENT OF WORK BY THE**  
**APPLICANT**

1. (a) Is the Applicant currently involved in any Arbitration /  
litigation relating to any contract works Yes/No  
(b) If Yes, Details thereon
  
2. (a) Has the Applicant or any of it's constituent partners  
been Debarred/Expelled by any agency during the  
last Three years Yes/No  
(b) If yes, Details thereon
  
3. (a) Has the Applicant or any of it's constituent Partners  
failed to complete, any contract work during the past  
Three years. Yes/No  
(b) If yes, give details thereon

**Dated Signature of Applicant with seal**

**Note:** If any information in this Annexure is found to be incorrect or concealed, the Qualification Application will be summarily rejected & price tender will not be opened.



**Annexure – D  
AFFIDAVIT**

**(To be furnished in a Twenty Rupees Non-Judicial Stamp Paper  
duly Certified by Notary Public)**

- 1). I/We the undersigned solemnly declare that all the statements made in the documents, records etc., attached with this application are true and correct to the best of my/our knowledge.
- 2). I/We the undersigned do hereby certify that neither my/our firm/company nor any of it's constituent partners have abandoned any work/works of similar nature and magnitude in India, during the Last Three years.
- 3). I/We the undersigned do hereby certify that any of the contracts awarded to me/us has not been terminated rescinded, due to breach of contract on my/our part, during the last Three Years.
- 4). I/We the undersigned authorize (s) and request any bank / person / firm / corporation / Government Departments to furnish pertinent information deemed necessary and requested by The Dy. General Manager (Engg.), TCMPF Ltd., Head Office, Aavin Illam, 3-A, Pasumpon Muthuramalinganar Salai, Nandanam, Chennai – 600 035 to verify the statement made by me/us or to assess my/our competence and general reputation.
- 5). I/We the undersigned, understand(s) that further qualifying information / clarifications on the statement made by me / us may be requested by The Dy. General Manager (Engg.), TCMPF Ltd., Head Office, Aavin Illam, 3-A, Pasumpon Muthuramalinganar Salai, Nandanam, Chennai – 600 035. and agree(s) to furnish such information/ clarification within SEVEN Days from the date of receipt of such request from The Dy. General Manager (Engg.), Aavin Illam, Head Office, 3-A, Pasumpon Muthuramalinganar Salai, Nandanam, Chennai – 600 035.

**Dated Signature of Applicant with Seal:**

To be signed by the officer authorized by the Firm/Company to sign on behalf, the Firm/Company with company's seal)

**Note:** In case of sole proprietary concern, affidavit should be signed only by the sole proprietor.

(Title of the Officer)

(Title of the firm/Company)

(Date)

The above named deponent has understood the contents well and solemnly and sincerely declared and affirmed by the deponent in my presence at.....and signed before me on this day of .....  
(Seal).

**(Signature of the Notary Public)**

**Annexure – E**  
**SAMPLE FORMAT FOR EVIDENCE OF ACCESS TO OR AVAILABILITY OF**  
**CREDIT FACILITIES**

**BANK CERTIFICATE**

This is to certify that M/s ..... is a 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 the above contract.

Signature of Senior Bank Manager .....  
Name of the senior Bank Manager .....  
Address of the Bank .....

Stamp of the Bank

**Note: Certificate should be on the letter head of the bank.**

## **6.0 EVALUATION AND COMPARISON OF THE TENDER OFFERS**

- 6.1. The tenders will be evaluated strictly as per the Tamilnadu Transparency in Tenders Act 1998 and the Tamilnadu Transparency in Tenders Rules 2000 and amendments made thereon in the Act & Rules by the Government.
- 6.2. The tender offers received will be examined to determine whether they are in complete shape, all required data's have been furnished, properly signed and generally in order and confirms to all the terms and conditions of the specification without any deviation.
- 6.3. For the purpose of evaluation of tender offers, the following factors will be taken into account for arriving the evaluation price.
  - a). The quoted price will be corrected to arithmetical errors.
  - b). In case of discrepancy between the price quoted in words and figures, lower of the two shall be considered.
  - c). The evaluation of offer will be computed by taking into account Design, Supply, Erection, Installation, Testing and Commissioning put together.
- 6.4. Bidders should quote their rates both in figures and in words for each item per unit and amount for each item of work for full quantity. Grand total of the whole contract should be furnished without fail in the Price Quote Schedule of Price Bid.
- 6.5. The bidder shall fill in rates and prices and line item total (both in figures and words) for all the items of the works described along with total bid price (both in figures and words). Items for which no rate or price is entered by the bidder will not be paid for by the purchaser when executed.
- 6.6. The evaluation for L1 shall be on total end price of all items.

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## **7.0.SPECIAL CONDITIONS OF CONTRACT**

### Contents

1. Definitions
2. Performance Security
3. Inspection and Tests
4. Delivery and Documents
5. Insurance
6. Incidental services
7. Spare Parts
8. Warranty/Guarantee
9. Payment
10. Resolution of Disputes
11. Notices

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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:

**1. Definitions (Clause 1)**

- 1.1 The Purchaser is Tamilnadu Cooperative Milk Producers' Federation Ltd., and would include the term "Owner"
- 1.2 The Bidder/Supplier is (Name of Bidder/Supplier).
- 1.3 Equivalency of Standards and Codes (Clause 4)
- 1.4 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 Bidder/Supplier and submitted to the Purchaser at least 30 days prior to the date when the Bidder/Supplier desires the Purchaser's approval. In the event the Purchaser determines that such proposed deviations do not ensure equal or higher quality, the Bidder/Supplier shall comply with the standards set forth in the documents.

**2. Performance Security**

- 2.1 The Performance Security shall be in the amount of 10% of the Contract price up to sixty days after the date of completion of performance obligations including warranty obligations.

**3. Inspection and Tests**

- 3.1 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

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procedures laid down in the Schedule of Specifications and the Contract conditions.

#### **4. Delivery and Documents**

4.1 **For imported goods:** Upon shipment, the Bidder/Supplier shall notify the Purchaser and the Insurance Company by email / fax / ink the full details of the shipment including purchase order number, description of goods, quantity, the vessel, the bill of lading number and date, port of loading, date of shipment, port of discharge, etc. The Bidder/Supplier shall mail the following documents to the Purchaser, with a copy to the Insurance Company:

4.2 **For imported goods:** Original and three copies of:

- The **Supplier's invoice** showing purchase order no., Goods description, quantity, unit price, total amount;
- The negotiable, clean, on-board bill of lading marked freight prepaid and three copies of non-negotiable bill of lading;
- Packing list identifying contents of each package;
- Insurance certificate;
- Manufacturer's/Bidder/Supplier's guarantee certificate;
- Inspection certificate, issued by the nominated inspection agency and the Bidder/Supplier's factory inspection report; and
- Certificate for Country of origin.
- The Supplier's certificate certifying that the defects pointed out during inspection have been rectified.

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

4.4 **For Domestic Goods:** Original and three copies of:

- The Supplier's invoice showing purchase order no., Goods' description, quantity, unit price, total amount;
- Delivery note/packing list/lorry receipt;
- Manufacturer's/Bidder/Supplier's guarantee certificate;
- Inspection Certificate issued by the nominated inspection agency, and the Bidder/Supplier's factory inspection report;
- Excise gate pass/ Octroi receipts, wherever applicable, duly sealed indicating payments made; and

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- Any other document evidencing payment of statutory levies.
- Single MCE insurance policy shall cover the entire project.

4.5 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/contract. The dispatch particulars including name of transporter, LR Number and date should also be mentioned in the invoice/s.

## **5. Insurance**

- 5.1 The marine/transit insurance shall cover an amount equal to 110% of the FOR destination value of the goods from "warehouse to warehouse" on "All Risks" basis including War Risks and Strike clauses valid for a period not less than 3 months after the date of arrival of Goods at final destination.
- 5.2 The Insurance charges shall be paid by successful Bidder/Supplier towards all risks during storage, erection, testing, commissioning and up to acceptance of the plant.

## **6. Incidental services**

- 6.1 The incidental services shall be provided as per the requirements outlined in the Schedule of Specifications and as covered under Clause 3.13. The cost shall be included in the contract price, if provided for in the scope of the Contract.

## **7. Spare Parts**

- 7.1 Bidder/Suppliers shall carry sufficient inventories to assure ex-stock supply of consumable spares such as gaskets, plugs, washers, belts, etc. Other spare parts and components shall be supplied as promptly as possible but in any case within three months of placement of order. Basic Spare part list already provided in the technical section which is mandatory to supply.

## **8. Notices**

For the purpose of all the notices, the following shall be the address of the Purchaser and Supplier.

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The Dy. General Manager (Engg.),  
Tamilnadu Cooperative Milk Producers' Federation Ltd.,  
Aavin Illam, 3-A, Pasumpon Muthuramalinganar Salai,  
Nandanam, Chennai – 600 035.

## **9. SALIENT FEATURES OF SOME MAJOR LABOUR LAWS APPLICABLE TO ESTABLISHMENTS ENGAGED IN BUILDING AND OTHER CONSTRUCTION WORK.**

(The law as current on the date of bid opening will apply to the bidder for executing the tendered project)

- a) **Workmen Compensation Act 1923**: The Act provides for compensation in case of injury by accident arising out of and during the course of employment.
- b) **Payment of Gratuity Act 1972**: Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.
- c) **Employees P.F. and Miscellaneous Provision Act 1952**: The Act Provides for monthly contributions by the employer plus workers @ 10% or 8.33%. The benefits payable under the Act are:
  - (i) Pension or family pension on retirement or death, as the case may be.
  - (ii) Deposit linked insurance on the death in harness of the worker.
  - (IV) Payment of P.F. accumulation on retirement/death etc.
- d) **Maternity Benefit Act 1951**: The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.
- e) **Contract Labour (Regulation & Abolition) Act 1970**: The Act provides for certain welfare measures to be provided by the Contractor to contract labour and in case the Contractor fails to provide, the same are required to be provided, by the Principal Employer by Law. The Principal Employer is required to take Certificate of Registration and the Contractor is required to take license from the designated Officer. The Act is applicable to the establishments or Contractor of Principal Employer if they employ 20 or more contract labour.

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- f) **Minimum Wages Act 1948:** The Employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employments.
- g) **Payment of Wages Act 1936:** It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.
- h) **Equal Remuneration Act 1979:** The Act provides for payment of equal wages for work of equal nature to Male and Female workers and for not making discrimination against Female employees in the matters of transfers, training and promotions etc.
- i) **Payment of Bonus Act 1965:** The Act is applicable to all establishments employing 20 or more employees. The Act provides for payments of annual bonus subject to a minimum of 8.33% of wages and maximum of 20% of wages to employees drawing Rs.3500/-per month or less. The bonus to be paid to employees getting Rs.2500/-per month or above upto Rs.3500/- per month shall be worked out by taking wages as Rs.2500/-per month only. The Act does not apply to certain establishments. The newly set-up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of this Act.
- j) **Industrial Disputes Act 1947:** The Act lays down the machinery and procedure for resolution of Industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.
- k) **Industrial Employment (Standing Orders) Act 1946:** It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the Employer on matters provided in the Act and get the same certified by the designated Authority.
- l) **Trade Unions Act 1926:** The Act lays down the procedure for registration of trade unions of workmen and employers. The Trade

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Unions registered under the Act have been given certain immunities from civil and criminal liabilities.

- m) **Child Labour (Prohibition & Regulation) Act 1986:** The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of Child Labour is prohibited in Building and Construction Industry.
- n) **Inter-State Migrant workmen's (Regulation of Employment & Conditions of Service) Act 1979:** The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The Inter-State migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, travelling expenses from home upto the establishment and back, etc.
- o) **The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act 1996 and the Cess Act of 1996:** All the establishments who carry on any building or other construction work and employs 10 or more workers are covered under this Act. All such establishments are required to pay cess at the rate not exceeding 2% of the cost of construction as may be modified by the Government. The Employer of the establishment is required to provide safety measures at the Building or construction work and other welfare measures, such as Canteens, First-Aid facilities, Ambulance, Housing accommodations for workers near the work place etc. The Employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.
- p) **Factories Act 1948:** The Act lays down the procedure for approval at plans before setting up a factory, health and safety provisions, welfare provisions, working hours, annual earned leave and rendering information regarding accidents or dangerous occurrences to designated authorities. It is applicable to premises employing 10 persons or more with aid of power or 20 or more persons without the aid of power engaged in manufacturing process.

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## **10. PROTECTION OF ENVIRONMENT:**

The contractor shall 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.

During continuance of the contract, the contractor and his sub-contractors shall abide at all times by all existing enactments on environmental protection and rules made thereunder, regulations, notifications and bye-laws of the State or Central Government, or local authorities and any other law, bye-law, regulations that may be passed or notification that may be issued in this respect in future by the State or Central Government or the local authority.

**Salient features of some of the major laws that are applicable are given below:**

**The Water (Prevention and Control of Pollution) Act, 1974,** This provides for the prevention and control of water pollution and the maintaining and restoring of wholesomeness of water. 'Pollution' means such contamination of water or such alteration of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water (whether directly or indirectly) as may, or is likely to, create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants or of aquatic organisms.

**The Air (Prevention and Control of Pollution) Act, 1981,** This provides for prevention, control and abatement of air pollution. 'Air Pollution' means the presence in the atmosphere of any 'air pollutant', which means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment.

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**The Environment (Protection) Act, 1986**, this provides for the protection and improvement of environment and for matters connected therewith, and the prevention of hazards to human beings, other living creatures, plants and property. 'Environment' includes water, air and land and the inter-relationship which exists among and between water, air and land, and human beings, other living creatures, plants, microorganism and property.

**The Public Liability Insurance Act, 1991**, This provides for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling hazardous substances and for matters connected herewith or incidental thereto. Hazardous substance means any substance or preparation which is defined as hazardous substance under the Environment (Protection) Act 1986, and exceeding such quantity as may be specified by notification by the Central Government.

*[Employers should note that the Loan Agreement between IBRD and the borrowing country may establish specific measures to be taken during construction of the Works for the protection of the environment. Sub-clause 16.2 should be modified/expanded to take into account such specific measures or other measures considered appropriate by the Employer]*

**Purchaser**

Tamilnadu Cooperative Milk Producers’ Federation Ltd.,

*Supplier*

Bidders to provide details.

Noted and agreed to the above

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**8.0. Special Conditions of Contract for General Erection & Commissioning**

**Contents**

- 1. Sufficiency Of Tender
  - 2. Programme Of Installation & Commissioning
  - 3. Preparation of Drawings for Approval
  - 4. Superintendence, Team And Conduct
  - 5. Purchaser's Instructions
  - 6. Right Of The Purchaser
  - 7. Bidder/Supplier’s Functions
  - 8. Variations
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  - 16. Extension of Time for Completion
- Table 1 List of Drawings required Submission

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## **1. Sufficiency of Tender**

- 1.1 The Bidder/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. Programme of Installation & Commissioning**

- 2.1 As soon as practicable after the acceptance of the bid, the Bidder/Supplier shall submit to the Purchaser for his approval a comprehensive programmed in the form of bar chart showing the sequence of order in which the Bidder/Supplier proposes to carry out the works including the design, manufacture, delivery to site, Erection, Installation, Testing and Commissioning thereof. After submission to and approval by the Purchaser of such programmed, the Bidder/Supplier shall adhere to the sequence of order and method stated therein. The submission to and approval by the Purchaser of such programmed shall not relieve the Bidder/Supplier of any of his duties or responsibilities under the Contract. The programmed approved by the Purchaser shall form the basis of evaluating the pace of all works to be performed by the Bidder/Supplier. The Bidder/Supplier shall update the PERT Network every month, submit it to the Purchaser and shall inform the Purchaser the progress on all the activities falling on schedule for the next reporting date.

## **3. Preparation of Drawings for Approval**

- 3.1 The Bidder/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 Bidder/Supplier shall submit to the Purchaser for approval:
- 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.
  - 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.

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- During the progress of works and before the start of the erection activities, Supplier to submit the intelligent 3D for entire plant in the freeware software format for the approval to the Purchaser/Consultant
- 3.2 Wherever necessary, the Bidder/Supplier would be provided with a set of architectural drawings for the buildings where the erection works would be carried out and also the equipment details/ drawings of various equipment's handed over to the Bidder/Supplier by the Purchaser.
- 3.3 The specifications/ conditions concerning the submission of drawings by the Bidder/Supplier are detailed as under:
- 3.4 Bidder/Supplier shall furnish a list of all necessary drawings, which the Bidder/Supplier shall submit for approval, identifying each drawing by a serial number and descriptive title and expected date of submission. A brief list of drawings is given in *Table 1*. This list shall be revised and extended if necessary, during the progress of work depending on the nature of the contract also.
- 3.5 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 programmed.
- 3.6 The purchaser shall issue, within four weeks of time in all circumstances, any drawing requested by the Bidder/Supplier and required to be provided by us. If the Bidder/Supplier suffers delay and/ or incurs costs due to delay on purchaser's part in this regard, then the Purchaser shall take such delay into account in determining any extension of time to which the Bidder/Supplier is entitled under Clause 15 hereof and the Bidder/Supplier shall be paid the amount of such cost as shall be reasonable.
- 3.7 P&I Drawings, Plant Layout and GA Drawings submitted for approval shall be signed by responsible representative of Bidder/Supplier and shall be to any one of the following sizes in accordance with Indian Standards: " **A0, A1, A2, A3 and A4**".
- 3.8 All drawings shall show the following particulars in the lower right hand corner in addition to Bidder/Supplier's name:
- |                         |                            |
|-------------------------|----------------------------|
| • Name of the Purchaser | • Date of drawing          |
| • Project Title         | • Drawing number           |
| • Title of drawing      | • Space for drawing number |
| • Scale                 | • Drawing Revision Number  |
- 3.9 In addition to the information provided on drawings, each drawing shall carry a revision number, date of revision and brief description of revision

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carried out. Whenever any revision is carried out, correspondingly revision number must be updated.

- 3.10 All dimensions on drawings shall be in metric units.
- 3.11 Drawings (**three sets**) submitted by the Bidder/Supplier for approval will be checked, reviewed by the Purchaser, and comments, if any, on the same will be conveyed to the Bidder/Supplier. It is the responsibility of the Bidder/Supplier to incorporate correctly all the comments conveyed by the Purchaser on the Bidder/Supplier's drawings. The drawings, which are approved with comments, are to be re-submitted to the Purchaser for purpose of records. Such drawings will not be checked / reviewed by the Purchaser to verify whether the Bidder/Supplier has incorporated all the comments. If the Bidder/Supplier is unable to incorporate any comments in the revised drawings, Bidder/Supplier shall clearly state in his forwarding letter such non-compliance along with the valid reasons.
- 3.12 Drawings prepared by the Bidder/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 Bidder/Supplier of his responsibility for engineering design, workmanship, and quality of materials, warranty obligations and satisfactory performance on installation covered under the contract.
- 3.13 If at any time before completion of the work, changes are made necessitating revision of approved drawings, the Bidder/Supplier shall make such revisions and proceed in the same routine as for the original approval.
- 3.14 *Date of submission*: In the event, the drawings submitted for approval require many revisions amounting to redrawing of the same, and then the date of submission of the revised drawings would be considered as the date of submission for approval.
- 3.15 The Bidder/Supplier shall furnish to the Purchaser before the works are taken over, Operating and Maintenance instructions together with Drawings of the works as completed, in sufficient detail to enable the Purchaser to maintain, dismantle, reassemble and adjust all parts of the works. Unless otherwise agreed, the works shall not be considered completed for the purposes of taking over until such instructions and drawings have been supplied to the Purchaser.

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#### **4. Superintendence, Team and Conduct**

- 4.1 The Bidder/Supplier shall employ one or more competent representatives, whose name or names shall have previously been communicated in writing to the Purchaser by the Bidder/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 Bidder/Supplier shall be deemed to have given to the Bidder/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.
- 4.2 The Bidder/Supplier shall, execute the works with due care and diligence within the time for completion and employ Bidder/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 Bidder/Supplier shall ensure adequate workforce to keep the required pace at all times as per the schedule of completion. Bidder/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.
- 4.3 The Bidder/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, Installation, Testing and Commissioning of plant and equipment of comparable capacity.
- 4.4 When the Bidder/Supplier or Bidder/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 given to the Bidder/Supplier.
- 4.5 The Bidder/Supplier shall furnish to the Purchaser a fortnightly labour force report showing by classifications the number of employees engaged in the work. The Bidder/Supplier's employment records shall include any

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reasonable information as may be required by the Purchaser. The Bidder/Supplier should also display necessary information as may be required by statutory regulations.

- 4.6 None of the Bidder/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.
- 4.7 The Purchaser shall be at liberty to object to any representative or person, skilled, semi-skilled or unskilled worker employed by the Bidder/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 Bidder/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 Bidder/Supplier's own expense within a reasonable time.
- 4.8 In the execution of the works no persons other than the Bidder/Supplier, sub-Bidder/Supplier and their employees shall be allowed on the site except by the written permission of the Purchaser.

## **5. Purchaser's Instructions**

- 5.1 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:
- Any additional drawing and clarifications to exhibit or illustrate details.
  - Variations or modifications of the design, quality or quantity of work or the additions or omissions or substitution of any work.
  - Any discrepancy in the drawings or between the schedule of quantities and/or specifications.
  - Removal from the site of any material brought there by the Bidder/Supplier, which are unacceptable to the Purchaser and the substitution of any other material thereof.
  - Removal and/or re-execution of any work erected by the Bidder/Supplier, which are unacceptable to the Purchaser.

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- Dismissal from the work of any persons employed there upon who shall in the opinion of the Purchaser, misconduct him, or be incompetent or negligent.
- Opening up for inspection of any work covered up.
- Amending and making good of any defects.

## **6. Right of the Purchaser**

### **6.1 Right to direct works**

- 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.
- Whenever in the opinion of the Purchaser, the Bidder/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 Bidder/Supplier.
- If in the judgment of the Purchaser, it becomes necessary at any time to accelerate the overall pace of the plant erection work, the Bidder/Supplier, when directed by Purchaser, shall cease work at any particular point and transfer Bidder/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 Bidder/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 Bidder/Supplier to ensure safety, and increase their efficiency and adequacy and the Bidder/Supplier shall promptly comply with such directives. If at any time the Bidder/Supplier's working force and equipment are inadequate in the opinion of the Purchaser, for securing the necessary progress as stipulated, the Bidder/Supplier shall if so directed, increase the working force and equipment to such an extent as to give reasonable assurance

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of compliance with the schedule of completion. The absence of such demands from the Purchaser shall not relieve the Bidder/Supplier of Bidder/Supplier's obligations to secure the quality, the safe conducting of the work and the rate of progress required by the contract. The Bidder/Supplier alone shall be and remain liable and responsible for the safety, efficiency and adequacy of Bidder/Supplier's methods, materials, working force and equipment, irrespective of whether or not the Bidder/Supplier makes any changes as a result of any order or orders received from the Purchaser.

### 6.3 Right to inspect the work

- The Purchaser's representative shall be given full assistance in the form of the necessary tools, instruments, equipment and qualified operators to facilitate inspection.
- The Purchaser reserves the right to call for the original test certificates for all the materials used in the erection work.
- 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 Bidder/Supplier's compliance with the specifications of erection work.
- Even though inspection is carried out by the Purchaser or Purchaser's representatives, such inspection shall not, however, relieve the Bidder/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. Bidder/Supplier's Functions

- 7.1 The Bidder/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 Bidder/Supplier finds any discrepancy therein, Bidder/Supplier shall immediately refer the same to the Purchaser whose decision shall be final and binding on the Bidder/Supplier.

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7.2 The Bidder/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.

## **8. Variations**

8.1 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 Bidder/Supplier to do and the Bidder/Supplier shall do any of the following:

- Increase or decrease the quantity of any work included in the contract,
- Omit any such work,
- Change the character or quality or kind of any such work,
- Change the levels, lines, position and dimensions of any part of the works
- 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.

8.2 The Bidder/Supplier shall make no such variations 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 also that if for any reason the Purchaser shall consider it desirable to give any such order verbally, the Bidder/Supplier shall comply with such order and any confirmation in writing of such verbal order given by the Purchaser, whether before or after the carrying out of the order, shall be deemed to be an order in writing within the meaning of this clause. Provided further that if the Bidder/Supplier shall within seven days confirm in writing to the Purchaser and the Purchaser shall not contradict such confirmation in writing within 14 days, it shall be deemed to be an order in writing by the Purchaser.

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- 8.3 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 Bidder/Supplier. Any Extra Work, carried out by the Bidder/Supplier would be at mutually agreed cost (Landed cost + 15% service charge).
- 8.4 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 Bidder/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.
- 8.5 Provided also that no increase or decrease mentioned above or variation of rate or price 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:
- By the Bidder/Supplier to the Purchaser of his intention to claim extra payment or a varied rate or price, or
  - By the Purchaser to the Bidder/Supplier of his intention to vary a rate or price
- 8.6 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 Bidder/Supplier and the Purchaser or, failing agreement, fixed by the Purchaser having regard to all material and relevant factors, including the Bidder/Supplier's site and general overhead costs of the contract.

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- 8.7 The Bidder/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 Bidder/Supplier may consider himself entitled and of all extra or additional work ordered by the Purchaser which he has executed during the preceding month.
- 8.8 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 Bidder/Supplier's failure to comply with this condition, if the Bidder/Supplier has, at the earliest practicable opportunity, notified the Purchaser in writing that he intends to make a claim for such work.
- 8.9 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 Bidder/Supplier's job schedule must not disturb or interfere with Purchaser's or the other Bidder/Supplier's schedules of day-to-day work. The Purchaser will provide all reasonable assistance for carrying out the jobs.
- 8.10 *Night work* will be permitted only with prior approval of the Purchaser. The Purchaser may also direct the Bidder/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 Bidder/Supplier at no extra cost. The Bidder/Supplier should employ qualified electricians and wire-men for these facilities. In case of Bidder/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 Bidder/Supplier.
- 8.11 In order to enable the Purchaser to arrange for insurance of all items received at the site including the items of supply covered under this contract, the Bidder/Supplier shall furnish necessary details of all the equipment immediately on its receipt at site, to the Purchaser. Any default on the part of the Bidder/Supplier due to which any item does not get covered under the insurance of the Purchaser; the cost of such equipment shall be charged to the Bidder/Supplier.

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8.12 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 Bidder/Supplier or any sub-Bidder/Supplier, save and except an accident or injury resulting from any act or default of the Purchaser, his agents, or servants. The Bidder/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.

Purchaser shall be liable for and shall indemnify bidder/supplier against all losses, expenses or claims in respect of loss of or damage to any physical property or of death or personal injury whenever occurring, to the extent caused by any negligence or breach of statutory duty of purchaser or its employees, contractors or agents.

8.13 The Bidder/Supplier shall ensure 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-Bidder/Supplier, the Bidder/Supplier's obligations to ensure as aforesaid under this sub-clause shall be satisfied if the sub-Bidder/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 Bidder/Supplier shall require such sub-Bidder/Supplier to produce to the Purchaser or Purchaser's representative, when required such policy of insurance and the receipt for the payment of the current premium.

8.14 Whenever proper execution of the work under the contract depends on the jobs carried out by some other Bidder/Supplier, the Bidder/Supplier should inspect all such erection and installation jobs and report to the Purchaser regarding any defects or discrepancies. The Bidder/Supplier's failure to do so shall constitute as acceptance of the other Bidder/Supplier's installation/jobs as fit and proper for reception of Bidder/Supplier's works except those defects which may develop after execution. Bidder/Supplier

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should also report any discrepancy between the executed work and the drawings. The Bidder/Supplier shall extend all necessary help/cooperation to other Bidder/Suppliers working at the site in the interest of the work.

8.15 Bidder/Supplier shall carryout final adjustments of foundations, levelling and dressing of foundation surfaces, bedding and grouting of anchor bolts, bed plates etc. required for seating of equipment in proper position. The Bidder/Supplier shall be responsible for the reference lines and proper alignment of the equipment. However, all civil works like making cut-outs in walls, floors and ceilings for pipelines shall be done by the purchaser. Adjustment & levelling are to be carried out by the Bidder/Supplier at no extra cost. The Purchaser shall arrange the necessary refilling/repairs of these cut-outs and pockets. The Bidder/Supplier should arrange for laying the supports, cut-outs, grouting of bolts, etc. When the civil works are in progress, so as to avoid refilling/repair works. The Purchaser at Bidder/Supplier's costs shall make the damages occurring to civil and other works good. For fixing of piping/equipment supports on wall/beams/roof floor etc., preferably anchor bolts shall be used by the Bidder/Supplier. Drilling of holes for fixing anchor bolts & supply of anchor bolts is in the scope of Bidder/Supplier without any extra cost.

8.16 The Bidder/Supplier shall keep a check on deliveries of the equipment covered in the scope of erection work and shall advise the Purchaser well in advance regarding possible hold-up in Bidder/Supplier's work due to the likely delay in delivery of such equipment/components to enable him to take remedial actions.

## **9. Duties of the Bidder/Supplier Vis-à-Vis the Purchaser**

9.1 The equipment and the items, if any, to be supplied by the Purchaser for erection, testing and commissioning shall be as listed in the contract.

9.2 Besides the utilities/ services as specified in battery limits, Purchaser shall also provide the following assistance/ facilities to the Bidder/Supplier for carrying out the installation work:

- Plant building ready for installation of equipment/items.

9.3 If the Bidder/Supplier suffers delay and/or incurs costs 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:

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- Any extension of time to which the Bidder/supplier is entitled due to delay caused by Purchaser.
- Any extension of time to which the Bidder/Supplier is entitled under **clause 20 of GCC** (General Conditions of Contract).

## **10. Supply of Tools, Tackles and Materials**

10.1 The Bidder/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, Installation, Testing and Commissioning.

## **11. Protection of Plant**

- 11.1 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 Bidder/Supplier or any of Bidder/Supplier's Sub-Bidder/Suppliers even though such tools and equipment may be furnished, rented or loaned to the Bidder/Supplier or any of Bidder/Supplier's Sub-Bidder/Suppliers. The acceptance and/or use of any such tools and equipment by the Bidder/Supplier or Bidder/Supplier's Sub-Bidder/Supplier shall be construed to mean that the Bidder/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 equipments.
- 11.2 The Bidder/Supplier and Bidder/Supplier's Sub-Bidder/Supplier shall be responsible, during the works, for protection of work, which has been completed by other Bidder/Suppliers. Necessary care must be taken to see that the Bidder/Supplier's men cause no damage to the same during the course of execution of the work.
- 11.3 All other works completed or in progress as well as machinery and equipment that are liable to be damaged by the Bidder/Supplier's work shall be protected by the Bidder/Supplier and protection shall remain and be maintained until the Purchaser directs its removal.
- 11.4 The Bidder/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.

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- 11.5 The Bidder/Supplier shall carry out the work without damage to any work and property adjacent to the area of Bidder/Supplier's work to whomsoever it may belong and without interference with the operation of existing machines or equipment.
- 11.6 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 Bidder/Supplier at Bidder/Supplier's cost. The Bidder/Supplier should adequately light the work area during night time also. The Bidder/Supplier should also engage adequate electricians/wiremen, helper etc to carry out and maintain these lighting facilities. If the Bidder/Supplier fails in this regard, the Purchaser may provide lighting facilities as he may deem necessary and charge the cost thereof to the Bidder/Supplier.
- 11.7 The Bidder/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 Bidder/Supplier and to the satisfaction of the Purchaser. The Bidder/Supplier shall also be liable for any loss of or damage to the works occasioned by the Bidder/Supplier or the Bidder/Supplier's Sub-Bidder/Supplier in the course of any operations carried out by the Bidder/Supplier or by the Bidder/Supplier's Sub-Bidder/Suppliers for the purpose of completing any outstanding work or complying with the Bidder/Supplier's obligations.

## **12. Unloading, Transportation and Inspection**

- 12.1 The Bidder/Supplier shall be required to unload all the materials/equipment from the carriers, those received at site after Bidder/Supplier's team arrives at site. Bidder/Supplier shall be paid extra for unloading of the equipment being supplied by the purchaser whereas no extra payment for unloading of the equipment/piping shall be paid to Bidder/Supplier for the equipment being supplied by the Bidder/Supplier. The Bidder/Supplier shall plan in advance, based on the information received from the Purchaser, Bidder/Supplier's requirement of various

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tools, tackles, jacks, cranes, sleepers etc. required to unload the material/equipment promptly and efficiently. The Bidder/Supplier shall ensure that adequate and all measures necessary to avoid any damage whatsoever to the equipment at the time of unloading are taken.

- 12.2 Any demurrage/detention charges incurred due to the delay in unloading the material/equipment and releasing the carriers shall be charged to the Bidder/Supplier's account.
- 12.3 The Bidder/Supplier shall be responsible for the reception on site of all plant and Bidder/Supplier's equipment delivered for the purposes of the contract.
- 12.4 The Bidder/Supplier shall safely transport/shift the unloaded materials/equipment by the Bidder/Supplier to the storage area.
- 12.5 All the materials/equipment received by the Purchaser prior to arrival of the Bidder/Supplier at site shall be handed over to the Bidder/Supplier and there upon the Bidder/Supplier shall inspect the same and furnish the receipt to the Purchaser. The manner in which the inspection shall be carried out is enumerated below:
- 12.6 The materials/equipment would be carefully unpacked by opening the wooden cases/other modes of pickings as the case may be.
- 12.7 Detailed inventory of various items would be prepared clearly listing out the shortages, breakage/damages after checking the contents with respect to the Bidder/Supplier's packing list, the Purchaser's purchase order and approved equipment drawings. The Bidder/Supplier shall also check each & every equipment for any shortage/shortcoming that may eventually create difficulty at the time of installation or commissioning.
- 12.8 All the information and observations by the Bidder/Supplier shall be furnished in the form of 'INSPECTION REPORT' to the Purchaser with specific mention/suggestions which in the opinion of the Bidder/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.
- 12.9 The inspection for all the equipment handed over to the Bidder/Supplier shall be completed within three week's period.

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12.10 The protection, safety and security of the materials so taken over from the Purchaser shall be the responsibility of the Bidder/Supplier, until they are handed over to the Purchaser after erection, commissioning and testing as per the terms of the Contract.

### **13. Storage of Equipment**

13.1 The Bidder/Supplier shall be responsible for the proper storage and maintenance of all materials/equipment under Bidder/Supplier's custody. Bidder/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.

13.2 The Bidder/Supplier's inspector shall check stored and installed equipment/materials 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 Bidder/Supplier shall immediately arrange a coat of protective painting whenever required. A record of all observations made on equipment, defects noticed shall be promptly communicated to the Purchaser and Purchaser's advice taken regarding the repairs/rectification. The Bidder/Supplier shall there upon carry out such repairs/ rectification at Bidder/Supplier's own cost. In case the Bidder/Supplier is not competent to carry out such repairs/ rectification, the Purchaser reserves the right to get this done by other competent agencies at the Bidder/Supplier's responsibility and risk and the entire cost for the same shall be recovered from the Bidder/Supplier's bills.

13.3 The Bidder/Supplier's inspector shall also inspect and provide lubrication to the assembled equipment. The shafts of such equipment shall be periodically rotated to prevent rusting as well as to check freeness of the same.

13.4 The Inspector shall check for any signs of moisture or rusting in any equipment.

13.5 If the commissioning of equipment is delayed after installation of the equipment, the Bidder/Supplier shall carry out all protective measures suggested by the Purchaser during such period.

13.6 Adequate security measures shall be taken by the Bidder/Supplier to prevent theft and loss of materials handed over to the Bidder/Supplier by

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the Purchaser. The Bidder/Supplier shall carry out periodical inventory checks of the materials received, stored and installed by the Bidder/Supplier and any loss noticed shall be immediately reported to the Purchaser. The Bidder/Supplier shall maintain a proper record of these inventories. The Bidder/Supplier should not sell, assign, mortgage, hypothecate or remove equipment or materials which has been installed or which may be necessary for completion of the work without the written consent of the Purchaser.

- 13.7 Suitable grease recommended for protection of surfaces against rusting (refined from petroleum oil with lanolin minimum (70 °C) and water in traces) shall be applied over all equipment as required once in every six months.
- 13.8 All equipment 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 mugger readings shall be maintained equipment wise. Such records shall be presented to the Purchaser whenever demanded.
- 13.9 All the necessary items/goods required for the Bidder/Supplier as described above shall arrange protection and such cost shall be included in the Contract price.

#### **14. Approvals**

- 14.1 The Bidder/Supplier shall obtain the necessary approvals of the 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.
- 14.2 The Bidder/Supplier will furnish all the necessary details, drawings, and submission of application and proofreads to the Purchaser for verification/ signature. The Bidder/Supplier on behalf of the Purchaser shall submit the necessary application duly filled-in, together with the prescribed fees to the

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appropriate authorities. However all the actual statutory prescribed fees paid by the Bidder/Supplier shall be reimbursed by the Purchaser upon production of the receipt/vouchers.

- 14.3 The bidder shall arrange for approval from concerned statutory authority on behalf of the AAVIN and the statutory fees shall be reimbursed by the AAVIN at actuals on production of receipts.
- 14.4 Bidder/Supplier shall provide all necessary documents/details to the Purchaser for obtaining the necessary approval of Factory Inspector and related area.

## **15. Review & Co-Ordination of Erection Work**

- 15.1 The Bidder/Supplier shall depute **senior and competent personnel** to attend the site co-ordination meetings that would generally be held at **the site every month or at such frequency as the purchaser may decide from time to time**. The Bidder/Supplier shall take necessary action to implement the decisions arrived at such meetings and shall also update the erection schedule.

## **16. Extension of Time for Completion**

- 16.1 Should the amount of **extra or additional work** of any kind or any cause of delay referred to in these conditions, or exceptional adverse climatic conditions, or other special circumstances of any kind whatsoever which may occur, other than through a default of the Bidder/Supplier, be such as fairly to entitle the Bidder/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 Bidder/Supplier accordingly. Provided that the Purchaser is not bound to take into account any extra or additional work or other special circumstances unless the Bidder/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.

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<p>Table 1</p> <p>List of Drawings required Submission but not limited too</p>	
<b>S. No.</b>	<b>Drawings</b>
1	GA drawings for All equipment / items to be supplied.
2	Plant Detail Layout Drawings.
3	Detail P&IDs.
4	Histograms for each utility along with the timing/Process Schedule diagram.
5	General Piping layout drawing for the new piping being done in 3D and 2D format. 3D should include the entire plant detailing.
6	Electrical cable, conduit/ cable tray layout, Single line Diagrams
7	Automation Architecture, including Philosophy of Control and written Automation logic of plant.
8	Instrumentation cable, Single line Diagrams, Local panels, instrument locations, Instrumentation routes, etc to be provided
9	The Civil structural, architect drawings required for preparing civil estimate are to be provided

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**9.0. SPECIAL CONDITIONS OF CONTRACT FOR MECHANICAL WORKS**

**Contents**

- 1. Scope
- 2. General Installation
- 3. Service Piping Installation
- 4. Special Instructions And Specifications
- 5. Insulation of Piping and Equipment
- 6. Interconnections of Services
- 7. Guidelines For Expansion Work
- 8. Cleaning Chemicals and Lubricants
- 9. Testing, Commissioning and Start-Up
- 10. Trouble shooting during the trial period
- 11. Painting
- 12. Training of Personnel
- 13. Code of Practice for Painting Service Pipe Lines

Table 1 Painting of Equipment & Structural Work

Table 2 Colour Code For Pipelines as per BIS 2379-1963

Table 3 Testing Pressures for Various Pipelines

**1. Scope**

General installation i.e. positioning and installing all the production, miscellaneous and service equipment as per approved layout drawings and as per the contract.

- 1.1 Supply and installation of structural platforms and tables.
- 1.2 Supply and installation of all service and product piping including ancillary items.
- 1.3 Insulation and cladding of piping, equipment including supply of materials.
- 1.4 Interconnections of services and Electrical with equipment.
- 1.5 Guide line for expansion work.
- 1.6 Clean up of work site.
- 1.7 Supply of all cleaning chemicals and lubricants.
- 1.8 Testing, commissioning and start-up.
- 1.9 Painting including supply of paints as approved by the Purchaser.
- 1.10 Training of personnel.
- 1.11 Detailed specifications are given in the subsequent clauses.

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## **2. 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, de-crating and placing on the foundation wherever required. ***The Purchaser shall arrange all the civil foundations as per the manufacturer/Bidder/Supplier's drawings. The Bidder/Supplier shall place the equipment and carry out final adjustment of the foundations including alignment.*** The Bidder/Supplier shall be responsible for obtaining correct reference lines for the purpose of fixing the alignment of various equipments from master benchmarks provided. Tolerances shall be as specified in equipment manufacturer's drawings or as stipulated by the Purchaser's Engineer. No equipment shall be permanently bolted down to foundations or structure until the Bidder/Supplier has checked the alignment and witnessed by the Purchaser. The Bidder/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 Bidder/Supplier shall supply all the necessary foundation/anchor bolts and bedplates if required without extra cost if these have not been provided with main equipment.
- The Bidder/Supplier shall supply, fix and maintain, at his own cost, during the erection work, all the necessary cantering, 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 Bidder/Supplier shall take out and remove any or all such cantering, 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 Purchaser. The Bidder/Supplier shall be paid no additional amount for the above.

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## **2.2 Structural Platforms and Tables**

- Structural platforms shall be required to provide access for various equipment. Tables shall be required for handling products. These platforms and tables shall be fabricated keeping stability and other functional as well as aesthetic requirements into consideration as approved by the Purchaser. 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.

## **3. Service Piping Installation**

### **3.1 General Guidelines**

- All piping systems shall comply with the **latest editions as applicable.**

### **3.2 Scope of Supply**

- The Bidder/Supplier shall supply all piping materials like pipes, fittings, flanges, measuring instruments and all other items as shown in the P&I diagram/specifications and schedule of quantities. All the pipes & fittings and insulation material etc. should be of class and make as approved by the Purchaser. The Bidder/Supplier, for the class and make of all materials, must obtain prior approval of the Purchaser. The Bidder/Supplier should furnish the details of makes selected by him, in the pro forma given in *Table 5*.

### **3.3 Scope of Piping Erection**

- The scope of erection for piping, includes all system covered in the flow diagrams and specifications. The Bidder/Supplier's work commences/terminates at the pipe connections with valves or flanges as specified in flow diagrams/ battery limits.
- The Bidder/Supplier shall also install necessary piping and any specialties furnished with or for equipment such as relief valves, built-in-bypass, primary elements for flow measurements, control valves and on-line metering equipment.
- The Bidder/Supplier shall perform necessary internal machining of pipes for installing orifices, flow nozzles, control valves etc. The Bidder/Supplier shall install all pipes, valves and specialties being procured from other sources.

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### 3.4 Testing of Piping

- The Bidder/Supplier shall test sample piping systems including valves and specialties and instruments as required.
- All piping shall be **internally cleaned and flushed** by the Bidder/Supplier after erection in a manner suited to the service.
- For **hydrostatic testing and water flushing**, the Bidder/Supplier shall furnish necessary pumps, equipment, instruments and piping etc, if required.

### 3.5 Other Guidelines

- **Colour code** shall be used to identify pipe material. The Bidder/Supplier shall be able to identify on request all random piping prior to field fabrication.
- The Bidder/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.
- All piping supports, guides, anchors, hangers, rollers with structural framework shall be supplied and erected by the Bidder/Supplier. The kinds of pipe supports like CI clamps, wooden saddles, roller supports and support framework shall be as per the design approved by the Purchaser prior to taking up the work.
- 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 Bidder/Supplier to avoid all interference while locating hangers and supports.
- 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 any movement of the support pipes cannot disengage them.
- 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

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such that no material is left on the inner or on outer surfaces, which will affect the serviceability of the pipes.

- 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 Purchaser.

#### **4. Special Instructions and Specifications**

##### **4.1 Steam Piping**

- Steam piping work can be classified into **two categories**:
  - **High-pressure** steam piping when the working pressure of steam is **more than 3.5 kg/cm<sup>2</sup>**.
  - **Low-pressure** steam piping when the working pressure of steam is **up to 3.5 kg/cm<sup>2</sup>**.
- 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, with required **SCHEDULE of pipe**.
- The high-pressure steam piping work should also include fabrication and installation of **pressure reducing stations** strictly conforming to **IBR**.
- For low pressure, prevailing laws as per IBR/ISO shall be followed.

##### **4.2 Other Piping**

- ALL THE PIPING FOR CHILLED WATER,/GLYCOL,/AMMONIA, RO,SOFT AND RAW WATER, H.P. AND L.P. STEAM, AIR AND LSHS PIPING SHALL GENERALLY BE 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. Insulation of Piping and Equipment**

##### **5.1 Cold Insulation of Chilled Water/Glycol /Ammonia Pipeline**

- All the chilled water, glycol & ammonia pipelines shall be insulated by **PUF** pipe sections. The insulation shall be carried out in the **following manner**:

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- Before starting insulation work all pipelines shall be **tested** as specified.
- The surface of the pipes to be insulated should be properly **cleaned**.
- **Hot bitumen** of **85/40** or **85/25** conforming to **IS 702** should be applied uniformly @ **1.5 kg/m<sup>2</sup>** on the surface of the pipes.
- A similar layer of **bitumen** should be applied on the **inner surface** and on the **edges** of the **insulation sections**.
- The sections should then be stuck to the coated pipes with **joints staggered**. Adjacent sections should be tightly pressed together. All **joints** should be properly **sealed** with bitumen.
- A thick **vapour seal** with **hot bitumen @ 2.5 kg/m<sup>2</sup>** should be applied uniformly on the outer surfaces of the pipe sections and allowed to dry.
- The **thickness** of insulation shall be as required.
- Alternatively Armaflex insulation materials can be used for cold insulation of piping and equipment. Armaflex insulation materials shall have silver colour outer film so as to protect the Armaflex and to give the metal-look surface.
- The outer silver colour metal-look surface shall effectively protect the insulation material against mechanical impact. It shall be able to recover from blows, and shall leave no dents in the surface. Shall be suitable for both indoor and outdoor applications. Shall be UV and weather proof. Shall have high Puncture and tear resistance

## **5.2** Insulation of Chilled Water Tank

- The surfaces shall be **cleaned** with the help of brushes to remove any loose particles.
- A coat of **bitumen** of **85/40** or **85/25** conforming to **IS 702@1.0 kg/m<sup>2</sup>** shall be applied over the **flooring** and **walkathon sheets** shall be press-laid to act as a **vapour barrier**.
- Bitumen shall then be applied on the walkathon sheets and one side and edges of the insulation slabs to ensure total rate of **2.00 kg/m<sup>2</sup>** between contacting surfaces. The slabs shall then be fixed in position, making sure that there shall be **no joints between slabs**.
- For **double layers** insulation bitumen shall again be applied on all contacting surfaces to ensure a total rate of **1.5 kg/m<sup>2</sup>** between contacting surfaces.

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- A coat of bitumen at **1.5 kg/m<sup>2</sup>** shall be applied over the insulation surfaces.

### 5.3 Hot Insulation of Steam, Condensate & Hot Water Pipe Lines

- All the steam and hot water pipelines shall be insulated with **mineral wool** or equivalent of specified thickness. The insulation shall be carried out in the **following manner** and should be supplied in the form of properly required sizes.
- **Clean** the surfaces to be insulated. Apply **a coat of red oxide primer** and fix glass wool/mineral wool of specified thickness, tightly to the pipes, **butting all joints** and **tie with lacing wire**.
- It should then be covered with GI wire netting of 20 mm x 24 SWG.
- In case the insulation does not have the desired insulation properties, the entire insulation will have to be **redone** at the **Bidder/Supplier's cost** to give the desired results.
- In case of **condensate return piping** all the steps mentioned above shall be executed except that **thickness** of the insulation shall be minimum **25 mm**.

### 5.4 Aluminium Cladding / Armaflex Cladding

- The chilled water, glycol, ammonia, water, steam & hot water lines after insulations shall be **covered** by Aluminium/ Armaflex **cladding**.
- Aluminium cladding will be done with 22 gauge aluminium sheet with proper grooves and overlaps and screwed in position with 12 mm self-tapping parker screws.
- Armaflex insulation materials shall have silver colour outer film so as to protect the Armaflex and to give the metal-look surface. The outer silver colour metal-look surface shall effectively protect the insulation material against mechanical impact. It shall be able to recover from blows, and shall leave no dents in the surface. Shall be suitable for both indoor and outdoor applications. Shall be UV and weather proof. Shall have high Puncture and tear resistance. Shall have required thickness of cladding material.

