| | | |
|---|---|---|
| NAME OF ITEM / WORK | : | **SUPPLY, ERECTION AND COMMISSIONING OF IMPORTED HIGH STAGE SCREW COMPRESSORS COMPLETE SET WITH AUTOMATION OF REFRIGERATION SYSTEM FOR TIRUNELVELI DCMPU UNDER NADP SCHEME FOR THE YEAR 2019-20** |
| TENDER NOTICE REFERENCE NO | : | 14300/Proj.2/2019, Dated:23.10.2019 |

# 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

Managing Director.

# TENDER INFORMATION

| | | |
|---|---|---|
| 1. Name and address of the Purchaser. | : | The Managing Director,<br>Tamilnadu Cooperative Milk Producers' Federation Ltd.,<br>Aavin Illam, 3-A, Pasumpon Muthuramalinganar Salai,<br>Nandanam, Chennai – 600 035.<br>E-Mail: aavindgmeng@yahoo.co.in<br>aavintenders@aavin.tn.gov.in |
| 2. Name and address of the User | | The General Manager<br>Tirunelveli DCMPU LTD |
| 3. Name of the Item / Work | : | Supply, Erection and Commissioning of Imported High Stage Screw Compressors Complete Set with Automation of Refrigeration System for Tirunelveli DCMPU under NADP Scheme for the year 2019-20 |
| 4. Tender Reference Number | : | 14300/Proj.2/2019 |
| 5. Tender Estimated Value | : | Rs.272.00 Lakhs |
| 6. Earnest Money Deposit (EMD) | : | Rs.2,72,000.00 |
| 7. 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.<br>**Alternatively,** Tender documents can also be downloaded from the designated website at free of cost (i.e.) www.tenders.tn.gov.in and www.aavinmilk.com for submission of tender **by post (or) courier /** www.tntenders.gov.in for **e-submission.** |
| 8. Sale of tender documents | : | **From:** 31.10.2019 To 04.12.2019<br>**Time:** 11.00 AM To 3.00 PM |
| 9. Date of Pre-Bid meeting | : | **Date:** 14.11.2019<br>**Time:** 11.00 AM |
| 10. Last date and time for submission of the two part tender – both technical and commercial bids. | : | **Date:** 05.12.2019<br>**Time:** 2.00 PM |
| 11. Date and time of opening of Part I Technical Bid Document. | : | **Date:** 05.12.2019<br>**Time:** 2.15 PM |
| 12. 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. |
| 13. Place of Sale of Tender Documents, Pre- Bid meeting & Part I Technical Bid and Part II Price Bid opening | : | The Managing Director,<br>Tamilnadu Cooperative Milk Producers' Federation Ltd.,<br>Aavin Illam, 3-A, Pasumpon Muthuramalinganar Salai,<br>Nandanam, Chennai – 600 035. |

# INDEX

## 1.0. TECHNICAL BID – CHECK LIST

**PREAMBLE OF TENDER:-**

**1.1.** The Managing Director, TCMPF Ltd. invites Bids by way of **E-Submission** / **OFF Line** from eligible bidders on behalf of Tirunelveli DCMPU Ltd. by two cover system Supply, Erection and Commissioning of Imported High Stage Screw Compressors Complete Set with Automation of Refrigeration System for Tirunelveli DCMPU under NADP Scheme for the year 2019-20.

**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 Supply, Erection and Commissioning of Imported High Stage Screw Compressors Complete Set with Automation of Refrigeration System for Tirunelveli DCMPU under NADP Scheme for the year 2019-20. | | Yes / No |
| 2. | Whether the EMD amount as detailed below is enclosed in the technical bid | | |
| **Item No.** | **Name** | **EMD amount** | |
| 1. | Imported High Stage Screw Compressors Complete Set with Automation of Refrigeration System for Tirunelveli DCMPU | Rs.2,72,000.00 | Yes / No |
| 3. | If so, whether D.D. is attached with the Tender offer - Part I / Tech.Bid | | Yes / No |
| 4. | If so, Details of D.D. No. date, Bank on which drawn etc. may be furnished<br>D.D. No(s)…….. Dated…….<br>For Rs…… Bank Name and Branch ……. in favour of The Managing Director, TCMPF Ltd. payable at Chennai | | 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 |
| 6. | Whether details of infrastructural facilities such as equipment / man-power / financial statement (FY – 2016-17, 2017-18 & 2018-19) details etc., are enclosed. | | Yes/No |
| 7. | Whether details of past experience (i.e) Purchase order copy(s) for same capacity (or) above of High Stage Screw compressors complete set with Automation System | | Yes/No |

SIGNATURE OF THE TENDERER WITH SEAL

| | | |
|---|---|---|
| 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 Managing Director,
Aavin Illam, 3-A, Pasumpon
Muthuramalinganar Salai, Nandanam,
Chennai – 600 035.

Sir,

Sub: Two Part tender – Supply, Erection and commissioning of Imported High Stage Screw Compressors Complete Set with Automation of Refrigeration System for Tirunelveli DCMPU under NADP Scheme for the year 2019-20 – 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 Managing Director, TCMPF, 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 Supply, Erection and commissioning of Imported High Stage Screw Compressors Complete Set with Automation of Refrigeration System for Tirunelveli DCMPU under NADP Scheme for the year 2019-20 and again put both the sealed technical bid cover and commercial bid cover in a larger wax sealed cover duly superscribed as "Supply, Erection and commissioning of Imported High Stage Screw Compressors Complete Set with Automation of Refrigeration System for Tirunelveli DCMPU under NADP Scheme for the year 2019-20" and addressed to "The Managing Director, TCMPF Ltd, 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 as provided in the TNTT 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.

I agree to abide by the above instructions

SIGNATURE OF THE TENDERER

3.7 **Go through the check slip given and ensure compliance of the terms and conditions.**

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 and other accessories** (i.e.) Technical Bid (Prequalification) & Price Bid (item rate tenders) are invited for and on behalf of Tirunelveli DCMPU Ltd., by the Managing Director, TCMPF Ltd. for the Supply, Erection and Commissioning of Imported High Stage Screw Compressors Complete Set with Automation of Refrigeration System for Tirunelveli DCMPU under NADP Scheme for the year 2019-20.

4.2

4.2.1.The tenderer should be manufacturer / supplier of High Stage Screw compressors complete set with Automation System

4.2.2. The tenderer should have previous experience in having supplied same capacity (or) above of High Stage Screw compressors complete set with Automation System, in India either to any cooperative institution or reputed dairies / firms.

4.2.3. The tenderer should have supplied same capacity (or) above of High Stage Screw compressors complete set with Automation System, for which tender called for, and enclose copies of purchase order / supply order within a period of 5 years.

4.2.4.The performance certificate for above such supply for which Purchase Order / Supply order furnished as per 4.2.3 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.

4.2.5.The Tenderer should have minimum experience of 5 Years in the manufacturing / supply of High Stage Screw compressors complete set with Automation System. Copies of Registration of firms with list of activities/GST registration certificate etc. should be enclosed as supporting document.

4.2.6.If the tenderer is an authorized dealer / supplier of a manufacturer, the tenderer shall furnish the authorization letter from the manufacturer for supply of High Stage Screw compressors complete set with Automation System.