## 6.0 Interconnections of Services

- ### 6.1
- The Bidder/Supplier shall lay service piping and provide connections with the equipment complying strictly with the equipment manufacturers'

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instructions. The Bidder/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 Bidder/Supplier shall also carry out **electrical connections** for equipment with the control panels including equipment lighting as per the wiring diagrams of the equipment Bidder/Suppliers. Connection shall be made for small electrically operated devices on equipment installed as accessories to, or assembled with equipment. Connections regarding instruments, float switches, limit switches, pressure switches, thermostats and other miscellaneous equipment shall be done as per manufacturers' drawings & instructions.

## **7.0 Guidelines for Expansion Work**

### **7.1 Shutdowns**

Plant shutdown shall be required for making tapings/ interconnections of the new equipment/ piping, to be installed under expansion, with the pending new equipment/piping in case of delay. These shut downs should be planned carefully well in advance to enable the Purchaser to take suitable actions for minimum shutdown period. The details of shut downs, the numbers and duration should be worked out and intimated to the Purchaser for approval. The Bidder/Supplier should ensure completion of all the necessary works well within the allowed time so that no inconvenience is caused in regular operation and working of the existing plant.

### **7.2 Cleanliness**

Wherever the Bidder/Supplier is required to work in existing plant area he should take due care and extra precautions to ensure absolute cleanliness and minimum hindrance for proper working of the existing plant.

### **7.3 Change over**

The programmers for change over from existing plant system to new plant system should be prepared by the Bidder/Supplier and should be got approved by the Purchaser.

- 7.4 Modifications and rectification of existing plant and equipment and any other Extra Work not specified in the Original Contract.

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During expansion work, the Bidder/Supplier shall be required to carry out modifications, repairs/replacement of the existing equipment or any other extra work. The alterations/modifications not specified in the contract/order or any other Extra Work, will be carried out by the Bidder/Supplier at mutually agreed cost (Landed cost + service charge).

#### 7.5 Clean Up of Works Site

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 Bidder/Supplier from the site of work for proper disposal.

The Bidder/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 Bidder/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.

If the Bidder/Supplier fails to comply with these requirements in spite of written instructions from the Purchaser, the Purchaser will proceed to clear these areas and the expenses incurred by the Purchaser in this regard shall be payable by the Bidder/Supplier. Before completion of the work, the Bidder/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 Purchaser. Any packing materials received with the equipment shall remain as the property of the Purchaser and may be used by the Bidder/Supplier on payment of standard charges to the Purchaser and with prior approval of the Purchaser. At the completion of his work and before final payment, the Bidder/Supplier shall remove and shall restore the site to neat workman like conditions at his cost.

#### **8.0.Cleaning Chemicals and Lubricants**

- 8.1 The necessary quantities of cleaning chemicals, lubricants etc., required for the installation, commissioning, testing and start-up of all the equipment till handing over are to be supplied the Bidder/Supplier and nothing extra would be paid for these.

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## **9.0. Testing, Commissioning and Start-up**

- 9.1 The Bidder/Supplier shall operate, maintain and give satisfactory trial run of the plant for the design product satisfactorily for a maximum period of one week or as mutually agreed by Bidder/Supplier/purchaser/Purchaser of the plant at the rated output. The Bidder/Supplier should carry out all rectification of damages/defects and routine troubleshooting during commissioning with the help of purchaser's staff.
- 9.2 During this period, Bidder/Supplier shall incorporate/execute necessary minor modifications during the trial period for maximizing operational efficiency. The Bidder/Supplier should also execute minor modifications as may be suggested by the manufacturer/Purchaser, if required. The Bidder/Supplier shall suggest recommended log sheet proofread for recording necessary operating data and pass it on to the Purchaser in proof of satisfactory rated output and performance of the equipment/plant.
- 9.3 The **commissioning** shall also **include**, for all the equipments, the **following**:

Field disassembly and assembly

- Clean out of lubrication system including chemical cleaning wherever required.
- Circulation of lubricant to check flow.
- Clean out and check out of all the service lines
- 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 Purchaser before start-up.
- Recharging or make-up filling of lubricant oil up to the desired level in the lubrication system of individual machine.
- Operation in empty condition to check general operation details wherever required and wherever possible.
- Closed loop dynamic testing with water wherever required.
- Operation under load and gradual load increase to attain maximum rated output.

## **10.0. Trouble shooting during the trial period**

- 10.1 The Bidder/Supplier shall demonstrate proper working of all mechanical and electrical controls; safety and protective device, in presence of the Purchaser's engineer and the same should be duly recorded.
- 10.2 After conducting testing, in case a particular equipment is not working properly or not giving rated output the Bidder/Supplier will furnish a

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detailed report to the Purchaser stating therein the detailed account on the performance of the equipment with possible reasons for improper or not working of the same.

- 10.3 The Purchaser after receipt of report from the Bidder/Supplier would take up the matter with the manufacturers and if required would invite the representative of original manufacturers. In case the Purchaser considers that the non-performance of equipment is only due to inexperience of the Bidder/Supplier, then the charges incurred for the manufacturer's representative visit would be debited to the Bidder/Supplier's account.
- 10.4 Further, before the commencement of testing or commissioning, the Purchaser reserves the right to invite the **original manufacturer's representative** at the cost of the Bidder/Supplier for start-up help, assist and guide the Bidder/Supplier during commissioning in the following cases: The Bidder/Supplier has **no previous experience** of commissioning and start-up of the similar equipment.

The Purchaser is of the opinion that the **Bidder/Supplier is not capable** to commission and start-up of certain specific equipment.

- 10.5 However, in either of the cases the manufacturer's representatives would be called with prior information to the Bidder/Supplier and the Bidder/Supplier will have to extend all co-operation to such representatives in good spirit and in the interest of the work.
- 10.6 After satisfactory commissioning and start-up the Bidder/Supplier shall keep his representatives under whose **supervision** the **Purchaser's staff shall be operating and maintaining** the plant and equipment for a **minimum period of one month**. The Bidder/Supplier's representatives should be present at all times during the running and operation of plant and equipment. During this period the Bidder/Supplier shall ensure proper working of complete plant and equipment and attend any works required to be done and shall also take complete responsibility for proper operation and maintenance of the complete plant and equipment.

## **11.0 Painting**

- 11.1 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

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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 anticorrosive 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 Bidder/Supplier.

- 11.2 **Lettering and other markings**, including capacity and flow direction markings, shall also be carried out by the Bidder/Supplier on the tanks, pipe lines, starters, motors, isolators and wherever else necessary, as directed and as per the standard practice of installation. **ISI colour codes** and colour charts as mentioned in *Table 3& Table 2* must be adhered to.
- 11.3 Supply of all paints and all other materials required is included in the scope of supply of the Bidder/Supplier under this contract/order.

## **12.0 Training of Personnel**

- 12.1 The Bidder/Supplier for operating the plant as may be deputed by the Purchaser shall train necessary staff. 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.

## **13.0 Code of Practice for Painting Service Pipe Lines**

- 13.1 On Non-insulated Pipe Line & Insulated Pipeline without Aluminium Cladding
- 13.1.1. Ground colour to be applied throughout the length of the pipeline.
- 13.1.2. Colour bands to be applied near every valve and branch connection as well as in every room near the entry.
- 13.1.3. The 1st band should be 4" wide and the second band should be 1" wide.
- 13.1.4. On the 1st band a white arrow to be put to indicate the direction of flow.

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- 13.1.5. 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.
- 13.1.6. The valves should be painted with the same colour as the ground colour of the pipeline.
- 13.2 On Insulated Pipeline with Aluminium Cladding
- 13.2.1. Ground colour to be applied in a length of 500 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.
- 13.2.2. **Colour bands** should be applied in the **middle** of every ground colour strip. The **1<sup>st</sup> Colour** band should be **4"** wide and the **second** band should be **1"** wide.
- 13.2.3. On the **1st band** a **white arrow** is to be put to indicate the **direction of flow** of the fluid.
- 13.2.4. 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.
- 13.2.5. The valves should be painted with the same colour as the ground colour.
- 13.2.6 The **ground colours** and the colours of the **1st** and **2nd** colour **bands** have been indicated on the **enclosed list** for the pipelines 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.
- 13.2.7. 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**.
- 13.2.8. 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 same should be 4" wide and applied on the ground colour. In case of 2 nos. colour bands, the 1st band should be 4" wide and second band 1" wide and should be applied on the ground colour.
- 13.2.9. 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.

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<b>Table 1</b> <b>Painting of Equipment &amp; Structural Work</b>		
<b>S N</b>	<b>Item</b>	<b>Painting Shade</b>
1	All Milk Storage Tanks if with outer MS	Pale Cream Shade no. 352 of ISI
2	All M.S. platforms/pipe supports/pipe bridges and any other structures	Dark admiral gray shade No.632 of ISI
3	Water Pumps, Geared Motor of tanks and vats.	Original colour
4	HT & LT panels	Original colour
5	LT distribution switchboards	Dark admiral gray
6	Coal Handling Equipment	Black
7	Boiler Chimney, Chimney & Generator Exhaust	Aluminium Paint
8	Refrigeration Compressor, air Compressor	Original colour
9	Air Handling Units of Cold Store, Deep Freeze, Butter Packing, Machine room & Laboratory including Ducting	Aluminium Paint
10	Can Washer	Original colour
11	Refrigeration Plant Receiver	Dark Red
12	Atmospheric Condensers	Bitumen Paint
13	Milk Weigh Scale	Original colour

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<b>Table 2</b> <b>Colour Code For Pipelines as per BIS 2379-1963</b>				
<b>S N</b>	<b>Services</b>	<b>Ground Colour</b>	<b>First Band</b>	<b>Second Band</b>
1	Cooling Water	Sea Green 217	French Blue 166	-
2	Boiler Feed Water		-	-
3	Condensate		Light Brown 410	-
4	Hot Water		Light Brown 410	-
5	Drinking Water		French Blue 166	Signal Red 37
6	Treated Water		Light Orange 557	-
7	Cold Water		French Blue 166	Canary Yellow
8	Untreated Water		White	
9	Compressed Air	Sky Blue 101		
10	Vacuum		Black	
11	Steam	Silver Grey 628		
12	Diesel	Light Brown 410	Brilliant 221	
13	Lubricating Oil		Light Grey 631	
14	Drainage	Black		
15	Ammonia	Signal Red 537		

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<b>Table 3</b> <b>Testing Pressures for Various Pipelines</b>					
<b>Sr No</b>	<b>Name</b>	<b>Test Pressure kg/cm<sup>2</sup></b>	<b>Test medium</b>	<b>Duration of Test (Hour)</b>	<b>Allowable pressure Drop (kg/cm<sup>2</sup>)</b>
1	H.P.Steam pipe lines	27	Water	½	0
2	L.P.Steam pipe lines	8	Water	½	0
3	Water pipe lines Soft, Raw, Chilled and Glycol	8	Water	½	0
4	LSHS	16	Water	½	0
5	SS pipes for dairy	6	Water	½	0
6	Air	12	Air	8	0.1
7	<i>Ammonia pipe lines</i>				
7a	Suction	16	N2	24	0.2
7b	Discharge	24	N2	24	0.2
7c	Vacuum Test of Ammonia Lines	Absolute Zero	Vacuum	48	NIL
8	Molasses pipe lines	16	Water	1/2	0
Engineer-in-charge shall provide water at available supply point from which the Supplier shall connect temporary piping for testing water.					

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## **10.0.SPECIAL CONDITIONS OF CONTRACT FOR ELECTRICAL WORKS**

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18. Not Relevant in this tender.
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Table 1 Bureau Indian Standards (BIS)

Table 2 Pro forma for PCC, DB, Motor Control Centres Test

Table 3 Pro forma for motor testing

Table 4 Pro forma for Testing Cables

Table 5 Recommended Cables Sizes For Industrial Wiring

Table 6 Sizing of Earthing Lead/ Wire

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## **1. Scope**

- 1.1 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. Panels, oil circuit breakers, LT. Panels and power control centres, distribution boards, capacitor banks & panels, power & control 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. Standards**

- 2.1 The work shall be carried out in the best workmanship 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 Bureau of Indian Standards is listed in Table 1.
- 2.2 In addition to these standards, all works shall also confirm to the requirements of the followings:
- Indian Electricity Act and Rules framed there under.
  - Fire Insurance Regulations.
  - Regulations lay down by the Chief Electrical Inspector of the State/State Electricity Board.
  - Regulations lay down by the Factory Inspector of the State.
  - Any other regulations lay down by the local authorities.
  - Installation & operating manuals of original manufacturers of equipment.

## **3. Equipment and Accessories Specifications**

- 3.1 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, switchboards and motors etc which may be supplied by the Owner.
- 3.2 All materials, fittings and appliances to be supplied by the Bidder/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

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with the BS or NEMA 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.

3.3 All similar materials and removable parts shall be uniform and interchangeable with one another.

3.4 You must furnish *makes of bought out items*.

#### **4. Power Cables (HT)**

4.1 Specifications as per Section V Sub-Section 6

#### **5. Power Cables (LT)**

5.1 Specifications as per Section V Sub-Section 6

#### **6. Control Cables**

6.1 Specifications as per Section V Sub-Section 6

#### **7. Cable Trays**

7.1 Specifications as per Section V Sub-Section 6

#### **8. Cable Glands**

8.1 These shall be provided at both ends of armoured/ Unarmoured electrical cables. Cable glands to be manufactured as per performance requirements of BS 6121 amended as on date, with BRASS material accurately machined and NICKEL finish. Single compression cable glands to be complete with checkout, gland body, 3 nose metal washers, and outer seal rubber ring and compression nut. Double compression glands to be complete with checkout, gland body, neoprene outer 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 For instruments MOC of cable gland shall be polyamide.

#### **9. Cable Connectors**

9.1 Cable connectors, lugs/sockets, shall be of copper/Aluminium alloy, suitably tinned, soldering less, crimping type. These shall be suitable for

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the cable being connected and type of function (such as power, control or connection to instruments, etc.)

## **10.Cable Route Markers**

10.1 These shall be galvanized Cast Iron plate with marking (LT/HT) diameter 150 mm with 600 mm long 25x25 mm MS. angle riveted/bolted with this plate. Sample to be got approved before use.

## **11.Cable Indicators**

11.1 Individual symbols / numbers printed on yellow strips of glossy PVC should be used for cable indicator.

## **12.Pipes for Cables**

12.1 For lying of cables under floor, G.I. class 'A' pipes shall be used. MS. conduits are not acceptable for this purpose. 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. To determine the size of pipe, assume that 40% area of pipe shall be free after drawing of cable. In dairy's process area wherever required SS-304 pipe, 1.6 mm thick shall be used.

## **13.Motor Isolators**

13.1 These shall be in Aluminium cast housing, completely dust, vermin and weather proof (IP 55), suitable for 30/25 A, 415 volts, 50 Hz with rotary type switch complete with cable gland for incoming and outgoing cables. For dairy's process area SS-304 motor isolator shall be used. Final finish of housing to be buffer mirror for SS and powder coated gray for Aluminium housing. Sample to be got approved before supply.

## **14.Control Junction Box**

14.1 These shall be in Aluminium cast housing, completely dust, vermin and weather proof (IP 55). For dairy's process area SS-304 junction box shall be used. Final finish of housing to be buffer mirror for SS and powder coated gray for Aluminum housing. Sample to be got approved before use.

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## **15.Remote Push Button Stations**

- 15.1 These shall be used for remote OFF for motors, away from MCC. These shall be suitable for surface/structure mounting in Cast Aluminium housing having IP-55 class of protection i.e. completely weather proof. For dairy's process area SS-304 push button shall be used. Final finish of housing to be buffer mirror for SS and powder coated gray for Aluminum housing. Sample to be got approved before supply.
- 15.2 Riveted type bi-colour plastic nameplate to be provided for each feeder.
- 15.3 For outdoor installation suitable canopy to be provided.

## **16. Erection of Equipment**

- 16.1 The cases containing the equipment (being supplied by the purchaser shall be handed over to the Bidder/Supplier. The Bidder/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 storage space identified by engineer in charge 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.

## **17. Erection and Testing of Motors**

- 17.1 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 and the insulation resistance of the motors will be measured and recorded by the Bidder/Supplier. 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 Bidder/Supplier shall take adequate precaution and care while executing the work. For all

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damage due to negligence etc. the Bidder/Supplier shall be responsible to replace/repair at his own cost.

- 17.2 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.
- 17.3 **Motors** shall be **operationally tested** together with the **starting gear** and **auxiliary apparatus** such as push button stations, the contractors, level and pressure controls, signal and alarm apparatus, power and control circuits etc.
- 17.4 Check the anti-condensation heater and its circuit (if installed).
- 17.5 Check the setting of the thermal overload protection / single phase prevent or. Testing of these devices is to be done wherever required as per the instructions of the Engineer-in-charge.
- 17.6 **Run all motors uncoupled for a maximum period of 4 hours** before the driven equipment is placed in regular service. Fill up Test Certificate as per *Table 3*.
- 17.7 All outdoor-installed motors must be shrouded with cover made out of 14 gauge GI sheet with lifting hook and louvers as approved by AAVIN.

## **18.Installation of Cable Network**

- 18.1 Cable network shall include power, control and lighting cables which shall be laid in underground trenches, home pipes, open trenches, cable trays, GI pipes, or on building structure surfaces as detailed in the relevant drawings, cable schedules or as per the Engineer-in-charge's instructions. Supply and installation of cable trays, GI pipes/ conduits, cable gland sockets at both ends, isolators, junction boxes, remote push buttons stations, etc shall be under the scope of the Bidder/Supplier. For selection of cable size please refer to *Table 5*.

## **19.General Requirements for Handling of Cables**

- 19.1 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.

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- 19.2 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 lie 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.
- 19.3 Sharp bending and kinking of cables shall be avoided. The bending radius for PVC insulated and sheath armoured cable shall not be less than 10 D Where 'D' is overall diameter of the cable.
- 19.4 While drawing cables through GI 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.
- 19.5 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.
- 19.6 Armoured cables shall never be concealed in walls/floors/roads without GI pipes, conduits RCC pipes.
- 19.7 Joints in the cable throughout its length of lying 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.
- 19.8 A minimum loop of 3 M shall be provided on both ends of the cable, or after every 50 M of uncounted 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 lying.
- 19.9 Cable shall be neatly arranged in the trenches/trays in such a manner so that crises crossing are avoided and final take off to the motor/switchgear is facilitated. Arrangement of cables within the trenches/trays shall be the responsibility of the Bidder/Supplier.
- 19.10 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 are indicative only and the same may be rechecked with the Engineer-in-charge before cutting of cables. While selecting cable routes,

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interference with structures, foundations, pipeline, future expansion of buildings, etc. should be avoided.

- 19.11 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.
- 19.12 Wherever cable rises from underground/concrete trenches to motors/switchgears/push buttons, these shall be taken in G.I./MS pipes of suitable size, for mechanical protection upto 300 mm distance of concerned cable gland or as instructed by the Engineer-in-charge.
- 19.13 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 Bidder/Supplier shall determine their location and obtain approval of the Engineer-in-charge before cutting is done.

## **20. Laying of Cables (Underground System)**

- 20.1 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.
- 20.2 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 lying of required number of cables.
- 20.3 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

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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.

- 20.4 For all underground cables, route markers should be used
- 20.5 Separate cable route markers should be used for LT, HT and telephone cables.
- 20.6 Route markers should be grounded in ground with 1:2:4 cement concrete pedestal size 230 x 230 x 300 mm.
- 20.7 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.
- 20.8 RCC Hume pipe for crossing road in cable laying shall be provided by Owner. No deduction shall be made for cable lying in home pipe for not providing bricks, sand and excavation. RCC home pipe at the ends shall be sealed by bituminous compound after laying and testing of cable by electrical Bidder/Supplier without any extra charge.

## **21.Laying of Cables under Floors**

- 21.1 GI class a pipe shall be used for lying of outgoing cables under floors from distribution boards to motors, isolators/junction boxes of motors, starter of motors and push button stations. 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 %.
- 21.2 Use of elbows is not allowed at all and number of bends shall be kept minimum. Instead of using bends with sockets, pipe-bending machine shall be used for making long smooth bends at site.
- 21.3 Ends of pipe shall be sealed temporarily while laying with cotton/ jute/ rubber stopper etc to avoid entry of building material.
- 21.4 Exact location of equipment motor/ isolator/ push buttons etc shall be ascertained prior to lying of pipe.

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## **22.Laying of Cable in Masonry Trenches**

- 22.1 Masonry/ concrete trenches for lying of cable shall be provided by Owner. However steel members such as MS angles/ flats etc shall be provided & grouted by electrical Bidder/Supplier to support the cables without any extra charge. Cables shall be clamped to these supports with Aluminium saddles/ clamps. More than one tier of cables can be provided in the same trench if the number of cables is more. If required cable trays can also be provided in trenches.
- 22.2 Entry of cables in trenches shall be sealed with bituminous MASTIC compound to stop entry of water in trenches.

## **23.Laying of Cables in Cable Trays**

- 23.1 Cable trays and supporting steel members such as MS angle/ channel/ flats etc shall be provided and fixed by the Bidder/Supplier.
- 23.2 Cables shall be fixed in cable trays in single tier formation and cables shall be clamped with Aluminium flat clamps and galvanized bolts/unit.
- 23.3 Earthing flat/ wire can also be laid in cable tray along with cables.
- 23.4 After lying of cables minimum 20 % area shall be spare.

## **24.Laying of Cables on Building Surface/ Structure**

- 24.1 Such type of cable lying shall be avoided as far as possible and will be allowed only for individual cables or small group of cables, which run along structure.
- 24.2 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 revenged. Only/GI clamps with GI bolts/nuts shall be used.
- 24.3 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.

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## **25.Termination & Jointing of Cables**

- 25.1 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, etc. by means of suitable size single/double compression type cable glands. Armour of cable shall be connected to earth point. The Bidder/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.
- 25.2 In case of termination of cables at the bottom of the panel over a cable trench having no access from the bottom, a 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.
- 25.3 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 connecting without lugs/sockets.
- 25.4 The following is the recommended procedure for crimped joints and the same shall be followed:
- Strip off the insulation of the cable end with every precaution, not to severe or damage any strand. All insulation to be removed from the stripped portion of the conductor and ends of the insulation should be clean and square.
  - 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 aluminium conductors, the socket should be fitted with corrosion inhibiting compound. This compound should also be applied over the stripped portion of the conductor and the palm surface of socket.
  - Correct size and type of socket/ ferrule/ lug should be selected depending on size of conductor and type of connection to be made. Make the crimped joint by suitable crimping tool. If after crimping the

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conductor in socket/ lug, some portion of the conductor remains without insulation the same should be covered sufficiently with PVC tape.

## **26.Dressing of Cable inside the Equipment**

- 26.1 After fixing of cable glands, the individual cores of cable shall be dressed and taken along the cableways (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.
- 26.2 For motors of 20 HP and above, terminal box if found not suitable for proper dressing of Aluminium cables, the Bidder/Supplier shall modify the same without any additional cost. Cables inside the equipment shall be measured and paid for.

## **27.Identification of Cables/ Wires/ Cores**

- 27.1 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.
- 27.2 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.

## **28.Cable between Isolators/ Junction box & Motors/ Controls**

- 28.1 Wherever possible Copper cables with glands shall be used between isolator/junction box (installed near motor/controls) and motors/controls. If terminal box of the motor or control switch is not suitable for accepting armoured cable or it is difficult to lay, copper conductor, multi-core, Unarmoured flexible cable in PVC flexible conduit steel (reinforced) with flexible conduit glands shall be used.

## **29.Testing of Cables**

- 29.1 Before energizing, the insulation resistance of every circuit shall be measured from phase to phase and from phase to ground. This requires 3 measurements if one side is grounded and 6 measurements for 3 phase circuits.

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- 29.2 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.
- 29.3 DC High Voltage test shall be made after installation on all 1100 Volts grade cables in which straight through joints have been made and all cables above 1100 V grade.
- 29.4 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:
- 29.5 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.
- 29.6 The test voltage and duration shall be as per relevant codes and practices of Indian Standards Institution. Fill up the Test Certificate as per *Table 4*.

### **30.Earthing Network**

- 30.1 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 there under. The Bidder/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.

### **31.Earth Pit with Electrode**

- 31.1 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: 3043-1966 (code of practices for Earthing). All earth electrodes shall preferably be driven to a sufficient depth to reach permanent moist soil.

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- 31.2 Prior approval of the engineer-in-charge shall be taken for selecting type of earth electrode (pipe or plate).
- 31.3 Earth pit centre shall be at a minimum distance of 2 m from nearest building, unless otherwise advised. The minimum 3 m distance shall be maintained between centres of 2 earth pits.

### **32. Earth Bus, Earthing Lead & Earth Wire/ Strip**

- 32.1 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 equipments shall be as specified in the drawing or as instructed by the Engineer-in-charge. However, the length of the branch leads from equipment to earthing grid/ ring shall not be more than 10 to 15 meters.
- 32.2 All hardware for earthing installation shall be hot dip galvanized. Spring washers shall be used for all earthing connections of equipment having vibrations.
- 32.3 Size of earthing lead/ wire shall be as specified in schedule of quantities/ drawings. *Table 6* may be considered as general guidelines.
- 32.4 When earthing wire is to be drawn under floor/in underground, Aluminium wire 10 mm dia. With PVC insulation shall be used. Instead of GI wire, PVC insulated copper conductor wires can also be used.
- 32.5 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 ohms in order to ensure satisfactory operation of protective devices.
- 32.6 G.I. wire/ Aluminium wire shall be connected to the equipment by providing crimping type socket/ lug.
- 32.7 Wherever earthing strip to be provided in cable tray, it shall be suitably bolted on cable tray and electrically bonded to the cable tray at regular interval.
- 32.8 Excavating & refilling of earth, necessary for laying underground earth bus loops shall be the responsibility of the Bidder/Supplier.

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- 32.9 Wherever earth leads/ strips/ wire are laid in cable trenches, these shall be firmly and suitably cleared to the walls/ supporting steel structure on which cable is clamped.
- 32.10 The neutral of the transformer shall be connected to earth pit independently and earth pit shall have copper earth plate.
- 32.11 Long runs of GI strip shall be connected at each end with lap type welding to ensure continuity.

### **33. Erection Procedure Guidelines of Instrumentation & Control System**

- The erection of Instrumentation & Control System shall be carried out generally conforming to General Technical Standards as described herein. However, the Bidder shall select and adopt methods and procedures for equipment erection to suit the nature of equipment and erection work, involved according to the best modern practice and his own experience.
- Shop tests as well as Site tests shall be performed to ensure that all equipment / sub-systems / systems furnished are manufactured and tested conforming to the requirements of the specification and approved Quality Assurance Program.
- All assembly and erection procedures adopted by the supplier shall be open for inspection and approval by the Client. Acceptance of erection procedures shall not in any way relieve the supplier of his responsibility for proper erection of the equipment.
- Transmitters, converters and pressure & temperature switches shall generally be installed on Instrument Stands made of 2" SS pipes located at convenient points. Level transmitters shall normally be flanged for direct mounting in the tank / equipment.
- Temperature / Pressure Stub on equipment and pipelines shall preferably be of same material or higher grade of material
- Suitable Root Valves shall be provided with every tap-off point.
- Installation of Pressure and Differential Pressure Transmitter shall be as per standard engineering practice incorporating Drain Valves, Isolation Valves, 2/3-Valve Manifold, Syphon etc. as applicable.
- For instrument air, SS. Pipe shall be used for air distribution from Battery Limit to the designated point of use. Take-off connections to

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instruments / actuators shall be with suitable size nipples and shut-off valves. Individual air supply shall be provided by 6 mm OD PU tube through an isolating needle valve and air filter regulator.

- Perforated Aluminium Trays (minimum 2 mm thick) shall be utilized for routing of signal tubing / cables in field. All cables / tubes in the supporting trays / channels shall be tagged properly. The loading of the cable trays shall not exceed 60 % of the available space. Proper gap between the electrical trays, as per the voltage level, shall be maintained in the cable tray layout. Tray numbers shall be provided at suitable intervals.
- Rigid and flexible conduits along with necessary fittings shall be used for cable laying from instrument to JB or instrument to trays etc.

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<b>Table 1</b> <b>Bureau Indian Standards (BIS)</b>		
<b>S N</b>	<b>Description</b>	<b>BIS</b>
1	PVC insulated cables (light duty) for working voltage upto 1100 volts	694-1977 Part I & II
2	PVC insulated cables (heavy duty) for voltage upto 1100 volts	1554-1976 Part I
3	-- Do -- for voltage 3.3 kV to 11 kV	1554-1976 Part II
4	Specification for polyethylene insulated PVC sheathed heavy duty electric cables, voltage not exceeding 1100 V	5959-1970 Part I
5	-- Do -- voltage 3.3 kV to 11 kV	5959-1970 Part II
6	Guide for marking of insulated conductors	5578-1970
7	Code of practice for installation and maintenance of paper insulated power cables	1255-1967
8	Code of practice for earthing	3043-1966
9	Guide for safety procedures and practices in electrical work	5216-1969
10	Code of practice for installation and maintenance of AC induction motor starters	5214-1969
11	Code of practice for installation and maintenance of induction motors	900-1965
12	Code of practice for installation and maintenance of switchgears	372-1975
13	Code of practice for installation and maintenance of transformers	1886-1967
14	Code of practice for electrical wiring installation, voltage not exceeding 650 V	732-1963
15	Code of practice for electrical wiring installation (system voltage exceeding 650V)	2274-1963
16	Guide for testing three phase induction motor	4029-1967

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<b>Table 2</b> <b>Pro forma for PCC, DB, Motor Control Centres Test</b>		
<b>SN</b>	<b>Test</b>	<b>Report</b>
1	Circuit (Breaker/Bidder/Supplier Module)	
2	<b>Insulation resistance</b> (Contacts open, breaker Racked in position)	
a.	Between each Phase & Bus ( <b>Mega Ohm</b> )	
b.	Between each phase and earth ( <b>Mega Ohm</b> )	
c.	DC and AC control & auxiliary circuits ( <b>Mega Ohm</b> )	
d.	Between each phase of CT/PT and between CT & PT	
3	<b>CT Checks</b>	
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	<b>Checking breaker/Bidder/Supplier circuits for</b>	
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	
Signature and seal of Engineer-in-charge of TCMPF Ltd.,		Signature and seal of Engineer-in-charge of Bidder/Supplier

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<b>Table 3</b> <b>Pro forma for motor testing</b>		
<b>SN</b>	<b>Test</b>	<b>Report</b>
<b>1</b>	<b>Name plate details</b>	
A	Voltage	
B	HP / KW	
C	Mounting	
D	Current	
E	RPM	
F	Frame size	
G	Make	
H	Sr No	
I	Others	
<b>2</b>	<b>Insulation test (before cable connection)</b>	
A	Between Phase and Earth (Mega Ohms)	
B	Between each Phase (Mega Ohms)	
<b>3</b>	<b>Insulation test (after cable connection)</b>	
A	Between Phase and Earth (Mega Ohms)	
B	Between each Phase (Mega Ohms)	
<b>4</b>	<b>No load current</b>	
A	R Phase Amps	
B	Y Phase Amps	
C	B Phase Amps	
<b>5</b>	<b>Full load current</b>	
A	R Phase Amps	
B	Y Phase Amps	
C	B Phase Amps	
<b>6</b>	<b>Temperature rise after 4 hours run</b>	
A	On no load degree C	
B	On full load degree C	
C	Ambient temperature during test degree C	
<b>7</b>	<b>Operation of thermal overload relay</b>	
A	At normal Full Load current of motor	
B	At twice Full Load current of motor trips in seconds	
Signature and seal of Engineer-in-charge of TCMPF Ltd.,		Signature and seal of Engineer-in-charge of Bidder/Supplier

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<b>Table 4</b> <b>Pro forma for Testing Cables</b>		
<b>Sr No</b>	<b>Test</b>	<b>Report</b>
1	Date of Test	
2	Drum Number (from which cable is taken)	
3	Cable From -> To	
4	Length of run of this cable (meter)	
5	<b>Insulation resistance test (In Mega Ohm)</b>	
A	Voltage of Megger Volts	
B	Between core-1 to earth	
C	Between core-2 to earth	
D	Between core-3 to earth	
E	Between core-1 to core-2	
F	Between Core-2 to Core-3	
G	Between Core-3 to Core-1	
6	<b>High Voltage Test (Voltage Duration)</b>	
A	Between Cores and Earth	
B	Between Individual Cores	
Signature and seal of Engineer-in-charge of TCMPF Ltd.,		Signature and seal of Engineer-in-charge of Bidder/Supplier

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<b>Table 5</b> <b>Recommended Cables Sizes For Industrial Wiring</b>				
<b>3 Ø 415 V Motor HP</b>	<b>Aluminium Conductor Cable Size (in mm<sup>2</sup>)</b>			
	<b>Rotor Resistance Starter</b>		<b>Star Delta Starter</b>	
	<b>Supply side</b>	<b>Motor Side (2 Cables)</b>	<b>Supply side</b>	<b>Motor Side (2 Cables)</b>
10	6	6	6	4
15	10	10	10	4
20	16	16	16	6
25, 30	25	25	25	10
40	35	35	35	16
50	50	50	50	25
60	70	70	70	35
75	95	95	95	50
100	120	120	120	70
125	150	150	150	95
150	225	225	225	120
180	300	300	300	150
215	300	300	300	185
For <b>DOL Starter up to 10 HP</b> Motor, <b>4 mm<sup>2</sup></b> cables should be used.				

<b>Table 6</b> <b>Sizing of Earthing Lead/ Wire</b>		
<b>Sr No</b>	<b>ITEM</b>	<b>Size</b>
1	Control switches	G.I. wire 14 SWG
2	Motor unto 10 HP	G.I. wire 8 SWG
3	Motor above 10 HP unto 125 HP	G.I. strip 25 x 3 mm
4	Motor above 125 HP	G.I. strip 25 x 6 mm
5	Switch Board	G.I. strip 25 x 6 mm
6	Power control centre/ LT panel of sub-station	G.I. strip 40 x 6 mm

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**11. TECHNICAL SPECIFICATION DESIGN, SUPPLY, ERECTION,  
INSTALLATION, TESTING AND COMMISSIONING OF 50 TLPD CAPACITY  
NEW DAIRY PLANT AT THOOTHUKUDI DCMPU LTD.,**

**1. BRIEF DESCRIPTION**

The objective of the project is to establish a new dairy plant of 50 TLPD capacity with modern and energy efficient technology thereby giving optimum value of milk to milk producers and supply of quality milk and milk products to consumers at reasonable price.

**1.1 DESIGN BASIS OF THE PLANT:**

The essential sections of a milk processing plant are:

- a) Raw chilled milk through tankers will be received at dairy which are to be weighed and unloaded at tanker milk reception. The milk to be chilled and stored in Raw milk storage tank for processing activities.
- b) The stored Raw milk to be taken for processing activities such as Pasteurization, Homogenization, Separation and Standardization.
- c) The Separated skim milk will be stored in silos and to be dispatched through tankers.
- d) The milk standardization is to be carried out in by adding Skimmed Milk Powder for SNF correction and cream for Fat correction.
- e) The Standardized milk to be sent to sachet packing section to pack in different variants and stored in the Milk cold room.
- f) Despatch of sachet milk from cold room through marketing vehicles.
- g) Milk sachet empty crate unloading, washing, drying, conveying to packing section and cold room.
- h) The cream obtained from Separator is pasteurized through cream pasteurizer and stored in cream storage tanks.
- i) The cream from storage tanks is taken for milk standardization and surplus cream is dispatched to other unions.
- j) The Butter from storage shall be melted in Butter melting vat, boiled in Ghee Boilers to manufacture Ghee of capacity 1 MT per day. The Ghee shall be filled in PET bottles and bulk packing.
- k) The milk shall be taken for manufacturing Curd and Butter milk of capacity 2 MT per day which shall be packed in pouches and cups.
- l) The raw chilled milk shall be taken for producing Khoa / Peda of capacity 150 Kgs per day which shall be packed in vaccum packing

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machine of different variants.

- m) CIP arrangement for Milk Tanker reception line, Process equipments, storage silos, packing machines, ghee production equipments, milk reconstitution equipment, rinse milk recovery tank, fermented process equipments etc.
- n) Generation of Process utilities (CWS/CWR/Steam/RW/SW) for the equipment of process and production plant and distribution from the service block to the equipments.
- o) Compressed air generation system with distribution lines up to the consumption points.
- p) Receiving HT Electrical supply. Transforming to operational voltage, Power Control Centre, Distribution to various MCC's, Process & CIP MCCs including all cabling, electrical etc. Providing standby power through Generator set and interconnection with the main power.
- q) Supply & commissioning of Electrical distribution system with MCCs, power & control/instrumentation cables, cable trays (GI & SS), SS drop conduits pipe in process section, earthing, isolators, RCPs, insulating elastomer, mats etc.
- r) Supply and commissioning of Refrigeration system for generating chilled water for chilling applications, maintaining temperature at milk cold room. Distribution of the chilled water system in the plant to the consumption points and refrigerant to cold rooms.

The plant shall be designed with the following salient features which shall be at par with International Standards:

- ✓ The plant should be designed with latest technology with state of art for design.
- ✓ Hygienic design of the plant to meet stringent Food laws
- ✓ Energy efficient equipments and automated equipments.
- ✓ Low processing cost & minimum losses.

The plant shall be fully automated with SCADA and PLC based control system for all activities. The control room should be able to control the entire plant activities including Utilities.

The Tender comprises of design, engineering, supply, installation, testing and commissioning of Milk Reception, processing, Milk sachet packing, Ghee

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production, fermented production area, khoa production, Utilities, services and waste water treatment plant. The design and layout of the facilities, selection of equipment and services, methodology of plant execution, testing and commissioning shall be carefully planned and executed with the knowledge of normal operational & processing routines of Milk Processing plant.

**The general technical specification of the major components and the ancillary items described in the technical section, its capacities and quantities proposed by the Purchaser are furnished in the 'Basis of Design' and 'Bill of Quantities (BOQ)'. These are only for the guidance of the bidders to quote their prices on comparable basis. However, it shall be construed and understood that bidder is familiar / acquainted about the nature and the quantum of work involved and has submitted his offer without deviating the basic configuration of the plant.**

**The capacity and quantity of the machinery, equipments, pipes, fittings, valves, cables, cable trays, earthing, instruments, structural and supports etc. are to be offered based on the actual requirement at site. The bidder shall have to work out the details based on the system offered**

**1.2 REQUIREMENTS OF THE PROCESS PLANT:**

**Plant basis and Utility basis:**

Plant operations	24 hours a day
Electricity Charges	Rs. 8.5/KW unit
Steam Charges	Rs. 4 / Kg of Steam
Source of Water	River and Well
Building	New building.
Raw Milk	Received through Tankers.

**1.3 WORKING CONDITIONS:**

Site work of every nature has to be planned and executed with the knowledge of site conditions. The design and layout of the new facilities, selection of equipment and services, methodology of project execution, testing and commissioning should all be carefully planned with this point in mind.

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**1.4 PROJECT TIME SCALE:**

The Plant should be completed in time as specified in the IFB of this tender.  
Product trials are to be commenced at the end of this period.

**1.5 SITE CONDITIONS:**

Altitude above Mean Sea Level (Meters):     Approx. 4  
Average Ambient Temperature (Deg C) : 35 - 40 max  
Minimum Ambient Temperature (Deg C) : Around 25  
Relative Humidity (%) : 74

**1.6 SITE ADDRESS:**

The plant shall be installed in Thoothukudi.

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**2. INSTRUCTIONS TO BIDDER**

- 2.1 This Sub - Section of the tender defines the way that bidder is required to structure the presentation of the technical section of their bid.**
- 2.2 All technical data required by the tender is to be provided in the format given in this Sub - Section. If no format is given for any specific item the bidder may submit bid in their format**
- 2.3 Any bidder not following the required bid document structure of presenting technical data that is not in the required format is liable to be deemed non- responsive**
- 2.4 BID STRUCTURE OF TECHNICAL SECTION**
  - 2.4.1 The technical section of the bid is to be structured in the same order as Tender Document. Each statement is to be numbered with the same Sub-section and paragraph number as in the Tender Document. Every page of the technical section of the bid is to be numbered. Section number is also indicated in every page. The general structure, therefore, is to be as follows:

<b>Sub – Section</b>	<b>Subject</b>
1	Introduction
2	Instruction to the Bidders
3	Design Basis
4	Responsibilities
5	Project Management
6	Scope of Supply and Technical Specifications ( Tender package)
7	List of Preferred Makes of Major Bought Out Items
8	Battery Limits
9	Deviations from Technical Requirements
10	Optional Items
11	Drawings, data and Documentation Submission

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**2.5 The bidder is to cover each requirement of the Tender Document by statements, technical data and descriptive material and, in particular to detail the following section**

**SUB - SECTION 1 INTRODUCTION**

Brief Introduction of the tender is given including the site working conditions.

**SUB - SECTION 2 INSTRUCTIONS TO THE BIDDER**

Instructions are provided but not limited to the bidder to provide the technical bid in line with the tender sequence and details.

**SUB - SECTION 3 DESIGN BASIS**

**Preamble**

The bidder is to describe his technical proposal in details, stating the processes and systems, which he has applied in designing the plant. Also to highlight any special technical innovations that the bidder proposes to include in the plant that will improve the performance, reduce operating cost or improve product quality. The "Preamble" should commence at the start of the process and work logically through the process. Any such highlights should be cross-referenced with the Bid sub-Section and paragraph number to which they apply.

**The bidder is required to follow the Basic of Design in the tender and indicate clearly where additional processes or alternative processes of equipment are considered to be necessary or desirable to achieve optimum plant operation efficiency, optimum product quality within the standards specified, and optimum plant operation convenience.**

Under the utilities section, the peak and daily loads of each utility has been quantified.

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**SUB – SECTION 4      RESPONSIBILITIES**

**Responsibilities of the Bidder**

The bidder is required to specifically state his acceptance or non-acceptance of each clause in this sub-section. Non acceptance shall be deemed a deviation from the tender and should be mentioned in deviations, Sub - Section 8.

**Responsibilities of Client**

The bidder is required to state here any additional responsibilities that he consider are to be borne by Client besides those described in the tender.

**SUB – SECTION 5      PROJECT MANAGEMENT**

- **Time Schedule**

The bidder is to state in this subsection the proposed program of implementation from receipt of order to commencement of product trials, to be provided as per Sub - Section 10.

- **Management Team**

The bidder is to provide detail of the management team in terms of designation, accordance with this Sub - Section of the tender. Also to quantify the support that will be given by foreign collaborators, with designation and man months of attendance in India and at site.

This bidder is to ensure that the following Sub - Sections are fully detailed and quantify the duration and manpower supplied to each.

- **Commissioning**
- **Product trials**
- **Training**

**SUB – SECTION 6      SCOPE OF SUPPLY & TECHNICAL SPECIFICATIONS  
(TENDER PACKAGE)**

The bidder is required to follow the sequence of the tender Document and to make a statement on each paragraph. **Do not** leave any item without a clarify statement.

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## **SUB – SECTION 7 LIST OF PREFERRED MAKES OF BOUGHT OUT ITEMS**

Bidder to strictly follow the list of preferred makes of Bought out items and shall select a make for supply out of the list only. Make selected by the bidder other than the said list shall be considered as Deviation from the tender and should be mentioned in deviations. All given makes are preferred however the bidder to get the approval from the consultant/client before placement of order to the sub-vendor during execution.

## **SUB – SECTION 8 BATTERY LIMITS**

Battery limits for the plant are mentioned in this sub Section.

## **SUB – SECTION 9 DEVIATIONS**

All technical deviations are to be stated. This is mandatory, and failures to comply with make the bid liable to be deemed non-responsive

## **SUB – SECTION 10 OPTIONAL ITEMS**

Items that the bidder includes in this Sub - Section that are considered by evaluation team to be essential to the satisfactory operation of the plant, shall be included in the commercial evaluation of the bid.

## **SUB – SECTION 11 DRAWINGS, DATA & DOCUMENTS SUBMISSION**

The list of drawings and technical documents required for technical evaluation is included in this Sub - Section. These include a number of data sheet formats to be completed by the bidder. The completion of this format is mandatory, and failure to comply will make the bid liable to be deemed non-responsive.

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### **3. DESIGN BASIS:**

#### **3.1**

##### **3.1.1 INTRODUCTION :**

TCMPF Ltd is setting up a DAIRY PROCESSING PLANT OF CAPACITY 50 TLPD AT THOOTHUKUDI .

##### **3.1.2 SCOPE**

The Tender comprises of Design, Supply, Erection, Installation, Commissioning and Testing of Tanker Milk Reception, processing, Milk sachet packing, Ghee production, fermented production area, khoa production, Utilities, services and waste water treatment plant Milk Reception, processing, Milk sachet packing, reconstitution of milk with Skimmed milk powder and cream / butter, Ghee manufacturing and packing, curd and buttermilk production and packing, khoa production and packing, storage of sachet milk, utilities such as Refrigeration, Boiler, Electrical, Hydro flow, ETP, Compressed air Etc for operation of the plant.

The bidder has to design the Dairy plant consisting of process system, packing, storage, mechanical structures, utilities, automation required for the process. The available space should be effectively utilized with minimum ground works. The bidder should design the plant with latest processing technology, design for the milk process, product manufacturing, packing and storage activities. The design should be energy efficient with minimum handling losses. The plant shall be fully automatic with SCADA controls in the control room.

The bidder has to prepare necessary drawings for obtaining Factory License, Consent to Establish/ Operate from TNPCB, Explosives License etc as per state and central statutory requirements.

##### **3.1.3 The scope of work includes:**

The basis for the proposed dairy and the various sections shall be as given below.

The proposed dairy shall be capable of receiving & storage raw chilled milk, processing, standardizing and storage of milk, transfer to the

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Pouch milk packing section, Cream handling, storage. The required amount of milk shall be standardized for transfer to the Milk packing section and balance milk shall be utilized for by product preparation. The cream generated shall be pasteurized and stored. The pasteurized skim milk shall be transferred to other dairies through road milk tankers for drying. The processed cream is utilized for standardization and dispatched to other Dairies. Ghee manufacturing consists of butter melting, ghee boiling, clarification, storage and packing. All utilities and services shall also be designed accordingly.

The plant shall be automatic type with centralized control of reception, processing & CIP. However, other product sections and all utility sections are controlled through localized control system with PLC/hard wired as per technical specifications.

The various sections shall be as follows

**A. Milk Processing and Packing**

1. Tanker Reception.
2. Reconstitution section.
3. Milk processing, Past milk & Past. skim milk Storage.
4. Sachet milk packing.
5. Cream Pasteurization & storage
6. Rinse Milk Recovery Section
7. Ghee making and packing section.
8. Curd and Butter milk manufacturing and packing
9. Khoa / Peda production and packing
10. Centralized CIP system consisting of Tanker CIP and Process CIP
11. Instrumentation & Automation

**B. Utilities:**

1. Refrigeration plant.
2. Electricals
3. Steam Generation and distribution
4. Compressed air section.
5. Water treatment plant
6. ETP

The plant shall have the following salient features as in table below:

- Reception, Processing & Packing of milk, CIP operations through Centralized control system.
- Rinse milk, Reconstitution, Cream processing, storage, and skim milk through centralized control system.
- Localized control system as per table below to be considered
- Hygienic design of the plant to meet stringent Food laws
- Energy efficient equipment
- Low processing cost & minimum losses

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**3.1.4 PLANT CONFIGURATION CONSIDERED**

MAIN AREAS	SUB AREAS	TYPE OF PLANT
MILK RECEPTION AND PROCESSING 50 TLPD CAPACITY	RAW MILK TANKER RECEPTION	FULLY AUTOMATIC AFTER TANKER CONNECTION
	TANKER CIP	FULLY AUTOMATIC AFTER TANKER CONNECTION
	RAW MILK STORAGE AREA	FULLY AUTOMATIC
	PASTURIZATION AREA	FULLY AUTOMATIC
	PAST. MILK STORAGE AREA	FULLY AUTOMATIC
	RECONSTITUTION AREA	FULLY AUTOMATIC EXCEPT ADDING OF POWDER MANUALLY INTO HIGH SHEAR MIXER
LIQUID MILK PACKING AREA	HMST AREA	FULLY AUTOMATIC
	MILK FILLING AREA	FULLY AUTOMATIC TILL POUCH PACKING MACHINE. AFTER MACHINE SEMI AUTOMATIC CONVEYOR SYSTEM
CREAM PROCESSING	CREAM BUFFER STORAGE AREA	FULLY AUTOMATIC
	CREAM PASTURIZATION AREA	FULLY AUTOMATIC
	CREAM STORAGE AREA	FULLY AUTOMATIC
CENTRALIZED CIP KITCHEN	BUIK CIP STORAGE AREA	FULLY AUTOMATIC
	CENTRALIZED CIP KITCHEN	TANKER 1 CIRCUITS, PROCESS 2 CIRCUITS, FULLY AUTOMATIC
RINSE MILK RECOVERY	CENTRALIZED MILK RECECOVERY AREA	FULLY AUTOMATIC
GHEE MAKING AND PACKING SECTION	BUTTER MELTING, BOILING, CLARIFYING, STORAGE AND PACKING	SEMI AUTOMATIC

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MAIN AREAS	SUB AREAS	TYPE OF PLANT
CURD AND BUTTER MILK MANUFACTURING AND PACKING	MILK STORAGE, PASTEURIZATION, INNOCULATION, FILLING AND PACKING	SEMI AUTOMATIC
KHOA/PEDA PRODUCTION	MILK STORAGE, PREPARATION AND PACKING	SEMI AUTOMATIC
<b>UTILITIES</b>		
1. WOOD/BRIQUETTE FIRED BOILER 2. AMMONIA BASED REF. SYSTEM WITH IBT 3. OIL FREE AIR COMPRESSOR 4. HYDROFLOW SYSTEM FOR WATER 5. ETP 6. ELECTRICAL SYSTEM	STEAM GENERATION	AUTOMATIC BUT LOCALLY CONTROLLED
	CHILLED WATER GENERATION	AUTOMATIC BUT LOCALLY CONTROLLED
	COMPRESSED AIR AREA	AUTOMATIC BUT LOCALLY CONTROLLED
	WATER TREATMENT AND STORAGE	LOCALLY CONTROLLED
	ETP	LOCALLY CONTROLLED
	INDUSTRIAL ELECTRICALS	LOCALLY CONTROLLED WITH MCC AND FEEDBACK SYSTEM AS PER TECHNICAL SPECIFICATIONS

**3.1.5 The Mechanical scope comprise of following:**

1. Design, engineering, supply of Tanker Milk Reception, processing, Milk sachet packing, Ghee production, fermented production area, khoa production, Utilities, services and waste water treatment plant Milk Reception, processing, Milk sachet packing, reconstitution of milk with Skimmed milk powder and cream / butter, Ghee manufacturing and packing, curd and buttermilk production and packing, khoa production and packing, storage of sachet milk, utilities such as Refrigeration, Boiler, Electrical, Hydro flow, ETP, Compressed air Etc for operation of the plant with all accessories and utilities piping, MCCs and cabling etc.

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2. Labour charges and consumables for installation, testing and commissioning of Tanker Milk Reception, processing, Milk sachet packing, Ghee production, fermented production area, khoa production, Utilities, services and waste water treatment plant Milk Reception, processing, Milk sachet packing, reconstitution of milk with Skimmed milk powder and cream, Ghee manufacturing and packing, curd and buttermilk production and packing, khoa production and packing, storage of sachet milk, utilities such as Refrigeration, Boiler, Electrical, Hydro flow, ETP, Compressed air Etc for operation of the plant with all accessories and utilities piping, MCCs and cabling etc.

All the equipment for the plant/systems shall be designed, engineered, supplied and installed in accordance with the prevailing and applicable standards in general all major equipment and processes should be in line with *fssai* requirements.

### **3.2 BASIS OF DESIGN : GENERAL DESCRIPTION**

The plant has been designed with the following basis:

#### **3.2.1 MILK RECEPTION SECTION:**

**The total Raw milk received shall be as per the following proportion respectively**

- Raw milk data received through Tanker:
- Milk fat content (Avg.) : 4.0%
- Milk solids non fat content (Avg.): 8.0%
- Temperature –Tanker milk : < 10 deg. C
- Smell and taste: Good and pass Organoleptic tests
- Tanker reception : 50,000 liters per day
- Tanker capacity : 9KL, 15KL, 25KL & 30 KL
- Tanker reception time: 60% in the Morning & 40% in the evening
- Total line for tanker reception: Capacity & qty as per BOQ

#### **3.2.2 LIQUID MILK PROCESSING**

The Dairy Plant shall receive raw chilled milk from tanker reception. The tankers (either filled or empty) shall be weighed with one weigh bridge

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(Capacity &Qty as per BOQ). After weighment, the tankers shall be unloaded at tanker unloading bay on acceptance of the raw milk through the system, based on measurement of Fat/SNF/Temp./acidity etc. Final Chilling of raw milk would be done during unloading process through chiller & stored in any of RMSTs (Capacity & qty as per BOQ). Stored milk shall be processed (pasteurized, skimmed, and standardized) & stored in PMSTs (Capacity &qty as per BOQ). Tanker capacity of 5 KL, 15KL and 20KL.

From the PMSTs the milk shall be transferred to the pouch packing section. Excess cream shall be stored in tanks. Also provision shall be made for milk dispatch in tanker to other dairies. Facility of powder reconstitution shall be provided for SNF makeup. Separate dispatch of pasteurized milk to products section from pasteurizer storage tank. Dispatch of raw chilled milk to Khoa section has to be creates with CIP.

The Dairy plant shall be designed, engineered, supplied, installed, tested, and commissioned by the contractor. The scope of work shall include, but not limited to, milk reception & processing, powder reconstitution, cream processing and storage, CIP (tankers, milk reception, storage/ processing equipment , pipelines), utilities and complete automation of the plant including interfacing with utilities i.e. refrigeration, boiler, electrical substation, air compressor, ETP etc.

The brief of processing requirement and equipment details are mentioned here under.

For pipeline sizing following velocities of the fluid shall be considered

Milk	2 m/s
CREAM	1.3 m/s
LP steam	20 m/s
Water	3 m/s
Air	20 m/s

**3.2.3 MILK RECEPTION SECTION**

The proposed LMP Plant shall receive raw chilled milk in road tankers (cap. 9000 L to 30000 L). The tankers shall be weighed at Weigh Bridge.

Milk received in tankers shall be weighed at the weigh bridge ( 40 MT) provided at the entry of tanker reception bay. The operator shall manually enter tanker ID/select relevant tanker details in the weighbridge PC and the weighment shall be taken automatically after confirmation of

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position of the tanker by sensor provided. After completion of milk unloading & CIP, the empty tankers would also be weighed at the weighbridge. The data would be transmitted through network to automation/SAP system for record /MIS/ printing of truck slip & payment purpose. Un manned operation of the weighbridge will be facilitated.

During tanker unloading operation, milk would also be measured through mass flow meters in the unloading line for inventory/material balancing/functional requirement and shall be analysed for Density, Temp.

The raw chilled milk received and unloaded at 6-10°C shall be chilled to 4 °C through plate type chillers and stored in 2x 20 KL Raw milk storage silos.

Milk samples from the tankers shall be taken manually and fed to online testing equipment for measurement of fat, SNF, acidity and temperature etc. through rapid test instruments. Based on the acceptable parameters, actual results and the tanker consignment shall be accepted or rejected automatically by the system. The test results shall be transferred through the automation network to the automation system for acceptance of raw milk/inventory purpose. The communication from milk analyzer and acidometer to the central automation system shall be established by the bidder. Milk samples collected from the plant shall be analyzed separately in another set of milk analyzer/acidometer (connected with automation communication network) of main laboratory & weighbridge reading would be considered for payment/mass balancing purpose.

No substandard milk shall be accepted at the Dairy. The automation system will provide indication for rejection of milk is having fat, SNF, temperature & acidity/pH etc. not conforming to acceptable range (to be set by the Dairy management). However, the Dairy manager will have authority to override the logic and accept any tanker as per his discretion.

Tanker shall be connected manually to the unloading line. Each tanker shall be emptied to the selected raw milk silo. The milk reception capacity of the line shall be designed for 10,000 LPH. The average fat & SNF percentage in the raw milk shall be 4 % and 8.0 % respectively. After milk unloading operation, tankers would be moved forward for CIP.

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The tankers reception bay shall receive one tanker at a time. The milk shall be transferred to any of the raw milk silos (2 x 20 KL) through 20 KLPH PHE chiller & valve battery system.

The tanker unloading system shall have provision to de-aerate any entrapped air in the milk and to filter the milk by Inline pipe in pipe type filter. A pipe in pipe type simplex filter shall also be provided at the outlet of the tanker unloading pumps. All measures shall be kept to ensure unloading of the tanker and hose up to the pneumatic on/off valve smoothly and completely. Immediately after unloading operation, pressurized water flushing facility of milk tankers with RO water (Spray ball type) system shall be provided to recover milk solid particles from the vessel & transfer the same to raw milk silos. For the flushing purpose, predetermined quantity (minimum) of water shall be used to prevent dilution of raw milk in storage silos. The tanker reception line shall have one hose and one flushing unit with spray ball arrangement. CIP of the tanker reception line with hose would be carried out through a pneumatic valve based & suitable sensor for hose connection.

Automatic RO water purging/pushing of reception milk lines as per pre-set interval & rinse recovery system shall be provided. Water purging of all other milk transfer lines shall also be provided. The water purging system shall be flow meter / timer based. Rinse water flushing of pipelines/ tanks/equipment & recovery of the same in rinse milk collection tank shall also be provided before CIP operations. The rinse milk recovery system shall be flow meter/ timer & turbidity based.

In the event of automation failure, suitable simple and quick manual system to be provided to clear the stored milk from the raw milk silo through the raw milk tanker dispatch line. HMI operation for tanker unloading and loading from tanker reception dock may be provided.

Valve manifold shall be designed to ensure the flexibility in operation & secured (fool proof) against mixing of two different flows/CIP fluids in case of malfunctioning in system/equipment or power failure. Pasteurized milk transfer facility from PMSTs to RMSTs for re-pasteurization shall be provided. The lateral headers of the valve battery shall have independent

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water flushing & CIP facility without affecting any other operation except that silo.

The RMST valve battery shall consist of self-cleaning type mix proof valves with 3 solenoids each. The valve battery shall have a SS-304 tray below the valves.

Total no. of headers at the RMST silo valve battery shall be as follows:

**1. Loading Headers:**

- ✓ 01 Nos for milk reception lines.
- ✓ 01 No transfer of milk from PMST to RMST header /RMST inter silo transfer /Reconstituted milk dosing

**2. Unloading Headers:**

- ✓ 01 Nos for milk unloading to 5 KLPH MPLs
- ✓ 01 No for Inter silo transfer

**3. 1 No CIP return header**

Pneumatically operated drain valves would be provided at all lowest points/suitable locations in the piping system to ensure complete draining of entrapped water/very diluted mixed phase from the system.

All equipment, valves, pipes, fittings, instruments shall be sanitary type. Welded connections should be provided wherever practical, to minimize the use of fittings. Hygienic Sampling valves (easy to operate/self-clean type) shall be provided at required points. Necessary controls and instrument including flow meters, level transmitters/sensors, conductivity transmitters, pressure/ temperature sensors/ transmitters, flow switches, turbidity meter, proximities etc. shall be provided as per functional requirement.

All reception operations shall be normally performed, controlled & monitored from reception field HMIs/control room. However, there should be a facility to carry out these operations from the central control room also.

SS platform fabricated from chequered plate, box section and staircase with skirting & pipe railing shall be provided for all tanker milk reception & tanker CIP. Necessary supports for the tanker bays platform shall be taken from the RCC columns/ beams/ slab in tanker bays. SS

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collapsible type platform extension with SS railing shall be provided in each bay to approach the tanker man way(s).

**3.2.4 MILK RECONSTITUTION / RECOMBINATION SECTION**

Milk reconstitution with proportionate blending system before pasteurization shall require making up SNF level of milk in PMST / balancing tank of pasteurizer.

It would be used for reconstituting milk from Rinse / RO water and whole milk powder or skim milk powder continuously at a temperature of around 30-45 deg C using high shear turbo mixer. Water addition shall be based on level transmitter as well as magnetic flow meter based. PHE of 10 KLPH capacities for heating of water/reconstituted milk up to 35-45 degree for effective reconstitution of powder shall be provided. Also, chillier shall be provided to chill reconstitute milk up to 6-7 deg before transferring to RMST/MPL. The powder shall be dumped manually to hopper of high shear mixer. Capacity of high shear turbo mixer for reconstitution shall be 1000Kg per hour with 30% T.S. Two RCM preparations cum storage tanks of 2 X 5 KL capacity shall be used for preparation of RCM through a 10 KLPH circulation pump (with VFD), 10 KLPH PHE heaters and chiller. Suitable heating mechanism should be provided to warm water or milk up to 55°C.

Chilled reconstituted milk shall be stored in reconstitute milk storage tank. From this reconstituted milk storage tank through 10 KLPH capacity pump and mass flow meter reconstituted milk shall be dosed in the PMSTs/ balance tank of pasteurizer.

The RCM valve battery shall consist of self-cleaning type mix proof valves with 3 solenoids each. The system shall also utilize rinse milk for RCM preparation. The valve battery shall have a SS-304 tray below the valves. The lateral headers of the valve battery shall have independent water flushing & CIP facility without affecting any other operation except that tank. Butter pre melting tank with proper dosing system should be provided for adjusting fat in case of non-availability of cream.

Total no. of headers at the recon preparation tank valve battery shall be as follows:

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### **1. Loading Headers:**

- ✓ 01 No for blending line/Inter transfer/rinse milk

### **2. Unloading Headers:**

- ✓ 01 Nos for transfer to MPLs with suitable capacity pumps, one of this shall be used for transfer in RMST

### **3. 1 No CIP return header**

The milk reconstitution operations shall be normally performed, controlled & monitored from PLC control room. However, there should be a facility to carry out these operations from the central control room also. One no HMI shall be provided for local operation/control of the entire milk reconstitution activity

## **3.2.5 MILK PROCESSING SECTION**

The raw milk at 4°C (max.) shall be drawn from any of the two raw milk silos to balance tank of the milk pasteurization plant for pasteurization, cream separation, and standardization. Homogenized milk cream index should not more than 10.

The capacity of the Milk Processing Line (MPL) along with Tri-purpose Centrifuge unit shall be 5000 LPH.

The milk separator shall be solid bowl type. Separator and homogenizer bypass arrangement & duplex pipe in pipe type filter (with auto changeover facility from HMI) is included in the scope. CIP of both pipe in pipe type duplex filters shall be done simultaneously in line with plant CIP with use of special type valve arrangement. Final standardizing with cream only would be carried out in PMSTs if required. The pasteurized milk at 4 °C shall be stored in any processed milk outdoor silos (2x20KL)

Milk pasteurizer shall have a regeneration efficiency of not less than 93% and would have a re-generative cream chilling section designed for cream outlet temperature at 8°C through a separate plate pack. Sanitary design control valve shall be provided to control the milk flow for cream chiller. A separate hot water generator (PHE/THE) and Milk heating unit (PHE) type with both side SNAP/CLIP ON EPDM/Viton gaskets) having  
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accurate control of hot water temperature with suitable automatic pumping type condensate trap (APT) for complete recovery of condensate ensuring minimum steam consumption to maintain steady temperature as per process requirement to be provided.

Magnetic type flow meter is to be provided in the milk processing lines, other transfer lines / other places inside the plant for inventory/ material balancing/ functional requirement. Magnetic meter shall be provided for RMST to MPL transfer line. The milk transfer pumps from RMSTs to balance tank of the MPLs shall be VFD operated.

Piping & automation system shall be provided as per the requirement. The standardized milk shall be transferred to packing sections from PMSTs only. For inter-silo transfer facility necessary mix proof self-cleaning type valves (one row) shall provided /installed in PMST valve battery for processed milk transfer to any of the PMSTs without affecting any other operation except the silo to which it is being transferred. All the transfer lines shall have water push / flushing for TS recovery & CIP facility. Facility to carryout CIP of the lateral header independently shall be provided.

Arrangement for pushing milk lying in dispatch line into tanker through water push & rinse milk recovery is included in the scope. However, system shall be provided for complete emptying of PMST header up to valve battery to minimize the TS loss. Weighment (tare & gross) of the milk tankers would be carried out in the weigh bridge to measure the outgoing milk quantity accurately for billing purpose & transfer the data through network to automation system/ MIS/ SAP. The milk analyzer/acidometer would measure fat/ SNF/ Temp/ Acidity/ pH etc. of milk & the data would also be transferred through the network to automation system for recording, printing of truck slip & billing purpose.

RO water purging/pushing of all milk transfer lines & solid recovery system shall be provided. The water purging system shall be volumetric flow meter/timer based. Rinse water flushing of pipelines/tanks/equipment & recovery of the same in rinse milk collection tank shall also be provided before CIP operations. The rinse milk recovery system shall be volumetric flow meter/timer/turbidity/CT based.

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There shall be facility for blending of chilled rinse milk in the reconstitution tank /recon milk preparation tank shall be provided with VFD operated pump and flow meters. All the dosing lines shall have RO water push/flushing arrangement for TS recovery & CIP facility.

Facility for inter silo transfer of milk, Past. Milk transfer facility from PMSTs to RMSTs for re-pasteurization post mil transfers to product section shall be provided by a separate common header. A common VFD operated pump may be used for the purpose. In the event of automation failure, suitable simple and quick manual system to be provided to clear the stored milk from the storage silos/tanks through tankers. Separate dispatch line for SSM or pasteurized whole milk to road milk tankers should be provided.

Pneumatically operated drain valves would be provided at all lowest points/suitable locations in the piping system to ensure complete draining of entrapped water/very diluted mixed phase from the system.

All equipment, valves, pipes, fittings, instruments shall be sanitary type. Welded connections should be provided wherever practical, to minimize the use of fittings. Sampling valves (3A Sanitary, FDA approved, easily sterile and clean type) to be provided at required points. Necessary controls and instrument for safety of the product and system including flow meters, level transmitters/ sensors, conductivity transmitters, pressure/ temperature sensors/ transmitters, flow switches, proximities etc. shall be provided as per functional requirement.

Valve manifolds to be designed to ensure the flexibility in operation & secured (fool proof) against mixing of two different flows/CIP fluids in case of malfunctioning in system/equipment or power failure. The lateral headers of the valve battery shall have independent water flushing & CIP facility without affecting other operations except that silo.

PMST Valve Battery shall have following number of loading & unloading headers:

**1. Loading Headers:**

- ✓ 1 Nos. for filling milk from MPL.
- ✓ 01 no cream dosing from CRT /for reconstituted milk Dosing.
- ✓ 1 No. for Inter silo

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## **2. Unloading Headers:**

- ✓ 1 No. for Pouch packing
- ✓ 1 No for skim milk / condensed milk transfer to tankers.
- ✓ 1 No. for Intersilo/ Transfer to RMST for re pasteurization

### **3. 1 No CIP return header**

Future Provision shall also be made in the layout, valve battery, piping, CIP facility & automation system for addition of Valve battery at the PMSTs shall be provided with distance piece to add 1X5 KLPH MPL , 1x20 KL pasteurized milk storage silos. For future expansion distance piece is to be kept in the valve battery.

Unloading header shall be designed for two simultaneous dispatches from one PMST

The PMST valve battery shall consist of self-cleaning type mix proof valves with 3 solenoids each. The valve battery shall have a SS-304 tray below the valves.

All milk processing & inter sectional transfer/dispatch operations shall be normally performed, controlled & monitored from reception & central control room.

### **3.2.6 CREAM PROCESSING SECTION**

The cream shall be collected at 8°C in each cream buffer tank (1 x 500 L) from the cream separator through cream chillers and shall be pasteurized in cream pasteurizer of 1 KLPH capacity. The raw cream feed pump (1 KLPH) to cream pasteurization unit balance tank shall be VFD operated.

The cream buffer tank valve battery shall consist of self-cleaning type mix proof valves with 3 solenoids each. The valve battery shall also receive cream from cream storage/ripening tank for re-processing. The valve battery shall have a SS-304 tray below the valves. The lateral headers of the valve battery shall have independent water flushing & CIP facility without affecting any other operation except that tank. For future expansion of one cream processing line, distance piece is to be kept in the valve battery.

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Cream buffer tank valve battery shall have following number of loading & unloading headers:

**1. Loading Headers:**

- ✓ 1 No. from cream separator
- ✓ 1 from cream from CRT to CBT for re pasteurization of cream.
- ✓ 01 no. future from cream separator (Only provision of distance piece without valves)

**2. Unloading Headers:**

- ✓ 01 No to cream processing line
- ✓ 01 no. Future CPL. (Only provision of distance piece without valves)

**3. 1 No CIP return header.**

The plate pack for cream pasteurizer shall be for 1 KLPH. Pasteurized Cream shall be stored in 1 X 2 KL insulated and jacketed cream storage tanks.

Cream pasteurizer would have a separate hot water generation unit (PHE/THE type with both side SNAP/CLIP ON EPDM/Viton gaskets) having accurate control of hot water temperature with suitable automatic pumping type condensate trap for complete recovery of condensate ensuring minimum steam consumption to maintain steady temperature as per process requirement to be provided.

Piping & automation system shall be provided as per the requirement. RO water purging/flushing of all cream transfer lines & solid recovery system shall be provided. The water purging system shall be volumetric flow meter & timer based. Rinse water flushing of pipelines/tanks/equipment & recovery of the same in rinse milk collection tank shall also be provided (to be done before CIP operations). The rinse cream recovery system shall be volumetric flow meter/timer/Turbidity/CT based.

Magnetic meters shall be provided in cream processing & dispatch lines inside the plant for inventory/ material balancing/ functional requirement. Necessary mix proof self-cleaning type valves to be provided /installed in CRT valve battery to meet the functional requirement.

Pressure transmitter shall be provided at outlet of all Lobe pump/Positive displacement pump to safeguard forward line/equipment.

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Pneumatically operated drain valves would be provided at all lowest points/suitable locations in the piping system to ensure complete draining of entrapped water/very diluted mixed phase from the system.

All equipment, valves, pipes, fittings, instruments shall be sanitary type. Welded connections should be provided wherever practical, to minimize the use of fittings. Sampling valves (easy to open/easy clean type) to be provided at required points. Necessary controls and instrument including flow meters, level transmitters/sensors, conductivity transmitters, pressure/ temperature sensors/ transmitters, flow switches, Proximities etc. shall be provided as per functional requirement.

Valve manifold shall be designed to ensure the flexibility in operation/easy expansion (with dummy housing) in future & secured (fool proof) against mixing of two different flows/CIP fluid in case of malfunctioning in system/equipment or power failure.

The CRT valve battery shall consist of self-cleaning type mix proof valves with 3 solenoids each. The valve battery shall have a SS-304 tray below the valves. For future expansion, distance piece is to be kept in the valve battery. The lateral headers of the valve battery shall have independent water flushing & CIP facility without affecting any other operation except that tank.

Cream ripening tank valve battery has following number of loading & unloading headers:

**1. Loading Headers:**

- ✓ 01 for cream loading from cream processing line (CPL)/ inter silo
- ✓ 01 Future for CPL (Only provision of distance piece without valves)

**2. Unloading Headers:**

- ✓ 1 No for cream transfer to MPL balance tank
- ✓ 1 No for Butter churn /re-pasteurization of stored cream

**3. 1 No CIP return header.**

All cream processing & transfer/dispatch operations shall be normally performed, controlled & monitored from central and reception control room.

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**3.2.7 MILK POUCH PACKING**

Total packaging requirement considered is 50,000 LPD in two shift operation.

The pasteurized and standardized milk at **4 to 6° C** shall be drawn from any of the PMSTs to any of the Horizontal Milk Storage Tanks (capacity & qty as per BOQ) through independent transfer headers. PHE for deep chilling of milk from 6 deg C to 3 deg C in each of the transfer header shall be provided. HMSTs shall be kept at one floor (minimum) above the pouch filling section. Standardized milk from HMSTs shall be kept on first floor and fed by gravity to the insulated balance tanks of FFS pouch filling machines.

However, filling of HMSTs cannot be started until and unless the PMSTs shall be cleared by the computerized quality control system through laboratory personal.

There shall be unloading headers (capacity & qty as per BOQ) from HMSTs. Any HMSTs shall feed milk to any/all of packing line unloading headers through valve matrix.

HMSTs shall have milk inlet nozzle at the top with no foam arrangement and outlet nozzle at the bottom to facilitate simultaneous loading and unloading of the HMSTs. Effective cleaning/CIP of top loading line with no foam inlet shall be provided.

Piping & automation system shall be provided as per the functional requirement.

There shall be facility to transfer balance milk of HMST to rinse milk recovery tank through the leaky pouch tank. All the unloading and transfer lines shall have CIP facility.

Valve manifold shall be designed to ensure the flexibility in operation & secured (fool proof) against mixing of two different flows/CIP fluids in case of malfunctioning in system/equipment or power failure.

The HMST valve battery shall consist of self-cleaning type mix proof valves with 3 solenoids each. The valve battery shall have a SS-304 tray below the valves.

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Pneumatically operated drain valves would be provided at all lowest points/suitable locations in the piping system to ensure complete draining of entrapped water/very diluted mixed phase from the system.

Required facilities shall be provided for handling leaky pouches and recovery of milk of the same. There shall be set of leaky pouch milk recovery systems as per BOQ which consists of circular insulated, Hinged cover type of tank of capacity mentioned in BOQ, with suitable cover and perforated SS screen for cutting of leaky pouches manually. Milk collected from leaky pouch shall be stored in this tank and pumped through inline filter and chiller with capacity as per BOQ to rinse milk recovery tank.

Water used for jaw cooling of packing machines shall be used after chilling in close loop. Necessary pump with chiller, balance tank with level control and temperature control, Pressure transmitter shall be provided

The CIP of HMSTs, pipelines and pouch filling machines after milk solid recovery shall be done from the central CIP system. Necessary CIP hose adaptors, CIP return lines and pump shall also be provided for carrying out CIP for pouch packing machines.

All equipment, valves, pipes, fittings, instruments shall be sanitary type. Welded connections should be provided wherever practical, to minimize the use of fittings. Sampling valves (easy to operate/easy clean type) to be provided at required points. Necessary controls and instrument including flow meters, level transmitters/ sensors, conductivity transmitters, pressure/ temperature sensors/ transmitters, flow switches, proximities etc. shall be provided as per functional requirement. All milk transfer and unloading operations shall be normally performed, controlled & monitored from central control room.

**3.2.8 MILK POUCH PACKING - CRATE WASHING – EMPTY CRATE CONVEYING - CRATE FILLING – FILLED CRATE TRANSFER TO COLD STORE:**

Double head, high Speed, servo motor operated and PLC controlled pouch filling machines (capacity & qty as per BOQ) shall be provided for packing of liquid milk in pouches. These machines shall have a packing capacity of 10000 pouches/ hr on 500 ml pouch. The machine shall be

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PLC and servo operated and shall have modem facility for interfacing/communication with main plant CPU and SCADA/HMI station. Each pouch filling machine shall be provided with SS chute. Packed milk pouches shall be collected in a tray and manually stacked in the empty crates received through the conveyor. The filled crates are sent to cold room through conveyors.

Necessary SS platforms with SS railing for operation & maintenance of the packing machines and suitable approach to filling machine balance tank shall be provided. SS cross over bridge wherever required in the pouch packing section shall also be provided.

SS crate conveyors shall be provided for transfer of both empty and filled milk pouch crates right from reception up to cold store. Dirty crates shall be loaded manually to the fully SS construction crate washer and the washed crates from the crate washer to be conveyed up to the pouch filling area through a set of SS crate conveyors.

Crate washing shall be done with single track crate washers (capacity & quantity as per BOQ) with pre rinsing, detergent washing, after rinse, drying and shall have 3 pumps in each line (Inline type energy efficient) to ensure proper cleaning. The washed crates shall be fed to crate filling area through suitable conveying system.

Crate conveying from the outlet of crate washer up to the bottom of the hopper for pouch filling shall be automatic. Packed pouches from the machines falling on the trays will be stacked manually in the crates and loaded in the conveyor to transfer to the cold room. Double decker conveying system shall be used for transferring cleaned crates to packing machine and filled crates from packing machine to cold store.

The filled crates received through conveyor at cold room will be manually moved in a crate trolley to cold room.

**3.2.9 RINSE MILK RECOVERY & DOSING SYSTEM:**

Rinse water flushing of all pipelines/tanks/equipment & recovery of the same in rinse milk collection tank shall be provided before CIP operations. The rinse milk flushing system shall be volumetric flow meter with Conductivity Transmitter before collection tank. The system shall be

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designed in such a way that flushing is completed with minimum quantity of water (to minimize dilution).

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.

There shall be separate rinse milk collection tank of capacity mentioned in BOQ to recover rinse milk from lines and tanks through CIP lines. A transfer pump of with chiller shall be provided to transfer collected rinse milk to rinse milk storage tank of capacity mentioned in the BOQ

The rinse milk shall be collected & stored in an insulated storage tank (capacity & qty as per BOQ). The rinse milk shall be blended with raw milk in reconstitution tank through pump for further processing.

The system would be operated, monitored & controlled from main control room. Necessary valves, piping, controls, and instrument including flow meters, level sensor, conductivity transmitters, temperature sensors etc. shall be in scope of supply.

### **3.2.10 Ghee production**

The Butter is melted in Butter melting vat of capacity 1 KL PHE type and pumped to the pre-stratification tank of capacity 500 L. On draining the residue the molten butter is pumped to Ghee Boiler of capacity 500 L for boiling and stored in settling tank of capacity 500 L. The ghee from settling tank is clarified through a 500 LPH Ghee clarifier and stored in 1 KL Ghee settling tank. The ghee from the storage tank is fed to the Automatic Ghee PET jar filling machine for packing. Necessary SS packing tables, leaky ghee collecting system should be provided. All the above equipment should be provided with auto CIP arrangements.

From the ghee settling tank the ghee without residue is transferred to a storage cum buffer tank of capacity 500 ltrs. And which is connected to ghee filling machine.

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Fat recovery system with butter melting tank, transfer lobe pump and fat recovery tank shall be installed to recover the fat.

### **3.2.11 Curd and Butter milk manufacturing and packing**

The raw chilled milk shall be taken for the fermented product preparation along with the reconstituted milk and shall be stored in separate storage tank of capacity 2 KL. The milk then taken for processing as per the required product production plan. The milk is homogenized and pasteurized using a 500 LPH Process line constitute of 500 LPH Pasteurizer and homogenizer. The pasteurizer should be designed in such a way that the milk should be heated to 90 °C and holding it for 20 minutes (The holding coil should be designed in such a way that it can also hold only for 10 minutes also). The pasteurizer shall also be used as an HTST pasteurizer for flavored milk. Additional holding coil of 15 sec duration also to be provided.

The milk for curd should be pasteurized and cooled in different cycles as mentioned below.

- 1). 4 °C to 90 °C for 20 minute/10 minutes and cooled to 40 °C.
- 2). 4 °C to 90 °C for 20 minutes/10 minutes and cooled to 4 °C and stored.
- 3). 4 °C to 40 °C using as a pre heater for inoculation.

The pasteurized milk shall be either directly fed to the Innoculation tank at 40 °C or to the curd milk storage tank of capacity 1 KL at 4 °C.

The product push and water push should be done with only pasteurized water and provision should be given in the pasteurizer skid. All the above equipment should be provided with auto CIP arrangements.

The milk stored in curd milk storage tank at 4 °C is preheated using the preheater provision in the curd pasteurizer and shall feed to the Innoculation tank. The milk at 45 °C is fed to the two 500 Liter capacity Innoculation tank where mixing of culture is carried out. The inoculated milk is fed to Cup filling machine / sachet packing machine for packing in cups and sachets.

The milk from pre heater is connected to two 500 L inoculation tanks for adding culture and connected to a 5000 sachets/hour sachet packing machine to pack in sachets and 2400 cups per hour cup filling machine to pack in cups. There should be facility to pack inoculated milk in both

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sachet and cups simultaneously. There should not be any collar fitting and plug valves in the culture inoculated lines. All the lines are TIG welded. There should be facilities like platforms for adding culture in the inoculation tank.

### **3.2.12 Butter Milk**

The processed milk from curd milk pasteurizer or from storage tank after preheating to 40° C shall be stored in Butter milk mixing tank of capacity 500 Liters where inoculation of culture and setting of curd will be carried out. On setting of curd addition of chilled water shall be carried out through PHE type chiller which is also used for chilling the Butter milk. A shear pump of 2 KLPH capacity shall be used for circulating and preparing Butter milk. The prepared butter milk shall be packed in the sachet packing machine. Provision to add the masala preparations in the tank to be provided.

All the above equipment should be provided with auto CIP arrangements.

### **3.2.13 CIP SYSTEM**

There shall be centralized automatic CIP system for Process and Tanker.

- Dedicated circuit for road milk tankers(to be installed near tanker reception bay)
- Dedicated with suitable no. of circuits for liquid milk reception and storage, liquid milk processing and storage, cream processing, storage, HMST for pouch milk, Pouch packing machines, Rinse milk section and fermented product section.

All the circuits of the CIP systems should be able to operate simultaneously and independently, with the set of CIP tanks, tubular heaters (THEs), filters, pumps, valves & fittings, instruments etc. All the THEs and equipments, pipeline directly in contact with acid and lye should be fabricated with SS 316 H material.

**All CIP forward & return lines shall be provided with hot insulation over with aluminum cladding as per relevant BIS code.**

The CIP operations including receiving concentrate chemicals shall be normally operated, controlled and monitored from the reception control room. However, there should be a facility to carry out these operations from the central control room also.

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The system shall be equipped with necessary valves, piping, controls and instrument including flow meters, level sensor, conductivity transmitters, temperature sensors/ transmitters, flow switches, proximities etc.

The system shall be totally secured (fool proof) against mixing of the cleaning solutions with the products in case of malfunctioning in system/equipment 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 reception as well as main control room.

Necessary facility shall be provided to keep the solution in the tank at the required temperature and concentration all the time/as per requirement. This facility may be provided by using THE installed in the forward circuit. The facility of carrying out CIP of the CIP tanks should also be provided.

#### CIP Chemical Storage:

Acid and lye shall be received in bulk in road tankers and shall be unloaded into bulk storage tanks. Two numbers of bulk storage tanks (one for acid and one for lye) having capacity and qty. as per BOQ shall be provided. Chemical unloading of tankers shall be done with the help of independent pumps as required. For measuring/recording consumption of lye/acid, magnetic flow meters shall be provided.

Concentrated chemical storage tank should not have any nozzle for chemical inlet and outlet. There shall be elevation unit to draw concentrate chemical from storage tank and transfer to acid and lye dosing tank. Diaphragm type pump shall be provided for transfer of concentrated chemicals as and when required to the dosing tank based on the level of the dosing tanks. Gravity dosing into respective CIP solution tank based on its conductivity transmitter reading.

The tank shall be provided with top mounted high-level switch. Vapour outlet from the acid storage tank shall be provided with water seal arrangement (integrated with air-vent). The tanks shall be provided with radar type (roof mounted) Level indicator cum Transmitter. No separate low level switch would be required in the storage tanks. Low level signals

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from the level transmitter would be used as interlock for stopping of the transfer pumps/elevation unit.

Also, there shall be a lye flakes dissolving tank (capacity as per BOQ / MOC: SS-316 with agitator) and an acid carboy unloading tank (capacity as per BOQ / MOC : SS-316) with suitable SS-304 unloading platform. The tanks would be unloaded with the help of chemical tanker unloading pumps only.

The concentrated acid and lye from the bulk storage tanks shall be pumped through Diaphragm type metering pumps (1W+1Standby) for each type of chemical to dosing tank from where these chemicals shall be dosed to respective CIP tanks based on the concentration/conductivity measurement. All concentrated acid/lye handling equipment/ tanks/ piping shall be of SS-316 only.

### **3.2.14 Tanker CIP: One circuit**

The tankers shall undergo CIP operations fully or partly depending on the requirement. The tanker slip will show the status whether a tanker has undergone CIP or not.

The CIP plant shall be provided with fresh water tank (capacity and qty as per BOQ, MOC: SS-304 single walled), lye solution tank (capacity and qty as per BOQ/MOC: SS-316, insulated & SS-304 clad), hot water tank (capacity and qty as per BOQ/ MOC: SS-304, insulated & SS-304 clad) & recuperation or rinse water tank (capacity and qty as per BOQ/MOC: SS-316 insulated & SS-304 clad). Conductivity transmitter shall be provided for feeding of desired quantity of lye concentrate from dosing tank to lye solution tank. A pump (capacity and qty as per BOQ) based circulation system shall be provided for preparation of uniform solution in the lye solution tank.

Heating of solution would be done in THE ( capacity and qty as per BOQ/ plate MOC: SS-316, frame clad with SS-304, both side SNAP-ON type gasket, suitable for 20 deg. C temp. rise in one cycle) with steam heating control arrangement (PID type). There shall be suitable diversion valves in all the circuits at the discharge of the CIP heaters for diverting and recirculation of CIP solution through return line in case the forward temperature drops below set-point for quick heating of the solution instead

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of circulating the cold CIP solution in the equipment to be CIP. **(The process CIP tanks shall be used for tanker CIP )**

CIP forward pumps (capacity and qty as per BOQ-VFD operated) and CIP self-priming type return pumps (capacity and qty as per BOQ) shall be provided with suitable head. The contact parts of the pumps shall be AISI-316. The pumps shall be centrifugal type and sanitary design complete with motor. CIP return pumps shall be self-priming type.

Tanker CIP shall be pressure based instead of flow-based system. For this purpose, there shall be a Pressure Transmitter and forward Pump VFD control (PID based) system to be provided.

CIP program shall ensure that the line connection for the tankers is made and the man way is open before starting the CIP operation. For proper cleaning, CIP connection to spray ball(s) fitted with each tanker manhole shall be provided through suitable flexible hose. In all bays, double hose arrangement would be required for cleaning of tankers with single / multiple compartments.

Suitable tanker hoses shall also be provided for collection of CIP solution from the out let of the tankers. Simplex angular type (Pipe-in-pipe) strainers with proximity sensors to be provided in forward line of each tanker CIP circuit to filter out the impurities from CIP solution at pump discharge to avoid chocking of the spray balls in the tanker. The CIP return line shall have duplex bucket filters with manual changeover valves. Proximity switches for safety interlocks shall be provided. The bucket filter shall remove all the impurities in the CIP solution before returning it to the respective tanks.

Drain from all CIP tanks shall be connected to SS 304 header of adequate size and discharged to drainage manhole outside the CIP room. Similarly, drain from all return circuits shall be connected to separate SS 304 header of adequate size through a collection funnel and discharged to drainage manhole outside the CIP room.

SS platform made of dimpled/ chequered plate, box section and staircase with skirting & pipe railing shall be provided tanker CIP bays & kitchen. Necessary supports for the tanker bays platform shall be taken from the RCC columns/beams/slab in tanker bays.

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SS collapsible/adjustable type platform extension with SS railing shall be provided in each CIP bay to approach the tanker man way(s).

### **3.2.15 Process CIP: Two Circuits**

The CIP plant shall be provided with one each fresh water tank (capacity and qty as per BOQ /MOC: SS- 304 single walled), lye solution tank (capacity and qty as per BOQ /MOC: SS-316, insulated & SS-304 cladded), acid solution tank (capacity and qty as per BOQ /MOC: SS-316, insulated & SS-304 cladded), hot water tank (capacity and qty as per BOQ /MOC: SS-304, insulated & SS-304 cladded) & recuperation or rinse water tank (capacity and qty as per BOQ /MOC: SS- 316). Conductivity transmitters shall be provided for feeding of desired quantity of lye & acid concentrate from dosing tank to the respective solution tanks.

Forward circuits (capacity and qty as per BOQ) with supply pumps (VFD operated) and CIP return pumps (suitable flow rate) of required head as per the design of plant shall be provided considering present/future requirement. Forward flow control arrangement would be done with frequency drives with close loop feedback from flow meters etc. CIP solution distribution piping/circuits shall be designed in such a manner to maintain required velocity in the pipeline/up to the spray balls/nozzles. The CIP return line shall have duplex bucket filters with manual changeover valves. Proximity switches for safety interlocks shall be provided. The bucket filter shall remove all the impurities in the CIP solution before returning it to the respective tanks.

The contact parts of the pumps shall be AISI 316. Pump shall be centrifugal type and sanitary design complete with motor. CIP return pumps shall be self-priming type with AISI 316 contact parts & to be provided at various locations to ensure effective cleaning of pipelines/equipment & tanks as per requirement.

Distribution of CIP circuit & number of routes in each circuit shall be provided as per functional requirement.

Heating of solution would be done in PHE (plate MOC: SS-316, frame cladded with SS-304, both side suitable gaskets, Suitable for 20 Deg. C. temp. rise) with steam heating control arrangement (PID type). There shall

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be suitable diversion valves in all the circuits at the discharge of the CIP heaters for diverting and recirculation of CIP solution through return line

in case the forward temperature drops below set- point for quick heating of the solution instead of circulating the cold CIP solution through set of equipment to be CIP.

Drain from all CIP tanks shall be connected to SS 304 header of adequate size and discharged to drainage manhole outside the CIP room. Similarly, drain from all return circuits shall be connected to separate SS 304 header of adequate size through a collection funnel and discharged to drainage manhole outside the CIP room. CIP of flush water tank is included in the scope.

SS platform made of chequered plate, box section and staircase with skirting & pipe railing shall be provided for CIP tanks. Necessary supports for the platform shall be taken from the RCC columns/beams/slab of CIP room.

### **Cleaning / Controls / Program**

The CIP system (applicable to available CIP Kitchens) shall generally comprise the following sequence.

- Water pre rinse for TS recovery
- Pre- Rinse with recuperation water
- Hot detergent circulation
- Hot/Cold water rinse
- Hot acid circulation
- Fresh water rinse
- Hot water sterilization etc.
- Cold Sterilization by using suitable agent (by using sterilization tank)

Further to above basic steps, each step shall be divided into 4 sub-steps like "Push-in", "Emptying", "Push- out" and "Circulation" with respective interlocks for start/stop/skip a particular step timer to avoid dilution, maximum recovery of chemicals and effective use of CIP solution & time.

All CIP steps with timers shall be pre-programmed and shall be defined in Recipes as per various combinations. Based on selection of the

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recipe before starting a CIP operation, the program shall execute in respective steps automatically.

At the end of detergent and acid cleaning, the solution shall be recovered with the help of sensors provided in the return line and substandard solution shall be automatically diverted to drain/ recuperation tank.

Intermediate rinse shall be with plain fresh water and this shall be recovered and re-used after acid circulation.

The alkaline/Acidic traces shall be removed with the help of fresh water. Hot water rinse shall ensure satisfactory cleaning of the lines and equipment. Final rinse water shall be recovered in the recuperation tank.

Concentration of Alkali and acid solutions shall be maintained with the help of an automatic dosing system equipped with necessary conductivity probes. Foam control arrangement shall be taken care in designing the system. Dosing shall be done based on the strength of the solution measured by the conductivity meters installed on the re-circulation lines /respective chemical solution tanks. Duration of the re circulation of the solution shall be carried out such that the homogeneous strength of the solution is obtained.

Suitable flow meters would be required in each circuit to measure the forward flow rate during circulation. In each return line there should be flow switches for sensing blockage in the path & conductivity transmitters for recovery purpose. Temperature transmitters would also be required in each return circuit for monitoring return solution temp.

The completion of CIP of every circuit shall be signalled with an audio-visual alarm in OS.

The temperature and concentration of cleaning solution shall be continuously monitored and corrected automatically. In case of noncompliance 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/turbines. CIP solution shall be returned to CIP tanks through self-priming CIP return pumps in each route.

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If the program execution stops at step due to power failure or fault, then commencement of program execution, after rectification, should be from the same step where the program 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.

All water/ air header/ distribution lines in CIP kitchen shall be of SS-304. The steam header / distribution lines in CIP kitchen shall be clad with SS - 304 sheet of suitable gauge.

### **3.2.16 LABORATORY**

A Laboratory is to be established with the equipments listed. The Lab should be connected to the main control room through SCADA and all the reports and actions should be monitored and controlled.

### **3.2.17 AUTOMATION**

To 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 on turn-key basis.

### **3.2.18 AUTOMATION DESCRIPTION**

The control system proposed for the new Dairy plant shall be automatic using DCS/ High end PLC controls. All the operations from milk reception to pouch Packing including CIP operations are automated and are controlled from control system with some manual interventions. All the data referring to raw materials, products and utilities are made available for transfer to the main MIS server.

The automatic control should include starting operation, operation on product, shut down and CIP.

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 the other

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section PLC (for plant view) and Utility sections like Refrigeration, Boiler etc. Supplier has to consider necessary hardware for interfacing the above Automated Systems.

All the independent automation systems (other than main DCS / PLC system) shall have communication port suitable for the main automation system all the systems shall be seamlessly connected to the main system. There shall be no hardware hand shake signals with the main DCS / PLC systems. All the systems must communicate digitally to have better information exchange.

The automation system for the Dairy shall control all operations in the plant, and monitor log and produce management reports.

The Dairy automation shall include all operations involved in tanker milk reception, laboratory measurements, chilling and processing, milk storage and transfer, Cream separation, processing, cream storage, and cream aging system. The system shall also control all CIP operations on the plant, and tanker CIP cleaning.

The system shall also send/receive data for MIS report generation from all other PC's connected on same Network; these PC's are located at the product dispatch, stores, Weighbridge, Laboratory and services. Wherever the data is not possible to acquired automatically, manual data entry at all these PC's and MIS reports are to be generated.

The system shall be expandable for eventual inclusion of all data and controls required for the dairy expansion up to 1.0 LLPD.

**3.2.19 Automation of milk tanker reception**

**a) Milk Measurement:**

Milk mass measurement shall be determined by weighbridge system and also cross checked by mass flow meters system. However for commercial purpose, only weigh bridge data shall be valid. While for MIS report generation and quantity transfer, flow meter data shall be used.

**b) Flow meters:**

Milk tankers shall be driven after weighment at Weighbridge and collection of milk samples at the reception lab. The driver shall report to the reception laboratory where details of the consignment, milk route, and [Noted and agreed to the above](#)

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tanker identity shall be typed into the system. After completion of the reception, the automation system shall print out all details of the consignment.

**c) Calculation of fat content:**

The system will calculate the expected average Fat% in the tanker milk, from the consignment note details of individual loads collected from Societies. i.e. Volume x fat % at each pick up point, and check this while unloading the tanker. Authorized person shall take appropriate decision in case the difference is more than acceptable limit.

**d) Milk sampling:**

The reception laboratory operator shall manually take samples from the tanker, and enter the set of rapid testing system for measurement of fat %, SNF%, pH and temperature. The operator shall manually enter the results to the laboratory PC. The PC will compare the test results with the set values and shall reject the consignment: -

- If the milk is too acid
- If calculated and measured fat% are different
- If SNF% is below specified limits

If the tanker is rejected by the system, the laboratory operator shall advise the plant manager, who may decide to reject or accept the milk. Override of the reject system shall be by the manager's password.

**e) Accepted milk:**

The tanker bay shall have a control panel with press buttons and indicator lights. The driver shall disconnect the tanker hose from the flush/CIP point, and connect to the tanker. When he is ready to discharge milk he shall press the-Ready-button. The central control room will then receive the signal

- a) That his consignment is accepted and
- b) That he is ready to discharge

**f) Milk reception:**

The central control room shall initiate reception to pre-selected raw milk silos, during which the- Running-light shall illuminate on the tanker  
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bay control panel. The system shall control milk in take until the tanker is empty, when the-Finished-light shall illuminate. The driver then transfers the hose from the tanker to the flush/CIP point. i.e. The hose is always connected to the flush/CIP line when not connected to a tanker.

**g) Hose flushing:**

If the tanker reception point is not reused within a preset time, the line will automatically flush or blow milk through to the chillers to prevent milk spoilage in the reception lines.

Tanker CIP operations.

After unloading, the tanker shall be moved to the CIP position, and the dummy man way and spray head lowered by electric hoist. Full tanker CIP shall be carried out, and milk solids recovered to milk recovery system. Suppliers are required to state their Proposed CIP program for road milk tankers.

**h) Reception pumps and milk chillers:**

Facilities shall be provided to purge milk through to the chillers, to flush through to silos, and to recover milk solids to the recovery system. All operations shall be controlled by the system.