4.2.7.If the tenderer is an authorized dealer / supplier for High Stage Screw compressors complete set with Automation System then the experience of the manufacturer for supply of High Stage Screw compressors complete set with Automation System, their performance shall be taken for evaluation of technical bids, even if the supply has been made either by the manufacturer directly or through other agencies.

4.3.

Noted and agreed to the above

SIGNATURE OF THE TENDERER

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 **05.12.2019 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 Supply, Erection and Commissioning of Imported High Stage Screw Compressors Complete Set with Automation of Refrigeration System for Tirunelveli DCMPU under NADP Scheme for the year 2019-20.

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.

**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 should be dropped in the tender box before closure time.**

4.9.2 EMD Payable is as detailed below:-

Noted and agreed to the above

SIGNATURE OF THE TENDERER

| Sl. No. | Name of equipment | Qty. | EMD amount |
|---|---|---|---|
| 1 | Imported High Stage Screw Compressors Complete Set with Automation of Refrigeration System for Tirunelveli DCMPU under NADP Scheme for the year 2019-20. | 1 Set. | **Rs.2,72,000.00** |

The EMD amount to be drawn by means of the Demand Draft only 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.** ***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 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.

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.

Noted and agreed to the above

SIGNATURE OF THE TENDERER

4.9.6.3 Each bidder's modification notice shall be prepared, sealed, marked and delivered with the outer and inner envelops 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.

3). If the tenderer is an authorized suppliers of a manufacturer, the tenderer shall furnish the authorization letter from the manufacturer for supply of High Stage Screw compressors complete set with Automation System

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

Noted and agreed to the above

SIGNATURE OF THE TENDERER

**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 Bank Draft 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 TNTT Act and the same should be remitted by Demand Draft. Bank guarantee or 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.

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.

Noted and agreed to the above

SIGNATURE OF THE TENDERER

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 supply, Erection and commissioning order along with the D.D. for Security Deposit.

**4.14. DELIVERY SCHEDULE:-**

| | | |
|---|---|---|
| 4.14.1. Supply | : | 16 – 20 weeks from the date of receipt of purchase order |
| 4.14.2. Erection & Commissioning | : | 12 – 16 weeks 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 High Stage Screw compressors complete set with Automation System and such advance shall be recovered with interest applicable at the time of recovery from the bills payable at the time of release of 80% basic price + taxes and other charges.

**(OR)**

80% of basic price + taxes and other charges shall be released on receipt of the High Stage Screw compressors complete set with Automation System in good condition at site.

b). The remaining 20% payment shall be released after the Erection and satisfactory commissioning of the High Stage Screw compressors complete set with Automation System at site.

**(OR)**

If the site is not ready due to unavoidable circumstances for carrying out the Erection and commissioning of the equipments within 3 months period, then the balance 20% payment on supply will be considered for release on submission of irrevocable Bank Guarantee for a value equal to 20% 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 and commissioning charges.

Noted and agreed to the above

SIGNATURE OF THE TENDERER

**4.15.2. ERECTION AND COMMISSIONING:**

a). 80% of the Erection and commissioning charges shall be released on satisfactory completion of the Erection and commissioning of the High Stage Screw compressors complete set with Automation System

b). Balance 20% of Erection and commissioning charges shall be released after 3 months from the date of satisfactory commissioning and performance of the High Stage Screw compressors complete set with Automation System

**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 supply, Erection and commissioning of two or more number 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 and commissioning at 0.5% per month, if the contract value is more than Rs.50.00 Lakhs (Rupees fifty lakhs).

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.

Noted and agreed to the above

SIGNATURE OF THE TENDERER

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 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. <u>WARRANTY:</u>**

A warranty certificate shall be furnished on the workmanship, parts and performance of the High Stage Screw compressors complete set with Automation System 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. <u>FORCE MAJEURE:</u>**

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.

Noted and agreed to the above

SIGNATURE OF THE TENDERER

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 mejeure 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, TCMPF Limited. The arbitrator's decision shall be final, conclusive and binding on both the parties.

**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 80% payment for the 10% of the supply order value of the High Stage Screw compressors complete set with Automation System ordered as Bank Guarantee from a Nationalized Bank / Scheduled Banks for a period of one year and extendable to one more year if needed.

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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 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 Screw compressor with Evaporator

5.2. The tenderer should have previous experience in having supplied same capacity (or) above of High Stage Screw compressors complete set with Automation System in India either to any cooperative institution or reputed dairies / firms.

5.3. The tenderer should have supplied same capacity (or) above of High Stage Screw compressors complete set with Automation System, 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 / supply of Screw compressor with Evaporator. 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 a manufacturer, the tenderer shall furnish the authorization letter from the manufacturer for supply of Screw compressor with Evaporator.

5.7. If the tenderer is an authorized dealer / supplier for Screw compressor with Evaporator then the experience of the manufacturer for supply of Screw compressor with Evaporator, their performance 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**

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**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.**

5.9. **FINANCIAL:** The tenderer shall have ***average annual sales turn-over for the last three financial years equal to the tender estimated value and minimum annual sales turn-over in each of the last three financial years 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.

Noted and agreed to the above

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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<br>Address<br>Mobile No<br>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. | : | |

SIGNATURE OF THE TENDERER WITH SEAL

**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 |
| | | : | 2016-17 | | |
| | | : | 2017-18 | | |
| | | : | 2018-19 | | |
| 5 | Financial Position | : | | | |
| | I. Cash in hand | : | | | |
| | II. Cash in Bank | : | | | |
| | III. Current Assets | : | | | |
| | IV. Current Liabilities | : | | | |
| | V. Working Capital | : | | | |
| | VI. Net worth | : | | | |
| 6 | 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 |
| | | : | 2016-17 | | |
| | | : | 2017-18 | | |
| | | : | 2018-19 | | |
| 9 | Applicant's financial arrangements. | : | | | |
| | (a) Own resources | : | | | |
| | (b) Bank credits/ Over Draft | : | | | |
| | (c) Other source (Specify the source) | : | | | |

SIGNATURE OF THE TENDERER WITH SEAL

**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:** It 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 Managing Director, TCMPF Ltd., 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 Managing Director, TCMPF Ltd., 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 Managing Director, Aavin Illam, 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 datas 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 supply & Erection 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

Noted and agreed to the above

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## SUPPLY, ERECTION AND COMMISSIONING OF HIGH STAGE SCREW COMPRESSORS COMPLETE SET WITH AUTOMATION SYSTEM FOR AMBATTUR DAIRY UNDER FEDERATION FUNDS

## TECHNICAL SPECIFICATION

### Scope of Work

The scope of this contract shall include design, supply, erection, testing & commissioning of the plant as per the requirement indicated below and the scope of work includes following.