**i) Tank and silo pre-selection:**

There shall be one group of raw milk silos, and one group of silos for pasteurized milk. The pasteurized milk silos may contain skim milk or standardized milk for dispatch through road milk tankers.

All vessels in a group shall be pre-selectable for filling and emptying operations. When the first selected vessel is full, the second selected vessel commences filling. When the first selected vessel is emptied, the second selected vessel commences emptying. No vessels excepting balance tanks may be filled and emptied simultaneously. It shall be possible to transfer milk from one silo to any other silo with in a group, and to empty any silo to a road milk tanker in case of emergency. This arrangement does not need to be automated, but may be on a manual flow plate basis.

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**j) Tank and silo operations:**

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.

**k) Valve Manifold:**

All liquid milk and cream handling and CIP operations shall be by mix proof sanitary spillage free pneumatic valves and not by using bends or flow plates.

**l) Tank and Silo CIP cleaning:**

At completion of emptying a vessel the system shall display- Empty / Dirty- on the display, and prompt the operator to commence CIP cleaning. The time of this warning shall be logged. No vessel shall be reused without CIP cleaning excepting by use of the managers override password.

**m) Milk processing:**

When the first selected silo is full, the system shall prompt the operator to commence pasteurizing. 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 except separators which shall be started locally at the machine, for mechanical safety checks.

**n) Pasteurization:**

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. 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 6 to 8 hours) or when the differential temperature sensors indicate the need to clean. Full CIP cleaning shall be selected by the operator only at the end of the days run.

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**o) Cream separators:**

Solid bowl 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. Separator PLC shall have communication through suitable bus system to main DCS / PLC system.

**p) Cream Pasteurization and Storage**

Cream Pasteurization and transfer operation are to be carried out from main control room

**q) Utilities monitoring:**

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 (excepting steam and compressed air which will be monitored for each of the plants as detailed above).

There would be separate control rooms/operating panel (preferably touch screen) in the refrigeration plant & steam generation plant. The refrigeration plant & Steam generation plant automation systems shall also send generation and consumption data for monitoring, analysis and MIS report generation.

**NOTE:** Connectivity with following PLCs to be considered in the scope;

- (a)Boiler PLC
- (b)Refrigeration PLC
- (c)Air compressor PLC
- (d)Electrical System
- (e)ETP plant PLC
- (f) WTP plant PLC
- (g)Main Lab PLC etc

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### **3.3 DESIGN OBJECTIVE**

The entire Control & Instrumentation (C&I) system shall be designed, supplied and commissioned to enable the operator to operate the Dairy in a safe, efficient and reliable manner, without exceeding plant operational limit and ensuring the overall performance guarantee conditions.

The C&I 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 down time and high mean time 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

#### **3.3.1 Control & Monitoring Philosophy**

The C&I Systems shall be configured to perform the following basic functions: -

Start-up and shutdown of major equipment of the plant maintaining the operating conditions

Regulation function 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 activity and shall be connected to the main control network for interfacing with the main DCS / PLC system.

### **3.4 Scope of Work**

The Supplier shall include in their proposal and shall furnish all equipment and services, which may not be specifically stated here in, but are needed for completeness of the system operability, maintainability

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and reliability of the total work to meet the intent and requirement of this specification.

**3.4.1 Scope of Supply**

The Supplier is to supply the hardware and software for high end PLC / DCS.

The envisaged System configuration is as per the attached Appendix-2, however supplier may come out with alternate system configuration.

The system shall support Client Server Architecture with Fiber Optics as a backbone. All the Personnel Computers (PC) shall have latest configuration at the time of ordering.

Man Machine Interface (MMI) PC shall have 24" color TFT-LED display. All the PC's other than MMIPC's shall have 21" color TFT-LED display.

Quantity and technical requirement of each item shall be as per the text of the specification.

The DCS / PLC system shall be backboned by remote I/O panel located at strategic points of the plant based on ease of operation and maintenance. From PLC / DCS, suitable type field bus to be used to hook up all the remote I/O panel. Field bus shall have Ring topology to ensure redundancy at panel level.

**3.4.1.1 Automation hardware DCS / PLC System:**

Qty : As per BOQ

Microprocessor based High end PLC system / Distributed Control System (DCS) shall be used for centralized operation of the plant.

The DCS / PLC 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 using led at a base.

Scalability: The offered system should be suitable for future expansion.

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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 of PLC / DCS shall comprise of various signal interface cards suitable for digital communication with distributed I/O stations, local control panel, and other PLCs.

Sensors will be checked for open and short circuit conditions. Failure of sensor/transmitter shall not lead to malfunction of the corresponding control system as shown in the configuration diagram.

**3.4.1.2 Human Machine Interface (HMI) Operator Console PC (2 OS+1 ES in control room & 1 OS in pouch packing section)**

Qty : As per BOQ  
Type : LED type  
Size : 24"

Configuration : 5<sup>th</sup> generation Intel core processor with 8 GB RAM, 4 GB graphics memory (Dedicated) and 1 TB SSD

Note : Both the OS in control room shall have dual monitor.  
ES + OS at pouch packing section shall have single monitor.

All the PC for HMI shall be server grade only.

**3.4.1.3 MIS server PC**

Quantity : As per BOQ

Server will store all the relevant information from the DCS / PLC and all networked computers connected and will generate the MIS reports. Necessary RDBMS software either ORACLE or SQL Server and D2K or Visual Basis as front end will be considered for data storage and MIS reports generation.

**3.4.1.4 Weigh Bridge PC**

Quantity : As per BOQ

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Weigh bridge shall be connected to this PC via. USB/RS232port 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 will generate the weighment slip in a specified format, which forms the basis of payments. If there is failure in weighbridge communication the operator can manually enter data looking into 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 print out indicating the milk quantity unloaded along with the process parameters.

**3.4.1.5 Reception Lab PC**

Quantity : As per BOQ

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. USB/ RS232Cport for analysis of Milk. Necessary driver software is to be developed for connectivity of these instruments via. RS232Cport. 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 saved along with the warning. The remarks will appear in their port. Only after test results are completed the data will OK the Sample OK will appear against the Remark Column, else warning will be given.

**3.4.1.6 Main laboratory PC**

Quantity : As per BOQ

Main Lab PC will be located in Main Lab and will be connected on same network. Two instruments (Milko- Scan and Acidometer) are

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connected to this PC via. RS232Cport for analysis of Milk. Necessary driver software is to be developed for connectivity of these instruments via.RS232Cport. 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 tank in the Plant all these data shall be transferred to file server for report generation.

**3.4.1.7 Dispatch PC**

Quantity : As per BOQ

Dispatch PC will be located in milk dispatch dock and will be connected on same network. This will be manual data entry terminal. All the dispatch report and schedules will be generated here.

**3.4.1.8 Printers**

A3 Laser B/W - 1 No. A4 Laser B/W-2 Nos., A4 Color Inkjet -1 No

**3.4.1.9 Network hardware**

Fiber Optic Cable (if required) –1Lot UTP/STP Cables–1Lot  
Switches–As required

**3.4.1.10 Automation / System software**

Qty : 1 Lot

The system software will preferably be based on open architecture and shall support minimum32bitprocessingplatform.Fornetworking TCP/IP or ISO-OSI model will be in use. It shall be latest object-oriented software, which result in fully saleable system. Original license version of the latest release of software shall be used.

**3.4.1.11 MIS Software**

Qty : 1 Lot

This shall be based on RDBMS software. Following minimum reports are envisaged from the system. Necessary forms to developed on the networked 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 consider for development.

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- Weigh bridge reports
- Milk Analysis report
- Milk Reception report
- Milk Transfer report
- Utility consumption report
- CIP log report
- Milk production report
- Online histogram graphs for all critical plant data
- Lab reports

**NOTE:**

**A.All the data shall be stored and available for 6 month period.**

### **3.4.1.12 Control desk and cabinet**

Qty : 1 Lot

The design of all console/panels/cabinet sand layout shall be based on human engineering considerations, fully keeping in view of 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 system 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.

**No. of Consoles for main control room: Single modular (with all electrical points)**

### **3.4.2 Scope of Services:**

#### **3.4.2.1 System Design and Engineering.**

Development of Application Software including data base graphics, mimics, log sand report format generation etc.

Development of Management Information Software ( MIS ) software. Factory and site testing, Performance guarantee testing

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Erection and commissioning of the entire Control &Instrumentation system  
Dry testing of the system

Commissioning for the system

Providing guarantee for performance of the equipment supplied  
Training of Operators, systems engineers and maintenance engineers

Manuals and documentation, 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 Owner in multiple sets.

**3.4.2.2 General Technical Requirements**

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. A list of proven/ reputed Vendor for Control &Instrumentation items is enclosed as general guideline.

The design of various control systems and related equipment shall adhere to the principle of fail safe operation implying that loss 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.

**3.4.2.3 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

Relative humidity 95% at <55 deg C

**3.4.2.4 UPS System for Automation**

**3.4.2.5 System Power Supply Condition:**

For applications requiring AC power, 240 V AC, 50 Hz uninterrupted power supply shall be made available by supplier from redundant type

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UPS with common battery backup complete with voltage and frequency regulators.

The UPS power supply should be considered for DCS / PLC-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 60 minutes to allow safe shut down 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 Supplier along with all required hardware.

### **3.4.3 FIELD INSTRUMENTS**

#### **3.4.3.1 General**

Field Instruments shall be suitable for area in which these are located. In general, field instruments shall be weather proof, dust tight and corrosion resistant with Protection Class IP- Field instruments shall be suitably mounted, supported and terminated in RIO panel (smart JB) in SS304 panel, wherever required during detailed engineering. Die cast aluminum or stainless-steel casing shall be used as case material in general. Dial size for all pressure and temperature gauges 150 mm and any lower size selection specific to the application shall be subject to the Owner/Engineer's approval. In general the minimum accuracy of the instruments shall be as elaborated in detail specifications

**All SS pneumatic valves shall be with Asi bus connectivity. Balance all field instruments shall be hard wired type (4-20mA, 24VDC) signal output type connected to PLC through remote I/O panel. A Profinet / Ethernet with ring topology shall connect all remote I/o panels to main DCS / PLC system.**

The repeatability of pressure, temperature, level and flow switches shall be  $\pm 2.0\%$  of FSD.

Temperature stub to be welded on process pipe/ vessel and shall match with thermowell process connection and size. Thermowell shall be drilled out of bar stock and the length & construction shall comply with [Noted and agreed to the above](#)

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process requirement/relevant standards. Material of construction of thermowell shall be AISI 316. Suitable for the application.

The cable inlet at the instruments mounted on the plant will have a female threaded connection for protection pipe with nominal diameter 1/2" NPTF.

The instruments pneumatic connections will be 1/4" NPT female.

All field instruments /equipment shall be provided with stainless steel (AISI304) tag plates with engraved tag no. and service description. The tag plate shall be secured to the instrument /equipment with SS chain.

**3.4.3.2 Process transmitters**

Quantity : 1 Lot

All the Process Transmitters will be connected to PLC RIO panel (smart JB) through Hard wired communication (4-20 mA, 24V DC). Transmitters shall be provided with integral Digital Indicator except TT. However, if specifically asked in tender for local display of TT, it shall be provided.

Following TT shall be considered with panel mounting type local digital indicator

- 1. All milk silo
- 2. All past. (Milk & Cream)
- 3. All cream tanks

Measuring range of transmitters shall be selected in such a way that the rated value of the measuring variables appears at approx. 50-70% of the span.

The sensing elements and internal parts shall be constructed with AISI316. In case of stock and corrosive fluid application, diaphragm seal type transmitter with capillaries foreseen.

Transmitters shall generally be installed on Instrument Stands made of 2" SS pipe at convenient points

**3.4.3.3 Process gauges**

Quantity: 1 Lot

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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 SS316 sensing element and AISI304 movement material.

All accessories, such as 2-valve manifold etc. shall be provided with pressure gauges according to application. Where process temperature exceeds 70°C, siphon loops shall be utilized.

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 3Mtrs) as per the application area.

The sensing element / bulb / capillary etc. shall be of SS 316 for temperature gauges.

**3.4.3.4 Temperature elements**

Quantity: 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, gasketed cover and stainless-steel chain. Screwed covers shall be used.

**3.4.3.5 Process switches**

Quantity : 1 Lot

Local switches for pressure, differential pressure, temperature, level etc. shall be blind type and shall be suitable for 24 V DC switching. Set points shall be adjustable throughout the range. Switching differential shall be adjustable.

**3.4.3.6 Magnetic flow meters**

Quantity : 1 Lot

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Magnetic flow meters shall be considered with Hardwired communication (4-20mA,24VDC) through local junction box to PLC RIO panel. The flow tube material shall be of AISI304 with PTFE lining. The electrode material shall be either SS 316L or Hastelloy 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. —Integral / remote digital flow rate as well as totalizer display shall be provided.

Earth ring of SS 316 shall be provided for proper grounding of magnetic flow meter.

**3.4.3.7 Mass / Density flow meters**

Quantity : 1 Lot

The Mass flow meter shall be used for evaporator inlet & outlet service. The Mass flow meter envisaged shall be Coriolis Curved tube type. The Mass flow meter shall be capable of measuring mass flow rate, density, temperature, volumetric flow rate and totalized flow.—Integral / remote digital flow rate as well as totalizer display shall be provided.

Mass flow meters shall be smart type with Hard wired communication (4-20 mA,24 VDC) through local junction box to PLC RIO panel. 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 plus or minus 0.2% of flow rate or better.

**3.4.3.8 Vortex flow meters**

- Type : Vortex flow
- Capacity : Suitable
- Qty : 1 Lot
- Duty : For flow measurement of air
- Accuracy : +/-1% of FSD
- Transmitter : with 4-20 mA output
- Local Display : integral or remote mounting type required

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#### **3.4.3.9 Level instruments**

Quantity :1Lot

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 gauges shall be of the reflex/ transparent/ tubular type as per the application 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 at the top. Flanged connections, rated same as the vessel, shall be used. 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.

#### **3.4.3.10 Conductivity analyser**

Quantity :1Lot

The conductivity analyser may be installed on-line or at a distance connected by sampling line. The necessary mounting of analyser electronic unit shall be taken care suitably. The process connection shall be SMS type.

The conductivity analyser shall be microprocessor based. The electrode and cell material shall be of SS 316.

Automatic temperature compensation shall be provided with the analyser. The meter shall have 4-20 mA output

Special cable for connection between electrode and transmitter

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### **3.4.3.11 Control valves**

Quantity:1Lot

Pneumatic control valves complete with conventional hard-wired type electro- pneumatic positioners.

The control valve sizing shall be done in such a way that the calculated noise level at worst operating condition shall not be more than 85dBAat1m distance.

Valve trim material shall be harder than, but compatible with, the pipe in which it is installed.

All control valves shall have sufficient overload range. At maximum operation, the control valves shall be at 75-80% open. Valve bodies shall be no more than two (2)line sizes smaller than the pipe in which they are installed.

Leakage class ANSI IV

All control valves stroke/ through put characteristic shall, dependent on the purpose. The valves tems shall be well guided and the valves shall operate without excessive vibration and noise. The above shall achieve as table fluid control over the entire flow range. Control valve design and location shall take in to account flashing and cavitation conditions.

In case of failure of electric or pneumatic supply or in case of failure of the controller output signal, the actuators shall remain locked in actual position or shall reach as a deposition, depending on the case.

### **3.4.4 UTILITY**

#### **3.4.4.1 COMPRESSED AIR SYSTEM**

Compressed air system shall supply oil free compressed air to plant and utility areas which is part of scope of tender. Two number of Screw type oil free air compressor of capacity 130 CFM one working and one spare as per BOQ for the generation of oil & moisture free air suitable for instruments. The compressor shall have PLC control system for capacity control and for performance. The compressor shall have advanced control system for capacity control and for performance monitoring with VFD operated high efficiency motor. Cooling air duct would be required for proper functioning of the air compressor. The hot air exhaust duct (as

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recommended by OEM) shall be fabricated from GI sheet material and shall be considered in the scope of supply. The ducting for each compressor would be independent. Necessary oil filter is to be provided for oil free air. Air flow meters shall be installed on the main air delivery line and shall give feedback to DCS.

Integrated/standalone refrigerated Air Dryers of matching the capacity of the air compressor for ensuring the quality of air suitable for instrumentation, a common MS air receiver (capacity and qty as per BOQ) with automatic moisture separator and automatic drain valve is included in the scope of work. The scope also includes additional receivers near the major consumption areas as required.

The compressed air shall be distributed up to various sections as per battery limits. The headers and pipelines from receiver to all area shall be of SS-304 (with 1.6 mm thickness) with isolation diaphragm valves for servicing. Flexible piping shall be used for maximum 1.5 meter.

Measurement and recording of instrument air pressure with suitable pressure transmitter shall be provided for total generation/usage. The data shall be made accessible at the central control room. The system would be operated, monitored & controlled from local panel & necessary arrangements shall be made for taking feedback for automation interface/MIS. FRL units shall be provided at all distribution headers near all consumption points inside the plant. Measurement of the air is required at main header level only.

Necessary valves, piping, controls and instrument Pressure/temperature sensors etc. shall be in scope of supply. Every branch should have the separate valves to control the airflow.

The distribution network for compressed air shall be designed in such a way so as to maintain uniform required pressure at all consumption points to meet the flow rate without any hammering in pipeline. Preferably ring main system may be considered. The main header size will be calculated considering future expansions also.

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**3.4.4.2 Specifications**

**3.4.4.3 Screw, Oil free Type Air compressor with PLC and Frequency Drive with integrated/Standalone Refrigerated Type Air Dryer**

- Quantity : As per BOQ
  - Capacity : As per BOQ
  - Type : Screw Type, Oil Free, Air- cooled design
  - Controls : Suitable for automatic operation with variable frequency drive & necessary Instruments for energy saving.
  - Accessories : Pre-filter, after cooler, VFD and control panel, ducts for hot air and fresh air, terminal filters, bird guard etc.
- The compressor should have all controls for auto operation and data transmission of air Consumption and pressure monitoring to DCS.

**3.4.4.4 Air Receiver (MS)**

- Capacity : As per BOQ
- Quantity : As per BOQ
- Material : Mild steel
- Type : Vertical cylindrical.
- Mounting : Self-supporting.
- Accessories : Inlet & outlet nozzles, auto drain valves, pressure transmitter, pressure gauge, safety valves, condensate drainpipe etc.

**3.4.4.5 Air Receiver (SS)**

- Capacity : As per BOQ
  - Quantity : As per BOQ
  - Material : Stainless-steel
  - Type : Vertical cylindrical
  - Mounting : Self-supporting
  - Accessories : Inlet & outlet nozzles, auto drain valves, pressure transmitter, pressure & temp gauge, safety valves, condensate drain pipe etc.
- Note: This receiver shall be kept in process section and fermented process section.

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**3.4.4.6 Compressed air distribution piping & supports**

Quantity : 1 Lot

Complete air distribution shall be through SS 304 pipe line From main line, a line should be tapped for particular sections and accessories considered are isolating valve, air filter regulator and distribution plate. From distribution plate, nylon tube should be provided to connect to the utility points.

Instruments tubing more than 1 meters should be laid in protective flexible hose conduit.

**3.4.5 WATER TREATMENT AND DISTRIBUTION SYSTEM**

The Water Treatment Plant (WTP) of suitable capacity is to be designed, supplied, erected and commissioned for feeding water to the production area for various applications. The Hydro flow distribution P and I diagram should be prepared and approval to be obtained from the purchaser before executing the work.

**Raw water shall be made available to new proposed dairy at one point** area. Further distribution up to consumption point shall be in scope of tender and further do all required treatment and distribution as per new plant requirements. The main header size will be calculated considering future expansions also

Water treatment plant shall include following:

- Raw water hydroflow system
- Soft water hydroflow system.
- R.O water hydro flow system
- Raw and soft water distribution piping

Raw water from overhead tank shall be used mainly for floor cleaning and general purpose. Soft water shall be used for the entire dairy plant process, milk/product pushes/purges, tanker flushing CIP & hot water generation for milk pasteurizers, etc. RO water shall be used for preparation of reconstituted milk, product mixing etc,.

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The bidder has to supply softening plant and RO plant of adequate capacity to carry out the treatment of the raw water and necessary storage tanks of adequate capacity is to be supplied for storing and distribution

Pumping of filtered raw water to distribution of raw/ soft water through hydro flow/ pressure pumping systems, (constant pressure system) up to various utility points included in the scope including headers up to utilities along with necessary MCC & other electrical/automation is included in the scope of the work. Pressure pumping systems (Hydro flow system) for raw/ soft water comprising of 2 sets of vertical inline multistage SS pumps and pressure/ diaphragm tanks (cap. around 500 L each) with necessary valves, pipes, level probes, pressure transmitters, gauges, controls & electricals etc. The pumps of each system shall be controlled by VFD through multiple pump control system. The pumps shall also have soft starter for operation on VFD by-pass mode. Pumps shall be interlocked with respective pressure transmitter.

The raw, filtered & soft water pumps shall have SS-304 contact parts with CI body.

Water distribution piping up to all the consumption points for the plant along with isolation valves is included in the scope of work. Water distribution header sizes shall be designed for plant and related Utilities and other miscellaneous/general use. The header shall be designed keeping in mind the future requirements of the new plant also. The distribution network for raw/ soft water shall be designed in such a way so as to maintain uniform required pressure at all consumption points to meet the flow rate without any water hammering. Ring main system (or additional diaphragm tank) may be considered if necessary.

All water line drops (for Raw and soft) from headers for distribution in reception & process area and other areas shall be of SS-304 with manual isolation valves.

Necessary valves, piping, controls and instrument including flow meters etc. for the entire Water distribution system shall be in scope of supply. The entire Hydro flow system should be connected to the control room and the flow quantities should be monitored and controlled. All the

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water pumps shall be of high efficiency type & selected based on best efficiency available for the duty with Eff.-4 motors.

Note:

No Raw water analysis report is available, Bidder to collect the sample from dairy site and shall test water at their own. In case silica content is observed bidder to provide the suitable equipment's at their own cost for the removal of silica.

#### **3.4.5.1 TECHNICAL SPECIFICATION FOR RAW AND SOFT WATER GENERATION & DISTRIBUTION**

##### **3.4.5.2 RAW WATER PUMPS**

Capacity : As per BOQ

Qty : As per BOQ

Type : Self priming, Centrifugal / High efficiency vertical pump

Duty : To pump raw water from raw water storage tank / Bore well line to UG filtered water storage tank through duplex filtration plant.

Motor : Efficiency (IE4 or above)

Material : Body & working parts SS 304 with cast iron base.

Valves : Suction Side Manual Butterfly Valve- 01 no each Discharge Side Non Return Valve - 01 no each Discharge Side Manual Butterfly Valve - 01 no each

##### **3.4.5.3 MULTI GRADE FILTERS (MGF)**

Capacity : As per BOQ

Qty : As per BOQ

Duty : To filter raw water for further treatment

The incoming raw water is passed through a multigrade filter to reduce the suspended solids present in the raw water. This filter is to be provided to keep a check on the suspended solids. The suspended particles in the raw water get entrapped in the filter media

Type : Manual duplex type with indication of differential pressure and alarm for manual change over

Material : MS with outside anti-corrosive paint & inside rubber lined (MSRL)

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#### **3.4.5.4 NAOCL DOSING SYSTEM**

Capacity : As per BOQ

Qty : As per BOQ

Duty : to dose NAOCL in the raw water for killing of any bacteria from the raw water

One Electronic diaphragm type-metering pump

One chemical solution tank with lid

One Foot valve with strainer fitted on pump suction assembly

One Tank level switch fitted on pump suction assembly.

One No. : UPVC Sch.40 Interconnecting pipe work as per our specifications.

One No. : Water Meter

One No. : MCC panel with cabling as per our specifications.

#### **3.4.5.5 ACTIVATED CARBON FILTERS**

Capacity : As per BOQ however Suitable for raw water flow rate of 20 KLPH

Qty : As per BOQ

Duty : For dechlorination of chlorinated raw water for further treatment

Type : Manual Duplex type with indication of differential pressure and alarm for manual change over

Material : MS with outside anti-corrosive paint & inside rubber lined (MSRL)

#### **3.4.5.6 FILTERED WATER PUMP FOR SOFTNER**

Capacity : As per BOQ

Qty : As per BOQ

Type : Self priming, Centrifugal / High efficiency vertical inline pump

Material : Body & working parts SS 304 with cast iron base

Duty : To pump filtered water from UG storage tank to softening plant

#### **3.4.5.7 SOFTENING PLANT**

Capacity : As per BOQ (OBR- 100 Cu. M. between two regenerations)

Qty : As per BOQ

Type : Duplex type with semi automatic changeover/re-generation facility based on flow meter (Output) with alarm system

Duty : To soften raw water for process application/boiler requirement

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**3.4.5.8 Semi-Automatic Softening plant (Duplex Type.**

Capacity: As per BOQ  
Qty : As per BOQ  
Type : Semi-Automatic

**Design Data :**

TDS	600
Total hardness	150
Turbidity ( PPM)	< 5
DESIGN STANDARD	As per relevant IS code
DESIGN PRESSURE (Kg/cm2)	3.5 Kg/cm2
LINING / PAINTING	FRP

**3.4.5.9 Softener:**

Vessel Size	Bidder to specify
Resin Quantity	Bidder to specify
Resin type	Bidder to specify
REGENERANT QUANTITY REQD (KG)	Bidder to specify
MOC of vessels	MS as per relevant IS code
Outlet Hardness	<5 ppm
Mode of operation	Semi-automatic
Regeneration qty (min)	1,00,000 Liters

**3.4.5.10 Reverse Osmosis (RO) Plant**

Capacity : As per BOQ  
Qty : As per BOQ  
Type : Semi-Automatic  
Treated Water TDS: < 50 PPM the RO plant shall comprise of;  
a. Dual media filter in SS construction  
b. Activated carbon filter  
c. Anti-Scaling dosing system  
d. Micron cartridge filter  
e. RO membrane  
f. High pressure pump (1W+1S)  
g. PLC based control panel for complete plant operation  
h. Interconnecting SS piping

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**Note:**

1. Raw Water Analysis report to be collected from the purchaser before designing the plant.
2. Bidder shall submit the technical specifications of all the items/equipment mentioned in the above list

**3.4.5.11 RO Water Storage Tank (SS)**

Qty : As per BOQ  
Capacity : As per BOQ  
Type : Vertical cylindrical Storage tank, uninsulated  
MOC: SS 304

**3.4.5.12 Hydro flow system for Raw Water**

Quantity : As per BOQ  
Capacity : As per BOQ  
Pump Type : Vertical Multistage, Centrifugal Type  
Accessories : The skid mounted system shall consist of;

- a. Suction Discharge manifold with isolation valves,
- b. Pumps as mentioned above Hydro pneumatic Tank of suitable Capacity,
- c. VFD For control of the speed as per varying demand
- d. Pressure Transmitter in the discharge line
- e. Necessary controls& electrical control panel

Duty : To feed Raw Water to the various duty points as per plant requirement

**3.4.5.13 Hydro flow system for Soft Water**

Quantity : As per BOQ  
Capacity : As per BOQ  
Duty : To feed Soft Water to the various duty point as per plant requirement

**3.4.5.14 Hydro flow system for RO Water**

Qty : As per BOQ.  
Capacity : As per BOQ  
Duty : To feed RO Water to the various duty point as per plant requirement

**3.4.5.15 Raw/Soft/RO water Distribution piping, Valves, Fittings & supports**

Qty : 1 Lot  
Capacity : Suitable

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The softener shall be of regenerating type with NaCl (common salt) as regenerate.

The entire regeneration sequence such as opening and closing of valves, brine injection, beginning of next regeneration etc., shall be Automatic.

Design requirement:

The softener shall be mild steel pressure vessel with inlet and outlet connection, resin charging and with suitable connections and supports. The vessel shall be internally rubber lined and painted externally with anticorrosive paint. Filter nozzles shall be provided at bottom and top portion of the softener vessel.

Water distribution system shall be Inverted Bell Mouth and water collection system Strainer Plate Design.

Brine solution/dosing tank of FRP/MS rubber lined (outer epoxy coated) construction to store and measure salt solution for regeneration of the softener complete with brine level indicator is included in scope of supply. A separate brine dissolving/preparation tank (FRP/HDPE tank of 10 KL) shall also be supplied with air agitation. Brine piping shall be of suitable grade PVC. Brine transfer from preparation tank to dosing tank shall be through gravity & brine injection from dosing tank to softner would be through venturi/ injector.

Pipes for raw and soft water are GI 'B' class pipes with CI gate valves with GM working parts for higher sizes and GM body gate/globe valves with GM working parts for smaller sizes and non return valves.

All required pumps to be considered in the system for distribution of the soft and raw water from the source to the required point in the plant area.

#### **3.4.6 STEAM DISTRIBUTION AND CONDENSATE RECOVERY (2,000kg/hr.)**

The steam for the process and product applications shall be generated through a 2 Tons/hr Wood/Briquette fired boiler. There shall be two boilers of 2 Tons /Hr one for operation and the other as standby/spare. The suitable Wood/Briquette handling and feeding system to the boiler shall be considered with a required capacity.

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Necessary steam pressure reducing stations (PRS) with steam flow meters shall be installed in the Boiler house. Individual headers for various sections based on the required pressure shall be taken from the Boiler house with suitable PRV stations. Further distribution up to consumption point with flow meter shall be in scope of tenderer. The main header size will be calculated considering future expansions also. Steam Distribution to various duty points as per Good Steam Engineering practices is part of this scope. Necessary steam pressure reducing valves (PRV) as per process requirement are to be included in the supplier's scope. The PRVs shall contain steam control valve with Roboter type with local pressure monitoring for both HP & LP steam line. All steam valves on high/low pressure lines shall be of glandless piston type to avoid leakage.

The steam flow meters of the distribution points shall be connected to the main control room to monitor the usage and arriving MIS.

**3.4.6.1 TECHNICAL SPECIFICATION FOR STEAM GENERATION & DISTRIBUTION**

Steam at 10.5 Kg/Sq.cm. shall be supplied by the Bidder at the Steam outlet valve of the boilers in the service block and all distribution after this terminal point shall also be done by the bidder. The Supplier has to supply & install IBR approved pressure reducing station separately for the plant, along with other steam fittings. All steam piping, installation shall be done as per IBR. Steam/condensate piping with insulation from Boiler area to all section (wherever steam requires including crate washer) is also covered in the bidder's scope. However, low-pressure piping should be non- IBR type and MS 'C' class ERW pipes may be used.

Specifications for Boiler

<b>1.1</b>	<b><u>Boiler</u></b>	:	Complete Bidders scope.
1.2	Duty	:	Continuous
1.3	Area	:	Outdoors
1.4	Location	:	Thanjavur
1.5	Capacity	:	2000 Kg/hr F&A 100 Deg C
1.6	Steam Pressure	:	10.55 kg/cm <sup>2</sup> (g)
1.7	Steam Quality	:	98% Dry Saturated

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- 1.8 Type : Smoke Tube
- 1.9 Fuel : Wood / Briquette (average calorific value – 3500 Kcal/Kg and 12 to 14 % moisture)
- 1.10 Water Quality : Soft Water

### **1.0 Design Requirements**

- a.** Boiler should be horizontal, shell type fully packaged 3- pass smoke tube design, automatically controlled, tested and proven under rigorous conditions and subject to the strictest quality control procedures. The boiler should be in modular construction with the feed water tank mounted on the platform or near by area.
- b.** The boiler should be of genuine three-pass flue path. Flue gases should pass through the furnace (first pass) whereas second and thirds passes should be formed by nests of smoke tubes. At the end of the furnace the flue gas reverses into second pass tubes.
- (i) The boiler shall be complete with all mountings, accessories, controls etc.
  - (ii) Boiler construction shall be in accordance with the latest revision of Indian Boiler Regulations 1950, Act 1923 applicable and in conformity with AOTC requirements for unattended boilers. All materials used shall be approved and tested as per relevant existing codes. All the welded joints shall be as per code requirement.
  - (iii) The boiler should be of modern compact design and be genuinely packaged design. The design source should confirm to international design.
  - (iv) The fire tubes in the tubes nest should be plain without any restriction inside. These tubes should be easily accessible both from inside as well as outside for inspection and maintenance. These tubes are to be tightly expanded in the tube plate and seal welded. The required number of stay tubes and stay bars are to be fitted the boiler. The stay tubes should be seamless & strength-welded to tube plates.
  - (v) All working parts of the boiler should be accessible for ease of inspection and maintenance. On the shell, one elliptical mandoor and on tube plate

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one mud hole must be provided. Access to the combustion chamber should be through bolted refractory lined access door whereas tube nest should be exposed through hinged mounted front door.

- (vi) Boiler front door is lined with ceramic fiber blanket with SS sheeting on the tube side of the door.
- (vii) The boiler mountings shall be as per the **Extent of Supply**.
- (viii) The boiler shall be designed and constructed to generate steam at efficiency of 89% on net calorific value (NCV) basis. Efficiency shall be demonstrated as per standard BS – 845 Part 1 Indirect method.
- (ix) The insulated cylindrical shell of the boiler shall be housed in rectangular box shaped sheet metal cover frame. Therefore the top of the boiler serves as platform and facilitates ease of movement for maintenance at elevation. A movable ladder shall be provided which can be moved as per convenience.
- (x) Boiler and accessories shall be mounted on a single base frame. Individual systems such as feed water pump etc. may be on separate base plates welded to the boiler base frame.
- (xi) The boiler shall not require any special foundation for the boiler and its mountings/fittings. It should be able to be mounted on simple PCC foundation.

**c. Burner** : This shall be suitable for handling the fuel specified. The burner should be suitable for firing Briquette / wood. The entire burner shall be mounted on the front door of the boiler.

**d. Feed water System**: 2 nos. electrically driven vertical centrifugal multistage pumps mounted on the boiler frame itself with motor capable of using feed water at temperature of 120 deg C with all SS internals, interconnected pipework between pumps and feed check valves. Feed water day tank (by customer) shall be placed at an elevation of 3.5m approx. from finished floor level.

**e. Blowdown system**: Automatic Blowdown Control System based on conductivity principle with pneumatically actuated valve for efficient control of TDS level within the boiler shell. This system shall be installed in parallel to the manual blowdown valve.

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**f. Drum Level Control System, 2 Sets**

Type – 2 Nos Magnetic Level controller

**g. Online Boiler Efficiency Monitoring System, 1 Sets**

Complete with instruments to be provided for the Boiler Efficiency Monitoring shall be as under but not limited to

- Steam Flow Meter, Vortex Type with Pressure and Density Compensation.
- TDS Based Automatic Blowdown Control System - TDS based Automatic Blow down Control System based on conductivity principle with pneumatically actuated valve for efficient control of TDS level within the boiler shell. This system shall be installed in parallel to the manual blow down valve
- Temperature Transmitters – 1 Set

The boiler efficiency along with other parameters shall be monitored on the touchscreen panel complete with trends and with storage capability of 12 months data.

**h. Controls :** The electro-mechanical compact control system shall be provided. The relay based control panel cum MCC shall be mounted on the same boiler frame.

- (i) Interlocking of the feed water pumps and water level in the boiler
- (ii) Audio-visual alarm for danger level of water in the boiler and also for flame failure.
- (iii) Programmer controller to ensure sequence of boiler start-up after ensuring required temperature and pressure of air etc.
- (iv) MCB's and contactors shall be provided for all electrical drives for the boiler
- (v) Pilot lamp to indicate operating status of the various equipment.
- (vi) Complete internal wiring to ensure power supply at a single point on the panel.
- (vii) Indicating lamps/ Audio alarm shall be provided for the following parameters -
  - Low water level in the boiler

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- Burner flame failure
- Feed water pumps failure
- Damper closed position

(viii) Pressure switch should be provided for burner interlock.

The control panel shall be mounted on the boiler and shall not be separate. The cabling between the boiler and the panel shall be done from the vendors factory.

#### **i. MS Self Supported Chimney, 1 Nos**

Type – MS Self Supported designed as per IS 6533

Corrosion Allowance – 3 mm

The chimney shall be designed for a boiler capacity of 1 X 2 TPH working.

The chimney shall be complete with

Type                      Cylindrical

Position                      Vertical

End Top                      Open with Canopy

Finish                      Clean & painted with three coats of Silver - heat resistance paints (300° C to 350° C)

Two Coat of black resistance paint inside Surface of Chimney

Brief Scope items & Material of Construction

- 1 Shell - IS 2062 GR.B
2. Top cone pieces - S.S.304 (1500 mm L )
3. Flanges    IS 2062- Gr.B
4. All nozzles - IS 2062 Gr.B.
5. Ladder & Structural (2 Nos Platform included)IS 2062 Gr.B.
6. Earthing Strips – Copper Strips - 25 mm x 6 mm x 40 mtr long – 2 nos
8. Railing pipe - ISI 1239 Class- B

The chimney should consist of all the accessories and the minimum requirement. Few of them are as follows:

- a) Base plate with gussets plate (minimum thickness of 8 mm) and base stool.

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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 should 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 should start from 3 meter from the base of the chimney and it should 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 should be located at a distance of 250mm from the chimney. The ladder rung should be made of 20 mm dia rod, the width of the rung should be of minimum 400 mm and the ladder step should be at a frequency of 200 mm C/C. Safety enclosure or cage shall be provided for the ladder.

d) Platform for flue gas sampling and inspection:

e) Painter's trolley.

f) Conical cowl with cowl stays:

The minimum cowl diameter should be 1.5 times the dia of the top of the chimney section.

g) 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 GLS 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 should be connected from the lighting circuit available in the boiler plant room with 3 x 2.5 Sq.mm., PVC sheathed, PVC insulated copper cable. The circuit cable shall be run on the rigid steel conduit, and shall be fixed on the chimney surface with suitable saddles and clamps mounted on the epoxy based insulators.

h) Lightning arrester:

The lightning arrester should be of GI with minimum 5 prongs, the lightning arrester should be connected to the two earth stations. The earthing conductor should be of size should not less than GI 25 X 6mm / or of equivalent size and conductor material as approved by the local statutory authorities. The

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earthling conductor should be mounted on the epoxy based insulators and not directly fixed to the chimney surface. Two earthling conductor should run parallel from the lightening arrester and each connected to the independent earth stations. The earth stations in turn should be interconnected with one another.

i) Flue gas inlet:

Flue gas ducting shall be provided from the boiler to the chimney; it should be made from MS sheet of thickness not less than 3mm and should be provided with baffle plates. The cutout made on the chimney should have stiffeners of not less than 50 x 50 x 6mm angles welded on the periphery of the cutout. The opening made on the chimney for the flue gas duct should be extended by 200 to 300mm and terminated on counter flanges to facilitate connection of the ducting on the chimney.

j) Helical strakes to reduce wind exited oscillations for the top 2/3rd height of the chimney.

k) Chimney bottom up to 3 M height should be insulated by 50mm white mineral wool followed by cladding with 3mm MS sheet. The mild steel cladding should be of butt welded construction.

l) All MS parts of the chimney shall be given initial surface treatment including degreasing, de- rusting etc., then a coat of primer shall be applied. The chimney should be finally painted with three coats of suitable heat resistant paint at site.

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.

Note:

Statutory approvals - Necessary drawing & other formalities required for MPPCB to be carried out by bidder. When MPPCB appoints Sub regional officer for

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Smoke nuisance dept, the same papers to be Submitted to MPPCB & get the approvals for Chimney from the concerned Sub Regional officer. This all shall be in bidder's scope.

**j. MS Flue Gas Ducting, 1 Set**

Type – Circular with thickness of 5 mm

The ducting shall be installed between the boiler and the chimney. The ducting shall be complete with

- (a) Expansion Bellows
- (b) Supports
- (c) Insulation & cladding.

**k. Feed water tank – MS Feed water tank fabricated out of 6 mm thick MS sheet – 5 KL with 3 point level control system, atmospheric deaerator, insulation and cladding.**

**l. MS structural Supports, 1 Set**

Type – MS Structural Supports complete with 1 coat of primer to be supplied for the following installations/ mountings.

MS Structural Supports for

- (a) Feed water tank
- (b) Flue Gas Ducting
- (c) Boiler House Piping
- (d) Boiler House Electricals
- (e) Access Platforms for Meters

**m. CONDENSATE RECOVERY SYSTEM**

Maximum recovery & utilization of steam condensate from all process equipment shall be made. The system shall consist of facilities for receiving condensate in collection/buffer tank(s) of centrifugal pump(s) and pumping to an overhead condensate storage tank. From the overhead condensate storage tank, condensate water to be transferred through gravity/pumping to boiler feed water tank of boiler house.

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Condensate recovery tank, equal to one-hour operation of boiler at full capacity, shall be provided to collect the clean condensate from plant. The quantity collected shall be measured through a Vortex type flow meter and data shall be transferred to Boiler PLC and also to central control room. The condensate collection lines from various steam traps to be led & connected with adjacent header lay on pipe rack for transferring to collection tank by centrifugal pump. The pumping traps of all water heaters/ CIP heaters etc. shall be of **compact design**. The milk/cream pasteurizer steam traps shall be selected to ensure complete clearing of condensate with the help of minimum quantity of motive steam against back pressure without effecting process heat requirement. Similarly, the TD-3 trap assembly for all steam headers/distribution lines shall be of **compact design/single piece**. Wherever possible the condensate from main steam headers/ distribution lines would be recovered for utilization. MOC of all condensate transfer piping shall be SS316 with hot insulation.

#### **N. Boiler House Piping - 1 Set**

The vendor shall deliver boiler house piping as detailed under.

- (a) Feed Water Piping from the Feed Water Tank to the individual feed water pumps complete with inlet Isolation Valves – 2 Nos and Strainers – 2 Nos. Inclusive of Insulation & Cladding.
- (b) Safety Valve Exhaust Piping from the outlet of the Safety Valves to outside of the boiler house, complete with insulation & cladding.
- (c) Blowdown piping from the outlet of the blowdown control system to the Blowdown pit.
- (d) Drain Piping from the boiler drain points, drain from the feed water tank shall also be delivered by the Vendor.
- (e) Steam piping and condensate piping of entire plant with all necessary valves, fittings and insulation shall be in the scope of the bidder.

#### **2.0 Extent of Supply**

The package boilers for specified duty shall be supplied complete with all accessories in all respects, but not limited, to the following, within vendor's battery limit.

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- Briquette/wood fired package boiler complete with all accessories as specified such, FD fan, boiler mountings, motors, starters, etc. Foundation bolts for all items to be supplied.
- Two feed water pumps of adequate capacity and rating complete with motor, starters etc.
- All necessary instrumentation complete with pre-wired control panel
- Inter connecting piping, fittings etc.
- Inter connected power & control wiring and instrument tubing etc.
- Items required for installation, commissioning & start up of boiler

The following items, but not limited to those mentioned, shall be supplied with the boiler.

### Pressure Parts

Boiler Shell	1 no.
Tube Plates	2 nos.
Furnace Flue	1 no.
Combustion Chamber	1 no.
Boiler Tubes	2 lots
Stays (Tubes, Bars, Gussets)	1 lot
Mud door on tube plate	1 no.
Man door	1 no.
Stand Pipes for Stop, Feed check, Safety and Blowdown Valves	1 lot
Stand pipes for gauge glass and level controller	1 lot

### General Construction Parts

Front casing with hinged door	1 no.
Rear casing with removable doors, Flue outlet flange	2 lot.
Insulation and sheeting for boiler shell	1 lot.
Refractory for front & rear access doors with support base frame. Refractory for furnace ring / burner ring	1 lot.

### Accessories

One Induced draft fan with coupled with motor and base frame	1 set
Primary air inlet with/ without FD fan	1 set
Firing / Poking door	1 set
Ash removing doors	1 set
Bigger fire doors for wood	1 set
Multistage feed pumps with motors and base frame. (cap 1.5 times boiler feed rating)	2 nos.

### Mounting & Fittings

Main steam stop valve	1 no.
Safety valve	2 nos. (with each capable

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	of 50% venting capacity)
Non return valve on feed water pump discharge line	2 nos.
Stop valves on feed water pump discharge line	2 nos.
isolation valves on suction side of feed water pump	2 nos.
Air vent valve	1 no.
Isolating valve for pressure gauge on feed water line	1 no.
Auxillary valve	1 no.
Blowdown valve with Automatic Blowdown Control System	1 no.
Isolating valve for water level controllers	2 nos.
Isolating valve for pressure switches and pressure gauge	2 nos.
Drain valve for water level controller	2 nos.
Sight glass assembly	1 set

### Instrumentation

Water level controllers	for feed pump operation and low water level alarm
Over-ride controller	for lockout under extra low water level alarm
Water pressure gauge with cock	For display of boiler feed water pressure
Steam pressure gauge with cock	For display of boiler steam pressure
Water level gauge assembly	For display of water level in the boiler
Switch gears, relays, connectors	For individual controls of equipment through control panel
Audio / visual alarm	In case of unsafe operation for lockout under extreme conditions
Pressure and temp gauge with thermostat	for burner operation
Steam pressure switch	For combustion control
Control panel	For housing above instruments and switchgears
Temperature indicator	For monitoring high flue gas temperature

### Controls & Safeties

Pressure switch	For firing positions of burner
UV Cell	Flame failure and audio visual alarm
Sequence controller	To control sequence of firing, pre-purging etc.
Level controller	To regulate feed water pump operation and trip burner in case of very low level with audio visual alarm.

### Safety Interlocks

Unsafe condition	Instrument	Action
High water level	Level controller No. 1	Feed water pump trip.
Low water level	Level controller No. 1	Alarm & Burner Shut down

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Extra low water level	Level Controller No. 2 (Overriding controller)	Alarm & lock-out
Flame failure	Photocell	Alarm & burner trip
Boiler high pressure	Safety valves	Lift & discharge
Very extra low level	Fusible plug	Fusible plug blow
Stack Temp high	Temperature switch	Alarm and boiler shut down

### **Electricals**

The control panel must be a part and parcel of boiler/boiler package. It should contain all necessary switchgears, safety alarms/interlocks and burner management system and is to be mounted on the boiler itself eliminating any cabling requirement at site.

Boiler should be complete with all necessary electrical cabling from the control panel till burner / FW pumps etc. Power cables shall be 1100 V grade, PVC insulated & PVC overall sheathed. Control cables shall be multi-strand copper conductors of minimum 2.5 sq.mm. All motors shall conform to squirrel cage induction motors, TEFC, IP-55, class 'F' insulation.

### **MCC Cum Control Panel**

A MCC cum control panel, complete with main isolator switch, starters, auxiliary contactors, relays, fuses, rotary switches, indicating lamps, isolator, hooters with programmer and combustion safety relay. The panel should be completely pre wired and factory tested. It should be mounted on the boiler itself and shall not require any separate foundation.

### **Insulation & Cladding**

The boiler should be completely insulated in the factory itself and there should not be any site work involved for insulation and electrical cabling. The cylindrical shell of boiler must be insulated with glass wool / Rock wool mattresses of desired thickness and should be housed in a box shaped CRCA covered frame giving the boiler a provides neat appearance and also reducing heat loss due to the air gap between insulated shell and outer sheet metal cover. The top plate of the box should be designed to provide working platform for maintenance.

### **Refractory**

Suitable refractory material is provided for all required parts as follows :

Front door : Ceramic fiber blanket with SS sheeting

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Rear door : Hysil blocks with Kynex HG / Insulyte 7

Furnace ring / burner ring : Hysil blocks with Insulyte 7

### **Pollution control equipments**

All required pollution control equipments as per local Pollution control board shall be supplied such as Dust collector, etc.

### **Other items:**

- a. Flue gas ducts between boiler and dust collector, dust collector to ID fan inlet and ID fan outlet to chimney.
- b. Air ducts between primary FD fan and primary air inlet dampers if required
- c. Chimney.
- d. Insulation of main shell and furnace.
- e. Insulated Feed Water storage tank of minimum double the boiler drum volume. This will be equipped with de gasser, level controller, feed water inlet, outlet, overflow, drain, level indicator etc. this will be installed at required height , provided by the bidder as apart of tender. All valves, accessories and controls are included in the scope of supply. The soft water line from one point in the boiler house (made available by purchaser) shall be included in the scope of supply.
- f. All steam, cold water, hot water and drain piping up to and from our terminals points.
- g. Labour, tools and tackles, utilities such as water, power, compressed air, fuel, etc. from one point in boiler house
- h. Consumables required for assembling, erection and commissioning the boiler. Other equipment. Spares for installation, operation and maintenance.
- i. IBR inspection and registration and any other IBR welding to be done at site.
- j. Necessary ladder, catwalk platform etc. for smooth operation
- k. Any other Pollution control equipment with necessary connecting ducting etc.
- l. Supply of Refractory and refractory work.
- m. Insulation and Lagging work wherever required.
- n. Any other item is not specifically mentioned above
- o. All IBR approvals including piping as well as boiler plant shall be in bidder's scope.

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### **3.0.Services**

The following services shall be provided by the vendor –

- Supervision of Erection & Commissioning
- IBR Approval of Boiler and IBR lines and all other required accessories.

### **4.0.Inspection & Approvals**

The boiler shall be subject to inspection and testing in accordance with latest IBR codes.

Boiler fabrication shall be subject to inspection & testing in accordance with latest revision IBR. Manufacturer shall ensure that the boiler meet the requirements of the Inspectorate of boilers.

Simulation test of boiler control panel shall be carried out in presence of customer's representative at the place of manufacture before delivery.

Boiler/ piping shall be hydro-tested at works.

### **5.0.Guarantees**

The boiler supplier shall guarantee the following

1. The boiler shall be guaranteed for trouble free operation for a period of 12 months from the date of handing over or 18 months from the date of receipt of material at site whichever is earlier.
2. Performance guarantee runs shall be conducted as per BS 845 part I – 1987 indirect test method – after one month of continuous trouble free operation.
3. Any defect due to faulty material / bad workmanship shall be rectified free of cost to the entire satisfaction of the purchaser.
4. All guarantees from equipment suppliers will be vested in the client.

### **6.0**

#### **INSULATION**

Thermal insulation of steam lines with resin bonded mineral wool including cladding with 22 G Al. sheet as per IS 737-1900 (new designation).

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## **A) STEAM VALVES AND FITTINGS**

The following shall be provided wherever required between boiler outlet and steam utility points : Cast steel flanged globe/ ball valves, CI strainers with brass screen, thermodynamic steam traps, needle valves, moisture separators, safety valves, non return valves (GM with SS Working Parts), dial type pressure gauges for HP and LP steam etc. Steam trap set-ups shall be complete with by-pass valves.

Steam flow meter to measure steam feed to various sections of the plant. Temperature sensor shall simultaneously give feed back to DCS for real time control for conditioning. A pneumatic operated steam control valve shall automatically control the feed rate of steam to the controller, regulated by the feed back received from the temperature sensor in the controller. By pass of the control valve shall be provided.

## **B) WOOD FEEDING SYSTEM TO BOILER**

Suitable manual wood handling and feeding system to boiler shall be considered. This shall be required to ease up the process of feeding fuel to the boiler

### **3.4.7 REFRIGERATION SYSTEM FOR CHILLED WATER AND COLD ROOMS.**

The required chilled water at 1 C for the process and product manufacturing activities shall be generated through a Ammonia refrigeration system with required compressors with standby provision. Adequate number of Ice Bank Tanks each of 50 KL capacity shall be used to store the Chilled water. The system shall be equipped with necessary ammonia receivers, pumps, Evaporative condensers, Electrical motors etc for effective operation.

The cold rooms are equipped with ammonia evaporators to maintain the required temperature.

Further distribution up to consumption point shall be in scope of tenderer. The system should be forced feed refrigerant type provided with necessary refrigerant liquid receivers, pumps, Economizers, prechillers etc for satisfactory operation

#### **3.4.7.1 Design, supply, erection, testing & commissioning of Refrigeration system as per the requirement indicated below.**

The scope of work includes following.

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- Design, supply, erection, testing & commissioning of Reciprocating ammonia Compressor packages for high stage operation of Chilled water system & various cold rooms, Evaporative type Condensers, HP & LP Receivers, Ammonia Pumps, IBT tank with Hot dip Galvanized Coil, Chilled water pumps for various chilled water systems, ACU for various Proposed Cold rooms, Electrical MCC panel, Controls systems, Control panels, Control instruments, Power / Control / Instrumentation Cabling, Safety systems, inter locking etc.,
- Design, supply, erection, testing & commissioning of all the electrical equipments, pipelines, valves, fittings for entire refrigeration system, pipe supports inside cold rooms and machine rooms, chequered plate for trench covers, Painting for new system's equipments & for un-insulated pipes etc., wherever required for the entire work.
- Fixing the PUF Panels Panel with both sides of PCGI Sheets with suitable size and thickness doors for various Cold rooms as per the room size and providing internal lighting, Safety System wherever required.
- Design supply, erection, testing & commissioning of MCC Panel with Power & Control wiring for proposed Refrigeration system equipments including feeders / suitable type starters for Future Equipments.

### 3.4.7.2 Details of Direct Expansion Refrigeration Loads for various Cold Rooms

		Milk Cold Room	Curd Incubation Room	Curd Cold Room	Cud Blast Room
Size of each chamber	:	6.77 x 6 x 3.8-m Ht	4.5 x 2.77 x 3.8-m	4.5 x4.77 x 3.8-m	4.5 x 3.77 x 3.8-m
No of Chambers	:	Two	One	One	One
Ante room Details		2.23 x 6 x 3.8-m		4.5 x 2 x 3.8 -m	--
Incoming load / Batch	:	50,000 Ltrs.-Totally	2000 Kgs	2000 Kgs	2,000 Kgs. Max
Product temp. to be maintained	:	3 to 4 °C	40 to 42 °C	4 °C	18 °C
Incoming product temp.	:			18 °C	42 °C
Room temp to be	:	0 to 2 °C	0 to 2 °C	0 to 2 °C	0 to 2 °C

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maintained					
Pull down time	:	4 Hours	4 Hours	6 Hours	2 Hours
Compressor Operating Duty	:	-10°C / 38 °C	----	-10 °C / 38 °C	-10 °C /38 °C
Roof not exposed to sun	:	No	No	No	No
Floor insulation (PUF Slab)	:	100-mm	100-mm	100-mm	100-mm
Ceiling & Wall Insulation	:	100-mm	100-mm	100-mm	100-mm
Electrical equipment Load	:	FDC	Heater	FDC	FDC
No. of Workers	:	4+4	4	4	4

**NOTE:** PUF Panels & Doors unit rate (rate per sq. mtr.) to be indicated in commercial bid and tenderer has to supply as per BOQ quantity. However any change in room size or orientation, then Bidder has to supply and install PUF as per site requirement indicated and any Variation (additional / less in quantity) in quantity will be settled after final inspection on actual site joint measurement based on unit rate cost as per final negotiated tender rate.

**3.4.7.3 Basis for Proposed Refrigeration Plant & Summary of Proposed System for Thoothukudi Dairy for 50,000 LPD**

- 1 The refrigeration system shall use ammonia R717 as refrigerant and liquid distribution shall be of liquid over feed system for high stage of ice water plus various cold rooms.
- 2 Refrigeration system comprising of High Stage Reciprocating as per Basis of Design with Evaporative Condensers, HP Receiver, LP Accumulators, IBT System, Forced Draft Coolers for various Cold rooms and the system shall fully automated and equipped with all necessary equipments to cater the following loads.
  - Refrigeration Equipments to cater Chilled water loads to various chilling, processing & cooling requirement of entire Dairy
  - Direct Expansion System for Various Positive cold rooms
- 3 Proposed plant shall be equipped with necessary equipments as per the Basis of Design within the specified battery limit.  
 Total Chilled loads will be Chilled thro IBT Combination at -10 °C suction systems and all Positive cold room loads also run at the same common - 10°C suction systems. The above -10 °C Ammonia Based systems will be operated through Ammonia pump system.

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- 4 Proposed system consists of totally Two nos Reciprocating compressor of each 65 TR for at –10 °C Suction for all Chilled water and Positive cold room loads system, out of two nos, one shall act as common stand by compressor.

Suppliers/ Bidders scope includes supply of 2 nos. x 120 TR (1 w + 1 s) Evaporative type Condenser with SS Basin, 1 Nos. H.P Receivers of 4,000 Liters. each capacity, suitable size Ice Bank Tank with Hot Dip Galvanized Coil of 1,536 rmt x 1 Set , 2 Nos. x 60 M<sup>3</sup>/hour at 40 MWH Vertical inline Chilled Water Pump for process Load ,out of which one shall act as stand by.

Bidder scope includes New MCC Panel, Ammonia Pump system for –10°C application, Automation PLC Panel etc., Air Cooling Units (ACU) for Various cold rooms & PUF Panels for flooring, Walls & Ceiling with Accessories.

- 5 Condenser shall be imported make with SS Water Basin. Condenser to be selected with 28 °C WBT and 37 °C condensing temp and ensure to be selected with extra large heat transfer area felicitate to reduce power consumption in fan & pump . All condenser fan and pump motors shall be IE-4 with 1.15% safety factor. Condenser to be selected with Large capacity Heat transfer coil surface area to reduce connected Fan and pump Load.
- 6 Scope includes common Ice Bank Tank made of Hot Dip Galvanized Seamless tubes of SA 106 Grade with r.m.t of 1,536 x 1 sets.  
Scope includes necessary PUF Tank cover, Liquid feed assembly & Agitators for proposed New IBT. Bidder has to Provide new ice thickness controller for each IBT and providing control / instrument cabling from new central control panel, as well as to solenoid valves of liquid feed assembly for controlling / monitoring from central control panel.
- 7 Bidder to supply suitable capacity Two nos each Vertical Inline Multi stage pump for chilled water application for Processing as per flow rate and Head indicated in tender, all pumps shall be VFD drive with minimum rating of IE-4 Motors and shall be supplied with standby pumps as per BOQ quantity.
- 8 Bidder scope includes additional valves in the Headers for future / standby compressor & condensers in each application so that future equipments to be connected without any interruption of running plant in future. Also

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Supplier has to consider necessary valves in Priority Vessels & LP receiver for future connections and all drawing to be get approved prior to commence / process of equipments and during drawing approval any additional valves required considering future interconnection, then successful supplier / bidder has to includes / incorporate the same in the quoted price without any additional cost.

- 9 Similarly Chilled water supply and return Headers to be designed for all proposed pumps working + additional same capacity and same no of pumps working in future.
- 10 All ammonia pumps shall be Seal free Hermetic types. Bidder scope includes new ACU made of SS tubes with Al Fins as per tender specified capacity for various cold rooms with Powder coating casing or SS Casing and scope including Liquid feed assemblies comprising Strainer, Liquid Solenoid Valve, Isolating Valve, valves Bypass, Metering Valve, Pump-out connection, valves & plugged, pressure gauge connection with isolation valve and Pressure Gauge. Scope includes power, signal and control wiring from proposed new MCC/ Sub MCC for the all ACU. The bidder has to supply of new Air cooling units with Fins space shall be of as per tender specifications. All positive and Negative application room ACU shall be suitable for pump system. ACU Fan motors shall be IE-3 Specification.
- 11 Bidder scope includes suitable rating SS Made Room Heaters for Curd Incubation room.
- 12 Also, necessary refrigerant Pipe Insulation inside all Cold Rooms & inside processing hall (if refrigerant routing pass thro inside processing hall) shall be SS cladding. Like that all supports for piping and equipments inside various / all cold rooms shall be SS Box type supports. Outside Cold room & machine room shall be With PUF insulation & Al cladding .All supports outside cold rooms & machine room shall be spray Galvanized. Like SS cladding inside cold rooms, all Cable trays inside cold rooms shall be SS Cage type SS trays. All Drain lines inside Negative temp rooms to be provided with Heating tape and then to be insulated with cladding.
- 13 Supply of MCC Panel for proposed Refrigeration system including space/ spare Feeders for future loads of refrigeration system and provision of I/O

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modules for various proposed system's stand by equipments, Air curtains, Lighting loads.

- 14 All motors above 3.7 KW (5 HP) to be supplied with soft starter/ VFD as per details and below 3.7 KW ( 5 HP) shall be DOL Starters
- 15 All Compressor motors are Super Premium energy efficient IE-4 efficiency & all VFD Panels are IP-54 covers of OEM.
- 16 Minimum Efficiency to be considered for various motors are as follows:
  - Compressor motor & Condenser Fan and Pump and Chilled water pumps : IE-4
  - Ammonia pumps, Agitator & all Air cooling unit fan motors of above 0.37 KW : IE-3
- 17 All pipelines are Seamless SA106 Sc.40 up to -19 °C and SA 333 for below - 20 °C
- 18 All pressure vessels are 100% radio graphed and made of SA 516 Gr. 70 plates. Bidder or their Authorized Agency should have "U" Stamping certificate for manufacturing Pressure Vessels and has to produce certificate.
- 19 Floor insulation to be done by successful bidder as per tender quantity and specification. The concreting below & above floor insulation where ever required and any specialized floor finishing are required to be done by other agencies as per tender scope battery limits.
- 20 Complete Room PUF Insulation, necessary Doors, Air Curtain, Internal Lighting, Safety Systems for various Cold Rooms & Deep Freeze are part of supplier's scope and the same is as per BOQ and specification. PUF Panels shall be 0.5-mm thick PCGI (with SMP coating) Coated on both sides with 100-mm thickness for various Cold rooms and 120-mm for negative temperature rooms.
- 21 Providing 4 sets of as-build drawings, detailed operation and maintenance manuals (along with soft copies of same).
- 22 Implant training to the operating personnel in systematic operation and maintenance of the complete plant and its components in efficient and safe manner and successful bidder to train and supervise round O clock for One Months from the date of commissioning (max one person per shift).
- 23 Providing required First charge of refrigerant to attain designed temperature which is part of erection work. Scope includes supply of first

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charge of lubricating oil for proposed compressors, as required by compressor OEM recommendation and all consumables as required for initial testing commissioning and trial run.

- 24 It is necessary to keep Bye pass lines valves and controls, hot gas valves outside cold rooms but if room orientation is not suit to keep outside then successful bidder to finalize the same with purchaser during final layout approval. Purchaser will do necessary rain protected cover for this on later stage. All Drain line inside cold room area to be insulated and supplied with heating tape and height of drain line not less than 1.5 m from finished floor level.
- 25 All power cables should be armored cables as per standard size, but not less than 2.5 sq. mm. All cold rooms, PHE chiller and IBT are to be provided with local Temperature indicator on refrigerant and water side with IP-66 Enclosure.
- 26 Bidder scope includes necessary Harmonic Filter to maintain THiD Level within Limit, which generated in the system of the proposed all VFD's. Limit of current Harmonic less than 8 % and Voltage Harmonic less than 5 % as set by CEA. This may be common Panel and type of Filter (Active or Passive) shall be decided during Detailed Engg drawing approval and the same to be supplied on quoted price without any additional cost
- 27 The schedule of major items required for the proposed refrigeration plant at purchaser site is listed in BOQ. The capacity, sizes, rating of the equipments / system components mentioned therein are the minimum requirements. The bidders are required to verify the equipment selection for the proposed plant, based on the basis of design given in this section, so as to guarantee the required performance. In case the capacity / size / rating of various equipment specified in BOQ is not adequate to meet the design / performance requirement, as per the bidder's estimation, then bidder shall propose and quote for suitable higher capacity units (wherever necessary), duly supported by technical details. However, in case the actual requirement works out lower than that specified in BOQ, then bidder shall provide the equipment as per the BOQ only, without any deviation.
- 28 Bidder scope includes necessary one set of Special Tools & Kits for compressor, Condensers, Ammonia pumps, and standard recommended

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tools for various other refrigeration equipments and the same to be supplied in enclosed safety Box.

- 29 Bidder to supply one set of recommended spares for major equipments like all Compressors, condensers, Motors, Ammonia pumps, Instrumentations and its price to be included in individual equipments price itself.
- 30 All Condenser area and LP Receiver area to be provided with galvanized platform by Bidder for ease of maintenance and necessary drawing to be approved by Purchaser before commence the work.
- 31 Scope includes one no Water flow meter in return water header and suitable size and qty ammonia flow meter where ever required to measure flow and the same to be in readable format in PLC system.

#### **3.4.7.4 Further Points to be noted by bidder while making offer and during execution of work**

- a. Prior approval is required for layout plan, elevation, pipeline and instrumentation drawing before execution / starting of the work and any additional valves / pipes required for inter connection / modification of the system then the same to be supplied in quoted price itself.
- b. Since it is Turnkey job, it is successful bidder's responsibility to supply and commission the plant in all respects and any changes in pipe routing at site during drawing finalization with successful bidder or any missed out items, but must/required to commission the system, then successful bidder has to supply and commission the same in all respects on quoted price itself to get desired design parameters in all respects.
- c. All pipes shall be internally cleared and flushed by the Contractor during erection & for hydro static testing and flushing wherever required, the contractor shall arrange all tools and tackles and carry out all the pre commissioning procedure testing.
- d. The pipes, cables rates should be quoted as per site condition on LOT basis to commission the plant and any variation and additional quantity due to change in routing as well as for any change in location of equipments will be not entitled to claim for additional payments, but to supply and commissioned the plant in all respects.
- e. The successful Bidder/ contractor shall be fully responsible to execute all the work involved in implementing the project, within the battery limits,

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confirming to high standards of engineering design & workmanship and be capable of performing in continuous commercial operation to meet agreed performance standards in a manner acceptable to the union / client.

- f. Only for PUF Panels & Doors unit rate (rate per sq. mtr.) to be indicated in commercial bid and tenderer has to supply and install PUF as per site requirement and any Variation (additional / less in quantity) in quantity will be settled after final inspection on actual site joint measurement based on unit rate cost as per final negotiated tender rate. However no other items will be entitled to claim for any variation in price or additional in quoted price.
- g. Any necessary modifications, augmentation with supply of required materials which are not specifically mentioned above, however for satisfactory operation of liquid over feed system, as well as integration with the centralized automation and control system in all respect is included in the scope of bidder
- h. The proposed refrigeration plant load has mentioned above and Bidder has advised to work out Heat load calculation for all the above loads with 10% safety margin while estimating the refrigeration loads. The bidder has to submit detailed Heat load calculation for chilled water load and for each and every cold rooms with justification for selection of equipments.

**3.4.7.5 BOQ/ Schedule of Equipments with Brief Specification**

**3.4.7.5.1 Part – A : Refrigeration System**

Sl. No.	Qty	Item Description	Data
1.	2 Nos.	High Stage Reciprocating Compressor operating at –10 °C SST / 38 °C SDT with all associated accessories. (One shall act as standby.)	Min. Compressor Capacity of 65 TR
2.	2 Nos.	Motor for compressor	Min 90 KW with Premium EFF IE-4, 4 Pole, suitable for VFD compatibility.
3.	2 Nos.	VFD for the above motors	Suitable for the above compressor motor built in an IP 54.
4.	2 Nos.	Evaporative type Condenser with IE-4 Eff. Pump & Fan motors c/w all accessories (1w + 1s)	Min. suggested capacity 120 TR. Design condensing temp. is 37 °C, when the ambient WBT is 28 °C with SS Basin
5	1 No.	High Pressure Liquid Receiver with all valves and accessories	Suitable for the system (min. 4,000 L).
6.	1 No	–10 °C Low Pressure Liquid	Suitable capacity including

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		Accumulator of minimum size 1.37 x 3.6-m	provisions future expansions.
7.	2 Nos	Refrigerant Liquid Pumps for –10 °C	Flow rate Min. 12 M <sup>3</sup> / Hour at 35 MWC
8.	1 No	Air Purger – Automatic	Minimum 4 points.
9.	1 Set	Ice Bank Tank (indoor type) with stiffening arrangement fully made of M.S Sheet including supports.	Made of 8 mm MS Sheet for bottom and 6 mm for all sides, agitator plates and over all Min. tank of size 7.52 m x 3.2 m x 2.73 m.
10.	1 No.	IBT Coil made of M.S Seamless tubes SA 106 Grade Sch 40	IBT Coil of 1,536 RMT per Tank complete with necessary valves, Liquid feed assemblies & ice limit switch
11.	Lot	Tank Insulation	100-mm EPS Sheets thick insulation of 40 kgs. for bottom & for all sides and Partition plates
12.	1 Sets	Agitator and its frame	20" dia agitator with all accessories.
13.	Lot	FRP Covers for IBT	Min 80-mm thick made of PUF sheet suitable for the above IBT Tank size
14.	2 Nos.	Chilled water pump for Process	Capacity 60 M <sup>3</sup> at 40 MWC with overall
15.	4 Nos.	Forced Draft Cooler with controls and accessories for <b><u>Milk Cold Room</u></b> (fin spacing not less than 6-mm) incl. liquid feed assembly.	19,500 Kcal / Hour (Min.) with evaporating temperature of –10°C and room temp. 0 °C (temp diff of 7 °C to be considered for selection of FDC)
16.	1 No	Forced Draft Cooler with controls and accessories for <b><u>Curd Cold Room</u></b> (fin spacing not less than 6-mm) incl. liquid feed assembly.	18,000 Kcal / Hour (Min.) with evaporating temperature of –10°C and room temp. 0 °C (temp diff of 7 °C to be considered for selection of FDC)
17.	1 No	Forced Draft Cooler with controls and accessories for <b><u>Curd Blast Room</u></b> (fin spacing not less than 6-mm) incl. liquid feed assembly.	33,000 Kcal / Hour (Min.) with evaporating temperature of –10°C and room temp. 0 °C (temp diff of 7 °C to be considered for selection of FDC)
18.	1 No	Forced Draft Cooler with controls and accessories for <b><u>Ante Room of Milk Cold Rooms</u></b> (fin spacing not less than 6-mm) incl. liquid feed assembly.	6,000 Kcal / Hour (Min.) with evap. temp. of –10°C and room temp. 5 °C.
19.	2 nos	Room Heater for Curd Incubation room	12 KW each with all accessories.to maintain

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			room temperature 40 to 42 °C
20.	Lot	M.S Seamless pipes, valves, fittings and accessories for refrigerant, oil lines, etc. SA 106 Sch 40 for temp. up to –19 °C and SA 333 for below –20 °C	Suitable for the system including provisions for future expansion
21.	Lot	G.I. B class pipes, valves, fittings & accessories for cooling water, defrosting water, etc.	Suitable for the system including provisions for future expansion
22.	Lot	PUF pipes Insulation for pipes & vessels, equipment, etc. complete Alu cladding.	As per requirement
23.	1 Set	Main MCC for entire plant etc.	As per requirement including spare feeder for future equipments
24.	1 Set	Harmonic filter Panel	As per requirement to maintain THiD level as per specification.
25.	Lot	Power, Control, signal and instrumentation cables plus Cable trays & Accessories, chemical earthing & accessories	As per requirement and Alu cables for compressor motor and main cable and copper cables for all other equipment.
26.	Lot	Instruments & Safety accessories including Ammonia Leak Deduction.	As per requirement
27.	Lot	Compressor Oil and other consumables like Gas and charging hose	As per requirement

**3.4.7.5.2 Part – B : PUF Panel & Accessories**

Sl. No.	Qty.	Item Description	Data
1.	As per room size	Floor insulation with all accessories for Various Cold Rooms	Conventional insulation for PUF slabs in two layers (each layer having 50-mm thick) of total 100-mm thick
2.	As per room size	Walls & Ceiling insulation with all accessories for Various Cold Rooms	Pre-engineered pre-fabricated sandwiched (PCGI) rigid Poly Urethane Panel 100-mm thick, 0.5 mm thick sheet
3.	Lot	Internal electrification of various cold rooms.	As per requirement moisture proof fittings as per lay out drawing)

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4.	9 nos	Manual Sliding type Door for Various Cold rooms.	80-mm PUF insulated door of size 1.5 x 2.1 mt.
5.	9 nos	Air Curtains and PVC strip curtain	Air curtain for 1.5 x 2.1 mt. Door
6.	1 Lot	Cold Store Safety Systems for cold rooms	As per requirement
7.	1 lot	Anything additional to above	

Note: As per final site condition, if any variation in PUF Quantity with respect to Tender quantity on either side shall be settled upon joint measurement and will be settled to successful bidder accordingly.

### 3.4.7.6 Reciprocating Compressor for High Stage

The Compressors shall be of "V/W" type Reciprocating, single acting, multi cylinders specifically intended for continuous operation with the refrigerant and at duties scheduled.

For each type of compressor, a complete set of special servicing tools shall be supplied. The bidder shall also furnish details of list of essential spare parts with price list for two year operation.

Each compressor shall incorporate:

1. Suction and delivery valves.
2. Suction, scale trap with strainer
3. Automatic 100% unloaded starting
4. VFD controlled compressor speed for capacity control.
5. Refrigerant Cooled Head to be provided (No cooling water or Air circulation)
6. Compressor in-built safety valve and its piping.
7. Oil pump and distributor.
8. Oil level sight glass to see oil level in the crankcase.
9. Flywheel, drive coupling and guard.
10. Controls and accessories
11. Oil separator of suitable size to match the compressor capacity with counter flanges, float valve and strainer for automatic return of oil to the crankcase of the compressor with bypass arrangement. The external oil drain line facility with isolating valve shall also to be provided.
12. In case of refrigerant cooled head cooling system complete with suitable shell and tube heat exchanger, (common for all compressors including

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future compressors installed at suitable height above high pressure liquid receiver), instruments and controls for maintaining proper temperature of oil returning to compressor with necessary control valves, isolating valves, inter connecting pipelines, safety features, oil drain arrangement, etc., complete as required.

13. Crank case heater with protection fuse and automatic thermostat to CUT-IN automatically when the compressor is in OFF mode and CUT-OUT automatically when the compressor is in ON mode, so as to maintain the oil temperature in the crank case at the desired level and as recommended by the compressor manufacturer.
14. The compressor and the motor along with drive coupling and coupling guard shall be mounted on a machined surface embedded on to a common base frame with alignment locating points, factory established to ensure correct positioning of motor and compressor, when mounted at site.
15. Discharge and suction gas thermometer pockets.

#### **Compressor Controls, Panels and Accessories**

Each compressor shall be provided with local gauge control panel with:

1. HMI for automatic capacity controller panel with pressure transmitter in suction line of each compressors. The pressure transmitters should be provided for display in HMI of oil & discharge pressure and safety interlocks for each compressor.
2. Pressure gauges showing suction, discharge, and oil pressures and temperature gauges showing suction gas and discharge gas temperature. Liquid filled gauges for pressure application and plain dial type gauges for temperature application shall be used.
3. Safety cutout switches for:
  - High refrigerant pressure
  - Low refrigerant pressure
  - Low oil pressure

These safety cutouts shall be of manual reset type and shall incorporate contacts for failure indication.

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All pressure gauges and temperature gauges as well as safety cut-outs shall be mounted on compressor control cubicle/panel, which is made out of CRCA sheet steel, totally enclosed construction. The control panel shall have locking facility to prevent tampering of safety cutout settings by unauthorized persons. All cut outs shall be mounted inside the cubicle with a slot open for re-setting the "OP" in case of "OP" failure. The failure indicating lamp, pressure gauges, temperature gauges shall be mounted inside the control panel. The nameplate details to indicate LP/OP/HP suction temperature; discharge temperature shall be affixed in front of the panel board below the respective gauges. However, the dials of all the gauges and the indicating lamps shall be projected outwards on the front face of the control panel. Necessary Toggle switches for capacity control, etc. in manual mode shall be incorporated.

Set of complete special servicing tools, operation/maintenance manual and spares for 2 years operation including oil filter elements, for each compressors shall be supplied. The bidder is requested to detail this in the offer.

Necessary test certificate and detailed test report for the factory tests to be submitted to purchaser at the time of delivery to site.

**3.4.7.6.1 Motors**

The motor for high stage compressors shall be of Super Premium efficiency ( IE-4 ), TEFC squirrel cage, heavy duty, high starting torque, AC induction motor, horizontal foot mounted suitable for, 4 Pole, 415 V  $\pm$  10%, 50 Hz., 3 phase supply of rating suitable for continuous duty for compressors. The motor shall be equipped with winding thermistors. The motor shall be assembled on compressor base frame, duly aligned complete with all accessories. The motor should be suitable for VFD Compatibility and speed controls according to suction pressure and capacity control.

Table for Minimum Acceptable Motor Efficiencies		
Motor Size (KW)	Efficiency (%)	
	2 Pole	4 Pole
1.1 (1.5 HP)	82.7	84.1
1.5 (2 HP)	84.2	85.3
2.2 (3 HP)	85.9	86.7
3.0 (4 HP)	87.1	87.7

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4.0 (5.5 HP)	87.6	88.3
5.5 (7.5 HP)	89.2	89.6
7.5 (10 HP)	90.1	90.4
11.0 (15 HP)	91.2	91.4
15.0 (20 HP)	91.9	92.1
18.5 (25 HP)	92.4	92.6
22.0 (30 HP)	92.7	93.0
30.0 (40 HP)	93.3	93.6
37.0 (50 HP)	93.7	93.9
45.0 (60 HP)	94.0	94.2
55.0 (75 HP)	94.3	94.6
75.0 (100 HP)	94.7	95.0
90.0 (120 HP)	95.0	95.2
110.0 (150 HP)	95.2	95.4
132.0 (180 HP)	96.4	96.4
160.0 (215 HP)	96.5	96.6
180.0 (240 HP)	96.5	96.7
200.0 ( 270 HP)	96.5	96.7
225.0 ( 300 HP)	96.5	96.7
250.0 ( 335 HP)	96.5	96.7
315.0 ( 425 HP)	96.5	96.7

#### **NOTE**

The above is minimum efficiency and Bidder has to quote as per efficiency range indicated in other pages for compressor , Condenser fan and pump and Chilled water pumps with IE-4 efficiency and IE-3 for Ammonia pumps and Air cooling units Fan motors above 0.37 KW.

#### **3.4.7.6.2 Starters**

- AC variable speed drive with all accessories for the High stage Reciprocating compressor motor and it shall be supplied with harmonic filters line choke confirming to electro-magnetic compatibility.
- The VFD includes over load, short circuit, earth fault, single phasing low / high voltage protections, relays responding to winding thermistors, digital ammeter and current transformer, metering grade, time totalizer, electronic kwh meter, auxiliary contactor to feed control supply to capacitor contractor situated in MCC to ON the capacitor while motor is in operation.
- The VFD shall be housed in suitable floor mounting, free standing dust and vermin proof, powder coated enclosure with ventilation fan door locking arrangement, etc. The VFD panel shall have suitable rating MCCB as incomer

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with copper bus bars, inter connection, power / control terminal blocks with adequate space for termination of power / control cable.

#### **3.4.7.6.3 Evaporative Condenser**

Condenser designed for compressor load plus 10 to 15% safety factor .Condenser will be induced draft counter flow design ammonia condensers suitable for vertical discharge comprising coil section, drain section, fan section, water distribution with eliminators and louvers. The condensers supplied with necessary air inlet screen, float control water valve, hot gas inlet connection with valve and liquid outlet connection with valve.

All cold water basin components including vertical supports and air inlet louver frames are constructed of **Stainless Sheet**. Casing, channels and angle supports are constructed of heavy gauge mill hot dip galvanized steel. All galvanized steel is coated with a minimum of 2.35 ounces of zinc per square foot of area (G235 designation). During fabrication, all galvanized steel panel edges are coated with a 95% pure Zinc Rich compound for superior protection against corrosion.

#### **3.4.7.6.4 Coil:**

Thermal pack coil design of all prime surface steel tubes encased in steel frame work with entire assembly hot dipped galvanized after fabrication. Tubes will be sloped for liquid drainage. Coil(s) will be pressure tested to 375 psig air under water.

#### **3.4.7.6.5 Fan with Fan Motor**

Fan of axial propeller type constructed of aluminum alloy complete with suitable rating, totally enclosed air over type with 1.15% service factor & IE-4 Specification. The fan drive is a multi-groove, solid pack and the sheave constructed of aluminum alloy.

#### **3.4.7.6.6 Water Distribution System**

Heavy duty molded nylon ZM spray nozzles with large 1-5/16" diameter opening and internal sludge ring to eliminate clogging. ZM nozzles are threaded

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into Schedule -40 Polyvinyl Chloride headers equipped with removable end plugs for ease of cleaning.

#### **3.4.7.6.7 Eliminators**

The eliminators are constructed entirely of Polyvinyl Chloride (PVC) in easily handled section. Design incorporates three changes in air direction and limits the water carry over to a maximum of 0.001% of the circulating water rate.

#### **3.4.7.6.8 Pump**

Closed coupled centrifugal pump of suitable rating as per OEM with mechanical seal with pump motor which is totally enclosed with protective cover. The pump shall be supplied with metering valve and it shall be IE-4 Specification.

#### **3.4.7.6.9 Air Inlet Louvers**

The air inlet louvers are constructed from UV inhibited Polyvinyl Chloride (PVC) and incorporate a framed inter locking design that allows for easy removal of louvers for access to the entire basin area for maintenance. The louvers have a minimum of two changes in air direction and are of a non-planar design to prevent splash out, block direct sun light and debris from entering the basin (Patent Pending).

The condenser shall be supplied with necessary make up float valve assembly, Pan Strainer. The condenser having provision of hinged door for easy maintenance.

Scope includes necessary electronic water level control system in the basin with a solenoid activated valve in the makeup line.

Our scope of supply includes the following accessories:

- Gas & Liquid inlet & outlet valve
- Dual safety valve with housing material with low temperature steel. Safety valve as back pressure dependent 2 nos.
- Isolating valve for pumping out
- Air Purge connection
- Pressure Gauge with valve

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- o Make up water connection with all fittings

Any Base frame where ever required as a structural members (all in galvanized steel construction) shall be included in the scope of work

#### **3.4.7.6.10 HP Receiver**

Ammonia liquid Receiver complete with:

- liquid inlet and outlet valves, Charging valve
- Dual safety valve with housing material with low temperature steel. Safety valve , 2 nos. purge valve,
- Quick drain valve with built in integral relief opening for safety, pressure gauge,
- Liquid gauge glass indicator with valve.

The HP receives will be inter connected with suitable isolating valve in order to act as single vessel. All Gauges and controls shall be directly mounted on needle valves, thereby eliminating additional weld joints. The receiver shall be complete with M.S. saddle supports.

All Ammonia valves & controls shall be manufactured from low temperature steel in accordance to EN 12284 / Equivalent standards. All valves and controls shall be preferably weld able valves to avoid leakage through flange joints.

The vessel shall be of IS: 2002 / SA 516 and IS: 2002 Clause –I and all the welding joints are tested 100% radiographed.

#### **3.4.7.6.11 Air Purger**

Multi point electronic Air Purger operating on 220 Volts, 50 Hz. The purger includes gauge glass, one no. electronic purger controller, solenoid valve, thermostatic expansion valve, strainer, liquid seal trap and metering Valve.

#### **3.4.7.6.12 LP Receiver**

The Refrigeration bidder to design separate LP Receivers for –10 °C. Necessary provision shall be made for future expansion fabrication / manufacturing of Pump

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Separator shall be carried out as per IS Code 2825 "Unfired Pressure Vessel - All weld joints shall be 100% radio graphically tested.

o **LP Receiver to be Supplied / Fitted With**

- a. Suction gas outlet shall be of dome type provided with mist eliminator. The gas outlet from the dome shall be with valve.
- b. Suction gas inlets (wet return) with valves
- c. Liquid outlets to circulating pumps with valves. (two spares for future pumps)
- d. Oil drains connection with valve and with suitable receiver at the bottom. A receiver of approx. Capacity 50 lit. Shall be provided with level indicator and all accessories at the bottom for collection of oil with oil drain facility using Quick Drain valve. Including provision for electrical heater for rectification of oil with necessary safety valves and all accessories as required. Plugged bottom drain.
- e. Liquid level control tapings, 2 Nos., valves. The liquid level manifold shall be provided for mounting Electronic liquid level transmitter cum sensor and high level electro Magnetic float switches shall have oil drain pot and provision to drain oil through oil drain valve. This header shall be insulated for better function of float controls. The header pipe diameter shall be minimum of 125 mm.
- f. Motorized Expansion valve controlled by liquid Level controller in the main liquid line from receiver shall be provided. The conventional valve train comprising of inlet Stop valve, Filter, solenoid valve with manual opener, Expansion valve and outlet stop valve can be replaced by ICF block type valves, which can reduce the number of weld joints from 10 to 2 and also brings in life time savings through lower operation cost and minimal down time in case of service / maintenance / break down.
- g. Liquid level gauge tapings, 2 No., valves. The branches to the gauge shall include isolation valves and automatic shut-off for gauge breakage.
- h. Mounting pads for. Level switches, high safety.
- i. Vapors vent connection from circulating pumps, with valves.
- j. Dual safety valve, housing material with low temperature steel. Safety valve , 2 nos. purge valve,
- k. Pressure gauge tapping with needle valve isolating the pressure gauge.

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- l. Manual fill connection with valve.
- m. Pressure stat connection with needle valve.
- n. Pump-out connection, valves and plugged.
- o. Suitable purge pipe arrangement to receive discharge gas from low stage compressor, with valve.
- p. Two nozzles shall be extra for gas returns from pressure differential switches and oil vessel. The vessel shall be supported on saddles adequately braced and gusseted to the shell. All mild steel support parts shall be hot dip galvanized after fabrication. The supporting structure, platforms and ladder are included in the scope of supply. Thermal barrier of approved construction to be incorporated.

**Each accumulator vessel shall be provided with:**

**Liquid level control:** A suitable Electronic liquid level transmitter (AKS Series or Equivalent type controls of Radar based technology) with suitable standalone controller to monitor and control the liquid level. The level transmitter shall give continuous feedback to Central PLC panel for dynamic display of the actual liquid level in the vessel. The controller shall give required input to the modulating Motorized expansion valve (ICM with ICAD actuator or Equivalent type / model controls) to maintain the desired liquid level accurately in the accumulator using in built PID functionality.

**High level Safety switches:** Electromagnetic micro switch mechanically operated,

**Pressure Sensor:** Fit a modulating pressure controller of all-steel construction and rated for the operating pressures on each accumulators. The vessels shall be mounted outdoor (in such height that it meets the requirement of the minimum Net Positive Suction Head (NPSH) of the Liquid Ammonia Pumps installed below the vessel manual type oil rectifier of vertical type with M.S. shell of size 500–mm dia x 1,400–mm long complete with inlet valves, outlet Quick drain valves, gauge glass, pressure gauge with valve, safety valve, electrical heater with thermostat and hot gas heating arrangement.

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#### **3.4.7.6.13 Ice Bank Tank & Accessories**

Ice Bank Tank fabricated out of MS sheets of 6mm thick for all sides & agitator plates and 8 mm for bottom plates with Single compartment. The tank shall be complete with necessary stiffening arrangements. The tank shall include a central baffle and guide end plates at all corners of the tank.

The tank shall be complete with flanged outlet, return water connections, over flow and make up water inlet with float valve, etc. However necessary concrete floor over insulation as well as Brick walls around the sides of IBT Tank to be done/ arranged by purchaser. The supplier shall thoroughly re-rust the IBT side walls after fabrication and after leak testing apply 1 coat of 100 microns thick epoxy based high built primer followed by 2 coat of high built epoxy based paint of 100 micron thick for each coat of paint of approved make. Scope includes painting inside existing IBT Tanks

#### **3.4.7.6.14 Ice Bank Tank Coil**

Ice accumulation coil fabricated out of 32 mm Seamless SA 106, Sch. 40 pipe. The coil shall be designed suitable for Over Feed System with necessary liquid inlet / outlet and gas inlet / outlet valves and the coil will be 'I' type (ASTRA type). **The Coil Shall Be Spray Galvanized after its Fabrication.**

For each compartment including for existing IBT Tanks to be supplied with Liquid feed assemblies comprising of Strainer, Liquid Solenoid Valve, Metering Valve, Isolating Valve, valved By-pass, Pump out connection, valved & plugged complete with Automatic Ice thickness switch.

#### **3.4.7.6.15 \_IBT Tank Insulation**

Ice Bank Tank insulation with 100-mm thick (2 layers of 50 mm each) heavy density EPS Sheet of 24 Kgs. / M<sup>3</sup> for the bottom and 100 mm thick (2 layers of 50 mm each) normal density of 18 Kgs. / M<sup>3</sup> UF Sheet for the sides. The scope of supply includes sufficient quantity of bitumen and a layer of tarfelt as vapour barrier for the bottoms.

#### **3.4.7.6.16 Agitator**

Agitator of minimum 20" with motor suitable for the above Ice Bank Tank

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### **3.4.7.6.17 IBT Cover**

FRP cover suitable for Indoor type complete with PUF slab inside of 80-mm thick and the size shall be suit to ice Bank tank and it shall be supplied with 2 nos. SS collapsible handles

### **3.4.7.6.18 Forced Draft Cooler (Air Cooling Unit)**

Cold rooms (All Cold Rooms) of the Dairy are to be maintained at required operating conditions by forced draft coolers. Forced draft coolers shall be supplied by a specialist manufacturer as fully assembled units. The manufacturer shall warrant performance. All Low temp. ACU shall be supplied with Fan heater and tray heaters.

All Positive cold room's ACU to be designed for Pumped system

The coolers required are of ceiling suspended cross draft type specifically intended to operate with pumped liquid supply. Cooling coils shall be made of stainless steel tubes with Aluminium fins with Pre coated /PCGI Casing as per approved make suppliers standard MOC for casing. All Fan motors shall be IE-3 Efficiency for above 0.37 KW fans and below 0.37 KW fans with normal efficiency. Fin spacing shall be:

Ante Room & All Cold Store : Not less than 6 mm

Water defrosts spurge pipes and header shall be provided, arranged to be self-draining.

For the Deep Freeze units,(Freon Unit) Electronic defrosting arrangement shall be provided. Also the Deep freeze FDC units shall be provided with hot gas heater pipes elements for drain tray. The system includes slow closing solenoid valves, pressure regulation valves, pressure gauge, timers and other necessary items required.

For cold rooms, off cycle defrost / water defrosting arrangement shall be provided with automatic controls.

Room Temp controller. Each room shall be provided with Room temperature controller ERC 211/ Equivalent type with Sensor with controlling room temp thro PLC. Once the desired temp is maintained in the room, the controller will close the liquid line solenoid valve and open the room temp is raised again.

The casing shall be of either Powder coated or stainless steel. Induced draft fans

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shall be axial, direct coupled to motors. Belt drives are not acceptable. Fans and motors shall be dynamically balanced. Fans made of Poly amide glass fibre reinforced material are acceptable. Fan and motor assemblies shall be resiliently mounted and effectively guarded. Motors and bearings shall be suitable for operation at an ambient temperature of  $-35^{\circ}\text{C}$ , and motors shall have degree of protection IP55 or better.

The drain tray shall be of heavy gauge galvanized sheet, cross broken to provide falls, and arranged to intercept condensation from the casing. The drain tray shall be suitably insulated. The outlet shall be vertical. Fixing of the unit shall be by adequate number of suspension rods attached to substantial lugs on the casing

Suspension members for the units shall incorporate a thermal break within the thickness of the insulation. The detailed arrangement and supply of this is the responsibility of the bidder to suspend the evaporators, level and lock the suspension nuts.

### **Pipe Connections**

To each evaporator supply and install a liquid feed assembly, this shall preferably be mounted outside the cold room. The liquid feed assembly comprising of

- \* Strainer
- \* Liquid solenoid valve
- \* Metering valve
- \* Isolating valves
- \* Valve by-pass
- \* Pump-out connection, valves and plugged –SNV needle valves.
- \* Pressure gauge with isolating valve –SNV needle valves.
- \* All controls as per functional requirement.

The metering valve shall be of a type purpose-made for liquid control in a pumped liquid system, and comprising a manual adjustable regulating cone for

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minimum pressure drop. The make and type are subject to approval.

All water pipelines (drain & supply) inside low temperature zone shall be electrically heat traced, with thermostatic controls and insulated. The defrost water assembly shall be generally as detailed and subject to approval.

**Connect:**

To the supply, spurge pipe with a section of hose fastened with stainless clamps. To the drain, with a funnel and water "U" seal of approved construction, outside low temperature area. The details of Unit, capacity and scheme are to be furnished in the bid.

**3.4.7.6.19 Pumps for various equipments**

**Cooling Water for Evaporative Condenser:** As provided by the OEM of the evaporative type condenser.

**Chilled Water:** This shall be vertical inline Multi stage pump of SS construction for the water contact areas. Connections shall be flanged. Pumps shall be provided with energy efficient IE-4 motors.

**Refrigerant Liquid:** All pumps shall be of Hermetic Type. Construction materials in contact with ammonia shall not contain copper and the Pump shall be immune from vapour binding. A casing vent shall be fitted, if necessary. Each pump shall be provided with a strainer and pressure differential control system. Positive displacement or centrifugal pumps may be offered; if the former a relief valve shall be provided to meet closed delivery operation. The supplier is responsible to determine pump operating conditions and to select appropriate pumps, which shall be subject to approval of purchaser.

Driving motors shall have continuous ratings in IP 55 enclosure, exceeding the limit load of the connected pump. Pumps and motors shall be mounted on common base plates, with alignment locating points factory established to ensure correct positioning of motor when mounted on site.

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**3.4.7.6.20 Refrigerant & Water Piping.**

Supply and install all required piping such as refrigerant, oil drain, defrost water cooling water lines for condensers, chilled water, etc., necessary for the operation of total refrigeration system installed by the Refrigeration Contractor. Required valves and NRV's, bends, support materials, etc. as needed, are included in the scope of the contractor and also to be supplied and installed by the Supplier within the contract value.

Suction and delivery main headers piping of High stage Compressors should be sized for simultaneous operation of all the compressors specified in Column 2 including standby plus Two more compressor of similar capacity proposed to be installed in future. Similarly, the main headers of condenser piping, oil cooler piping, etc. Shall be designed suitable for all proposed pumps plus one future pump. Chilled water supply and return Headers to be designed for all proposed pumps working + additional same capacity and same no of pumps working in future. Ie Headers to be designed for double the capacity of current peak flow rates. These headers shall be provided with necessary trappings and isolating valves duly dummied and suitable to hook up the future compressors, condensers, ammonia pumps, chilled water pumps, IBT, etc. readily.

**The maximum velocity of the fluids/gas shall be considered as under:**

a.	Suction gas line (NH3)	15.0 m/sec
b.	Discharge line (NH3)	18.0 m/sec
c.	Liquid line (NH3) condenser to	0.5 - 0.6 m/sec receiver
d.	Liquid line	(NH3) receiver to 1.0 m/sec system
e.	Wet return line (NH3)	10 m/sec
f.	Suction line (H2O)	1.0 to 1.2 m/sec
g.	discharge line (H2O)	2.0-2.5m/sec

All refrigerant, oil piping, the contractor shall use "seamless heavy duty class scheduled 80/40 pipes" as per international standard depending on size of pipe, of SA 53 grade/ SA 106 grade as applicable.

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All refrigerant, oil piping shall be SA 106 for -19 °c & SA 333 for below -20 ° c application. All water line/chilled water line will be G.I medium B class pipes  
 All vessel plates are steel plate & specification will be is: 2002 / SA516 Gr.70 & IS: 2825, class: 1

In case of hot dip galvanization wherever specified in the tender specification, the minimum zinc coating required is 75 to 80 microns uniform thickness all around the surfaces.

In case of spray galvanization wherever specified in the tender specification, the minimum zinc coating required is 120 to 125 microns uniform thickness all around in surfaces.

For all refrigerant lines, the Supplier shall follow the welding procedure based on international Code of Practice. It is expected to follow the procedure that the first route run welding shall be carried out by argon/nitrogen arc welding by filling argon/nitrogen gas inside the pipe and subsequent runs may be carried out by arc welding process.

All the refrigeration vessels in the system such as oil separator, condenser, receiver, pump separator (LP accumulator) shall be considered as class I vessel according to IS 2825 or equivalent British or American code and all weld joints shall be tested for 100% radiography.

**3.4.7.6.21 Line & Vessel Insulation**

Insulation for pipe lines shall be Rigid Poly Urethane Foam of Density 40 kgs / cb.mt (minimum) and equipments shall be carried out as per special condition (mechanical) and minimum recommended insulation thicknesses are as follows.

Minimum thickness of Rigid Poly Urethane Foam for Ammonia Pipe/Chilled Water Pipe Insulation

NOM. Pipe Dia in MM	15	20	25	32	40	50	65	80	100	125	150
Temp -10°C & above	30	30	30	30	40	40	50	50	65	65	80
Temp Below -10 °C	50	50	50	50	65	75	75	100	100	100	100

The insulated pipelines shall be supported using high density PUF block (minimum 80 kg/cum) or using seasoned teak wood as approved. These  
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insulating supports shall be enclosed in the vapour barrier. The pipe surface shall be thoroughly de-rusted and cleaned followed by 2 coats of approved primer prior to insulation.