- Design, supply, erection, testing & commissioning of skid mounted Screw Compressor packages for high stage operation suitable for pump system, Imported Evaporative type Condensers , ( Existing ) HP Receiver, LP Receiver for IBT & Pre Chiller, Ammonia Pumps,, Electrical equipments, entire Controls systems, , as per requirement and specification.
- Design, supply, fabricate and install all the pipe supports, structural pipe bridge between buildings, chequered plate for trench covers, etc., wherever required for the entire proposed work.
- Design supply, erection, testing & commissioning of MCC Panel with Power & Control wiring for proposed system with necessary feeders/ suitable type starters including for certain existing Equipments.
- Design, supply, erection, testing & commissioning of necessary instruments and controls of the refrigeration plant including for the following existing equipments also if necessary
  a. Temperature & controlling of water inside the existing IBTs temperatures
  b. Scope includes to supervise the plant and train the staffs by successful bidder for One months from date of commissioning on round O clock and one supervisor.

### Existing Refrigeration Plant

The existing refrigeration plant has been equipped with the following equipments and designed for minus 10 Deg C suction.

1. 9X9 & ACCELL with 120 HP Frick Ammonia Compressor 2 +1
2. IBT Size 10.4 X 6.8 X 2.5 M in two compartment with agitators.
3. IBT Coil length 2352 mtr ( 2 x 1176 rmt)
4. Atm condenser of 72 Rmt X 18 Set = 1,296 mtr with 10 HP pump x 3 Nos

Noted and agreed to the above

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5. Ammonia HP Receiver 26 " x 16 ' long.
6. Chilled water pump model 10 HP - 3 nos
7. MCC, Control Panels, Cables, etc. - 1 Lot
8. Piping, valves, fittings with insulation – 1 Lot

The following existing equipments are proposed to be retained for integrating with new refrigeration system & to have alternate to the new screw compressor during maintenance / unexpected breakdown

a. IBT tank & chilled water piping from Machine room to process & return up to Refrigeration machine room with proper modification
b. HP Receiver of size 26 " x 16 ' Long

However except items mentioned in a & b , balance all other above existing equipments will be de commissioned, dismantled on phased manner upon commissioning of the new system and dismantling of non using existing equipments will be done by Union later on.

However, Bidder scope includes the following.

a. All three reciprocating compressor to be removed by successful bidder during erection on phased manner and in that place new Screw compressor to be positioned with necessary modified foundation.
b. All existing IBT Coil to be replaced with new coil suitable for Pump system and new IBT Covers.. This to be done in phased manner after commissioning the proposed pre chiller.

**Proposed Refrigeration Plant**

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 and PHE Chiller.
2. Refrigeration system comprising of proposed high stage Screw for IBT, Pre Chiller as per Basis of Design. Bidder scope includes Two sets of New IBT Coil to replace existing IBT tank coil, FRP Cover, PHE Pre Chiller, chilled Water pump, Evaporative Condensers, LP Accumulators & some of existing equipments like IBT Tank, HP Receiver to be used as it is to cater the following loads.
   - Refrigeration Equipments to cater Chilled water loads to various chilling, processing & cooling equipment of entire Dairy.

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3. Proposed system consist of 2 nos. screw compressors of 125 TR ( with economizer load ) at – 5 °C with motors & VFD , One nos x 210 TR Evaporative type Condenser, One no 75 TR Return Water PHE type Chiller, two sets of IBT Tank with coil of 1176 RMT each, New MCC Panel, Pump system, etc., modification in the existing ammonia and water lines to suit for New Over feed system for new IBT & Pre Chiller .
4. The proposed equipments are to be inter connected with some of the existing Lines.. The lines are to be inter connected in such a way that any of proposed screw compressors will run for IBT suitable for Over feed system at –5 °C and Pre Chiller designed to run at –1 °C thro BPRV. However, If any additional valve required in the header / lines to interconnect the system on later on , then the same to be supplied by refrigeration contractor with in quoted value itself. It is being running system contractor has to plan in such a way that inters connection should not affect daily operation with minimum shut down
5. Supply and installation of 1 no. 75 TR Return Water Pre Chiller with necessary Controls & Accessories. PHE Chiller connections, bolt & nuts , frame bolts are to be SS . Also Base frame for PHE Chiller to be spray galvanized one. Necessary additional valves / arrangement to be provided in the refrigerant line to inter connect new Pre Chiller plus future chiller with Proposed Screw Compressor, so that during processing (or) operation of Pre Chiller, both Pre chiller & IBT will run at common suction at – 5 °C thro BPRV However during ideal period of Pre Chiller, Screw Compressors will be switched on to IBT load and these compressors run exclusively for IBT
6. Bidder scope includes additional valves in the Headers for future / standby compressor & condensers so that future equipments to be connected without any interruption of running plant. Also Tenderer has to consider necessary valves in Priority vessels, LP receiver and Economizers 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 bidder has to includes / incorporate the same in the quoted price without any additional cost.
7. Pre Chiller should be designed for suction temp for –2 °C with maximum allowable pressure drop on water side at 0.5 Kgs/ sq. cm and minimum nozzle size should be 100 mm. So Pre Chiller selection should be as per the above

Noted and agreed to the above

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condition and Bidder has to submit Technical data sheets received from OEM. Scope includes one no flow meter in main chilled water line which also to be connected thro automation.

8. All existing IBT Coil to be replaced with new coil suitable for pump system. . New IBT Coils made of SA 106, Sc 40 with spray galvanized tubes similar to existing size ie to match with existing length, row & height of the existing IBT Tank & with complete set of controls suitable for Liquid over feed system. New Liquid feed assemblies for each compartments of new Ice Bank Tank comprising Strainer, Liquid Solenoid Valve, Isolating Valve, Valved Bypass, Metering Valve, Pump-Out connection, valved & plugged, pressure gauge connection with isolation valve and Pressure Gauge & includes one set of Ice limit thickness controller..

   Scope includes cleaning and painting (Epoxy) for inside of existing IBT & providing new agitator for new IBT Tank. Necessary cabling for proposed & existing tanks agitators is also scope of work. New refrigerant piping with valves & controls shall be provided from proposed LP receiver/ Ammonia pump to all proposed IBT's

<u>The work has to be carefully planned and executed in a phased manner without any interruption to normal operational & processing routines of the existing Dairy.</u>

6. Even for any reason, Old IBT work to be taken up by successful bidder only upon commissioning of Pre chiller. Union will hand over one IBT compartment at a time for any modification and chilled water to be drain out by union in each compartment during modification . IBT Tank to be used as it is as per current condition. New IBT Cover made of PUF Sheet with 80-mm thick both covered by FRP Cover to be supplied.
7. Necessary provision with valves to be fixed in new LP Receiver now itself so that in future Union can interconnect new cold room without any shut down / pumping down gas.
8. Bidder scope includes supply of new Three nos Vertical in line chilled water pump (Out of 3 nos, 2 nos. with VFD drive), Chilled water line which will be modified/augmented such a way to return water will pass thro Pre chiller and return line taped with a valve on the new PHE type Pre Chiller up to existing IBTs inlet & proposed IBT's ( ie return water inlet through Pre Chiller

Noted and agreed to the above

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including for one no future ) with necessary isolation valve and by-pass arrangement with suitable header.

However existing supply ( Discharge ) chilled water lines including Discharge Header in existing IBT to be removed and new header with valves for existing & proposed IBT to be taken up to existing line near existing machine room above MCC Panel and the new headers to be provided with intermediate Valve in both header , so that erection to be done with any disturbance to running system. .