An outer vapour seal on ammonia/chilled water pipelines shall comprise an approved vapour barrier sheath (preferably aluminum coated polyester film of 50 micron thick) with joints lapped and sealed with self adhesive tape. Insulate the pump separator (LP Accumulator) with suitable thickness as insulation as but not less than 120 mm and insulation for –10 deg C application of the outer vessel operation below ambient condition. An outer vapour seal over the insulation using an approved sheet material (preferably aluminum coated polyester film of minimum 50 micron thick) with joints lapped and sealed with self-adhesive tape. Finished with Aluminium cladding of 24 SWG over the insulation shall be done in an approved manner. However, Inside of all cold rooms and deep freeze rooms shall be cladded with SS sheets instead of AL sheets.

#### **3.4.7.7 Electrical (MCC Panel, Power & Control Wiring, Cable Tray, Earthing, Etc.)**

It shall be as per the specifications mentioned in the Electrical system.

#### **Power Factor Improvement Panel with APFCR Relay:**

It shall be as per the specifications mentioned in the Electrical system.

##### **3.4.7.7.1 Instrumentation & Safety System**

Pressure Gauges: Pressure gauges shall be of Bourdon tube type, conforming to the requirements of IS:3624. Also in front of various cold rooms and deep freeze rooms, are to be provided with one set of Digital temperature Indicators each.

##### **❖ Ammonia Leak Deduction system**

Ammonia leak detection system with ammonia sensors, controls, audio visual alarm to detect the leakage of ammonia shall be supplied and installed in the plant room, condenser area, all deep freeze rooms.

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Bidder scope of supply includes 2 nos. gas masks with oxygen cylinder for 30 minutes in lockable enclosure. Also our scope includes necessary drench shower with eye / face wash with fountain

❖ **Emergency Ventilation System**

One no. Fixed type emergency ventilation system for the refrigeration plant room comprising of axial fan / blowers of suitable capacity to cater plant room volume multiplied by 10 complete with flame proof electrical motor and necessary cabling. The system shall have provision for switching on from the outside of the refrigeration plant room. Once the system is switched on all the electrical connections shall be switched off automatically.

The scope of this bid also includes supply, installation and demonstration of following safety accessories:

- a. Two sets of Ammonia gas mask (with oxygen cylinder for 30 min), in conformity with IS:660 and provided with a wall-mounted lockable enclosure approved by the purchaser at an accessible location just outside the refrigeration plant room and 2 sets of air tight safety suits.

**3.4.7.7.2 Compressor Oil & Consumables**

The system shall be located outside the compressor room suitable to charge ammonia from the cylinder and shall consist of following items:

Two sets of quick mounting attachment each with stop cum check valve, flexible piping and end connection suitable for the cylinder and charging port of ammonia loading station Ammonia pressure gauge. Filter.

First charge of compressor oil for the proposed all compressors. Scope includes sufficient quantity of ammonia gas for total refrigeration system commissioning.

**3.4.7.7.3 Sandwiched Panels**

**3.4.7.7.3.1 For Ceiling and Wall Column**

The wall and ceiling of the insulated cold rooms are to be constructed using pre-fabricated, self-supported, sandwich panels insulated with rigid polyurethane foam of required thickness.

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Sandwiched Panel shall be CFC free, manufactured using high pressure foam injection equipment in a precise ratio and proportion. The properties of the polyurethane insulation shall be as under

Injected density	:	40 $\pm$ 2 kg/m <sup>3</sup>
Thermal conductivity	:	0.023 W/mt/deg K.(Aged)
Compressive strength	:	155 Kpa
Closed cell contents	:	90 to 95 %
Operation temperature range	:	minus 60° C to 80° C

The skin material for the wall and ceiling panels shall of galvanized sel sheet (minimum grade 275 gsm) of minimum 0.5-mm thick with grooved profile to enhance strength and aesthetics. The external surface of sheet shall be pre-painted with minimum 25-micron thick with **Silicon Modified Polyester coating**.

The joining system of the panels shall be designed to ensure a quick and secure assembly at site, with the help of tongue and groove joints with eccentric cam locks or any other approved arrangement. The joints shall be made hermetic and perfectly vapour tight by use of silicone sealants. The wall panels shall be in single lengths to match the room height, and width of ceiling/wall panels shall be 1.2 mt., in order to pprox. the number of joints. The configuration shall incorporate factory made standard L shape panels for corners and TEE shape panels for partitions.

The system shall be complete with all ancillary items like, ceiling panels suspension system complete with insulated beam, suspension chain/hardware, suitable corner pieces, pre-painted steel/aluminium profiles for inner/outer junctions and joint corners, pressure relief valves, silicone sealants, foam chemicals and all other components & accessories as required. The costs of these ancillary items are to be included in the respective rates for installation of ceiling/wall panels and no separate payment shall be made for this items.

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#### **3.4.7.7.3.2 Floor Insulation**

The floor insulation shall be made of rigid polyurethane foam slabs in two layers of required thickness. The properties of polyurethane foam insulation shall be as mentioned above. The insulation shall be carried out in the following manner.

- Coat of bituminous primer shall be applied over the finished PCC floor, after thorough cleaning and drying.
- Tarfelt of 2.4 mm thick shall be applied on the concrete surface below the insulation layer as vapour barrier with bitumen as Adhesive. The joints shall be staggered having minimum 100 mm overlap thoroughly sealed to make it perfect vapour barrier. The ends shall be turned up the outer wall above the height of protective curb and completely sealed with silicone sealant.
- A coat of bitumen shall be applied on the outer surface of tarfelt and fix the first layer of rigid polyurethane foam insulation slabs (of required thickness) with the joints staggered. All joints sealed completely using hot bitumen.
- A coat of bitumen shall be applied on the surface of first layer of insulation and fix the second layer of rigid polyurethane foam insulation slabs with cross-wise joints staggered. Seal all joints completely using hot bitumen.
- Provide tarfelt of 2.4 mm thick above the insulation layer using bitumen as adhesive. The joints shall be staggered and shall have minimum 100mm overlap thoroughly sealed to make it waterproof barrier. The ends shall be turned up the inner wall above the height of protective curb ( approx.. height 500 mm above finished floor level) and completely sealed with silicone sealant.

#### **3.4.7.7.3.3 Sliding Door**

Milk / product cold store shall be provided with manual sliding type doors. The doors shall be of PUF or Styrofoam insulated with both side covered with impact resistant glass fiber reinforced food safe polyester complete with all accessories properly engineered and made by specialist manufacturer broadly meeting following requirements.

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The insulated doors shall be manually operated, horizontally sliding/hinge type, easy to mount, mechanically reinforced for heavy duty usage complete with all required fittings, sliding rails/hinges, bottom guide, rollers etc. mounted on a suitable frame. Necessary heavy-duty handle for easy opening and closing of doors shall be provided. Door pad Locking arrangement, emergency exit lock release knob/wheel shall be provided.

Sliding rail arrangement shall be easy to operate constructed so that the door drops a little down and towards the frame uniformly while closing to achieve a hermetic seal.

Shafts, nuts for roller shall be made out of SS. The gasket material shall be durable and shall not harden at low temperature. The doors shall have padlocking arrangement from outside. Safety release provision shall be made for opening door from inside, even with padlock in place. Kick plate made of SS chequered plate shall be provided up to a height of about 900 mm from bottom for mechanical impact protection.

The doors for butter deep freeze (sub-zero) application shall be equipped with electrical doorframe heaters with thermostat control with wiring.

Sil portion of main insulated door openings and hatch door openings shall be finished with pre coated sheet as per the requirement. Sil insulation shall be provided for the three sides of opening for main door openings and all the four sides in case of hatch door openings. The refrigeration contractor shall be responsible to finish the SIL portion of the Hinge/sliding door area with PUF insulation of appropriate thickness and clad with pre coated sheet, flashing, angles at the corner, etc.

In front of each sliding door (on closing and opening condition) a set of metallic guard made out of heavy duty `c` class pipe of 100 mm dia (stand type) and 50 mm dia `C` class pipe for brazing the stand pipes shall be supplied and installed by the contractor to protect the sliding doors from the external damages. The drawings shall be approved by the purchaser.

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#### **3.4.7.7.3.4 Air Curtain**

The air curtain shall be installed on each cold store doors consists of a case for air canalizing, conveniently shaped permitting a rational arrangement of the outgoing air. It shall consist of a set of deflectors for good distribution of the jet of air of adequate velocity on the whole door span surface to avoid loss of refrigeration.

The blower fan shall be made of Stainless steel and dynamically balanced to prevent vibration. The bearing shall be pre-lubricated & sealed for life and maintenance free, suitable for low temperature application. The fan motor shall be suitable for 415 V, 3 phase AC supply.

There shall be a limit switch with required accessories, contactors, etc in weather proof enclosure for automatic operation of blowers whenever the door is opened. Electrical cabling to be done from MCC.

Air Shield curtains with each air curtain, provide a transparent PVC air shield curtain having flaps (rounded edge) of minimum thickness 3 mm with 50% overlap between adjacent flaps. The strip curtain shall be complete with all accessories made of material suitable for low application and the PVC strips shall remain soft up to operating temperature of minus 25 °C.

Each cool room (all cold store and deep freeze stores) shall have a safety pilot light outside indicating the presence of people in distress in the room and electric bells shall be provided for distress signaling. The sirens shall be installed at approved locations-one in Refrigeration Plant room and other in outside cold room corridor. The siren push switch shall be of self-illuminated type. The 'EXIT' light provided inside the cold room shall be mounted adjacent to the exit hatch door/main door to indicate the "EXIT DOOR" its location. The safety pilot lights, sirens etc. shall work on 230 V through the UPS (Uninterrupted Power Supply).

The circuits for sirens, safety pilot lights, and safety illumination shall be independent of the mains power supply.

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### **3.4.7.7.3.5 Lighting**

Milk and Other cold store and ante rooms are to be provided with suitable moisture proof fittings as per the room layout. Necessary wiring from the DB to the fittings shall be made as per requirement.

- The light fittings for the cold rooms shall be 2 x 18 or 2 x 36 vapour proof fluorescent lamp fitting with IP 65 polycarbonate body with double gasket, UV stabilized polycarbonate diffuser with transparent prismatic interior and smooth exterior, double compression cable gland cable gland, with built-in switch gears consisting of super low loss electronic ballast and all accessories including lamps.
- Conduits inside the cold rooms shall be made of heavy duty PVC conduit with ISI mark. Wiring shall be using 3 core 2.5 sq.mm flexible copper cables. The conduits shall be suitably concealed using Pre-coated flashing of matching shade with panel.
- All end terminations shall be vapour tight to prevent ingress of moisture inside light fitting.
- All conduit entries, cutouts made in insulation panel shall be thoroughly sealed to make it vapour proof, by in-situ injection of PUF/silicone sealants.
- Power supply for the lighting shall be made available at one point near cold rooms in a MCB distribution board. The contractor shall carry out the complete internal wiring from the DB, including providing necessary control switches as required for the light points. Liquid ammonia charging system

### **3.4.7.7.3.6 Safety System for Cold Rooms**

Safety system for cold room (one no. for each cold rooms) comprising of safety pilot light, 2 nos. sirens, one at outside the cold rooms / corridor and another at plant room, electric bell and safety illumination. The system shall work on 230 Volts through UPS. The UPS shall be provided with free-sealed batteries of 500 Watts capacity for 30 minutes battery back up on continuous operation and an inverter to convert DC to AC supply.

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The exit light provided inside cold room near / adjacent to the door to indicate exit door location. In case peoples inside cold room in distress condition, they can locate "EXIT" and press the self illuminated push button.

**3.4.7.7.3.7 Special Instruction For Carrying Out Mechanical Instruction**

Scope of supplier work includes positioning, installation of the equipment as per approved drawing with necessary provision for expansion work, insulation and cladding, cleaning, painting, etc.

All the civil works, foundations are shall be arranged by the owner as per supplier's drawing. The supplier shall be responsible for all correct reference lines / codes for various equipments.

Civil contractor shall carry out all foundation, holding centering, scaffolding and they are responsible for remove and clean the site.

Structural (MS BOX) supports shall be required for various equipment to be part of supplier scope and any plat form, bridges / gantry if required to be arranged by owner.

**Pipe Welding & Testing**

The piping should be TIG welded for 1<sup>st</sup> route of run and subsequent runs may be carried out by ARC welding process.

The successful bidder has to testing of all pipes like raw water, chilled water, ammonia piping. Piping should be cleaned inside very neatly and flushed after erection under supervision of Federation staff.

The recommended testing pressures for various pipelines are as follows.

Sl. No.	Name	Test Pressure	Test Medium
a.	Water Pipelines	8 Kgs / M <sup>2</sup>	Water
b.	Ammonia Pipelines		
i.	Suction	14 – 16 Kgs / M <sup>2</sup>	Nitrogen
ii.	Discharge	20 – 22 Kgs / M <sup>2</sup>	Nitrogen
iii.	For Complete	Absolute 0 System for 48 Hours	

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All refrigerant and water line piping supports, guides, anchors and hangers, structural should be provided supplied by the Contractor. All the supports to be get prior approval by Federation Representative.

Cutouts details in the floors and slabs for installing various pipes are to be provided by the contractor immediately upon receipt of the purchase order.

All the chilled water pipelines shall be insulated by PUF insulation with suitable thickness as per tender specification.

**3.4.7.7.4 Technical Data on the Major Equipments**

Sl. No.	Description	-10 / 38 °C
	<b>A. <u>High Stage Reciprocating Compressor</u></b>	
1.	Make	
2.	Type	
3.	Model	
4.	Capacity	
5.	Saturated Suction temperature	
6.	Saturated Discharge temperature	
7.	Consumption of power at shaft	
8.	Speed of the compressor	
9.	No. of compressors	
	<b>B. <u>Oil Separator</u></b>	
1.	Type (Horizontal / Vertical)	
2.	Shell dia in mm	
3.	Shell height in mm	
4.	Material of Construction (Shell)	
5.	Oil Carryover	
6.	Type of oil filters	
7.	Low oil level cut outs	
8.	Sight Glass for oil level	
	<b>C. <u>Low Pressure Liquid Accumulator</u></b>	
1.	Type	
2.	Shell diameter	
3.	Shell height / length	
4.	Material of Construction (Tube)	
5.	Liquid Temperature	
6.	Controls	
7.	Fittings & Mountings	
	<b>D. <u>Refrigerant Pumps</u></b>	
1.	Make	
2.	Type	
3.	Model	

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Sl. No.	Description	-10 / 38 °C
4.	Capacity	
5.	Head	
6.	No. of Pumps (W + S)	
7.	Overall Efficiency	
8.	Motor Rating	
	<b><u>E. High Pressure Liquid Receiver</u></b>	
1.	Type	
2.	No. of Receiver	
3.	Capacity (Holding)	
4.	Shell Diameter	
5.	Shell Length	
6.	Material of Construction	
7.	Fittings & Mountings	
	<b><u>F. Evaporative Condenser</u></b>	
1.	Make	
2.	Model No.	
3.	No. of Condenser	
4.	Heat Rejection Capacity	
5.	Tube Diameter	
6.	Tube Thickness	
7.	Material of Construction (Tube / Fins)	
8.	Water Flow	
9.	Water Inlet Temperature	
10.	Water Outlet Temperature	
11.	Total No. of Tubes	
12.	Design wet bulb temperature	
13.	No. of Pump	
14.	Pump Rating	
15.	No. of Fan	
16.	Motor Rating for each fan	
17.	Air displacement rate of each fan	
18.	Total Weight (Shipping Weight)	
	<b><u>G. Automatic Air Purger</u></b>	
1.	Type (fully automatic) multi point	
2.	Make & Model	
3.	Controls	
	<b><u>H. Chilled Water Supply Pump</u></b>	
1.	Make	
2.	Type	
3.	Model	
4.	Capacity	
5.	Head	
6.	No. of Pump	
7.	Power Consumption	
8.	Efficiency	
9.	Motor Rating	
10.	Motor RPM	
11.	Motor Type	

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Sl. No.	Description	-10 / 38 °C
12.	Impeller	
	<b><u>I . IBT</u></b>	
1.	Type	
2.	Each IBT dimension in meters	
3.	Over all Dimension of the tank	
4.	No. of compartment	
5.	IBT Coil arrangement	
6.	Coil dia	
7.	IBT coil length	
8.	Liquid feed arrangement	
9.	Total surface area	
10.	MOC of IBT	
11.	MOC of Coil	
12.	No. of Agitator	
13.	Agitator size	
14.	Agitator motor rating	
15.	Make of Ice thickness controller	
16.	No. of Ice thickness controller	
17.	Type of IBT cover	
18.	Size of IBT cover	
19.	IBT cover thickness	

Sl. No.	Description	Milk Cold Stores	Cud Blast room	Cud Cold room
	<b><u>J.Forced Draft Cooler</u></b>			
1.	Make			
2.	Model No.			
3.	Dimensions (L x B x H)			
4.	Heat transfer capacity each			
5.	Temp. difference considered			
6.	No of Units per cold rooms			
7.	Coil Diameter			
8.	M.O.C. (Coil)			
9.	M.O.C. (Fins)			
10.	No. of Rows and Deep			
11.	Fin Spacing			
12.	Defrosting arrangement			
13.	No. of axial fans each unit			
14.	Motor rating for each fans			
15.	Air throw distance			
16.	Fan impeller material			

**3.4.7.7.5 List of Technical Documents, Details and Drawings to be furnished along with the Bid\_**

1. The bidder is required to furnish following drawings, technical and documents along with the bid:

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2. Layout drawings showing proposed refrigeration plant equipments like condenser, HP receiver, LP accumulator, pumps
3. Detailed machinery layout for the compressor room, control room, cold rooms.
4. P & I diagram for the ammonia refrigeration system, cooling water & Chilled water piping with line sizes
5. G A drawings for the electrical power distribution
6. Automation system configuration

❖ **Also bidder has to furnish the following**

1. Chilled water load (indirect system)
2. Direct expansion system load
3. Room-wise cold room load calculation sheet
4. Histogram for chilled water load demand / direct expansion load and the refrigeration input from the compressors (hourly basis showing peak demand, on 24 hour scale)
5. Calculation for the condenser capacity required
6. Electricity consumption data with operating time schedule for all the equipment and histogram (hourly basis showing peak demand, on 24 hour scale)
7. List of technical Literatures covering general and technical information for all the major equipment offered. viz compressor, condenser, FDC, pumps, purger, Falling Film Chiller, control valves, instrumentations, PLC automation system, soft starter, VFD,
8. Bar chart for project execution
9. Category-wise staff requirement for operating the plant
10. List of recommended spare for One year operation with break-up cost in commercial bid

**3.4.7.7.6 Latest Applicable Indian Standards for Ammonia, Electrical & Mechanical**

**A. Mechanical**

- |         |   |
|---------|---|
| IS: 660 | Safety code for mechanical refrigeration                                |
| IS: 661 | Code of practice for thermal insulation of cold storages                |
| IS: 662 | Anhydrous ammonia   |
| IS:702  | Industrial bitumen  |
| IS:778  | Gunmetal gate, globe and check valves for general purposes              |
| IS:1703 | Ball valves including floats for water supply purposes                  |
| IS:1239 | Mild steel tubes, tubular and other wrought steel pipe fittings         |
| IS:2041 | Steel plates for pressure vessels used at moderate and low temperatures |
| IS:2379 | Colour code for the identification of pipelines                         |
| IS:2494 | V-belts for industrial purposes   |
| IS:2629 | Hot-dip galvanizing of iron and steel                                   |
| IS:2825 | Code for unfired pressure vessels                                       |
| IS:3233 | Glossary of terms for safety and relief valves                          |
| IS:3503 | Steel for pressure vessels and welded structures                        |
| IS:3601 | Steel tubes for mechanical and general engineering purposes             |
| IS:3615 | Glossary of terms used in refrigeration and air-conditioning            |

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IS:3624	Pressure and vacuum gauges
IS:3696	Safety code for scaffolds and ladders
IS:4049	Formed ends for tanks and pressure vessels
IS:4503	Shell and tube type heat exchangers
IS:4544	Code of safety for ammonia
IS:4671	Expanded polystyrene for thermal insulation purposes
IS:4736	Hot-dip zinc coating on steel tubes
IS:4831	Units and symbols for refrigeration
IS:4984	HDPE pipes for potable water supplies, sewage and industrial effluents
IS:5428	Gauge glasses
IS:5905	Specification for sprayed Aluminium and zinc coating on iron and steel surfaces.
IS:6392	Steel pipe flanges
IS:8008	Injection moulded HDPE fittings for potable water supplies
IS:8172	Vertical steel ladders
IS:8188	Treatment of water for industrial cooling systems
IS:9520	Nominal sizes for valves
IS:9623	Selection, use and maintenance of respiratory protective devices
IS:9762	Polythene floats for ball valves
IS:9890	General-purpose ball valves
IS:10005	SI units
IS:10234	Recommendations for general pipeline welding
IS:11132	Ammonia valves
IS:11329	Finned type heat exchanger for room air conditioner
IS:11330	Refrigeration oil separators
BS:3059	MS tubes for vertical condenser

## **B. Electrical**

IS:325	Three-phase induction motors
IS:248	Electrical measuring instruments and their accessories
IS:2705	Current transformers
IS:2968	Dimensions of slide rails of electric motors
IS:3480	Flexible steel conduits for electrical wiring
IS:4064	Air-break switches
IS:8544	Motor starters for voltages not exceeding 1000 V
IS:9537	Conduits for electrical installation
IS:10028	Selection, installation & maintenance of transformers
IS:10118	Selection, installation & maintenance of switchgear & control gear
SP: 30	National Electrical Codes

## **C. Refrigeration Piping and Heat Transfer Components – ASME B 31.5**

### **3.4.7.8 ELECTRICAL SYSTEM**

Electrical distribution system shall be part of this project and the bidder should design the Electrical substation, transformers, Generators, distribution etc based on the total load of the plant with future expansion. The system should be suitable to

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operate, control, and maintain all the parameters required for Dairy Milk reception, Processing, Packing, Utilities, cold rooms etc.

Following are responsibility, but not limited to, of Bidder as part of scope of this tender:

- a) The HT substation to receive 11/22 KV electrical supply with necessary step down transformers, Power control centre (PCC), Generator sets etc Changeover panels etc should be provided.
- b) Required number of Motor Control Centers (MCC) and ancillary panels with complete switchgears as per the requirement of the equipment shall be provided for effective and safe operation of the Dairy plant and utilities. Spare feeder minimum 10 % of the capacity to be provided in all the MCC for future expansion.
- c) Single phase redundant UPS for Automation system.
- d) Required quantity of armored aluminium (PCC to Sub PCC & Sub PCC to MCCs) & copper power cable, copper control cable, instrument cable, cable trays in all processing & product making sections, SS/GI drop conduit pipes in other sections, plate type earth pit, earthing network, earthing conductors, load break Isolators/ plug & sockets with Push Button station near motors for emergency isolation, rubber mats for panels etc. shall be provided. All power cables from MCC to motors, control cables shall be of flexible copper steel braided type up to 50 sq.mm, above 50 sq.mm Armoured copper conductor , XLPE insulated , PVC sheathed cable & rodent proof of suitable size with derating factor as applicable to be considered for multiple cables laid together on cable trays (cable selection chart enclosed). For all cable distribution inside the plant (including vertical drops) SS cage (mesh) type trays shall be provided. Cable trays outside the plant building, inside MCC room, utility area including main cable from PCC to MCCs shall be GI perforated/ladder type with cover.
- e) All necessary documents and statutory fees required will be borne by/paid by the bidder and shall be reimbursed by Purchaser to bidder upon producing receipt of the same.
- f) Approval for LT electrical work with State Electricity Board, Electrical Inspector is Bidder's responsibility.

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The electrical LT distribution system specification is detailed in specification section.

**3.4.7.8.1 TECHNICAL SPECIFICATIONS FOR ELECTRICALS**

Following to be considered in the scope of supply: All electrical load values given are indicative and the system shall be supplied for actual values only. Entire electrical shall be in the scope of this tender.

**3.4.7.8.1.1 HT Sub-Station – 2 Pole/4Pole structure: suitable for 500 KVA transformer-1no.**

Two / Four Pole Structure:

- Type : Outdoor
- Quantity : One Set
- Function : To receive power from State Electricity Board. HT cable will connect GO switch in the structure with VCB in substation.
- Civil : ISMB 200 x 100 to be grouted in concrete 1:2:4 for at least 1/5<sup>th</sup> length i.e. 2 meters. Size of concrete pedestal -500 x 500 mm. All necessary civil works such as excavation, centering, concreting and back filling is included in vendor's scope.
- Rating : Suitable for 11 /22 kV, 500 KVA load
- Incoming : Conductor from State Electricity Board.
- Instrumentation: VCB shall be provided with microprocessor based protection relay.

**3.4.7.8.1.2 HT CABLE:**

- Type : 11/22 KV, XLPE
- Size : Suitable for 500 KVA load and considering Fault level of 35 KA or State Electricity Board fault level whichever is higher
- Quantity : As required
- Cable size : As required

**3.4.7.8.1.3 General Specifications:**

Applicable Standards:

The cable shall conform to this specification, the latest issue of the relevant Indian standard specifications or the equivalent specification of the country of

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origin or IEC specification. The cable shall comply with the latest edition of IS 7098 (Part II).

**General Construction:**

Power cable for 11 / 22 kV, shall be aluminium conductor, XLPE insulated screened, sheathed, armoured & overall PVC sheathed. The conductor shall be stranded & compacted circular complying to IS 7098. The cable shall be provided with both conductor screening & insulation screening. The conductor shall be provided with non-metallic extruded semi conducting shielding. The core insulation shall be cross linked polyethylene insulating compound applied by extrusion. It shall be free from voids & shall withstand all mechanical & thermal stresses under steady state & transient operating condition. The insulating shielding shall consist of non-metallic extruded semi conducting compound in combination with a non-magnetic metallic screening of copper.

The copper screen shall be capable of carrying the single line to ground fault current. The vendor shall furnish the calculation in support of selection of the size of copper screen. The conductor screen, XLPE insulation & insulation screen shall be extruded in one operation by triple extrusion process to ensure perfect bonding between the layers. The core identification shall be coloured strips or by printed numbers. The inner sheath shall be applied over the laid up cores by extrusion & shall conform to the requirement of type ST2 compound of IS: 5831.

The extruded inner sheath shall be of uniform thickness. The armouring shall be by galvanised steel strip. The outer sheath of the cable shall be applied by extrusion over the armouring & shall be PVC compound conforming to the requirement of type ST2 compound of IS : 5831. The dimension of the insulation, inner sheath & armour material shall be governed by values given in table 2, 3 & 4 (Method "b") of IS: 7098 Part II. The cable shall be suitable for laying in trays, trenches, ducts & conduits & for underground buried installation with uncontrolled backfill & possibility of flooding by water & chemicals.

Outer sheath of all PVC & XLPE cables shall be black in colour & the minimum value of oxygen index shall be 29 at 27+/- 2°C. In addition suitable chemicals shall be added into the compound of the outer sheath to protect the cable against the rodent & termite attack. The cable shall be flame retardant. The outer sheath of XLPE cable shall possess flame propagation properties meeting requirements as per IEC-332-3. Sequential marking of the length of the

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cable shall in meters shall be provided in the outer sheath at every one-meter. The embossing shall be legible & indelible.

**3.4.7.8.1.4 HT panel and protection system:**

The HT Panel is required to receive HT grid power from two/four pole steel structure with GO switch & then feed high-tension electric power to distribution transformer.

Quantity : 1 Set  
Capacity : Suitable for 500 KVA  
Feeders : Incomer from GO switch and outgoing to Transformer  
Standards:

The equipment shall conform to this specification, the latest issue of the relevant Indian standard specifications or the equivalent specification of the country of origin or IEC specification.

Design Requirements:  
The design, construction, manufacture & performance of HT panel shall conform to the latest applicable Indian standard & comply with all currently applicable statutory requirements & safety codes in the locality where the equipment will be installed.

**3.4.7.8.1.5 Basic Design**

The HT panel shall have vacuum circuit breakers, which shall be connected to incoming grid power & outgoing to distribution transformer.

The HT panel shall be indoor type in sheet steel enclosure, floor mounting type, dust & vermin proof, totally enclosed, compartmentalized design with suitable electrolytic copper busbars duly insulated & shrouded with epoxy based insulating materials for high voltage grade, with sliding carriage for circuit breaker, with mechanical & electrical interlocking & automatic safety operating & service/ test condition, earthing busbar of electrolytic copper & provisions etc. conforming to IEC: 298, IS: 3427, BS5227 & VDE 0670 Part 6/5.76 ( Read with latest versions) thermostatically controlled space heaters suitable for 240V AC supply shall be incorporated in all breaker panels to prevent all ingress of moisture.

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### 3.4.7.8.1.6 Transformer:

Capacity : 500 KVA.  
Quantity : 1 No.  
Type : Suitable for outdoor installation, oil cooled.  
Duty : 11/ 22 KV to 433 V.  
Instruments & controls : Oil and winding temp Indicator and control, Buchholtz relay, on-load tap changer etc.  
Accessories : Air breather, conservator, explosion vent, radiator, Marshalling box etc.  
Efficiency : Not less than 98 % at full load

Transformers should be with on load tap changer.

Transformers are to be manufactured as per BS: 171 & BIS: 2026 (amended as on date) specifications, Indian Electricity Rules.

Capacity 500 KV A, 11 /22 KV / 433 V

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.

Standard Accessories Required

The transformers shall be core type, double wound copper conductor, oil immersed, natural cooled, 3 phase, 50 Hz, having DYN 11 connection. The transformer will have CRGO Core.

Remarks

When LT cable box is provided, a neutral bushing shall be brought out for solid earthing. Bus links shall be provided in the cable box for proper cable terminations. Transformers shall be complete including first charge of oil. Oil can be supplied separately filled in sealed drums. Oil dielectric strength should be better than 40 KV.

The transformer shall be painted as under:

- Internally with oil resisting varnish paints.
- Externally with 2 coats of zinc chromate primer followed by two coats of enamel paint of approved shade.

Test certificates shall be furnished for all the routine tests conducted on the transformers at the manufacturers' premises.

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**RATINGS & ADDITIONAL ACCESSORIES:**

The transformer rating shall be as under

KVA	500 KV A-1nos., Frequency 50 cycles/sec
Voltage	HT : 11 / 22 KV L T : 433 V
Phase	3 (three)
Installation	Outdoor

Additional accessories shall be provided as mentioned below:

1. L T box suitable for L T bus duct termination
2. HT cable box
3. 150 mm dial thermometer with 2-meter capillary and alarm contacts with maximum reading pointer and high oil temperature alarm and trip contacts.
4. Double float Bucholtz relay with alarm, trip contacts, testing & sampling cocks and 2 nos. oil shut off valves.
5. Magnetic oil level gauge indicator with low-level alarm contacts. Min. size 150 mm.
6. Jacking pads
7. Marshalling box to house dial thermometer and terminals with wiring complete from Buchholtz relay and dial thermometer up to marshalling box.

CABLE DETAILS	
HT	Suitable size
LT	Suitable size L T bus duct, TPN
Type of HT cable	11 / 22 KV, XLPE, aluminium conductor
Type of L T bus duct	AI. conductor, TPN, totally enclosed, IP-55 protection, suitable for 25 KA fault level

**GUARANTEED PERFORMANCE TO BE PROVIDED BY THE BIDDER**

No load losses at rated voltage & frequency (Watts)
Full load losses at rated current at 75 ° C (Watts)
Impedance at rated current & frequency at 75° C (%)
Efficiency at full load with pF 0.8 lagging at 75° C (%)
Approximate quantity of oil required for first filling (liters)
Maximum winding temperature (Above Ambient temperature ° C)

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#### **3.4.7.8.1.7 LT Bus Duct/Cable**

Type : Suitable for outdoor mounting, for connecting transformer output to PCC installation

##### **FUNCTIONAL REQUIREMENTS:**

L T bus ducts shall be electrically connecting the distribution transformer to the incoming feeder of the power control centre (PCC). The bus duct shall be suitable to operate on 3 phase and neutral (neutral being solidly grounded), 415 V:  $\pm 10\%$ , 50 Hz:  $\pm 3\%$ , AC supply system.

#### **3.4.7.8.1.8 DESIGN REQUIREMENTS AND SCOPE OF SUPPLY**

##### **Statutory Requirements**

The design, construction, manufacture and performance of the bus ducts shall comply with all relevant currently applicable Indian Standards, Indian Electricity Rules and also statutory requirements and safety codes in the locality where the equipment would be installed and as per the detailed specification hereunder. Bus ducts to be manufactured as per IS: 8623 (PART II) -1993.

##### **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 rectangular. All 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. top cover for outside installation to have slope on both edges for draining of rainwater.

The bus duct MS fabrication shall be pre-treated as per standard practice and then 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.

#### **3.4.7.8.1.9 Bus bars & Supports**

Bus bars shall be of electric grade aluminum alloy conforming to grade E 91 E, IS-5082 and their sizes are to be selected on the basis of current density 0.8 Amp. per Sq.mm.

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

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design data, while the neutral shall be of at least half the section of phase bus. Bus bars shall be provided with heat shrinkable insulating sleeve of high dielectric strength which should be noninflammable, non-hygroscopic and self extinguishing type. The temperature rise of buses shall be limited to 40 deg. C above an ambient of 45 deg. C.

For electrical connections of the bus duct at both ends, copper braided flexible strips of suitable rating shall be provided.

The bus bar supports shall be of suitable size non-hygroscopic and non-inflammable epoxy compound cast blocks (SMC or DMC 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 switchgear. Main bus bars shall have rupturing capacity of 50KA.

The bus duct shall be complete with two nos. continuous earth buses of hot dip GI flats of suitable size to its entire length.

GA drawings for Bus Duct shall be prepared by the supplier and submitted to the purchaser for approval before start of the fabrication activity.

Making cut outs of required size in the walls, if required, and making good the same shall be in the scope of the contractor.

#### **3.4.7.8.1.10 BUS BAR CLEARANCE**

The supplier must ensure that there is no crossover of the bus bars while connecting between transformer and the PCC. Minimum clearance between main bus bars phase to phase 25mm and between phases to earth 20mm, is to be maintained.

#### **3.4.7.8.1.11 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.

#### **3.4.7.8.1.12 EARTHING SYSTEM**

The transformer, bus duct shall be provided with double earthing as per relevant IS and IE rules. The entire earthing system comprising plate type earth pits, 'earthing grid, connecting earthing strips/wires complete as required shall be provided by the supplier.

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The transformer neutral shall be provided 2 Nos. copper plate Earth Sets for neutral earthing and 2 Nos. GI plate Earth Sets for body earthing.

#### **3.4.7.8.1.13 STATUTORY APPROVAL:**

The bidders shall be responsible for arranging all requisite approvals from concerned authorities on behalf of the purchaser. The statutory fees shall, however, be reimbursed on production receipt.

#### **3.4.7.8.1.14 Power Control Center PCC:**

The PCC shall have incoming feeders for the transformer and outgoing feeders for the various sections. The bidder has to design the PCC based on the load and Motor control centers. All the incoming and outgoing feeders are to be connected to power monitoring system which in turn connected to the control room for monitoring. The change over panels for the Generator sets and necessary control panels are to be provided. The Generators shall be equipped with automatic start and stop with changeover arrangements during failure of the EB supply.

Instruments and controls: Ammeters & voltmeters for individual feeders. Energy Meter shall be provided on incomer of PCC for total power measurement. All controls shall be built-in type. Rigid mechanical and electrical interlocking wherever required.

Suitable cable & bus alleys shall be provided. Cable alleys shall be provided with hinged doors. Adequate number of slotted cable supports shall be provided in the cable alley. All doors shall be provided with concealed type hinges & captive screws. Rear doors also shall be openable. Gaskets of durable material shall be provided all round the parameters of adjacent panel, panel & base frame, removable covers & doors & cutouts.

All components shall be front operated. The PCC shall be single front type with bottom cable entry. For draw out modules only handles of switches, knobs, cutout for lamps & meters shall be arranged on the front doors to permit operation without opening the doors. Relays of circuit breaker shall be mounted on front doors of the compartments. Other accessories of VCB shall be mounted on with drawable chassis.

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In addition to outgoing feeders indicated above, suitable One No. outgoing feeder for APFC Panel is also to be provided in PCC. APFC Panel shall have APFC Relay, Capacitor Banks of suitable capacity, necessary feeders with switchgears and accessories for auto/manual operation of the capacitor units. Supply, installation and commissioning of heavy duty APP type power capacitors as required are included in the scope of this contract.

#### **3.4.7.8.1.15 Power Factor Improvement Panel with APFCR Relay:**

Bidder to provide APFC system centrally at PCC level for entire dairy plant. Active harmonic filter system shall also be provided at PCC level.

Power Factor Correction Panel with Microprocessor based Automatic Power Factor Controlling Relay and bank of capacitors as given in the data sheet shall be provided for PCC to continuously measure and monitor the power factor of the electrical system by sensing the total load from the incomer and switch ON / OFF bank of power capacitors to bring the power factor of the system to a preset value. The APFCR shall have a digital power factor meter with 4 digit LCD/ LED display.

Panel to be fabricated with 14 SWG thick cold rolled sheet steel structure, indoor type, floor/wall mounted, weather and vermin proof.

Panel should be suitable for 415 volt, 50 Hz, 3 phase supply. It would consist of

- An automatic power factor correction relay, microprocessor based, with arrangement for sensing the power factor of the inductive load (minimum 16 channels/outputs considering future) and giving signal to the 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 according to the reactive power required to correct the power factor of the load to the power factor set on the relay. The capacitors must be turned "on" and "off" 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 an 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

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- For each of capacitor feeder one set of suitable rating MCCB, contactor, pair of ON/OFF push button and indication lamp shall be provided. MCCBs for power capacitors shall be provided with thermo magnetic release only.
- 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
- Incoming feeder of APFC Panel: 4 Pole, 415 V, 50 Hz, MCCB of 630 A rating with built-in microprocessor based programmable protection.
- Suitable 3 phase and neutral bus bars.
- Panel shall have sufficient spare cubicles (space only- for future provision of capacitors & switch gear and shall be decided at the time of drawing approval of APFCR panel)

Wiring for all above accessories / functions should be complete and ready for use. The details of each capacitor bank rating, no. of capacitor banks for power factor improvement shall be as per details given in the data sheet and schedule of quantities.

All power cabling between PCC and capacitor banks panel and cabling of each capacitor are included in the scope of work of this package. Power improvement capacitor banks shall be housed in the APFC Panel itself and provided with adequate louvers with ventilation fans, prewired through MCB switch for adequate ventilation

#### **3.4.7.8.1.16 Power Capacitors Banks:**

The power capacitor banks shall be used to improve the power factor of an electrical system and shall be housed in the APFC panel itself and provided with adequate louvers for proper ventilation

#### **3.4.7.8.1.17 Design Requirements:**

Each basic unit is to be built up with a number of elements. These elements shall be of 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

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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.

All capacitors shall be of APP (All Polypropylene) Heavy Duty Type.

Externally each capacitor unit shall have two separate earthing points, name plate confirming to the requirements of IS-2834 (amended up to date), discharge resistances etc. Each capacitor should be suitable for operation on 440 V, 3 Phase, 50 Hz AC power supply.

#### **3.4.7.8.1.18 TECHNICAL REQUIREMENTS:**

Total bank capacity for each panel : As per requirement

#### **Power Factor control and active harmonic filter system**

REQUIRED QUANTITY: 1 Set.

RATING: Minimum 200 KVAR Bidder to calculate

The Brief Technical Descriptions of major items to be supplied shall be as follows;

##### **1. Load Details**

Load Voltage : 3 Phase, 415 V Load Power : 350 kW (min) /

Type of Connected Load : Linear + Non Linear inductive type Load Power Factor :0.85 Lagging

##### **2. Technical Details of APFC Panel& active harmonic panel**

Rated voltage: 415volts

TSC panel rating: bidder to specify

System Frequency: 50Hz, +/-1Hz

Number of steps : Five (min)

Reactor in series with capacitor: As per design to limit the inrush current

Incoming Switchgear: ACB- suitable rating kVAR of each branch: Bidder to specify TSC branch connection: Internal Delta Over load rating

Current: 20% of the designed value

Voltage: 10% continuous, 15% for 30 minutes with 50% duty cycle Switching device : Thyristor

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Control of switching: Auto / Manual override  
Tuning: Tuned to avoid the harmonic current to enter in. Panel  
Temp. : 50° Maximum  
Insulation: 2.5 kV rms for one minute  
First level protection: HRC fuse  
Second level protection: ACB- suitable rating  
Type of conductor: Copper  
Type of bus bar: Aluminum electrolytic grade  
Type of inductor: Gapped Iron Core  
Type of Capacitor: Metalized polypropylene (MPP) self-healing type  
Fuse: HRC  
Controller: Bidder to specify Protection CT : 1200/1Amp. Protection PT: 415/8.6Volts  
Measurement PT: XXXX / 110 volt (11 kV side)  
Measurement CT: XXX / 1amp, 11 kV side, burden 5VA (max)  
Cooling: Forced Air  
Communication with panel: profibus/profinet port should be available at controller, Discharge device on Capacitor:  
Residual voltage : 50 volts Time : 3 minutes  
Panel : CRCA with powder coating, with Siemens GRAY color shade (RAL-7032)  
Dimensions of panel : Bidder to specify

### **Capacitor Details**

Rated voltage : 415  
Rated frequency : 50 Hz  
Dielectric : Polypropylene Phase : Single  
Container : Aluminium  
Mounting arrangement : Stud type  
Maximum over voltage : 1.2 times  
Maximum over current : 1.3 times Capacitance tolerance : +10%  
Maximum ambient temp. : 55Deg  
Internal connection : Single phase  
Discharge devices : Resistor  
Capacitor type : MPP dielectric  
Watt losses per unit : <0.2watts / kvar

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Unit Kvar Capacity : 10

Protection class : IP – 43

Protection against over voltages & transients: Yes Protection against harmonics, Stringent harmonic duty Capacitor: Heavy duty

Capacitor bushing details: Pin type connector Terminal detail: Two stud at top of the capacitor.

**Tests on capacitor:**

Following tests shall be carried out for selected capacitor; Routine tests as per IS 2834 / IS 13585.

Visual inspection Sealing Test

Test for Output & Capacitance Insulation resistance test.

Voltage test between Terminals.

Voltage Test between terminals & containers. Test for efficiency of discharge device

Measurement of Tangent of dielectric loss angle (Tan delta) Type Test

Thermal stability test.

Tan delta & capacitor loss test Capacitance discharge test.

**Paintings & Nameplate:**

All metal surfaces shall be thoroughly cleaned & degreased to remove all scales, rust, grease & dust. Fabricated structure shall be pickled & treated to remove any trace of acid. The undersurface shall be prepared by applying phosphate paint & a coat of yellow zinc primer. The undersurface shall be made free from all imperfections before undertaking the final coat. After preparation of the undersurface the panel shall be spray painted/powder coated with final two coats of RAL-7032 paint shade. The finished panels shall be dried in strong ovens in dust free atmosphere, panel finish shall be free from imperfections like pinhole, orange peels, run of paint etc.

Nameplates for all incoming & outgoing feeders shall be provided on the doors of each compartment. Nameplate shall be fixed by screw only. Special danger plate shall be provided as per requirement. Inside panels, sticker shall be provided for all components giving identification number as per detailed wiring diagram.

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**Busbar Sizing Connection & Supports:**

The busbars shall be made of high conductivity electrolytic aluminium alloy conforming to grade E91E IS5082. Buses shall have uniform cross section throughout the length of the panel & upto the incoming feeder terminal. Maximum current density permissible for this plant shall be 0.8 Amps/ sq. mm for busbar area above 500 sq. mm & 1 amps/ sq. mm for busbar area below 500-sq. mm. A suitable section earthing busbar (300-sq. mm) shall be provided outside the PCC at back bottom throughout the length of the PCC. Busbar shall be provided with heat shrinkable insulating sleeve of high dielectric strength, which shall be non-inflammable & self-extinguishing type in fast colours to indicate phases. The busbar shall be adequately supported by epoxy compound cast blocks, adequate numbers & size to avoid sags in busbars & these shall be capable of withstanding stresses due to short circuit current of the associated switchgear. Main busbar shall have rupturing capacity of 35KA. Minimum clearance between main busbars phase to phase shall be 25mm & between phase to earth 20mm.

**Power Connection:**

Interconnection between the main busbars & individual units shall be made by using copper or aluminium busbar strips of adequate rating. These interconnection & terminal shall also be fully shrouded. The outgoing power connection from PCC will be through PVC insulated aluminium conductor armoured cable. The cable entry shall also be totally isolated from switchgear by suitable partition plates. For outgoing feeders above 100A, cable termination directly at switchgear terminals shall not be allowed & hence panel builder shall made provision by suitable bus links by switchgear terminals so that the required number of cables could be connected to this links.

**Auxiliary Wiring:**

Wiring for all controls, metering, protection, signalling etc. inside the switchboard shall be done with 1100/650 volts grey colour PVC insulated copper conductors. Minimum size of the control wire shall be 1.5 sq. mm. All control wiring shall be provided with necessary sockets/lugs at both the ends. Each terminal shall be identified at both the ends by PVC ferrule having numbers corresponding to the control circuit diagram

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## **MOTOR CONTROL CENTRE (SHEET STEEL ENCLOSURE)**

### **FUNCTIONAL REQUIREMENTS**

To receive, control and distribute electrical power at 440 V, 50 Hz, AC in a sheet steel housing.

#### **Design Requirement and Scope of Supply**

##### **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 detailed specification mentioned below.

MCC shall be suitable for indoor type.

Bus Bar Rating shall be capable of carrying 1.2 times of full load current of the total load in the MCC. For calculating full load current, the connected load of MCC including future load provisions and 20% spare feeders shall have to be considered.

**Incomer**: Four Pole, ACB / MCCB manual operated (draw out type) of suitable rating/ type with and with single phasing, over current, short circuit and earth fault protection relay. Also the incomer shall have Digital Load Manager

Bidder has to supply and install separate SUB-MCC near cold room / Deep Freeze areas for ease of maintenance

**Out-going Feeder**: Required number of feeders to feed all power loads and controls for the entire motors connected in the MCC.

Additional 20% spare feeders (but not less than one spare feeder in each rating) of different rating suitable for future compressor, condenser pumps/fan, chilled water pumps, NH3 pumps, cooling water pumps, forced draft cooler fans, as well as for IBT Agitators etc to be provided either in the refrigeration MCC or Sub MMC (If required). The spare feeders shall be fully equipped with all components and wired.

Necessary feeders required for 3 phase air curtains, electrical heat tracing, doorframe heater, etc are to be provided either in the refrigeration MCC or Sub

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MMC (If required). All equipments having distance behind 5 –m from MCC or Sub-MCC panel should have remote Isolating Switch near to respective units including for all existing equipments.

In addition to outgoing feeders indicated above, Successful bidder either has to provide suitable Du Tuned Type Shunt Capacitor for above 100 HP rating

All out-going feeders shall have isolation facilities such as fuse-switch units, contactors, thermal/magnetic over load protection and necessary operating control etc.

Supply and providing of 5-MM thick M.S Chequered plats including Painting for masonry / concrete trenches where ever required, 12.5-mm thick rubber mats in front of all electrical panel as per latest IS/ IER requirement including M.C.C.'s

All earthing mains shall be galvanized. The earthing to the equipment will be with the help of copper/ GI wire for motors up to 60 HP. For motor 60 HP and above the earthing shall be done with GI strip and the end connections shall be using tinned copper flexible connections of adequate rating

An earth pits and earthing system of instrumentation, computers and PLC controls shall not share the elec. Load earthing system of electrical power equipment and a separate copper plate earthlings as per statutory rules with copper interconnection strips/wire shall be supplied and erected. All related works are in the scope of Supplier including the earth pit civil works and painting, etc.

### **MCC PANEL**

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. The manufacturer of the panel must possess a type test certificate/ accreditation from CPRI.

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

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barriers may be made of 16 SWG. The switchboard shall consist of free standing front open-able 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.

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.

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.

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.

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.

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**Cubicle for DOL Starter    Cubicle for Star-Delta Starter    Width x Height x Depth**

Motor HP	Cubicle for DOL Starter Width x Height x Depth			Cubicle for Star-Delta /Soft/VFD/Starter Width x Height x Depth		
	mm	mm	mm	mm	mm	mm
Upto 10 HP	450	x	275	x	350	
10 HP to 30 HP				450	x	550
40 HP to 75 HP				450	x	825
100 HP to 150 HP				450	x	1100

**Approximate Size of Cubicles for SFU / MCCB Feeders**

Current Rating	Cubicle for SFU & MCCB		
	mm	mm	mm
Upto 63 A	450	x	275
10 A to 250 A	450	x	550
400 A & Above	500	x	825

- Minimum depth of cubicle for ACB Feeder shall be 1000 mm
  - Minimum width of cable and bus bar alleys shall be 300 mm
- a. **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 spray painted with final two coats of 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.
- b. **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

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the panels, stickers should be provided for all components giving identification no. as per detailed wiring diagram.

c. **Bus bar Sizing Connection and Supports:**

The bus bars shall be made from high conductivity electrolytic aluminium 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 Aluminium bus bars shall be 0.8 Amps/mm<sup>2</sup> for bus bar area above 500 mm<sup>2</sup> & 1.0 Amp/mm<sup>2</sup> for bus bar area below 500 mm<sup>2</sup>. An earthing bus bar of minimum 150 mm<sup>2</sup> 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 1.2 Amps/mm<sup>2</sup>

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 noninflammable epoxy compound SMC/DMC blocks and these should be adequate in number so as to avoid any sag in the bus bars.

Minimum clearance between phase to phase shall be 25 mm and that between phase to neutral / earth shall be 20 mm.

d. **Power Connection:**

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

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4.0 mm<sup>2</sup>. Cable lugs/ sockets of suitable size and type shall be used for all interconnections.

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.

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

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 thicknesses shall be provided on top/ bottom of panel, for cable entries.

To prevent accidental contacts, all interconnecting cables / bus bars and all terminals also shall be shrouded. Standard colour code of red, yellow and blue for phases and black for Neutral to be followed for all bus bars / conductors.

**e. Auxiliary wiring and Terminals:**

Wiring for all controls, protection, metering, signaling etc. inside the switchboard shall be done with 1100 volts gray colour PVC insulated FRLS copper conductors. Minimum size of these conductors shall be 1.5 mm<sup>2</sup>. However, CT circuit wiring shall be done with 2.5 mm<sup>2</sup>. Control wiring to components fixed on doors shall be flexible type.

The complete panel would be subdivided 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.

All control wiring should be provided with necessary cable sockets / lugs at both ends.

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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.

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.

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.

**f. Switchgears:**

**f.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 spring charging mechanism stored energy type shall be provided with 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

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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 colour 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.

**f.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

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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:**

MCCBs upto 100 Amps	:	35 KA
Above 100 Amps	:	50 KA

**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

**f.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.

**f.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 the modules to permit insertion of fuse pullers and removal of fuse links without any problem. One set of fuse pullers also shall be provided.

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#### **f.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 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. 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.

### **f.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 storable 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

## f.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.

### **f.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.

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**f.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.

**f.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.

**f.11   Measuring Instruments:**

These shall be of 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

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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.

**g. Special Requirements**

- a. All motor feeders above 5 HP ( 3.7 KW) rating shall have Soft starters and up to 5 HP ( 3.7 KW) shall have DOL starters unless specified otherwise.
- b. 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 having a minimum breaking capacity of 50 KA

The following selection table shall be followed for switches & contactors of motor feeders unless otherwise specified.

Sl. No.	415 V. Motor HP	Contactors Rating Amps.	Fuse Switch/MCCB Rating Amps.
1.	0 to 10 HP	16	63
2.	12.5 to 15 HP	25	63
3.	20 to 25 HP	32	63
4.	30 HP	32	100
5.	40 to 45 HP	40	100
6.	50 to 60 HP	70	100
7.	65 to 70 HP	70	200
8.	75 to 90 HP	110	200
9.	100to 125 HP	110	250
10.	150 to 180 HP	160	400

**Earthing**: Main Earthing will be of Chemical earthing of ASHLOK make and to be for both MCC Panel and PLC Panels severalty.

**h. LT Power & Control Cables:**

**LT Power Cables:**

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All Power cables for use on 415 V system shall be of 1100 V grade, copper cables XLPE insulated, PVC sheathed, armoured and overall PVC sheathed, strictly as per IS: 7098 (Part I)-1988. Unarmored cable to be used only if specifically mentioned in schedule of quantities.

Main cables from PCC to Refrigeration MCC and Refrigeration MCC to Sub MCC shall be Aluminum cables of suitable run and sizes

### **LT Control Cables:**

Control cables for use on 415 V system shall be of 1100 V grade, copper conductor, XLPE insulated, PVC sheathed armoured and overall PVC sheathed, strictly as per IS: 7098 (Part I) – 1988. Unarmored cables to be used only if specifically mentioned in schedule of quantities. The size of various cables shall be worked out by the contractor and details and indicated in single line diagram to be submitted with their bids. The minimum conductor diameter shall be 1.5 mm<sup>2</sup>.

### **Harmonic Filter Panel**

Supply one common Harmonic Filter Panel to maintain THiD level e within the limit set by CEA( ie current harmonic less than 8%,voltage harmonic less than 5%) . These filter shall be either Common one to all proposed refrigeration system or else Individual . Harmonic filter panel should show display panel showing percentage of THiD

### **Battery & battery charger ( Inbuilt )**

Suitable for HT & DG start up operation. Complete with battery & Charger

### **Conduits**

For laying of cables under floor, GI class 'A' pipes shall be used. For laying cable in air whereas 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.

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In milk & milk product handling area conduit, in process / CIP / water logged area and wherever required, of SS-304 tubes / SS304 wire mesh type cable tray shall be used. Drop down conduit/ tray from horizontal cable tray to individual motor within the plant building in process area shall be of AISI 304. Outside process area & MCC room shall be GI.

## **ELECTRIC MOTOR**

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 as per the IS 12615 – 2004(Rev 1) for Eff1 (IE 4) energy efficient motors.
- 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.
- d) The motors which shall be operated on VFDs shall be designed for Inverter application

The sizes of power cables for different capacity of loads / Motor rating shall be as indicated in the cable selection charts. All the power & control cables shall be laid through SS ladder type cable trays including the drops inside the plant & through GI perforated cable trays outside the plant.

SS shrouds for all pumps & motors shall be provided.

Supply & placement of insulating mats of proper size as per the IS 15652 and Tamilnadu State Electrical Inspectorate rules shall be provided.

Connection from plug & socket/isolator junction boxes to motor junction boxes shall be with steel braided PVC insulated copper conductor cables.

## **GEARED MOTOR**

### **FUNCTIONAL REQUIREMENTS**

For driving various slow speed machines.

### **DESIGN REQUIREMENTS**

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The geared motor should use helical gears. The electric motor and helical gear box should be built as one unit.

The geared motors should be suitable for minimum 15 start/stops per hour without undue heating, for continuous duty of at least 24 Hrs. and minimum safety factor of 1.4.

All motors supplied shall be energy efficient type.

The electric motors used for geared motors should be TEFC, degree protection IP-54, squirrel cage, induction type, with class 'B' insulation suitable for 415V, 50Hz, 3 phase AC supply. Electric motors performance in general should confirm to IS-325-1978.

### **SCOPE OF SUPPLY**

Geared motors complete as per design requirements specified in 2.0. Each geared motor to be provided with key 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 Oil should not be filled in the geared motor but should be packed separately in a drum and sent along with geared motor. Gear oil would be filled at site.

### **ELECTRIC MOTORS FOR Gear DRIVES.**

#### **FUNCTIONAL REQUIREMENTS**

For driving various machines of the plant.

#### **DESIGN REQUIREMENTS**

The motors should be TEFC (Totally Enclosed Fan Cooled), squirrel cage, degree of protection IP-54, horizontal foot mounted, induction type, rated for continuous duty, suitable for operation on 415 volts ( + 5% ), 50 Hz, 3 phase AC supply Efficiency class IV and above.

All motors to have at least class 'B' insulation.

The performance of the motors should conform to Indian Standard IS-325- 1978 amended till date.

The starting torque of the motors shall be at least 2.5 times of the rated torque.

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**All The motors should be of Efficiency IE4 or above motors.**

**SCOPE OF SUPPLY**

All Electric motors complete in all respects meeting above design requirements. Each motor shall be provided with key in driving shaft, direction of rotation marking, nameplate etc.

**REMARKS**

All motors above 25 HP shall be provided bigger terminal box to accommodate Al. cables.

Thermistor to be provided in windings of 60 HP & above motors. The thermistors shall be of two ranges, one being for the warning and the other for tripping the motor if the fault persists.

**LT Power & control cables**

**General Specifications for LT Power & control cables**

**Power Cables:**

Applicable standards: Cables shall comply, as a minimum, with the latest issue including all parts, revision and addends as on the date of the contract of Indian Standard.

Operating Conditions: All cables shall be suitable for laying in open air exposed to natural elements and in trenches and underground buried installation with uncontrolled backfill and possibility of flooding by water. The outer sheath shall be resistant to attack by vermin and rodents. Special treatment shall be given to make the cables rodent proof.

Temperature rise: For the ambient and operating condition specified above, the combination of ambient temperature and temperature rise due to load shall result in a steady conductor temperature not exceeding 70<sup>0</sup> C.

**Material Specification:**

**Conductor:**

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The conductor shall be composed of aluminium/copper wires complying with IS 8130. The conductor shall be without joints. The conductors for nominal cross sectional area up to 10-sq. mm shall be solid, those greater than 10-sq. mm shall be stranded. Conductors of nominal cross sectional area less than 25 sq. mm shall be of circular shape whereas those greater than 25 sq. mm and above shall be of sector shaped.

**Insulation:**

Cable insulation shall be of PVC compound as per IS 5831. It shall be extruded so that it fits closely on the conductor and it shall be easily possible to remove it without damage to the conductor. Minimum insulation thickness as well as tolerance shall be as per IS 1554 (Part I).

**Core Disposition:**

Cores shall be identified by the colour of their PVC insulation with different colour for each core as per IS 1554. The cores shall be laid up together with a suitable lay. The outermost layer shall have right hand lay and successive layers shall be of opposite lay. Wherever necessary, core interstices shall be filled up with non-hygroscopic material

**Inner Sheath:**

Inner sheath shall be of type ST-1 PVC compound as per IS 5831 and shall be of black colour. The inner sheath shall be so applied that it fits closely on the laid up cores & this shall be as circular as possible. It shall be possible to remove the inner sheath without damaging the insulation. The thickness of the inner sheath shall be as per IS 1554.

**Armouring:**

Armouring shall be of either galvanised round steel wire/steel strip as per IS 3975. Armouring shall be applied as closely as possible over the insulation in case of single core cable and over the inner sheath in the case of multi-core cables. The direction of lay of the armour shall be left hand and the armour shall consist of galvanised round / flat steel wires of dimensions as per IS 1554.

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**Outer Sheath:**

The outer sheath shall be of PVC compound confirming to the requirement of type ST-1 as per IS 5831. Rodent/termite proof treatment shall be given to the outer sheath of the cables. The outer sheath shall be applied by extrusion over the armouring. The colour of the outer sheath shall be grey for copper cable & black for aluminium cable.

**Identification:**

The manufacturer's name or trade mark, cable size with type of cable shall be either indented, printed or embossed on the outer sheath of the cable along the length of the entire cable at regular intervals.

**Packing:**

The cable shall be packed in drums in continuous lengths.

**Control Cable:**

Applicable standards:

Cables shall comply, as a minimum, with the latest issue including all parts, revision and addends as on the date of the contract of Indian Standard.

**Operating Conditions:**

All cables shall be suitable for laying in open air exposed to natural elements. The outer sheath shall be resistant to attack by vermin and rodents.

**Core / Pair Disposition:**

The cores shall be laid up together with a suitable lay. The outermost layer shall have right hand lay and successive layers shall be of opposite lay. Wherever necessary, core interstices shall be filled up with non-hygroscopic material.

**Binder Tape (for instrument signal cable):**

A non-hygroscopic tape of minimum thickness 0.023-mm shall be applied over the final layer with 50% overlap & offering 100% coverage.

Noted and agreed to the above

SIGNATURE OF THE TENDERER

Collective screen (for instrument signal cable):

A laminated screen tape shall be applied with the metallic side down in electrical contact with the longitudinally run collective drain wire. The laminated tape shall be AI foil having thickness of 0.08 mm & maximum pitch of 50 mm.

**Earthing**

To provide earth pits and earthing cables to all sections of the plant with a max. earth resistance of one ohm or as per the regulations of local Electrical Inspectorate.

The earth pits and earthing system of instrumentation, computers and controls shall not share the earthing system of electrical power equipment.

All earthing mains shall be galvanized. The earthing to the equipment will be with the help of PVC coated Copper cable.

Quantity : 1 Lot

General specifications:

Earthing Strips:

The earthing strips shall be of MS as per IS 2062. The MS strips shall undergo surface treatment like derusting, degreasing before being processed for hot dip galvanizing. The thickness of galvanizing shall be minimum 85 microns generally as per IS 2633.

**Earthing Plate For Pit:**

Each set shall consist of following

One number of 600mm X 600mm X 6thick plate

One number of 50-mm diameter, 900 mm long GI pipe along with 80mm X 50mm GI funnel (made out of concentric reducer) & GI mesh.

One number of 300mm X 300mm X 10 thick CI hinged, lockable cover.

Item	Application
25 mm x 6 mm hot dip galvanized strip	Switchboard, Earth Ring
25 mm X 3 mm hot dip galvanized strip	YD motor
8 SWG GI wire	DOL motor
14 SWG GI wire	PBs & isolator

Noted and agreed to the above

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For Transformer neutral, PLC system, Lightning arrestor copper earthing shall be used.

Bidder shall provide earth pits and earthing cables to all sections of the plant with a max. Earth resistance of one ohm or as per the regulations of local Electrical Inspector.

The earth pits and earthing system of instrumentation, computers and controls shall not share the earthing system of electrical power equipment.

All earthing mains shall be galvanized. The earthing to the equipment shall be with the help of PVC coated aluminum cable.

#### UPS system for Automation system

Capacity : As per BOQ

Qty : As per BOQ

The scope of work and other technical specifications covered under automation section

#### DG Set:

It is proposed to provide the standby power for carrying out essential operation in case of power failure. The DG set as per the quantity (1 Nos) and capacity (320 KVA) appearing in BOQ shall be considered with AMF system. The DG will be selected for continuous duty operation. The facility shall be self-contained, and it should be possible to hook up the power supply in to the power control centre. The bidder should ensure that the DG supply is connected to the essential feeders provided on the PCC. The division on essential and non- essential load distribution on the PCC with isolation breaker will be the responsibility of the bidder.

Type : Air and Water cooled DG set in Acoustic enclosure complete with silencer and chimney

Construction : Standard packaged unit

Duty : 415 V AC

Capacity : As per BOQ ( 320 KVA )

QTY : As per BOQ

Instrumentation & Control: Standard as per the IE rules Rating: The capacity mentioned in the BOQ is KVA electrical

Note: Diesel charging system to be included in the scope

[Noted and agreed to the above](#)

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### **Miscellaneous items**

GI cable trays, min 2 mm thick

Isolators

Rubber mats, 1.5 mtr width & full length of MCC. Insulation as per IS

Conduits shall be 2 mm thick & 25 mm diameter with ISI mark only

Other items

GI cable trays, isolators, rubber insulated mats, rubber gloves, HT pole, GI pipe conduits and other electrical miscellaneous items shall be supplied and installed as per the requirement wherever necessary for complete electric circuits as per IE rules. The entire scope under this item shall be measure as one lot and as such the bidder are requested to analyze the quantum of work carefully before quoting.

### **10.0 EFFLUENT TREATMENT PLANT 50 m<sup>3</sup>/day**

The bidder has to Design, Supply, Erection, Commissioning, testing and handover the ETP system including necessary Civil works. The bidder has to design the ETP process with treated parameters and necessary approval from TNPCB Consent to Establish should be obtained. On obtaining the CTE the ETP works shall be started. The equipments as per the CTE approval shall be supplied and installed. The plant shall be operated at rated flow and the treated water performance shall meet the approved CTE values. The treated water should comply with the standards of TNPCB. The Necessary TNPCB approval such as consent to Establish (COE) and Consent to operate (COP) should be obtained. The necessary statutory fees paid to the Government will be reimbursed on production of receipt. The bidder should lay raw efficient line from the plant to the inlet bar screen. The bidder shall level and clean the site for executing the works including storm water drain. The plant lighting shall be in the scope of bidder. The approach and internal roads site grading are in the scope of bidder. The ETP plant should be designed with Bio gas Digester and the generated gas shall be used for canteen. The necessary gas pumps and lines to utility point is in the scope of the bidder.

### **INDEX**

Design Data & Effluent Characteristics Process Description

Scope Of Work Battery Limits

[Noted and agreed to the above](#)

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## DESIGN DATA AND EFFLUENT CHARACTERISTICS

The suggested treatment scheme is based on following raw effluent characteristics as per the standard industry norms.

Design flow	50 M3/Day
pH	6 - 8
Inlet COD	3000 - 3500Mg /l
Inlet BOD	1200- 1500 Mg /l
O & G	300 Mg/l
TSS	500 Mg/l Max
Temperature	40 0C Max

Treated effluent characteristics:

Design flow	50 M3/Day
pH	7 to 8.5
BOD	<30 Mg/L
COD	<250 Mg/L
O & G	< 10 Mg/L
TDS	<2100 Mg/L
TSS	< 100 Mg/L

Biogas Generation 50 M3/day (for 50 M3/Day effluent at 3500 mg/lit COD)

Calorific Value of Biogas	5100-5300 Kcal / M3
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Note: Biogas generation depends upon total COD load in effluent.

## DESIGN CONSIDERATION

## CIVIL FOUNDATION

Safe bearing capacity is considered as  $20T / m^2$  at one meter below ground level.

Excavation in Rock is not considered.

No uplift pressure shall be considered while designing the foundation.

## ELECTRICALS

Noted and agreed to the above

SIGNATURE OF THE TENDERER

All electrical components shall be of reputed make, and are non-flameproof type.

Motors shall be TEFC with IP 55 Class "B" protection.

#### MECHANICAL

All material shall conform to relevant I.S. Code.

Piping shall be in MS 'C' Class & will be laid above ground.

HDPE piping shall be laid below ground.

Valves shall be Butterfly unless otherwise stated.

### PROCESS DESCRIPTION

The effluent will first receive into the screen cum grit chamber by gravity and shall flow to sump cum equalization tank. From sump cum equalization the effluent shall be pumped to the FAT Removal Unit which shall remove the floating FAT. The effluent from the FAT removal shall flow into the Flash Mixer. The Acid / Alkali dosing tanks are provided on the top of Acid Phase for manual dosing for adjusting the pH. The feed pump shall be provided on the acid phase reactor for feeding the effluent to UASB Digester in (MS Epoxy).

The digester reduces the COD load of effluent by up to 70 +/- 5% and generates the methane rich bio-gas in the course of anaerobic digestion process. To store and utilize this bio-gas we propose a Gas Balloon. The Flare arrangement is provided to ensure the safety aspect of bio-gas storage.

The effluent enters from the bottom and leaves from the top. The bottom distribution network provided in HDPE will distribute the effluent uniformly all over the surface. The anaerobic biomass mixes with effluent. The reaction will reduce the COD and BOD and will generate biogas as a source of energy. The top portion of the UASB digester is fitted three phase GLSS (Gas Liquid Solid Separator) which will separate the solids and clear liquid will be collected in the effluent gutters. The GLSS will be in MS-Epoxy to care of corrosion. The biogas shall be collected in the gas header provided on the top of GLSS and shall be taken to the gas balloon for further utilization.

### SALIENT FEATURES OF UASB

This requires minimum power for operations. There are no moving parts inside the digester. There is no corrosion inside the digester as the process is

[Noted and agreed to the above](#)

SIGNATURE OF THE TENDERER



anaerobic. The process can be restarted quickly once the power supply is restored. The maintenance cost of the system is less.

This liquid effluent is then taken out as an over flow stream from UASB. The effluent from the outlet of the UASB shall flow to the aeration tank.

We propose to install Diffused Aeration System with Retrievable arrangement as a secondary treatment scheme to reduce the remaining COD & BOD. Fine bubble diffusers shall be installed of silicone rubber material for longer life. Twin lobe air blowers are provided for supplying the air to the diffusers the secondary clarifier is provided for collecting the MLSS generated from the aeration process. MLSS is recycled back to the aeration tank to maintain the required concentration and excess sludge shall be sent to the sludge drying beds. Further to remove the remaining suspended solids, odour and residual BOD we propose Pressure Sand Filter and Activated Carbon Filter. The clear effluent from the outlet of ACF can be used for gardening, floor washing, flushing etc.

Hypochlorite dosing shall be provided for disinfection of treated water.

A. SCOPE OF WORK (CIVIL)

1 BAR SCREEN CHAMBER	
Capacity	0.6 m3
Qty	1
MOC	RCC
2 EQUALIZATION TANK	
Capacity	25 m3
Qty	1
MOC	RCC
3 FAT REMOVAL UNIT	
Capacity	5 m3
Qty	1
MOC	RCC
4 ACID PHASE REACTOR	
Capacity	15 m3
Qty	1
MOC	RCC
5 UASB FOUNDATION	
Capacity	62.5 m3
Qty	1
MOC	Built up Foundation with RCC raft
6 PLATFORM BIOGAS BALLOON / HOLDER	
Capacity	Suitable for 5 m3 Biogas Balloon
Qty	1
MOC	Suitable
7 AERATION TANK	

Noted and agreed to the above

SIGNATURE OF THE TENDERER

Capacity	50 m3
Qty	1
MOC	RCC

8 SECONDARY CLARIFIER TANK

Capacity	9 m3
Qty	1 no
MOC	RCC

9 TREATED WATER TANK

Capacity	15 m3
Qty	1
MOC	RCC

10 EQUIPMENT FOUNDATIONS

Capacity	Suitable
Qty	1
MOC	RCC

11 MCC/LAB ROOM

Capacity	Suitable
Qty	1
MOC	RCC frame + brick work

12 SLUDGE DRYING BEDS

Qty	Suitable
MOC	Brick work

13 PATHWAYS

Capacity	Suitable
Qty	1
MOC	Paving Blocks

B. SCOPE OF WORK ( MECHANICAL)

SCREEN

Qty	1 No
MOC	SS

EFFLUENT TRANSFER PUMP

Capacity	Suitable
Qty	1W + 1SB
MOC	C.I. Horizontal centrifugal

FAT REMOVAL MECHANISM

Qty	1
Accessories	Scraper Arm, Trolley with reverse and forward movement Guide wheel, panel etc.

Noted and agreed to the above

SIGNATURE OF THE TENDERER

**FLASH MIXER AGITATOR**

Qty	1
MOC	SS 304

**UASB FEED PUMPS WITH MOTORS**

Capacity	Suitable
Qty	1W + 1SB
MOC	C.I. Horizontal centrifugal

**UASB DIGESTER TANK**

Capacity	62.5 m3
Qty	1 lot
MOC	MSEP

The digester shall be erected on RCC raft without bottom plate and designed based on IS 803, The shell will be sand blasted & epoxy painted, (SA 2.5 grade with 200 micron epoxy thereon TYP) The spiral staircase and all around walkway with FRP grating shall be provided. Manhole will be provided at suitable location. Safety Hand rails in MS Epoxy on staircase and outer side of walkway shall be erected. The outside of the tank will be sand blasted and painted primer followed with enamel paint.

**SUPPORTING STRUCTURE FOR GSS**

Qty	1 Lot
MOC	MS construction with sand blasting and epoxy painting

These are supports as per drawing to keep Gas solid separator at desired location in UASB digester, these structures will be sand blasted and epoxy painted.

**EPOXY COATED GSS (3 mm thick)**

Qty	1 lot
MOC	MS EP

Noted and agreed to the above

SIGNATURE OF THE TENDERER

These are provided to separate treated effluent sludge and biogas, the biogas is collected from the top of GSS through a gas header network, treated effluent collects in launder and due to its typical shape the sludge remains in the UASB digester.

BASE DISTRIBUTION, WITH SUPPORT

Qty	1 lot
MOC	HDPE piping as per IS 4984 PN 6

RAILING (DIGESTER)

Qty	1 lot
MOC	MS piping

The hand railing is provided on staircase and outer portion of walkway as per safety requirement, the MS railing is coated with epoxy. This protection ensures longer life of railing.

PIPING, VALVES, FITTINGS

Qty	1 lot
MOC	SS/ MS `C` Class/ HDPE/UPVC

BIOGAS BALLOON / HOLDER

Qty	1 lot
MOC	RUBBERIZED FABRIC

GAS FLARE

Capacity	Suitable
Qty	1 No
MOC	Flare with SS tip & SS cover to protect from wind, Height is 6 mtrs

GAS PIPING

Capacity	Suitable
Qty	1 Lot
MOC	MS / HDPE to be laid under ground

FLAME ARRESTER

Capacity	Suitable
Qty	1 No

Noted and agreed to the above

SIGNATURE OF THE TENDERER

MOC	MS with SS Mesh
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FOAM TRAP, SEDIMENT TRAP

Capacity	Suitable
Qty	1 No each
MOC	MS construction as per required design, sand blasted and epoxy painted

DIFFUSERS FOR AERATION TANK

Capacity	Suitable
Qty	1 Lot
MOC	Silicone based rubber

RETRIEVABLE MECHANISM

Capacity	Suitable
Qty	1 Lot
MOC	GI piping

AIR BLOWER WITH MOTOR

Capacity	Suitable
Qty	1W + 1SB
MOC	CI twin lobe positive displacement

RAILING & WALKWAY

Capacity	Suitable
Qty	1 Lot
MOC	MS ('B' class)/FRP

CLARIFIER MECHANISM

Capacity	Suitable
Qty	1 No
MOC	fixed bridge, gear box, scrapper arm) with Wetted parts epoxy painted

CLARIFIER SLUDGE PUMP

Capacity	Suitable
Qty	1W + 1SB

Noted and agreed to the above

SIGNATURE OF THE TENDERER

MOC	C.I. Horizontal centrifugal
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PIPING & FITTINGS

Capacity	Suitable
Qty	1 Lot
MOC	MS, HDPE, GI etc as required

VALVES

Capacity	Suitable
Qty	1 Lot
MOC	Butterfly valves/ Ball valves etc

ACF/PCF FEED PUMPS

Capacity	3 m3/hr
Qty	1W + 1SB
MOC	C.I. Horizontal centrifugal

PRESSURE SAND FILTER

Capacity	Suitable
Qty	1 No
MOC	MSEP

ACTIVATED CARBON FILTER

Capacity	Suitable
Qty	1 No
MOC	MSEP

PIPING, VALVES, FITTINGS

Capacity	Suitable
Qty	1 Lot
MOC	MS `C` Class/ HDPE

ALKALI AND ACID DOSING FOR FLASH MIXER

Capacity	Suitable
Qty	2 No

INSTRUMENTATION

1 LIQUID FLOW METER

Type	On line Full Bore electromagnetic with totalizer
Qty	2

Noted and agreed to the above

SIGNATURE OF THE TENDERER

The flow meters are installed in between buffer tank to UASB digester to measure feed flow, The Flow meter will be provided with totalizer placed near flow meter at site.

3 PRESSURE GAUGES

Type	Dial Type
Qty	4 Nos

**ELECTRICALS**  
**M.C.C. PANEL**

Qty 1 No

INCOMMER CABLE, CABLES & ACCESSORIES

Qty 1 Lot

The electrical MCC Panel is provided for all electrical feeder required to operate the UASB digester and allied units as mentioned in scope of work. The energy meter, individual ammeter and Volt meter will also be provided, the internal will be L & T or Siemens make. The MCC panel will be fabricated in 16 swg sheet and coated with grey color. The local push button station shall be provided with rotary equipment at site. The cables will be laid below ground as per good engineering practice, the earthling will be provided as per requirement

LOCAL PUSH BUTTONS

Qty 1 lot

**TRAINING**

We shall provide in-plant training to your chemist for operation of the ETP.

**PCB APPROVAL:**

The bidder shall obtain the consent to establish and consent to operate from TNPCCB.

Please Note: Chemicals for process (alkali, acid and hypo chloride) shall be provided by the dairy.

**LIST OF EQUIPMENTS**

S No.	Item Description	Capacity	Qty.	Unit
A.	<b>TANKER MILK RECEPTION &amp; STORAGE WITHOUT OPERATOR</b>			
1	Pitless type electronic weigh bridge	40 Ton	1	Nos.
2	Tanker unloading Hose with Fittings	63.5 mm	1	No.
3	SS 304 Deaeration Vessel	200 L	1	No.

Noted and agreed to the above

SIGNATURE OF THE TENDERER

S No.	Item Description	Capacity	Qty.	Unit
4	Tanker Unloading Pump	10 KLPH	1	No.
5	Simplex Strainer (Pipe in Pipe)	10 KLPH	1	No.
6	Raw Milk Chiller	20 KLPH	1	No.
7	Raw Milk Silos	20 KL	2	Nos.
8	CIP Return Pump raw milk silo and tanker	20 KLPH	2	No.
9	Tanker CIP hose with fittings	38mm	2	No.
10	SS Folding Type Platform with SS Railing	Suitable	1	Nos
11	Dummy Man way	Suitable	2	No
<b>B</b>	<b>MILK PROCESSING With CYCLONE FILTER</b>			
12	Milk Transfer Pump to pasteuriser	5 KLPH	1	No.
13	Milk Pasteurization Module	5 KLPH	1	Set
14	Cream Separator Solid Bowl type (without auto standardization)	5 KLPH	1	No.
15	Milk Homogenizer	5 KLPH	1	Nos.
16	Milk balance tank	Suitable	1	Nos.
17	Milk Transfer Pump	5 KLPH	1	Nos.
18	Electric Hoist	Suitable	1	Set
19	Hydroflow system for Separator	Suitable	1	Set
20	Pasteurized Milk Silos	20 KL	2	Nos.
21	Pasteurized Milk Transfer Pumps	10 KLPH	3	Nos.
22	CIP return Pump for PM silo	20 KLPH	1	No.
23	Tanker Dispatch Hose with Fittings	63.5mm	1	Sets
<b>C</b>	<b>LABORATORY EQUIPMENTS</b>			
24	Chemical and Microbiology analysis equipments			
24.1	Digital Thermometer		5	Nos.
24.2	Gerber centrifuge		1	No.
24.3	Lactometers		50	Nos.
24.4	Butyrometer		100	Nos.
24.5	Adulteration Kit		1	No.
24.6	Aflatoxin & Antibiotic Analyser		1	No.
24.7	Waterbath		1	No.
24.8	Refrigerator		1	No.
24.9	Autoclave		2	Nos.
24.10	Remi Centrifuge 80 C		1	No.
24.11	Laminar airflow chamber		1	No.
24.12	Incubator		1	No.
24.13	Digital TDS Meter		1	No.
24.14	Digital pH Meter		1	No.
24.15	IR Moisture analyser		1	No.
24.16	Analytical balance 0.1mg to 220g		1	No.
24.17	Analytical balance 1mg to 220g		1	No.
24.18	Weighing scale 0.1g to 1 Kg		1	No.
24.19	Hot air oven		1	No.
24.20	Hot plate		1	No.
24.21	Muffle Furnace		1	No.

Noted and agreed to the above

SIGNATURE OF THE TENDERER



<b>S No.</b>	<b>Item Description</b>	<b>Capacity</b>	<b>Qty.</b>	<b>Unit</b>
24.22	Sediment tester		1	No.
24.23	Hot plate with Magnetic stirrer		1	No.
24.24	Digital Burette		1	No.
24.25	Butyro-Refractometer		1	No.
24.26	Milkoscreen		1	No.
24.27	Bottle Dispensor		2	Nos.
24.28	Fumigator		1	No.
24.29	Brix Meter		1	No.
24.30	Bunsen Burner		1	No.
24.31	Glasswares & Chemicals		1	Set
<b>D</b>	<b>RECONSTITUTION SECTION</b>			
25	Reconstitution Tanks	5 KL	2	Nos.
26	Recon Water Heater cum Chiller	10 KLPH	1	No.
27	Recirculation pump	10 KLPH	1	No.
28	Turbo blender High Shear Mixer	1 TPH	1	No.
29	Duplex Filter	10 KLPH	1	No.
30	Reconstituted Milk Transfer pump	10 KLPH	1	No.
31	CIP Return Pump	20 KLPH	1	No.
<b>E</b>	<b>CREAM HANDLING</b>			
32	Cream Pre Chiller	1 KLPH	1	No
33	Cream intermediate Tank	500 L	1	No.
34	Cream Transfer Pump from buffer tank to cream pasteurizer	1 KLPH	1	No.
35	Cream Pasteurizer	1 KLPH	1	No.
36	CIP Parallel PUMP	Suitable	1	No.
37	Cream Storage Tanks	2 KL	1	Nos.
38	CIP return Pump for CST	3KLPH	1	No.
39	Cream Transfer Pump to RMST	2 KLPH	1	No.
<b>F</b>	<b>MILK PACKING SECTION</b>			
40	Milk Deep Chiller For Pouch Milk	20 KLPH	2	NOS
41	Horizontal Milk Storage Tank (HMST) with two compartments For Pouch Milk Filling	10 KL	2	NOS
42	Simplex Inline Strainer	Suitable	1	NOS
43	Self Priming CIP Return Pump For HMST's and Packing M/C	SUITABLE	2	NO
44	Double Head Servo and PLC type FFS Milk Pouch Filling Machine	10000 PPH	2	NOS
45	SS Crate Washer- Single Track	800 CRT/HR	1	NOS
46	Leaky Pouch Milk Tank	500 L	1	NOS
47	Simplex Inline Strainer	Suitable	1	NOS
48	Milk Transfer Pump From Leaky Pouch Tank To Rinse Milk Recovery Tank	5 KLPH	1	NOS
49	Cooling Water Balance Tank	suitable	1	No.
50	Cooling Water Circulation Pump	suitable	1	No.
51	Simplex Inline Strainer	Suitable	1	NOS
52	Cooling Water Chiller	suitable	1	No.
53	Weighing Balance	2 KGS	1	NOS

Noted and agreed to the above

SIGNATURE OF THE TENDERER

<b>S No.</b>	<b>Item Description</b>	<b>Capacity</b>	<b>Qty.</b>	<b>Unit</b>
54	Weighing Balance	50 KGS	1	NOS
55	Trolley For Filled Milk Crate Handling	suitable	4	NOS
<b>G.</b>	<b>FERMENTED PRODUCTS MANUFACTURING</b>			
56	Milk storage tank	2 KL	1	No
57	Curd Pasteurizer	2KL	1	No
57 a	Venturi with reconstitution	500 LPH	1	No
58	Curd Innoculation tank	500 Lts	2	No
59	Curd Processed milk storage tank	2 KL	1	No
60	Curd Cup filling machine	2400 CPH	1	No
61	Curd pouch packing machine Servo and PLC type	5000 P/H	1	No
62	Curd Incubation room	2 KL	1	No
63	Curd cold room, Blast freezer	5 T	1	No
64	Butter milk mixing tank	500 Lts	1	No
65 a	Shear Pump	2 KLPH	1	No
66	Butter milk chiller	500 LPH	1	No
67	CIP Return pump	Suitable	1	No
68	Pipe lines and fittings	Suitable	1	Lot
<b>H</b>	<b>KHOA /PEDA PRODUCTION</b>			
69	Milk storage tank	500 Lts	1	No
70	Milk transfer pump	Suitable	1	No
71	Open type Khoa pan steam operated	240 Lts	2	Nos
72	SS Trays for Khoa		50	Nos
73	CIP Return pump	Suitable	1	No
74	Khoa Vacuum packing machine	Suitable	1	No
75	Ink Jet coding machine		1	No
76	SS Table	Suitable	1	No
77	Weighing balance	0- 2 Kgs	2	No
<b>I</b>	<b>GHEE PRODUCTION &amp;PACKING</b>			
78	Butter melting vat	1 KL	1	Nos.
79	Hot Water Recirculation System for Butter Melting Vat	Suitable	1	No.
80	Molten Butter transfer pump	2 KLPH	1	No.
81	Pre stratification tank	500 L	1	Nos.
82	Concentrated Fat transfer pump	2 KLPH	1	No.
83	Serum collection tank	SUITABLE	1	No.
84	Serum transfer pump	2 KLPH	1	No.
85	Ghee Boiler	500 L	1	Nos.
86	Ghee Balance Tank	Suitable	1	No.
87	Duplex Bucket Filter	Suitable	1	No.
88	Ghee Transfer Pump	1 KLPH	1	No.
89	Ghee Settling Tanks	500 L	1	Nos.
90	Ghee Transfer Pump	500 LPH	1	No.
91	Ghee Clarifier	500 LPH	1	No.
92	Ghee Balance Tank	Suitable	1	No.
93	Ghee Transfer Pump	1 KLPH	1	No.
94	Ghee Settling Tank	1 KL	2	No.

Noted and agreed to the above

SIGNATURE OF THE TENDERER

<b>S No.</b>	<b>Item Description</b>	<b>Capacity</b>	<b>Qty.</b>	<b>Unit</b>
95	Hot Water System for Ghee Storage Tank	Suitable	1	No.
96	AUTOMATIC GHEE PET JAR FILLING MACHINE 50 MI to 1000 MI	Suitable	1	No.
97	Inkjet Printer	Suitable	1	No.
98	Weighing Balance	0-2 Kgs	2	No.
99	SS WORKING TABLES	SUITABLE	1	Lot
100	PIPING, INSULATION, PLATFORMS, STRUCTURES ETC		1	Lot
<b>J</b>	<b>RINSE MILK SECTION</b>			
101	Rinse Milk balance Tank	1 KL	1	No.
102	Rinse Milk Transfer Pump	2 KLPH	1	No.
103	Rinse Milk Chiller	2 KLPH	1	No.
104	Rinse Milk Storage tank	5 KL	1	No.
105	Rinse Milk Transfer Pump to reconstitution	10 KLPH	1	No.
<b>K</b>	<b>CIP-THREE CIRCUIT</b>			
106	CIP Return pump	20 KLPH	1	No.
107	Bulk acid Tank	10 KL	1	No.
108	Bulk Lye Tank	10 KL	1	No.
109	Acid Carboy unloading tank	500L	1	No.
110	Lye flake dissolving tank with agitator	2 KL	1	No.
111	Overhead dosing tank for Process	500 L	2	No.
112	Chemical Unloading Pump	10 KLPH	2	No.
113	Chemical Unloading hose	51 mm	2	No.
114	Acid transfer pump - (1 W + 1 S)	40-500 LPH	2	No.
115	Lye transfer pump - (1 W + 1 S)	40-500 LPH	2	No.
116	CIP Tanks platform		1	lot
117	Lye Tank	8 KL	1	No.
118	Acid Tank	8 KL	1	No.
119	Hot water Tank	8 KL	1	No.
120	Recuperation Tank	8 KL	1	No.
121	Flush Water tank	5 KL	1	No.
122	CIP PHE	10 KLPH	2	No.
123	Duplex Inline Strainer	10 KLPH	2	No.
124	Acid/lye tank recirculation pump	5 KLPH	2	No.
125	CIP Supply Pump for liquid milk plant	10 KLPH	2	No.
126	CIP PHE	20 KLPH	1	No.
127	Duplex Inline Strainer	20 KLPH	1	No.
128	CIP Supply Pump for liquid milk plant	20 KLPH	1	No.
129	Safety Shower		1	No.
130	CIP tank platform		1	Lot
<b>L</b>	<b>PIPE FITTINGS AND VALVES</b>			
131	SS Piping (Milk, Product, CIP Etc.) and SS 304 Support	Suitable	1	Lot
132	SS Pneumatic Valves (All Types	Suitable	1	Lot

Noted and agreed to the above

SIGNATURE OF THE TENDERER

S No.	Item Description	Capacity	Qty.	Unit
	other than Mix Proof Type)			
133	SS Pneumatic Valves Mix proof Valves (Self Cleaning )	Suitable	1	Lot
134	SS Fittings and Manual Valves	Suitable	1	Lot
135	SS/ GI Structural for piping	Suitable	1	Lot
<b>M</b>	<b>SERVICE EQUIPMENTS-BOILER</b>			
136	Wood / Briquette fired Steam Boiler with accessories	2000 Kgs	2	Sets
137	HP and LP Steam Distribution Pipes & Supports	Suitable	1	Lot
138	Steam PRS with support	Suitable	3	Sets
139	Insulation of Steam and Condensate Piping	Suitable	1	Lot
140	Steam Water Mixing Battery	Suitable	15	Nos.
141	Fire Extinguishers	Suitable	1	Sets
<b>N</b>	<b>Refrigeration Plant</b>	Suitable	1	Lot
	<b>A.REFRIGERATION SYSTEM</b>			
142	High Stage Reciprocating Compressor operating at –10 °C SST / 38 °C SDT with all associated accessories. (One shall act as standby.)	65 TR	2	Nos.
143	Motor for compressor	90 KW	2	Nos.
144	VFD for the above motors	Suitable	2	Nos.
145	Evaporative type Condenser with IE-4 Eff. Pump & Fan motors c/w all accessories (1w + 1s)	120 TR	2	Nos.
146	High Pressure Liquid Receiver with all valves and accessories	4000 L	1	No.
147	–10 °C Low Pressure Liquid Accumulator of minimum size 1.37 x 3.6-m	Suitable	1	No.
148	Refrigerant Liquid Pumps for –10 °C	Suitable	2	Nos.
149	Air Purger – Automatic	Suitable	1	No.
150	Ice Bank Tank (indoor type) with stiffening arrangement fully made of M.S Sheet including supports.	Suitable	1	Set
151	IBT Coil made of M.S Seamless tubes SA 106 Grade Sch 40	Suitable	1	No.
152	Tank Insulation	Suitable	1	Lot
153	Agitator and its frame	Suitable	1	Set.
154	FRP Covers for IBT	Suitable	1	Lot
155	Chilled water pump for Process	Suitable	2	Nos.
156	Forced Draft Cooler with controls and accessories for <b>Milk Cold Room</b> (fin spacing not less than 6-mm) incl. liquid feed assembly.	Suitable	4	Nos.
157	Forced Draft Cooler with controls and accessories for <b>Curd Cold</b>	Suitable	1	No.