9. Proposed Screw Compressor will be suitable for Thermo siphon Oil Cooling System. Economizer shall be individual for all the screw compressor and if common economizer means, the same shall be decided during detailed drawing approval and to be supplied on quoted price with our any additional cost.
10. Bidder scope includes necessary Harmonic filter to maintain THD generated in the system of the proposed Compressor VFD and Chilled water pump VFD within the limit of current harmonic less than 8% voltage harmonic less than 5% as set by CEA. This may be Individual for VFD's or common for total proposed refrigeration system . The same and type of filter (Active or Passive) shall be decided during detailed drawing approval and to be supplied on quoted price with our any additional cost.
11. Successful Bidder to connect new One no. proposed condensers + one for future with proper valves to interconnect with new system headers so that condensers are connected parallel. However, Location of New evaporative condenser will be in terrace or else it shall be decided later on with successful bidder during drawing approval stage and no additional cost will be entitled for change of location / pipe routing if any..
12. Union will provide Power cables from Main PCC to proposed MCC. However, New Main earthing to be done by Bidder and it shall be chemical earthing.
13. All motors are High energy efficient IE-3 (premium efficiency) & all VFD Panels are IP-54 covers of OEM & VFD Panel should have proper air circulation facility to keep VFD's in below atmospheric temperature.
14. All pipelines are Seamless SA106 Sc.40 up to –19 °C and SA 333 for below – 20 ° if any

Noted and agreed to the above

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15. All pressure vessels are 100% radio graphed and made of SA 516 Gr. 70 plates and all controls are Danfoss Latest series where ever required.

The work has to be carefully planned and executed in a phased manner while interconnecting new chilled water lines / header with existing lines without any major interruption to normal operational & processing routines of the existing Dairy.

16. The schedule of major items required for the proposed refrigeration plant at Tirunelveli Dairy project is listed in Annexure – II. The capacity, sizes, rating of the equipments / system components mentioned in therein are the minimum requirements. The suppliers 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 Annexure – II is not adequate to meet the design / performance requirement, as per the supplier's estimation, then supplier 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 Annexure – II, then supplier shall provide the equipment as per the Annexure – II only, without any deviation

**Further Points to be noted by bidder for erection work**

A. Since it is Turnkey job, it is successful bidder's responsibility to supply and commission the plant in all respects and 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.
B. Prior approval from Union 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.
C. All pipes shall be internally cleared and flushed by the Contractor during erection.

Noted and agreed to the above

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D. For hydro static testing and water flushing wherever required, the contractor shall arrange all tools and tackles and carry out all the pre commissioning procedure testing.

E. 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/ change of equipments location during execution, will be not entitled to claim for additional payments, but to supply and commissioned the plant in all respects***.

F. Supplier has to submit screw rating chart along with technical offer as per SST/ SDT mentioned in spex. Bidder has to indicate BKW of compressor as per minimum requirement mentioned in specification. Screw compressor to be selected at 5 deg C superheat & with this condition , selected model to be not less than tendered minimum capacity asked for . Also motor rating mentioned in tender spex in minimum rating and bidder to quote according to their compressor rating capacity.

G. Prior to tender submission, it is better for Contractor /Bidder to visit site to assess the site conditions and quote accordingly all machineries to be positioned to respective places without any damage to building extra. Bidder can visit site any working days between 10.00 a.m to 5.00 p.m

H. The successful Bidder/ contractor shall be fully responsible to execute all the work involved in implementing the project, within the battery limits, 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.

I. Providing necessary provision in the proposed plant for easily hooking up of future compressors, condensers, chilled water pumps, ammonia pump plus future cold rooms, etc., with necessary isolating valves in various pipe headers, electrical feeders in MCC, etc., complete as required on quoted price and no of feeders and Automation I/O Modules will be freezed during detailed Engineering drawing.

J. All power cables should be armored cables as per standard size, but not less than 2.5 sq.mm . Except compressor motors, all other equipments shall be copper cables.

Noted and agreed to the above

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K. Providing required first charge of refrigerant ( ammonia and minimum quantity 4000 kgs) but whatever exact quantity required to achieve designed temperature to be supplied which is part of Erection work and the same shall be supplied at site during commissioning of the plant and the above quantity is minimum but successful bidder has to supply on the quoted price, if any additional gas required to obtain the design temperature. So it is total bidder responsible for achieve designed parameters.

L. Supply of lubricating oil including first change of oil after 500 hrs of operation, as required by compressor OEM recommendation and all consumables as required for initial testing commissioning and trial run.

M. Providing 4 sets of as-build drawings, detailed operation and maintenance manuals (along with soft copies of same) and Providing essential tools for compressor, Condenser, Ammonia pump n required . Also Bidder has to indicate separately recommended for one years of operation of the plant and minimum spares to be submitted with price for the same separately ( Not in main bidder).

N. In plant training to the operating personnel in systematic operation and maintenance of the complete plant and its components in efficient and safe manner. **For first One months after commissioning the supplier should train and supervise the operation / run the plant on general shift to train the staffs.**

O. All proposed LP receiver & PHE Chillers controls are to be latest Series of reputed indigenous make and all Ammonia valve to be leak proof and guaranteed for 18 months form date of commissioning.

P. Bidder has to quote separately as a optional items for running and maintain the plant round O clock to maintain the desired temp. This scope of work will be complete responsible of bidder to run and operate the refrigeration plant except spares and consumables which will be supplied by Dairy.

Q. All pressure gauges are SS finish . Bidder has to provide one set of DTI cum controller for all IBT Compartment and Control panel for VFD drives for Chilled water pumps.

R. CEIG approval for new MCC Panel to be taken by successful bidder including drawing approval.

Noted and agreed to the above

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S. The proposed refrigeration plant load has mentioned above and Bidder has advised to work out Heat load calculation for all the above Direct and Indirect loads (A and B) with **20 hours Operation and allow 10% safety margin** while estimating the refrigeration loads

## Annexure – II

## Schedule of Major Equipments for Tirunelveli Dairy

| Sl. No. | Cl. No. as per Anex.III | Qty. | Item Description | Data |
|---|---|---|---|---|
| | | | | |
| 1. | 1 | 2 Nos. | High Stage Screw Compressor package operating at –5 °C SST / 38 °C SDT with all associated accessories | Minimum 3,75,000 Kcal / Hour for each compressor (including economizer capacity) |
| 2. | 2 | 2 Nos. | Motor for compressor | Minimum 110 KW , 415 Volt, 50 Hz, 2 Pole, 3000 RPM TEFC, IE-3, heavy duty high torque AC induction motor suitable for VFD Compact ability |
| 3. a | 3 | 2 Nos. | VFD for the above motor | Suitable for the above compressor motor |
| 3. b | 3 | 1 Lot | Harmonic filter for VFD's | Suitable as per requirement |
| 4. | 4 | 1 Set | Common or Individual Economizer with all controls and accessories | Suitable for simultaneous operation of all high stage screw compressor plus one future |
| 5. | 5 | 1 No. | Imported Evaporative type condenser with pump and all accessories | Minimum suggested capacity 6,30,000 Kcal/ Hr , Selection of condenser shall be done with extra large heat transfer surface area to facilitate reduction fan motor KW. Design condensing temperature is 38 °C, when the ambient wet bulb temperature is 27.5°C |
| 6. | 6 | 1 No. | Priority Vessel for Thermo Siphon Oil Cooling. | Suitable for all the above compressors plus one future compressor. |
| 7. | 7 | 1 No. | Low pressure liquid accumulator (horizontal type) for IBT, Pre Chiller, | Suitable capacity including provisions future expansions. Dimension suitable for maximum upward vapour velocity 0.5 m/sec as well as |

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| Sl. No. | Cl. No. as per Anex.III | Qty. | Item Description | Data |
|---|---|---|---|---|
| | | | | adequate holding volume to accommodate liquid drained by gravity from all evaporators and pipelines. Minimum vessel size shall be 121 m diameter and 4.2 m length |
| 8. | 11 | 2 Nos. | Refrigerant liquid pumps with all accessories for IBT, Pre Chiller. | Suitable for liquid ammonia of Open/ Hermetic type pumping of flow rate minimum 14 Cu. Mt. Hour at 30 MWC |
| 9. | 8 | 1 No. | PHE type pre chiller with valves, controls, instruments and all accessories | Suitable for chilled water flow rate of 60 $M^3$/hour with maximum allowable pressure drop of 0.5 kg / sq. cm. Designed for refrigerant evaporating temp. of –2 °C and chilled water outlet temperature not less than +2°C. The minimum heat transfer capacity of PHE shall be 2,25,000 Kcal / hour. Nozzle size should be minimum 100 mm |
| 10. | 9 | 2 Sets | IBT Coil made of SA 106 Sch 40 pipes | IBT Coil of 1176 rmt per Tank complete with necessary controls. |
| 11. | 10 | 2 Sets | Agitator with frame | For existing IBT |
| 12. | 10. | Lot | IBT Cover | 80-mm thick suitable for existing IBT Tank size |
| 13. | 11 | 3 Nos. | Chilled Water Pumps – Vertical inline pump | Capacity 60 M3 at 34.5 MWC with over all efficiency (Hydraulic + Electrical) not less 70%. |
| 14. | 12 | 1 Lot | M.S Seamless Pipes, valves, fittings and accessories for refrigerant, oil lines, etc. | Inter connection with existing headers, modification in the lines where ever required, including provisions in the headers for future expansion |
| 15. | 12 | 1 Lot | G.I B Class Pipes, valves, fittings and accessories for new condenser water, chilled water, etc. | Inter connection with existing headers, modification in the lines where ever required, including provisions in the headers for future expansion |

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| Sl. No. | Cl. No. as per Anex.III | Qty. | Item Description | Data |
|---|---|---|---|---|
| 16. | 13 | 1 Lot | Insulation for new pipes & new vessels, equipment, etc. | As per requirement for new lines where ever required & detailed specification mentioned in Annexure- III |
| 17. | 14 | 1 Set | Main Motor Control Centre for entire plant with including for some of existing equipments, VFDs for chilled water pumps, etc. complete as per specification. | As per requirement & detailed specification mentioned in Annexure-III |
| 18. | 14 | 1 Lot | Power cables, control cables, Cable trays, Earthings etc | As per requirement including for existing equipments & detailed specification mentioned in Annexure-III |
| 19. | -- | 1 Lot | Erection charges for new system. | Complete erection, testing & commissioning of the system **including charging of Ammonia gas but not less than 4000 kgs** |

## Annexure – III

### 1. A. Screw Compressor for High Stage

The compressors for –5 °C application of **rotary twin screw type**, male rotor driven, running at a speed not exceeding 2950 RPM at 50 HZ AC supply and directly coupled to a 2 pole motor. The compressor will be supplied with the following and minimum capacities are mentioned in Annexure-II.

a. Suction and discharge line stop valves
b. Suction and discharge line check valves
c. Suction scale trap with strainer
d. By-pass arrangement
e. Oil level switch in oil reservoir
f. Electric heater with thermostat in oil separator
g. Pre lube oil system
h. Dual Oil filter of 15 microns

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i. Infinitely step less automatic capacity control system for a range of 100% to 10%
j. Unloaded starting
k. Dual safety valve
l. Compressor motor coupling and guard
m. Motor base.
n. Horizontal shell and tube oil cooler supplied with inlet/outlet connections, valves and fittings (Thermo siphon type).
o. Horizontal oil separator with coalescer filter. The oil separator with one sight glass in oil reservoir and one sight glass in coalescer section.

The design of the unit shall be of skid mounted packaged type. The package unit comprising of screw compressor, coupling, oil pump, oil cooler, oil separator, PLC based operator interface panel and interconnection, piping, necessary control wiring required between sensing element to microprocessor etc. shall be mounted on a common base frame.

Program Logic Controller (PLC) comprising of display unit with labeled keypad for various action settings. The compressor is controlled by the above control system and monitors, the condition and operation for compressor unit continuously and directs the operation of components like the status of Compressor. PLC will be touch screen colour display of 7” display area.

Supplier scope of supply includes necessary alarms set points for various parameters such as suction pressure & temperature, discharge pressure & temperature, Oil pressure & temperature, Pressure drop across the filter, economizer pressure & temperature, oil temperature inlet & outlet, ammonia temperature, slide valve position & mode, pump on / off, percentage of full load and compressor operating mode with time & data shall be recorded for all the events.

The CCP provides annunciation & hooter to indicate the first cause of shut down as well as pre alarm to warn of potential shut down condition. The CCP includes auto / manual mode selector switch. An emergency stop button with indication shall be mounted on the panel. The power supply for the CCP shall be taken from the UPS.

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**2. Motors:**

The motor for high stage and Booster compressors shall be of Premium efficiency ( IE-3 ), TEFC squirrel cage, heavy duty, high starting torque, AC induction motor, horizontal foot mounted suitable for 415 V ± 10%, 50 Hz., 3 phase supply of rating suitable for continuous duty for compressors. The motor shall be equipped with winding thermisters. The motor shall be assembled on compressor base frame, duly aligned complete with all accessories.

**3. Starters**

- AC variable speed drive with all accessories for the High stage Screw motor and it shall be supplied with harmonic filters line choke confirming to electro-magnetic compatibility directive 89 / 336 / EEC. The THD generated in the system should be 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.
- 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 with copper busbars, inter connection, power / control terminal blocks with adequate space for termination of power / control cable.

**4. Shell And Tube Economizer:**

High-stage screw compressor shall be supplied with a individual or common economizer of suitable capacity, which shall be suitable for simultaneous operation of all the proposed compressors plus one future. The economizer shall be supplied with necessary controls, solenoid valve, safety valve and isolating valve etc.

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**5. Evaporative Condenser:**

Condenser to be designed for compressor with economizer + Oil cooling load plus 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 steel*. 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.

**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.

**Fan with Fan Motor**

Fan of axial propeller type constructed of aluminium alloy complete with suitable rating totally enclosed air over type with 1.15% service factor. The fan drive is a multi-groove, solid pack and the sheave constructed of aluminium alloy. The Fan motor shall be suitable for VFD drive.

**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 into Schedule –40 Polyvinyl Chloride headers equipped with removable end plugs for ease of cleaning.

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**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.

**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.

**Air Inlet Louvers**

The air inlets 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. Supplier scope of supply includes the following accessories:

- Gas & Liquid inlet & outlet valve
- Dual Safety Valve
- Isolating valve for pumping out
- Air Purge connection
- Pressure Gauge with valve
- Make up water connection with all fittings

Condenser to be installed on the building top at suitable height to ensure proper functioning of thermo-siphon oil cooling system of screw compressor.

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Refrigeration bidder has to provide necessary layout drawings with static/dynamic load of the condensers to design the mounting structures.

Base frame for mounting condensers as structural members (all in galvanized steel construction) shall be included in the scope of work

**6. Thermo Siphon Oil Cooling:**

Thermo siphon based oil cooling vessel fabricated from MS steel plates supplied with instruments & controls for maintaining proper temperature of oil returning to compressor with necessary control valves, isolating valves, inter connection pipelines, safety features, oil drain arrangement, etc.

The thermo siphon oil cooling system will be suitable for all compressors including 1 no. future compressor.

**7. LP Receiver**

**(Note : Existing HP Receiver to be used as it is )**

The Refrigeration bidder to design separate LP Receivers for –5 Deg. C. Necessary provision shall be made for future expansion fabrication / manufacturing of Pump Separator shall be carried out as per IS Code 2825 "Unfired Pressure Vessel - All weld joints shall be 100% radio graphically tested

**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.

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e. Liquid level control tappings, 2 No., valved. 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 tappings, 2 Nos. valved. 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. Vapours vent connection from circulating pumps, with valves.
j. Dual safety valve with PED approved / CE marked, housing material with low temperature steel. Safety valve as back pressure dependent "TUV pressure setting 2 nos. purge valve,
k. Pressure gauge tapping with SNV needle valve isolating the pressure gauge.
l. Manual fill connection with valve.
m. Pressure stat connection with SNV needle valve.
n. Pump-out connection, valved 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.

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**Each accumulator vessel shall be provided with:**

Liquid level control: A suitable Electronic liquid level transmitter (AKS 4100 Radar based technology) with suitable stand alone controller (EKE 347) 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 (EKE 347) shall give required input to the modulating Motorized expansion valve (ICM with ICAD actuator) to maintain the desired liquid level accurately in the accumulator using in built PID functionality.

Safety switches: Electromagnetic micro switch mechanically operated PED/CE marked,

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.

**8. PHE Type Water Pre-Chillers.**

The semi-welded PHE evaporator shall be suitable for low temperature application and equipped for liquid pumping/overfeed system with Ammonia refrigerant.

THE ICE WATER OUTLET TEMPERATURE AT THE WELDED PHE MUST BE DESIGNED NOT TO DROP BELOW 2 °C WHEN REFRIGERANT (AMMONIA) BOILING TEMP. AT –2°C. The wet return suction line is connected to minus 5 °C LP accumulators. A suitable capacity "Back Pressure regulating valve" (DANFOSS ICS 3 valve with Electronic pilot CVQ , Controller EKC 361 & Temp . sensor AKS 21) to be installed on the wet return suction line so as to maintain minus 2 °C (or higher) is evaporating temperature of Refrigerant (Ammonia) inside the welded PHE. The temperature will measure the chilled water temperature at PHE outlet and communicate to the stand alone Controller EKC 361. Based on the set point (Required chilled water temp) the EKC 347 controller will provide signal to CVQ which in turn maintains the back pressure by modulating the opening degree of ICS valve.)

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The PHE has to be tested after completely assembled, by OEM with following test pressures and medium.

| | | |
|---|---|---|
| Water side with water | : | 6 kg/cm$^2$. |
| Ammonia side with nitrogen | : | 20 kg/cm2 |
| Maximum Test Temperature with specified gaskets | : | 80 °C |

Plates: The plates shall be made from stainless steel conforming to AISI 316. Two numbers of plates shall be welded together by laser welding technology to form the cassettes so as to avoid any chances of ammonia leaking through the plates. All water contact surfaces shall be easily accessible or readily removable for cleaning and inspection – 1 set.

Gaskets: The sealing gaskets shall ensure complete sealing and prevent any cross leakage between Ammonia and water. Gaskets shall be durable and compatible for the application. - 1 lot

Supporting Frame: The supporting frame for the plate pack shall be of a self supporting design made of mild steel with epoxy painted, with a manually operated tightening devices. The tightening devices made up of MS and cladding with SS 316 plate able to exert uniform pressure on all the parts of heat transfer plates to prevent any leakages from the PHE. The frame and tightening device shall prevent the plates from deflecting under pressure differential of up to 18 Kg/ CM$^2$. The frame shall be capable of accommodating at least 25% of extra cassettes if need be. There shall be minimum two tightening devices.- 1 Set.

Accessories Inlets/Outlet: The inlets and outlets in of ammonia and water side of the heat exchanger shall be provided with studded end connections. - 1 set.

Thermo wells: Pockets for thermometer on the inlets & outlets of water side and the ammonia temperature at inlet & outlet side shall be provided. Also temperature sensors for monitoring /logging the data in Central Control panel shall be supplied by the Supplier.

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Mounting arrangement: The frame shall be provided with suitable mounting arrangement for securing it firmly with the flooring/foundation.

Provide on each PHE suitable fittings and mountings for following

a. Refrigerant outlet (two phase flow) connection flanged and valved.
b. Refrigerant liquid outlet flanged and valved.
c. Chilled water inlet flanged and valved.
d. Chilled water outlet flanged and valved.
e. Necessary arrangement for pump out/evacuating of the semi-welded PHE for maintenance
f. Provision with isolating valves for connecting "Cleaning-in-place" system for de-scaling of the water circuit of the PHE.
g. Oil drain arrangement with isolating valve
h. The temperature of both inlet & outlets of Chilled water & ammonia to be made with digital systems and signals to be transferred to the display system

NOTE : All bolts, nuts should be SS and base frame to be provided to rest PHE Chiller and base frame should be spray Galvanized before installation.

Controls : The water pre-chiller (Semi Welded PHE) must be equipped with suitable automatic control instruments such as temperature controller, anti-freeze thermostat, ammonia back pressure regulating valve in the suction line with attachment of two constant pressure regulation valves and a ON/OFF pilot valve, in such a way that whenever the chilled water temperature drops below the set value, evaporation temperature immediately changes over to higher evaporating temperature (above freezing point). Necessary local pressure gauges and digital temperature indications on refrigerant side and water side, etc, as well as pressure/temperature transmitters to Central PLC for monitoring and auto control. Also any other controls and instruments, which are required / essential for satisfactory functioning of the system, are included in the scope of work.

**9. 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**

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**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.

**10. Agitator with Motor & IBT COver**

Agitator with frame , belt guard with motor and accessories for proposed IBT (One set each for Each compartment) including TEFC Squirrel Cage Induction Motor for the above agitator suitable for operation on 400/440 volts, 3 phase, 50 cycles, AC supply.

IBT cover suitable for Indoor type made of Pre-painted Gal volume sheets 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

**11. Pumps For Various Requirements.**

1. Cooling water for evaporative condenser: As provided by the OEM of the evaporative type condenser.
2. Chilled water: This shall be vertical inline pump of SS construction. Connections shall be flanged. Pumps shall be provided with energy efficient motors.
3. Refrigerant liquid: 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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**12. Refrigerant & Water Piping.**

Supply and install all required one lot of piping such as refrigerant, oil drain, water lines for condensers, chilled water, etc. **for interconnecting with exiting lines and headers where ever required**, 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 and thermo siphon oil cooler piping of High Screw Compressors should be sized for simultaneous operation of all the compressors specified in Coloum 2 including one more compressor of similar capacity proposed to be installed in future. Similarly, the main headers of condenser piping, oil cooler piping, chilled water piping, etc shall be designed suitable for all proposed pumps plus one future pump. These headers shall be provided with necessary tappings 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 |
| | (NH3) receiver to 1.0 |
| d) Liquid line | m/secsystem |
| e) Wet return line (NH3) | 10 m/sec |
| f) Suction line (H20) | 1.0 to 1.2 m/sec |
| g) discharge line (H20) | 2.0-2.5m/sec |

**ALL REFRIGERANT, OIL PIPING,** THE CONTRACTOR SHALL USE **"SEAMLESS HEAVY DUTY CLASS SCHEDULED 40 PIPES"** AS PER INTERNATIONAL STANDARD DEPENDING ON SIZE OF PIPE, OF SA53 GRADE/SA106 GRADE AS APPLICABLE.

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ALL VESSELSPLATES ARE STEEL PLATE AND SPECIFICATION WILL BE IS : 2002 / SA 516 GR. 70 AND 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 vessel 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.

## 13. Line & Vessel Insulation

Insulation for new pipe lines and equipments where ever required, 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 |

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The insulated pipelines shall be supported using high density PUF block (minimum 80 kg/cum) or using seasoned teak wood as approved. These 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 aluminium coated polyester film of 50 micron thick) WITH JOINTS LAPPED AND SEALED WITH SELF DHESIVE TAPE

Insulate the pump separator (LP Accumulator) with suitable thickness as insulation but not less than 100mm and insulation 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.

**14. Electrical (MCC Panel, Power, Control Wiring, Cable Trays, Earting Etc**

MCC shall be suitable for indoor type.

Bus Bar Rating shall be capable of carrying 1.2 times of full load current of refrigeration MCC. For calculating full load current, the connected load of refrigeration MCC including future load provisions and 20% spare feeders shall have to be considered.

Incomer: Four Pole, ACB 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

Out-going Feeder: Required number of feeders to feed all power loads and controls for the entire refrigeration plant covered under the scope of this bid.

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*Two nos. of the chilled water pumps shall also be provided with VFD drives*

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, etc to be provided in the refrigeration MCC. The spare feeders shall be fully equipped with all components and wired. Also 02 No. 63 A 4P MCCB feeder for welding point with industrial type outlet socket and plug.

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 equipments having distance behind 10-m from MCC or Sub-MCC panel should have remote Isolating Switch near to respective units including for all existing equipments.**

All out-going feeders shall have isolation facilities such as fuse-switch units, contactors, thermal/magnetic over load protection and necessary operating control etc.

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 earthings 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 centre is to be manufactured / assembled as per the latest ISI Specification, Indian Electricity Rules, including special requirements of concerned State Electricity Inspectorate and the detailed specification mentioned below. The manufacturer of the panel must posses a type test certificate/ accreditation from CPRI.

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The switchboard shall be fabricated using pressed and shaped cold rolled steel sections structure of adequate thickness. The sheet steel used for panel shall be min. 14 SWG sheet except that the partition plates and inter-panel barriers may be made of 16 SWG. The switchboard shall consist of free standing front 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

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and control cables in cable alleys also shall be provided. Maximum shipping length of MCC shall be 2500 mm.

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 Starter Width X Height X Depth** |
|---|---|---|
| | mm mm mm | mm mm mm |
| Upto 10 HP | 450 x 275 x 350 | 450 x 275 x 350 |
| 10 HP to 30 HP | 450 x 550 x 350 | 450 x 550 x 350 |
| 40 HP to 75 HP | | 450 x 825 x 350 |
| 100 HP to 150 HP | | 450 x 1100 x 350 |

| **Approximate Size of Cubicles for SFU/MCCB Feeders** | |
|---|---|
| Current Rating | **Cubicle for SFU & MCCB** |
| | mm mm mm |
| Up to 63 A | 450 x 275 x 350 |
| 100 A to 250 A | 450 x 550 x 350 |
| 400 A & above | 500 x 825 x 350 |

Minimum depth of cubicle for ACB Feeder shall be 1000 mm

Minimum width of cable and bus bar alleys shall be 300 mm

**A. <u>Painting</u>**: 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.

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**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 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 aluminum conforming to grade E91E of IS 5082. The bus bars and supports shall be capable of withstanding the rated and short circuit current stated in the single line diagram/feeder details. Minimum size of power bus bars shall be 200 Amps rating. Maximum current density permissible for Aluminium bus bars shall be 0.8 Amps/$mm^2$ for bus bar area above 500 $mm^2$ & 1.0 Amp/$mm^2$ for bus bar area below 500 $mm^2$. An earthing bus bar of minimum 150 $mm^2$ 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/mm2

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.

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**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 COPPER BUSBAR STRIPS OF ADEQUATE RATING SHALL BE USED. MINIMUM SIZE OF COPPER CONDUCTOR TO BE USED SHALL BE 4.0 $mm^2$. Cable lugs/ sockets of suitable size and type shall be used for all interconnections.

For all aluminum to copper connections: The copper surface will be silver-plated and the aluminum 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, aluminum conductor cable will be used and hence the panel is to be designed for receiving these and wherever required cable boxes with bus bar extensions for receiving more no. of cables, shall be provided in panel by supplier. Removable gland plates of 12 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.

**F. 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 $mm^2$. However, CT circuit wiring shall be done with 2.5 $mm^2$. Control wiring to components fixed on doors shall be flexible type.

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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.

Conductors shall be terminated using compression type lugs. Each termination shall be identified at both the ends by printed ferrules indicating detail of concern wire. The identification termination details 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.

**G. Switchgears:**

**G.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.

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The control supply shall be 240 V AC. 6 NO + 6 NC auxiliary contacts shall be provided.

The interlocks shall be as under:

It shall not be possible to plug in a closed circuit breaker or to draw out a circuit breaker in closed position. It shall not be possible to operate a circuit breaker unless it is in fully plugged-in, test or fully isolated position. In test position, the breaker shall be tested without energizing the power circuit. The ACB feeder cubical door cannot be opened when ACB is "ON". However, it shall be possible to defeat this interlock for inspection purpose. Closing and trip coils shall work under the following voltage variation conditions:

Closing coils - 85 % to 110 % of rated voltage

Trip coils - 50 % to 130 % of rated voltage

For series tripping, overload, short circuit and under voltage/shunt trip release shall be provided. While incoming feeder ACB shall be provided with under voltage coil, the outgoing feeders ACBs shall be provided with shunt trip

The built-in earth fault relay shall be provided for incoming feeders ACB.

Current rating, short circuit current, protection relays etc. shall be as specified in feeder details

The circuit breaker position shall be indicated electrically. The following indicating colours shall be used.

**BREAKER 'CLOSE' RED**

**BREAKER 'OPEN' GREEN**

**BREAKER 'AUTO TRIP' AMBER**

The circuit breaker shall be provided with mechanically operated emergency tripping device. This device shall be available on the front of the panel

**Note:** The air circuit breaker for incoming feeder shall be of 4 pole construction, unless stated otherwise.

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## G.2 Moulded Case Circuit Breakers (MCCB):

MCCBs shall always be provided with separate operating handle mechanism with door interlocking. The MCCBs shall be of triple / four pole construction (as required in the feeder details) arranged for simultaneous three/four pole manual closing or opening and automatic instantaneous tripping on short circuits. MCCBs shall be provided with adjustable type tripping device with inverse time characteristics for over load protection. All MCCBs are to be provided with operating handles interlocked with cubicle doors.

Closing mechanism shall be quick make, quick break and trip free type. Operating handle shall give a clear `ON', `OFF' & `TRIP' indication. Control voltage for MCCB shall be 240 volts. The MCCBs shall be rated for continuous maximum duty as specified. The rating of the MCCBs shall be as per the feeder details.

Minimum rated breaking capacities shall be as under:

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

## G.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.

## G.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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**G.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.

**G.6 Protective Devises:**

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

**G.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.

**G.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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**G.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.

**G.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.

**G.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 digital ammeter. Ammeter shall also be provided for all incoming & outgoing switches / MCCB / ACB of rating 100 A & above.Ammeters shall always be CT operated.

## H. Special Requirements

a. All motor feeders above 10 HP rating shall have automatic Star-Delta Starters and upto 10 HP 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

c. All the power contactors of Star-Delta starters shall have same current rating

d. 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 |

- 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.

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- 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
- Suitable 3 phase and neutral bus bars.

Wiring for all above accessories/functions should be complete and ready for use. The details of each capacitor bank rating, no. of capacitor banks for power factor improvement shall be as per details given in the data sheet and schedule of quantities.

**EARTHING : Main Earthing will be of Chemical earthing of ASHLOK make and to be for both MCC Panel and PLC Panels seperatly.**

**APFC Panel With Automatic Power Factor Correction Relay**

**Power Factor Improvement Panel with APFCR Relay:**

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

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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

- 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

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**A. 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

**B. 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 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.

- **TECHNICAL REQUIREMENTS:**

Total bank capacity for each panel: 300 KVAR

No. of basic units X basic unit : 4 X 50 kVAR + 3 No X 25 kVAR + 2 No X 10 kVAR + 1 X 5 kVAR

Voltage rating : 440 V, 3 Phase, 50 Hz AC

**K. <u>LT POWER & CONTROL CABLES</u>:**

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**LT Power Cables:**

Power cables for use on 415 V system shall be of 1100 V grade, **aluminum conductor**, 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. However except compressor motors , all other equipments shall be copper cables and for all Liquid pump , Oil pump, Condenser fan & pump , agitator shall be copper cables.

Bidder scope does not includes supply, laying, termination ( on both end with suitable size lugs and glands) of power cables from our designated out going feeder of Main Dairy PCC up to Proposed Main Refrigeration MCC and the same to be provided by Union.

## 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. Unarmoured 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 2.5 $mm^{2.}$

## 15. Safety Accessories and Instruments

Pressure Gauges: Pressure gauges shall be of SS filled with Glistering , conforming to the requirements of IS:3624,. All cold rooms and each compartment of existing & proposed IBT per compartment to de supplied with one no Digital temperate indicators per room for all existing Cold room. Scope includes necessary RTD sensor.

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. and Filter

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**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
b. Air tight safety suits - 2 Sets and One set of Eye wash and drench shower with all accessories
c. Necessary First charge of ammonia gas , but not less than 4000 kgs of suitable quantity to achieve design temperature ( This is part of erection work) .Bidder scope includes first charge of compressor oil as well as first change of Oil

## Annexure – IV

## Special Instruction For Carrying Out Mechanical Installation

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 responsible3 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.

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**Pipe Welding & Testing**

The piping should be TIG welded for 1st 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.

| S.No. | NAME | TEST PRESSURE | TEST MEDIUM |
|---|---|---|---|
| 1 | Water pipe lines | 8 kg/sq. cm | Water |
| 2 | Ammonia pipelines: | | |
| | i) Suction | 14- 16 kg/sq. cm | Nitrogen |
| | ii) Discharge | 20 - 22 kg/sq. cm | Nitrogen |
| | iii) For complete | Absolute zero System for 48 hours | |

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 EPS insulation with suitable thickness as per tender specification.

**Special Instruction for carrying out Electrical Installation**

All electrical installation to be carried out as per the below Electrical standards

a) Indian Electricity Act and Rules.

b) Fire Insurance Regulations.

c) Regulations laid down by the Chief Electrical Inspector of the Karnataka

All HT Power Cables to be Three core, Aluminium conductor, screened, XLPE insulated, armored shielded and PVC sheathed cables suitable for 11/22/33 KV,

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earthed system, conforming to IS 7098 (Part II) - 1988 amended as on date and all LT Power cables to be of 1100 Volt grade, Aluminium conductor, XLPE insulated, PVC sheathed, armoured and overall PVC sheathed, strictly as per IS: 7098 (Part I) - 1988 amended as on date. Conductor of cable shall be solid type for sizes up to 6 mm2 and stranded for sizes above 6 mm2. NO POWER CABLE OF ALUMINIUM CONDUCTOR HAVING SIZE LESS THAN 4 $MM^2$ SHALL BE USED. Also, NO POWER CABLE OF COPPER CONDUCTOR HAVING SIZE LESS THAN 2.5 $MM^2$ SHALL BE USED.

Control cables for use on 415 V system shall be of 1100 Volts grade, Copper conductor, XLPE insulated, PVC sheathed, armored and overall PVC sheathed, strictly as per IS:7098 (Part I) - 1988 amended As on date.

The size of Power as well as control cables shall be as specified in schedule of quantities.

MINIMUM CONDUCTOR SIZE FOR COPPER CONTROL CABLES SHALL BE 1.5 $MM^2$
Moreover to carrying out analogue signals contractor has to use only Multi-stranded base annealed copper conductor, PVC insulated, cores, screened by braiding with ATC copper wire and finally overall PVC sheathed. Cable trays to be perforated type heavy duty, return flange or inward bend shape, manufactured from mild steel conforming to IS 226 and hot dip galvanized as per IS 2629/ BS 729. Minimum height of tray will be 50 mm and thickness of plate to be 1.5 mm up to 325 mm cable tray width. For cable trays having width more than 325 mm height must be 75 mm and thickness of plate to be 2 mm

Cable trays for automation network / instruments / signal cables shall be separate from the cable trays for power & control cables.

Cable glands to be supplied with both ends of armoured / unarmoured electrical cables. Cable glands are to be of BS-6121 amended as on date, with BRASS material accurately machined and NICKEL finish. These shall be of heavy-duty single compression type for cable conductor.

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Sizes above 35 $mm^2$ and weather proof double compression type for cable conductor sizes up to 35 mm2. Single compression cable glands must be complete with check