Noted and agreed to the above

SIGNATURE OF THE TENDERER

S No.	Item Description	Capacity	Qty.	Unit
	<b>Room</b> (fin spacing not less than 6-mm) incl. liquid feed assembly.			
158	Forced Draft Cooler with controls and accessories for <b>Curd Blast Room</b> (fin spacing not less than 6-mm) incl. liquid feed assembly.	Suitable	1	No.
159	Forced Draft Cooler with controls and accessories for <b>Ante Room of Milk Cold Rooms</b> (fin spacing not less than 6-mm) incl. liquid feed assembly.	Suitable	1	No.
160	Room Heater for Curd Incubation room	Suitable	2	Nos.
161	M.S Seamless pipes, valves, fittings and accessories for refrigerant, oil lines, etc. SA 106 Sch 40 for temp. up to -19 °C and SA 333 for below -20 °C	Suitable	1	Lot
162	G.I. B class pipes, valves, fittings & accessories for cooling water, defrosting water, etc.	Suitable	1	Lot
163	PUF pipes Insulation for pipes & vessels, equipment, etc. complete Alu cladding.	Suitable	1	Lot
164	Main MCC for entire plant etc.	Suitable	1	Set
165	Harmonic filter Panel	Suitable	1	Set
166	Power, Control, signal and instrumentation cables plus Cable trays & Accessories, chemical earthing & accessories	Suitable	1	Lot
167	Instruments & Safety accessories including Ammonia Leak Deduction.	Suitable	1	Lot
168	Compressor Oil and other consumables like Gas and charging hose	Suitable	1	Lot
	<b>B. PUF PANEL &amp; ACCESSORIES</b>			
169	Floor insulation with all accessories for Various Cold Rooms	Suitable	300	Sq.mt
170	Walls & Ceiling insulation with all accessories for Various Cold Rooms	Suitable	800	Sq.mt
171	Internal electrification of various cold rooms.	Suitable	1	Lot
172	Manual Sliding type Door for Various Cold rooms.	Suitable	9	Nos.
173	Air Curtains and PVC strip curtain	Suitable	10	Nos.
174	Cold Store Safety Systems for cold rooms	Suitable	1	Lot
175	Anything additional to above	Suitable	1	Lot
<b>O</b>	<b>AIR AND WATER</b>			

Noted and agreed to the above

SIGNATURE OF THE TENDERER

S No.	Item Description	Capacity	Qty.	Unit
176	Oil Free as per ISO 8573 class 0 water injected single stage screw air compressor with output 70 -133 CFM at 10 bar max working pressure at compressor outlet as per ISO1217. With inbuild VFD. Operating voltage 400 V with IP55 and IE 3 and above.	130 CFM	2	Set
177	Refrigerant Dryer Air cooled	200 CFM	2	Sets
177a	Upstream pre filter to suit compressor for dust filtration	200 CFM	2	No
177b	Down stream fine filter to suit compressor for dust / oil filtration.	200 CFM	2	No
178	Vertical Air Receiver (MS), 12.5 bar with auto drain valve.	2M <sup>3</sup>	1	Set
179	Compressed air Distribution piping and support		1	Lot
180	(RAW/SOFT/RO) WATER DISTRIBUTION SYSTEM		1	Lot
181	Raw Water Pump	20 KLPH	2	No.
182	Multi grade Filter	10 KLPH	1	No
183	NAOCL Dosing System		1	No
184	Activated Carbon Filter	10 KLPH	1	No
185	Filtered water pump for softner	20 KLPH	2	No
186	Semi automatic Softner plant with re generation system	1	10 KLPH	1 No
187	Raw filtered water hydro flow system with vertical pumps ( 2W + 1S)	20 KLPH	1	Set
188	Soft water hydroflow system with vertical pumps ( 2W + 1S)	20 KLPH	1	Set
189	Automatic RO plant	1000 LPH	1	Set
190	RO water buffer storage tank	1000 Liters	1	No.
191	RO water pressurized pumping hydro flow system (2W+1S)	Suitable	1	Set
192	Raw water pressurized pumping hydro flow system (1W+1S)	Suitable	1	Set
193	Water (Raw/Soft/DM) distribution piping and support	Suitable	1	Lot
194	STRUCTURAL BRIDGES/PLATFORMS	Suitable	1	Lot
<b>P</b>	<b>ELECTRICAL &amp;INSTRUMENTATION</b>			
<b>195</b>	<b>HT Transformer with accessories</b>	500 KVA	1	no
195	HT CABLES AND PANELS		1	LOT
196	PCC PANEL AND ACCESSORIES		1	LOT
197	MCC PANEL AND ACCESSORIES		1	LOT
198	Automation System	Suitable	1	LOT
199	Field Instruments	Suitable	1	LOT
200	EARTHING SYSTEM CABLE TRAYS		1	LOT

Noted and agreed to the above

SIGNATURE OF THE TENDERER

<b>S No.</b>	<b>Item Description</b>	<b>Capacity</b>	<b>Qty.</b>	<b>Unit</b>
201	OTHER ELECTRICAL ACCESSORIES		1	LOT
202	DG SET with accessories	320 KVA	1	NO
203	STANDBY OPERATION AND TRAINING (FOR 15 DAYS)		1	JOB
204	SERVICE COVER		1	JOB
205	MISCELLANEOUS EQUIPMENTS		1	

Noted and agreed to the above

SIGNATURE OF THE TENDERER

## **MAKES OF BOUGHTOUT ITEMS**

### **LIST OF PREFERRED MAKES OF BOUGHT OUT ITEMS**

<b>MILK &amp; CREAM RECEPTION, PROCESSING, STORAGE AND DISPATCH</b>	
<b>DESCRIPTION</b>	<b>MAKES</b>
PHEs	APV/TETRAPAK / ALFA LAVAL
Milk / CIP Hoses	SAINT GOBAIN/ BLAUDEIK/ JESITECH
Tri-purpose Centrifuge (Self Cleaning)	GEA WESTFALIA / TETRAPAK /SPX
Inline Blending Unit	GEA WESTFALIA / TETRAPAK / SPX/ Imported
Homogenizers	GEA NIRO SOAVI / TETRAPAK / SPX
High Shear Mixer	SPX / ALFALAVAL / GEA / TETRAPAK/
Milk Pouch Packing Machine	SAMARPAN / NICHROME / THIMONNIER/ATOMIC
Crate Washer	SWASTIK / SS ENGINEERS / IDMC
SS Milk & CIP Supply & Hot water Pump	ALFA LAVAL/ SPX/ WAUKESHA CHERRY- BURRELL / FRISTOM
CIP Return Pump (self-priming)	ALFA LAVAL / SPX/IDMC
Milk Silo Agitator (Side	ALFA LAVAL /STELZER / PRG / LENKA
TTO printer	DOMINO / IMAGE
<b>INSTRUMENTATION, CONTROLS &amp; AUTOMATION</b>	
<b>DESCRIPTION</b>	<b>MAKES</b>
PLC System / DCS System / Automation	ROCKWELL (ALLEN BRADLEY)/ABB/SIMENS
VFD	DANFOSS / ROCKWELL / ABB
HMI	ABB/ ALLEN BRADLEY
Level Transmitter & Indicator	E+H / EMERSON / ANDERSON-NEGLE / IFM
Temperature / Pressure Transmitter	E+H / EMERSON / BAUMER/IFM
Conductivity & pH Transmitter	E+H / EMERSON / YOKOGAWA
Turbidity Sensor	ANDERSON NEGELE
RTD	E+H / EMERSON / BAUMER/ANDERSON NEGELE
Flow Switch	IFM / E+H / BAUMER/ANDERSON NEGELE
Level Switch	IFM / E+H / BAUMER/ANDERSON NEGELE
Vortex / Magnetic Flow meter	E+H / YOKOGAWA / EMERSON
Mass Flow meter	E+H / EMERSON / YOKOGAWA
Control Valve	SAMSON/BURKET/FORBES MARSHALL
Pressure & Temperature Gauge	WIKA / WAREE / BAUMER / JUMO / FORBES MARSHALL
Load Manager / Power / Energy Monitor	ABB / ROCKWELL/SCHNEIDER
Workstation & Monitor (24")	HEWLETT-PACKARD / IBM / DELL
<b>ELECTRICALS</b>	
<b>DESCRIPTION</b>	<b>MAKES</b>
Electric Motors	SIEMENS / ABB
HT Transformer	Crompton / Kirloskar/ English Electric

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Diesel Generator	Cummins / Kirloskar /Greaves / Ashok Leyland
Air Circuit Breaker	L&T / SIEMENS / SCHNEIDER/ABB
MCCB	L&T / SIEMENS / SCHNEIDER/ABB
Contactors	L&T / SIEMENS / SCHNEIDER/ABB
Starter Overload Relays	L&T / SIEMENS / SCHNEIDER/ABB
Intelligent Motor Protection Relays	SIEMENS / ROCKWELL / L&T / SCHNEIDER/ABB
Timers Electronic	L&T / SIEMENS / SCHNEIDER/ABB
MCBs	L&T / SIEMENS / SCHNEIDER/ABB
Push Buttons	TEKNIC / L&T / SIEMENS/ABB
Indicating Lamps (LED)	TEKNIC / L&T / SIEMENS/ABB
Digital Ammeter & Voltmeter	CONZERV / MECO / HPL SOCOMEC / L&T / SIEMENS/ABB
Analog Ammeter & Voltmeter	RISHABH / IMP / MECO / AE/ABB
Digital Energy Meter	SIEMENS / ABB / ROCKWELL / SCHNEIDER/ABB
PVC Conduit & accessories	PRECISION / CLIPSAL / P – PLAST / POLYCAB
Power Factor Meter	L&T / IMP / MECO / AE / CONZERV/ABB
Programmable Protection Relay	MINILEC / CONZERV / L&T / SIEMENS / SCHNEIDER
Current Transformer	KAPPA / MECO / AE / IMP / INDCOIL
LT Power Cables (COPPER) FROM IMCC to various consumption points.	KEC (RPG) / FINOLEX / RR KABEL / POLYCAB/ SBEE / UNIVERSAL
LT Copper Control Cables	KEC (RPG) / FINOLEX / RR KABEL / POLYCAB/ SBEE / UNIVERSAL
Signal & Instrument cable	KEC (RPG) / FINOLEX / RR KABEL / POLYCAB/ SBEE / UNIVERSAL
LT Power Cables (Aluminium) from PCC to IMCC/power distribution Board	KEC (RPG) / FINOLEX / RR KABEL / POLYCAB/ SBEE / UNIVERSAL
Power Capacitors	EPCOS / SCHNEIDER / SIEMENS / L&T
APFC Relay	BELUKE / EPCOS / L&T / PHASITRON
Cable Tray	INDIANA / MEK / PILCO / ELCON / METALICAPRESSINGS / POWER CONTROLS / SILVER LINE
Isolating Switches	L&T / SIEMENS / SCHNEIDER
HRC fuses	L&T / SIEMENS / EE / C&S / BUSMANN / GE POWER
Plug & Socket	SCHNEIDER / LEGRAND / CLIPSAL / BCH / HENSEL
Terminal Blocks	WAGO / CONNECT WELL / ELMEX
Rotary Selector Switch	KAYCEE / SALZER / L&T / SIEMENS
Cable Glands	COMMET / EX-PROTECTA / DOWELS / BRACKO
Cable Lugs	DOWELS / COMMET
Mechanical Interlock	L&T / SCHNEIDER / ABB / SIEMENS
Electronic Soft Starter	DANFOSS / SIEMENS / ROCKWELL

Noted and agreed to the above

SIGNATURE OF THE TENDERER

	(ALLEN BRADLEY)
Servo Voltage Stabilizer	APLAB / NEEL / KRYKARD / DB ELECTRONICS / PRIMA / NUMERIC
UPS	APC / EMERSON / NUMERIC / REILLO / SIEMENS / HI-REL / APLAB
SMF Battery	YUASA-ROCKET / EXIDE
Lithium Ion Battery	SAMSUNG / LG / PANASONIC
Cable Joint Kit	3M / RAYCHEM-RPG
PVC insulated Tap	ANCHOR / STILL GRIP
Light fixture LED	PHILIPS / WIPRO
Exhaust Fan	CROMPTON / ALMONARD
Chemical Type earthing	
Rubber Mat	JYOTI / VARDHAN / RAYCHEM RPG
Harmoic Filter	APC / EMERSON / AMTECH/Danfoss
Boxes for motor isolators, push buttons, junction boxes etc.	HENSEL / HANSU / BCH
<b>VALVES &amp; PIPES (MS &amp; GI)</b>	
<b>DESCRIPTION</b>	<b>MAKES</b>
Water Valves (Butterfly / Ball)	AUDCO / SAUNDERS / INTERVALVE / BDK /L&T
Water Valves (Diaphragm)	SAUNDERS / BDK / L&T
Non-return Valve for water	AUDCO / INTERVALVE / BDK / L&T
Water Foot Valve	KIRLOSKAR / GG / LEADER
GI Pipes for Water, Chilled Water & Air	TATA / JINDAL
MS Pipes for Steam.	TATA / JINDAL / KALYANI / MSL
MS Pipes for Gychol	TATA / JINDAL / KALYANI / MSL
NRV for Air / Oil Line	INTERVALVE / AUDCO / LEADER / L&T
Solenoid Valve for Water line	DANFOSS / AVCON / ROTEX / BURKERT / FESTO
Globe Valves (For Hot Water , Steam)	AUDCO / SPIRAX / ARMSTRONG, USA / BDK /L&T
<b>SS PIPES &amp; VALVES</b>	
<b>DESCRIPTION</b>	<b>MAKES</b>
SS Pipes	RATNAMANI / BHANDARI FOILS & TUBES / APEX TUBES / RENSA
SS seat type Pneumatic Valves	GEA TUCHENHAGEN / ALFA LAVAL / SPX
Pneumatic SS Butterfly / Ball type valves	GEA TUCHENHAGEN / ALFA LAVAL / SPX
SS Manual Valves & Fittings	ALFA LAVAL / SPX / EQUIVALENT
<b>AIR COMPRESSORS &amp; AIR LINE FITTINGS</b>	
<b>DESCRIPTION</b>	<b>MAKES</b>
Air Compressor	Elgi / Ingersoll Rand/ Atlascopco
Air lines accessories	FESTO /SHAVO NORGEN / LEGRIS / NUCON / SMC / PARKER
Auto Drain Valve	ULTRA FILTER / ZANDER/HYDINT
<b>MISCELLANEOUS TEMS</b>	
<b>DESCRIPTION</b>	<b>MAKES</b>
Geared Motor / Gear Box	SEW/PBL / ELECON / IC BAUER/ BONFIGLIOLI

Noted and agreed to the above

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### Preferred make for refrigeration items

Sl. No.	Item Description	Preferred Make
1.	Reciprocating compressor package	FRICK INDIA/ MYCOM / KIRLOSKAR
2.	Motor	SIEMEN / ABB / BHARAT BIJLEE/ CROMPTON GREAVES
3.	Electronic soft starter /VFD	SIEMENS / ALLEN BRADLEY /L&T / DANFOSS
4.	Evaporative Type condensers	FRICK INDIA/ STAR COOLER/ THERMAX/ EVAPCO /BALTIMORE
5.	Forced draft coolers	FRICK / STAR COOLER/ GUNTNER/ GOEDHART
6.	Pre-fabricated insulating panels	FRICK/ LLOYDS/ RINAC/ METECNO/ KINGSPIN JINDAL
7.	Liquid ammonia pump	FRICK/ TH.WITT/ HERMETIC/HYDRODYNE
8.	Chilled water pump	GRUNDFOS / CRI
9.	Automatic air Purger	FRICK/ ARMSTRONG / DANFOSS /GEA
10.	Water Pipes	TATA / JINDAL / ZENITH / MST / KALYANI
11.	Air curtains	RUSSEL /ALMONARD/ MITZVAH
12.	Cold store e door (sliding )	METAFLEX / SALCO / MTH
13.	EPS/PUF slab insulation material	FRICK/ LLOYDS/ RINAC/ METECNO
14.	Saddles for cold insulation	SUPERTHERM (LLOYDS) / BEARDSSELL
15.	Refrigerant / Oil pipes	TATA / JINDAL /KALYANI /MSL / ISMT
16.	SS & MS Structural channels & angles	SAIL / TATA STEEL /RINL / ESSAR
17.	SS Coils & Plates	SAIL / TATA STEEL / RINL / JINDAL/ ESSAR
18.	SS Pipes and Tubes	RATNAMANI / BHANDARI FOILS & TUBES / APEX / JINDAL QUALITY TUBULAR / SHUBLAXMI / RENSA
19.	Ammonia system valves (all types)	PARKER /HERL-KIRLOSKAR/HANSEN/REVALCO/DANFOSS
20.	Water valves	SAUNDERS / L&T (AUDCO) /BDK / INTERVALVE / CRESCENT / LEADER/ GEMU
21.	Human Machine Interface (HMI)	ALLEN BRADLEY (ROCKWELL) / SIEMENS
22.	Reflux type ammonia liquid level gauge	REVATHI / RK DUTTA
23.	Dial type Pressure / Temperature gauges	H.GURU / PRICOL / FIEBIG/ WARREE
24.	Digital temperature sensors/ indicator / controller	E&H / EMERSON / ANDERSON NEGELE / IFM/ RADIX
25.	Harmonic Filter	P2 SOLUTION/ L&T / SIEMENS / SCHNEIDER / ABB / EMERSON / SCHAFNER

Noted and agreed to the above

SIGNATURE OF THE TENDERER

<b>Sl. No.</b>	<b>Item Description</b>	<b>Preferred Make</b>
26.	Digital temperature indicating	DANFOSS / JONHSON CONTROLS/ DIXELL-EMERSON/ HONEYWELL
27.	controller with defrost control for packaged refrigeration units	
28.	Harmonic Filter	L&T / SIEMENS / SCHNEIDER / ABB / EMERSON / SCHAFNER
29.	ACB / MCCB	SIEMENS/ L&T/ SCHNEIDER / ABB
30.	Switch fuse units	SIEMENS/L&T/SCHINDER / ABB
31.	MCB	HAGER / SIEMENS / MDS – LEGRAND / SCHNEIDER / ABB
32.	LT armored Power Cables	KEC (RPG) / FINOLEX / RR KABEL / POLYCAB/ SBEE / UNIVERSAL
33.	LT armored Copper Control Cables	KEC (RPG) / FINOLEX / RR KABEL / POLYCAB/ SBEE / UNIVERSAL
34.	LT steel braided copper power & control cables	LAPP KABEL / SBEE
35.	Protective relays / Over-load relays / Bidders / Timer / MPCB	L & T/SIEMENS/ SCHNEIDER/ABB
36.	Push button	L&T / SIEMENS / SCHNEIDER / ABB / TEKNIC / VAISHNAV / GE
37.	LED type indication lamp	L&T / SIEMENS / BINAY / TEKNIC / SCHNEIDER
38.	Terminal block	WAGO / LAPP INDIA / CONNECTWELL
39.	HRC fuse	L & T / SIEMENS /EE/GE POWER / C&S
40.	Measuring instruments	L&T / SIEMENS / IMP/ MECO / AE / RISHAB
41.	Resin Cast / Poly Carbonate Current transformer	KAPPA / BHARTI / L&T / NEWTEK / PRECISE / AE / SCHNEIDER
42.	Description	MAKE
43.	Rotary switches	L&T / SIEMENS/ SALZER /TEKNIC / KAYCEE
44.	Capacitors	EPCOS / SCHNEIDER / NEPTUNE DUCATI / L&T / KHATAU JANKAR / UNISTAR
45.	Lugs	DOWELLS/ COMET / LAPP KABEL
46.	Gland	DOWELLS/ COMMET / LAPP KABEL / BRAVO
47.	LT Energy meter/ Digital Voltmeter / Ammeter	L&T/ ENERCON/ INDIAMETER /CADEL
48.	Vapour proof Light fittings for cold store /deep freezes	PHILIPS / WIPRO
49.	Personal Computer	HEWLETT-PACKARD / DELL / LENOVO
50.	UPS	EMERSON / HI-REL / DB ELECTRONICS/ SOCOMEC / REILO
51.	SMF Battery	AMCO / EXIDE / AMARA RAJA / AMCO YUASA
52.	Plug & Socket	LEGRAND / CLIPSAL / BCH
53.	Package type Air Cooled Condensing Unit	SOUTHERN REFRIGERATION/ FRICK/EMERSON

Noted and agreed to the above

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<b>Sl. No.</b>	<b>Item Description</b>	<b>Preferred Make</b>
54.	Freon Package Compressor	BITZER/ EMERSON/DANFOSS
55.	Freon Package Evaporator	GUNTNER/ LUVE
56.	Frequency Inverter	BITZER/ DANFOSS/ SCHNEIDER
57.	Electronic Expansion Valve	CAREL/ DANFOSS

**. Preferred make for Steam generation items**

<b>Sl. No.</b>	<b>Item Description</b>	<b>Preferred Make</b>
1.	Boiler	FORBES MARSHALL, THERMAX
2.	Feed Water Pump	WILO, GRUNDFOSS, KSB,
3.	Burner	AS PER MFG STANDARDS
4.	Blower	BURNER MANUFACTURER'S STANDARD
5.	Photocell	BURNER MANUFACTURER'S STANDARD
6.	Motors	CROMPTON GREAVES, LAXMI HYDRAULICS, ABB, SIEMENS
7.	Main steam stop valve (Piston Type)	FORBES MARSHALL, BDK, UNIKLINGER,
8.	Steam & Water Valves	FORBES MARSHALL, UNIKLINGER, BDK, AUDCO, INTERVALVE
9.	Non Return valve	SPIRAX MARSHALL , AUDCO, BDK, INTERVALVE
10.	Safety valve	FAINGER LESSER, FORBES MARSHALL, MAZDA, INTERVALVE, LEADER, THERMAX
11.	Blow down valve	LEVCON, THERMAX, AS PER MFG STANDARDS
12.	Level indicator	TELEFLO / TECTROL,
13.	Level controller	MALHOTRA, AS PER MFG STANDARDS
14.	Pressure switches	INDFOSS, TRAFFIC/SWITZER/ ORION
15.	Pressure gauges	FORBES MARSHALL, WAREE, GENERAL INSTRUMENT, WIKA
16.	Steam flow meter	FORBES MARSHALL, E&H, EMERSON
17.	Automatic Blowdown Control System	SPIRAX MARSHALL, THERMAX
18.	Electrical Switch Gears	L&T/SIEMENS,
19.	Cables	POLYCAB, FINOLEX, HAVELLS, KEI, RPG ASIAN
20.	MCB	L&T, SNEIDER, HAVELLS

**Approved Makes for ETP Equipment**

<b>Sl. No.</b>	<b>Item Description</b>	<b>Preferred Make</b>
1.	Pump & Motor	KIRLOSKAR /KSB / JHONSON
2.	Valves	NORMEX / CRANE / UNISON/DELVAL
3.	Fat Removal unit	UEPL/ EQUV
4.	Flash Mixer	UEPL/ EQUV

Noted and agreed to the above

SIGNATURE OF THE TENDERER

5.	PSF & ACF	UEPL
6.	Liquid Flow Meter	MANAS / EQUIV
7.	Pressure Gauge	H GURU/ GENERAL / EQUIV.
8.	MS Structure	IS- 2062
9.	MS Piping	IS 1239/3589
10.	HDPE piping	IS 4984/ IS 14333
11.	Gear Box	INDOFAB/ PREMIUM
12.	Clarifier Mechanism	UEPL/ EQUV
13.	Epoxy Paint	ATUL /PIDILITE/BERGER
14.	Diffusers	REHAU GERMANY/OTT
15.	Air Blowers	USHA COMPRESSOR

**Approved Makes for Water Treatment System**

<b>Sl. No.</b>	<b>Item Description</b>	<b>Preferred Make</b>
1	<b>Water treatment system</b>	<b>Ion Exchange/ Thermax</b>

Noted and agreed to the above

SIGNATURE OF THE TENDERER



NAME OF ITEM / WORK	:	<b>DESIGN, SUPPLY, ERECTION, INSTALLATION, TESTING AND COMMISSIONING OF 50 TLPD CAPACITY NEW DAIRY PLANT AT THOOTHUKUDI DCMPU LTD.,</b>
TENDER REFERENCE NO	:	1111/Proj.4/2022, Dated:28.02.2022

**PART – II**

**COMMERCIAL BID**

THE TAMILNADU COOPERATIVE  
MILK PRODUCERS' FEDERATION LTD  
CHENNAI 600 035

### **QUALIFICATION**

The commercial offers of such of those tenderer who qualify themselves for being considered for **Design, Supply, Erection, Installation, Testing and Commissioning of 50 TLPD Capacity New Dairy Plant at Thoothukudi DCMPU Ltd.**, by fulfilling the entire terms and conditions as laid in Part I "Technical Bid" of this tender, will be considered for the finalization of the tender. Other commercial offers not qualifying as above will be rejected outright.



**Design, Supply, Erection, Installation, Testing and Commissioning of  
50 TLPD Capacity New Dairy Plant at Thoothukudi DCMPU Ltd.,**

**ABSTRACT  
PRICE QUOTE SCHEDULE**

				In Rupees
S.N.	DESCRIPTION			RATE
A	<b>SUPPLY:</b>			
1	Basic Price (Break up details – to be furnished in a separate enclosure)			
2	Packing Forwarding if any			
3	Transportation charges to site including loading and unloading charges			
4	Transit insurance			
5	GST/IGST			
	<b>Sub-Total (A)</b>			
B	<b>Installation, Testing and Commissioning</b>	<b>Material cost if any</b>	<b>Labour Cost</b>	
1	Unpacking, shifting and positioning charges			
2	Installation, Testing and Commissioning charges			
3	GST/IGST			
	<b>Sub Total (B)</b>			
	<b>TOTAL PRICE (A+B)</b>			
	<b>TOTAL PRICE IN WORDS</b>			

SIGNATURE OF THE TENDERER WITH SEAL

SIGNATURE OF THE TENDERER

## BREAK-UP DETAILS FOR ABSTRACT PRICE QUOTE SCHEDULE

In Rupees

S NO.	ITEM DESCRIPTION	CAPACITY	QTY.	UNIT	BASIC PRICE	P&F	TRANSPORT CHARGES	TRANSIT INSURANCE	GST/ IGST	TOTAL PRICE
<b>A.</b>	<b>TANKER MILK RECEPTION &amp; STORAGE WITHOUT OPERATOR</b>									
1	PITLESS TYPE ELECTRONIC WEIGH BRIDGE	40 TON	1	NOS.						
2	TANKER UNLOADING HOSE WITH FITTINGS	63.5 MM	1	NO.						
3	SS 304 DEAREATION VESSEL	200 L	1	NO.						
4	TANKER UNLOADING PUMP	10 KLPH	1	NO.						
5	SIMPLEX STRAINER (PIPE IN PIPE)	10 KLPH	1	NO.						
6	RAW MILK CHILLER	20 KLPH	1	NO.						
7	RAW MILK SILOS	20 KL	2	NOS.						
8	CIP RETURN PUMP RAW MILK SILO AND TANKER	20 KLPH	2	NO.						
9	TANKER CIP HOSE WITH FITTINGS	38MM	2	NO.						
10	SS FOLDING TYPE PLATFORM WITH SS RAILING	SUITABLE	1	NOS						
11	DUMMY MAN WAY	SUITABLE	2	NO						
<b>B</b>	<b>MILK PROCESSING WITH CYCLONE FILTER</b>									

S NO.	ITEM DESCRIPTION	CAPACITY	QTY.	UNIT	BASIC PRICE	P&F	TRANSPORT CHARGES	TRANSIT INSURANCE	GST/ IGST	TOTAL PRICE
12	MILK TRANSFER PUMP TO PASTEURISER	5 KLPH	1	NO.						
13	MILK PASTEURIZATION MODULE	5 KLPH	1	SET						
14	CREAM SEPARATOR SOLID BOWL TYPE (WITHOUT AUTO STANDARDIZATION)	5 KLPH	1	NO.						
15	MILK HOMOGENIZER	5 KLPH	1	NOS.						
16	MILK BALANCE TANK	SUITABLE	1	NOS.						
17	MILK TRANSFER PUMP	5 KLPH	1	NOS.						
18	ELECTRIC HOIST	SUITABLE	1	SET						
19	HYDROFLOW SYSTEM FOR SEPARATOR	SUITABLE	1	SET						
20	PASTEURIZED MILK SILOS	20 KL	2	NOS.						
21	PASTEURIZED MILK TRANSFER PUMPS	10 KLPH	3	NOS.						
22	CIP RETURN PUMP FOR PM SILO	20 KLPH	1	NO.						
23	TANKER DISPATCH HOSE WITH FITTINGS	63.5MM	1	SETS						
<b>C</b>	<b>LABORATORY EQUIPMENTS</b>									
24	Chemical and Microbiology analysis equipments									

S NO.	ITEM DESCRIPTION	CAPACITY	QTY.	UNIT	BASIC PRICE	P&F	TRANSPORT CHARGES	TRANSIT INSURANCE	GST/ IGST	TOTAL PRICE
24.1	Digital Thermometer		5	Nos.						
24.2	Gerber centrifuge		1	No.						
24.3	Lactometers		50	Nos.						
24.4	Butyrometer		100	Nos.						
24.5	Adulteration Kit		1	No.						
24.6	Aflatoxin & Antibiotic Analyser		1	No.						
24.7	Waterbath		1	No.						
24.8	Refrigerator		1	No.						
24.9	Autoclave		2	Nos.						
24.10	Remi Centrifuge 80 C		1	No.						
24.11	Laminar airflow chamber		1	No.						
24.12	Incubator		1	No.						
24.13	Digital TDS Meter		1	No.						
24.14	Digital pH Meter		1	No.						
24.15	IR Moisture analyser		1	No.						

S NO.	ITEM DESCRIPTION	CAPACITY	QTY.	UNIT	BASIC PRICE	P&F	TRANSPORT CHARGES	TRANSIT INSURANCE	GST/ IGST	TOTAL PRICE
24.16	Analytical balance 0.1mg to 220g		1	No.						
24.17	Analytical balance 1mg to 220g		1	No.						
24.18	Weighing scale 0.1g to 1 Kg		1	No.						
24.19	Hot air oven		1	No.						
24.20	Hot plate		1	No.						
24.21	Muffle Furnace		1	No.						
24.22	Sediment tester		1	No.						
24.23	Hot plate with Magnetic stirrer		1	No.						
24.24	Digital Burette		1	No.						
24.25	Butyro-Refractometer		1	No.						
24.26	Milkoscreen		1	No.						
24.27	Bottle Dispensor		2	Nos.						
24.28	Fumigator		1	No.						
24.29	Brix Meter		1	No.						
24.30	Bunsen Burner		1	No.						

S NO.	ITEM DESCRIPTION	CAPACITY	QTY.	UNIT	BASIC PRICE	P&F	TRANSPORT CHARGES	TRANSIT INSURANCE	GST/ IGST	TOTAL PRICE
24.31	Glasswares & Chemicals		1	Set						
<b>D</b>	<b>RECONSTITUTION SECTION</b>									
25	RECONSTITUTION TANKS	5 KL	2	NOS.						
26	RECON WATER HEATER CUM CHILLER	10 KLPH	1	NO.						
27	RECIRCULATION PUMP	10 KLPH	1	NO.						
28	TURBO BLENDER HIGH SHEAR MIXER	1 TPH	1	NO.						
29	DUPLEX FILTER	10 KLPH	1	NO.						
30	RECONSTITUTED MILK TRANSFER PUMP	10 KLPH	1	NO.						
31	CIP RETURN PUMP	20 KLPH	1	NO.						
<b>E</b>	<b><u>CREAM HANDLING</u></b>									
32	CREAM PRE CHILLER	1 KLPH	1	NO						
33	CREAM INTERMEDIATE TANK	500 L	1	NO.						
34	CREAM TRANSFER PUMP FROM BUFFER TANK TO CREAM PASTEURIZER	1 KLPH	1	NO.						
35	CREAM PASTEURIZER	1 KLPH	1	NO.						
36	CIP PARALLEL PUMP	SUITABLE	1	NO.						

S NO.	ITEM DESCRIPTION	CAPACITY	QTY.	UNIT	BASIC PRICE	P&F	TRANSPORT CHARGES	TRANSIT INSURANCE	GST/ IGST	TOTAL PRICE
37	CREAM STORAGE TANKS	2 KL	1	NOS.						
38	CIP RETURN PUMP FOR CST	3KLPH	1	NO.						
39	CREAM TRANSFER PUMP TO RMST	2 KLPH	1	NO.						
<b>F</b>	<b>MILK PACKING SECTION</b>									
40	MILK DEEP CHILLER FOR POUCH MILK	20 KLPH	2	NOS						
41	HORIZONTAL MILK STORAGE TANK (HMST) WITH TWO COMPARTMENTS FOR POUCH MILK FILLING	10 KL	2	NOS						
42	SIMPLEX INLINE STRAINER	SUITABLE	1	NOS						
43	SELF PRIMING CIP RETURN PUMP FOR HMST'S AND PACKING M/C	SUITABLE	2	NO						
44	DOUBLE HEAD SERVO AND PLC TYPE FFS MILK POUCH FILLING MACHINE	10000 PPH	2	NOS						
45	SS CRATE WASHER- SINGLE TRACK	800 CRT/HR	1	NOS						
46	LEAKY POUCH MILK TANK	500 L	1	NOS						
47	SIMPLEX INLINE STRAINER	SUITABLE	1	NOS						
48	MILK TRANSFER PUMP FROM LEAKY POUCH TANK TO RINSE MILK RECOVERY TANK	5 KLPH	1	NOS						

S NO.	ITEM DESCRIPTION	CAPACITY	QTY.	UNIT	BASIC PRICE	P&F	TRANSPORT CHARGES	TRANSIT INSURANCE	GST/ IGST	TOTAL PRICE
49	COOLING WATER BALANCE TANK	SUITABLE	1	NO.						
50	COOLING WATER CIRCULATION PUMP	SUITABLE	1	NO.						
51	SIMPLEX INLINE STRAINER	SUITABLE	1	NOS						
52	COOLING WATER CHILLER	SUITABLE	1	NO.						
53	WEIGHING BALANCE	2 KGS	1	NOS						
54	WEIGHING BALANCE	50 KGS	1	NOS						
55	TROLLEY FOR FILLED MILK CRATE HANDLING	SUITABLE	4	NOS						
<b>G.</b>	<b>FERMENTED PRODUCTS MANUFACTURING</b>									
56	MILK STORAGE TANK	2 KL	1	NO						
57	CURD PASTEURIZER	2KL	1	NO						
57 A	VENTURI RECONSTITUTION WITH	500 LPH	1	NO						
58	CURD INNOCULATION TANK	500 LTS	2	NO						
59	CURD PROCESSED MILK STORAGE TANK	2 KL	1	NO						
60	CURD CUP FILLING MACHINE	2400 CPH	1	NO						
61	CURD POUCH PACKING MACHINE SERVO AND PLC TYPE	5000 P/H	1	NO						



S NO.	ITEM DESCRIPTION	CAPACITY	QTY.	UNIT	BASIC PRICE	P&F	TRANSPORT CHARGES	TRANSIT INSURANCE	GST/ IGST	TOTAL PRICE
62	CURD INCUBATION ROOM	2 KL	1	NO						
63	CURD COLD ROOM, BLAST FREEZER	5 T	1	NO						
64	BUTTER MILK MIXING TANK	500 LTS	1	NO						
65 A	SHEAR PUMP	2 KLPH	1	NO						
66	BUTTER MILK CHILLER	500 LPH	1	NO						
67	CIP RETURN PUMP	SUITABLE	1	NO						
68	PIPE LINES AND FITTINGS	SUITABLE	1	LOT						
<b>H</b>	<b>KHOA /PEDA PRODUCTION</b>									
69	MILK STORAGE TANK	500 LTS	1	NO						
70	MILK TRANSFER PUMP	SUITABLE	1	NO						
71	OPEN TYPE KHOA PAN STEAM OPERATED	240 LTS	2	NOS						
72	SS TRAYS FOR KHOA		50	NOS						
73	CIP RETURN PUMP	SUITABLE	1	NO						
74	KHOA VACUUM PACKING MACHINE	SUITABLE	1	NO						
75	INK JET CODING MACHINE		1	NO						

S NO.	ITEM DESCRIPTION	CAPACITY	QTY.	UNIT	BASIC PRICE	P&F	TRANSPORT CHARGES	TRANSIT INSURANCE	GST/ IGST	TOTAL PRICE
76	SS TABLE	SUITABLE	1	NO						
77	WEIGHING BALANCE	0- 2 KGS	2	NO						
<b>I</b>	<b>GHEE PRODUCTION &amp;PACKING</b>									
78	BUTTER MELTING VAT	1 KL	1	NOS.						
79	HOT WATER RECIRCULATION SYSTEM FOR BUTTER MELTING VAT	SUITABLE	1	NO.						
80	MOLTEN BUTTER TRANSFER PUMP	2 KLPH	1	NO.						
81	PRE STRATIFICATION TANK	500 L	1	NOS.						
82	CONCENTRATED FAT TRANSFER PUMP	2 KLPH	1	NO.						
83	SERUM COLLECTION TANK	SUITABLE	1	NO.						
84	SERUM TRANSFER PUMP	2 KLPH	1	NO.						
85	GHEE BOILER	500 L	1	NOS.						
86	GHEE BALANCE TANK	SUITABLE	1	NO.						
87	DUPLEX BUCKET FILTER	SUITABLE	1	NO.						
88	GHEE TRANSFER PUMP	1 KLPH	1	NO.						
89	GHEE SETTLING TANKS	500 L	1	NOS.						

S NO.	ITEM DESCRIPTION	CAPACITY	QTY.	UNIT	BASIC PRICE	P&F	TRANSPORT CHARGES	TRANSIT INSURANCE	GST/ IGST	TOTAL PRICE
90	GHEE TRANSFER PUMP	500 LPH	1	NO.						
91	GHEE CLARIFIER	500 LPH	1	NO.						
92	GHEE BALANCE TANK	SUITABLE	1	NO.						
93	GHEE TRANSFER PUMP	1 KLPH	1	NO.						
94	GHEE SETTLING TANK	1 KL	2	NO.						
95	HOT WATER SYSTEM FOR GHEE STORAGE TANK	SUITABLE	1	NO.						
96	AUTOMATIC GHEE PET JAR FILLING MACHINE 50 ML TO 1000 ML	SUITABLE	1	NO.						
97	INKJET PRINTER	SUITABLE	1	NO.						
98	WEIGHING BALANCE	0-2 KGS	2	NO.						
99	SS WORKING TABLES	SUITABLE	1	LOT						
100	PIPING, INSULATION, PLATFORMS, STRUCTURES ETC		1	LOT						
<b>J</b>	<b>RINSE MILK SECTION</b>									
101	RINSE MILK BALANCE TANK	1 KL	1	NO.						
102	RINSE MILK TRANSFER PUMP	2 KLPH	1	NO.						
103	RINSE MILK CHILLER	2 KLPH	1	NO.						

S NO.	ITEM DESCRIPTION	CAPACITY	QTY.	UNIT	BASIC PRICE	P&F	TRANSPORT CHARGES	TRANSIT INSURANCE	GST/ IGST	TOTAL PRICE
104	RINSE MILK STORAGE TANK	5 KL	1	NO.						
105	RINSE MILK TRANSFER PUMP TO RECONSTITUTION	10 KLPH	1	NO.						
<b>K</b>	<b>CIP-THREE CIRCUIT</b>									
106	CIP RETURN PUMP	20 KLPH	1	NO.						
107	BULK ACID TANK	10 KL	1	NO.						
108	BULK LYE TANK	10 KL	1	NO.						
109	ACID CARBOY UNLOADING TANK	500L	1	NO.						
110	LYE FLAKE DISSOLVING TANK WITH AGITATOR	2 KL	1	NO.						
111	OVERHEAD DOSING TANK FOR PROCESS	500 L	2	NO.						
112	CHEMICAL UNLOADING PUMP	10 KLPH	2	NO.						
113	CHEMICAL UNLOADING HOSE	51 MM	2	NO.						
114	ACID TRANSFER PUMP - (1 W + 1 S)	40-500 LPH	2	NO.						
115	LYE TRANSFER PUMP - (1 W + 1 S)	40-500 LPH	2	NO.						
116	CIP TANKS PLATFORM		1	LOT						
117	LYE TANK	8 KL	1	NO.						

S NO.	ITEM DESCRIPTION	CAPACITY	QTY.	UNIT	BASIC PRICE	P&F	TRANSPORT CHARGES	TRANSIT INSURANCE	GST/ IGST	TOTAL PRICE
118	ACID TANK	8 KL	1	NO.						
119	HOT WATER TANK	8 KL	1	NO.						
120	RECUPERATION TANK	8 KL	1	NO.						
121	FLUSH WATER TANK	5 KL	1	NO.						
122	CIP PHE	10 KLPH	2	NO.						
123	DUPLEX INLINE STRAINER	10 KLPH	2	NO.						
124	ACID/LYE TANK RECIRCULATION PUMP	5 KLPH	2	NO.						
125	CIP SUPPLY PUMP FOR LIQUID MILK PLANT	10 KLPH	2	NO.						
126	CIP PHE	20 KLPH	1	NO.						
127	DUPLEX INLINE STRAINER	20 KLPH	1	NO.						
128	CIP SUPPLY PUMP FOR LIQUID MILK PLANT	20 KLPH	1	NO.						
129	SAFETY SHOWER		1	NO.						
130	CIP TANK PLATFORM		1	LOT						
L	PIPE FITTINGS AND VALVES									
131	SS PIPING (MILK, PRODUCT, CIP ETC.) AND SS 304 SUPPORT	SUITABLE	1	LOT						

S NO.	ITEM DESCRIPTION	CAPACITY	QTY.	UNIT	BASIC PRICE	P&F	TRANSPORT CHARGES	TRANSIT INSURANCE	GST/ IGST	TOTAL PRICE
132	SS PNEUMATIC VALVES (ALL TYPES OTHER THAN MIX PROOF TYPE)	SUITABLE	1	LOT						
133	SS PNEUMATIC VALVES MIX PROOF VALVES (SELF CLEANING )	SUITABLE	1	LOT						
134	SS FITTINGS AND MANUAL VALVES	SUITABLE	1	LOT						
135	SS/ GI STRUCTURAL FOR PIPING	SUITABLE	1	LOT						
<b>M</b>	<b>SERVICE EQUIPMENTS-BOILER</b>									
136	WOOD / BRIQUETTE FIRED STEAM BOILER WITH ACCESSORIES	2000 KGS	2	SETS						
137	HP AND LP STEAM DISTRIBUTION PIPES & SUPPORTS	SUITABLE	1	LOT						
138	STEAM PRS WITH SUPPORT	SUITABLE	3	SETS						
139	INSULATION OF STEAM AND CONDENSATE PIPING	SUITABLE	1	LOT						
140	STEAM WATER MIXING BATTERY	SUITABLE	15	NOS.						
141	FIRE EXTINGUISHERS	SUITABLE	1	SETS						
<b>N</b>	<b>REFRIGERATION PLANT</b>	SUITABLE	1	LOT						
	<b>A.REFRIGERATION SYSTEM</b>									
142	HIGH STAGE RECIPROCATING COMPRESSOR OPERATING AT —10 ° C SST / 38 ° C SDT WITH ALL ASSOCIATED	65 TR	2	NOS.						

S NO.	ITEM DESCRIPTION	CAPACITY	QTY.	UNIT	BASIC PRICE	P&F	TRANSPORT CHARGES	TRANSIT INSURANCE	GST/ IGST	TOTAL PRICE
	ACCESSORIES. (ONE SHALL ACT AS STANDBY.)									
143	MOTOR FOR COMPRESSOR	90 KW	2	NOS.						
144	VFD FOR THE ABOVE MOTORS	SUITABLE	2	NOS.						
145	EVAPORATIVE TYPE CONDENSER WITH IE-4 EFF. PUMP & FAN MOTORS C/W ALL ACCESSORIES (1W + 1S)	120 TR	2	NOS.						
146	HIGH PRESSURE LIQUID RECEIVER WITH ALL VALVES AND ACCESSORIES	4000 L	1	NO.						
147	— 10 ° C LOW PRESSURE LIQUID ACCUMULATOR OF MINIMUM SIZE 1.37 X 3.6-M	SUITABLE	1	NO.						
148	REFRIGERANT LIQUID PUMPS FOR —10 ° C	SUITABLE	2	NOS.						
149	AIR PURGER – AUTOMATIC	SUITABLE	1	NO.						
150	ICE BANK TANK (INDOOR TYPE) WITH STIFFENING ARRANGEMENT FULLY MADE OF M.S SHEET INCLUDING SUPPORTS.	SUITABLE	1	SET						
151	IBT COIL MADE OF M.S SEAMLESS TUBES SA 106 GRADE SCH 40	SUITABLE	1	NO.						
152	TANK INSULATION	SUITABLE	1	LOT						
153	AGITATOR AND ITS FRAME	SUITABLE	1	SET.						

S NO.	ITEM DESCRIPTION	CAPACITY	QTY.	UNIT	BASIC PRICE	P&F	TRANSPORT CHARGES	TRANSIT INSURANCE	GST/ IGST	TOTAL PRICE
154	FRP COVERS FOR IBT	SUITABLE	1	LOT						
155	CHILLED WATER PUMP FOR PROCESS	SUITABLE	2	NOS.						
156	FORCED DRAFT COOLER WITH CONTROLS AND ACCESSORIES FOR <b><u>MILK COLD ROOM</u></b> (FIN SPACING NOT LESS THAN 6-MM) INCL. LIQUID FEED ASSEMBLY.	SUITABLE	4	NOS.						
157	FORCED DRAFT COOLER WITH CONTROLS AND ACCESSORIES FOR <b><u>CURD COLD ROOM</u></b> (FIN SPACING NOT LESS THAN 6-MM) INCL. LIQUID FEED ASSEMBLY.	SUITABLE	1	NO.						
158	FORCED DRAFT COOLER WITH CONTROLS AND ACCESSORIES FOR <b><u>CURD BLAST ROOM</u></b> (FIN SPACING NOT LESS THAN 6-MM) INCL. LIQUID FEED ASSEMBLY.	SUITABLE	1	NO.						
159	FORCED DRAFT COOLER WITH CONTROLS AND ACCESSORIES FOR <b><u>ANTE ROOM OF MILK COLD ROOMS</u></b> (FIN SPACING NOT LESS THAN 6-MM) INCL. LIQUID FEED ASSEMBLY.	SUITABLE	1	NO.						
160	ROOM HEATER FOR CURD INCUBATION ROOM	SUITABLE	2	NOS.						
161	M.S SEAMLESS PIPES, VALVES, FITTINGS AND ACCESSORIES FOR REFRIGERANT, OIL LINES, ETC. SA 106 SCH 40 FOR	SUITABLE	1	LOT						



S NO.	ITEM DESCRIPTION	CAPACITY	QTY.	UNIT	BASIC PRICE	P&F	TRANSPORT CHARGES	TRANSIT INSURANCE	GST/ IGST	TOTAL PRICE
	TEMP. UP TO —19 ° C AND SA 333 FOR BELOW —20 ° C									
162	G.I. B CLASS PIPES, VALVES, FITTINGS & ACCESSORIES FOR COOLING WATER, DEFROSTING WATER, ETC.	SUITABLE	1	LOT						
163	PUF PIPES INSULATION FOR PIPES & VESSELS, EQUIPMENT, ETC. COMPLETE ALU CLADDING.	SUITABLE	1	LOT						
164	MAIN MCC FOR ENTIRE PLANT ETC.	SUITABLE	1	SET						
165	HARMONIC FILTER PANEL	SUITABLE	1	SET						
166	POWER, CONTROL, SIGNAL AND INSTRUMENTATION CABLES PLUS CABLE TRAYS & ACCESSORIES, CHEMICAL EARTHING & ACCESSORIES	SUITABLE	1	LOT						
167	INSTRUMENTS & SAFETY ACCESSORIES INCLUDING AMMONIA LEAK DEDUCTION.	SUITABLE	1	LOT						
168	COMPRESSOR OIL AND OTHER CONSUMABLES LIKE GAS AND CHARGING HOSE	SUITABLE	1	LOT						
	<b>B. PUF PANEL &amp; ACCESSORIES</b>									
169	FLOOR INSULATION WITH ALL ACCESSORIES FOR VARIOUS COLD ROOMS	SUITABLE	300	SQ.MT						
170	WALLS & CEILING INSULATION WITH ALL ACCESSORIES FOR VARIOUS COLD ROOMS	SUITABLE	800	SQ.MT						

S NO.	ITEM DESCRIPTION	CAPACITY	QTY.	UNIT	BASIC PRICE	P&F	TRANSPORT CHARGES	TRANSIT INSURANCE	GST/ IGST	TOTAL PRICE
171	INTERNAL ELECTRIFICATION OF VARIOUS COLD ROOMS.	SUITABLE	1	LOT						
172	MANUAL SLIDING TYPE DOOR FOR VARIOUS COLD ROOMS.	SUITABLE	9	NOS.						
173	AIR CURTAINS AND PVC STRIP CURTAIN	SUITABLE	10	NOS.						
174	COLD STORE SAFETY SYSTEMS FOR COLD ROOMS	SUITABLE	1	LOT						
175	ANYTHING ADDITIONAL TO ABOVE	SUITABLE	1	LOT						
<b>O</b>	<b>AIR AND WATER</b>									
176	OIL FREE AS PER ISO 8573 CLASS 0 WATER INJECTED SINGLE STAGE SCREW AIR COMPRESSOR WITH OUTPUT 70 -133 CFM AT 10 BAR MAX WORKING PRESSURE AT COMPRESSOR OUTLET AS PER ISO1217. WITH INBUILD VFD. OPERATING VOLTAGE 400 V WITH IP55 AND IE 3 AND ABOVE.	130 CFM	2	SET						
177	REFRIGERANT DRYER AIR COOLED	200 CFM	2	SETS						
177A	UPSTREAM PRE FILTER TO SUIT COMPRESSOR FOR DUST FILTRATION	200 CFM	2	NO						
177B	DOWN STREAM FINE FILTER TO SUIT COMPRESSOR FOR DUST / OIL FILTRATION.	200 CFM	2	NO						
178	VERTICAL AIR RECEIVER (MS), 12.5 BAR WITH AUTO DRAIN	2M <sup>3</sup>	1	SET						

S NO.	ITEM DESCRIPTION	CAPACITY	QTY.	UNIT	BASIC PRICE	P&F	TRANSPORT CHARGES	TRANSIT INSURANCE	GST/ IGST	TOTAL PRICE
	VALVE.									
179	COMPRESSED AIR DISTRIBUTION PIPING AND SUPPORT		1	LOT						
180	(RAW/SOFT/RO) WATER DISTRIBUTION SYSTEM		1	LOT						
181	RAW WATER PUMP	20 KLPH	2	NO.						
182	MULTI GRADE FILTER	10 KLPH	1	NO						
183	NAOCL DOSING SYSTEM		1	NO						
184	ACTIVATED CARBON FILTER	10 KLPH	1	NO						
185	FILTERED WATER PUMP FOR SOFTNER	20 KLPH	2	NO						
186	SEMI AUTOMATIC SOFTNER PLANT WITH RE GENERATION SYSTEM	1	10 KLPH	1 NO						
187	RAW FILTERED WATER HYDRO FLOW SYSTEM WITH VERTICAL PUMPS ( 2W + 1S)	20 KLPH	1	SET						
188	SOFT WATER HYDROFLOW SYSTEM WITH VERTICAL PUMPS ( 2W + 1S)	20 KLPH	1	SET						
189	AUTOMATIC RO PLANT	1000 LPH	1	SET						
190	RO WATER BUFFER STORAGE TANK	1000 LITERS	1	NO.						
191	RO WATER PRESSURIZED PUMPING HYDRO FLOW	SUITABLE	1	SET						

S NO.	ITEM DESCRIPTION	CAPACITY	QTY.	UNIT	BASIC PRICE	P&F	TRANSPORT CHARGES	TRANSIT INSURANCE	GST/ IGST	TOTAL PRICE
	SYSTEM (2W+1S)									
192	RAW WATER PRESSURIZED PUMPING HYDRO FLOW SYSTEM (1W+1S)	SUITABLE	1	SET						
193	WATER (RAW/SOFT/DM) DISTRIBUTION PIPING AND SUPPORT	SUITABLE	1	LOT						
194	STRUCTURAL BRIDGES/PLATFORMS	SUITABLE	1	LOT						
<b>P</b>	<b>ELECTRICAL &amp; INSTRUMENTATION</b>									
<b>195</b>	<b>HT TRANSFORMER WITH ACCESSORIES</b>	500 KVA	1	NO						
195	HT CABLES AND PANELS		1	LOT						
196	PCC PANEL AND ACCESSORIES		1	LOT						
197	MCC PANEL AND ACCESSORIES		1	LOT						
198	AUTOMATION SYSTEM	SUITABLE	1	LOT						
199	FIELD INSTRUMENTS	SUITABLE	1	LOT						
200	EARTHING SYSTEM CABLE TRAYS		1	LOT						
201	OTHER ELECTRICAL ACCESSORIES		1	LOT						
202	DG SET WITH ACCESSORIES	320 KVA	1	NO						

S NO.	ITEM DESCRIPTION	CAPACIT Y	QTY.	UNIT	BASIC PRICE	P&F	TRANSPOR T CHARGES	TRANSIT INSURANCE	GST/ IGST	TOTAL PRICE
203	STANDBY OPERATION AND TRAINING (FOR 15 DAYS)		1	JOB						
204	SERVICE COVER		1	JOB						
205	MISCELLANEOUS EQUIPMENTS		1							
206	ERECTION AND INSTALLATION AND COMMISSIONING OF THE PLANT									
	GRAND TOTAL									

**Note:-**

- 1). The rates should be quoted separately for equipment-wise with break-up of Basic Price, Packing & Forwarding, Transportation charges, Loading and unloading charges, Transit insurance, GST/IGST for supply, Unpacking, shifting and positioning charges, Erection & commissioning charges, GST/IGST for Erection & commissioning etc., which should be totaled and mentioned in the Abstract of Price Quote Schedule.
- 2). The tenderer shall furnish break up details for the above in a separate sheet for Price, GST/IGST, with the percentage.
- 3). All the rates should be only in terms of Indian Rupees.
- 4). Tenderer should indicate origin of country from which the equipment is imported and has to produce authorization letter from OEM.
- 5). Phrases like `Extra', `as applicable', `at the prevailing rate' etc. should not be quoted to avoid ambiguity.

**Seal of the firm  
tenderer**

**Signature of the**

Witness:

1

2

Date: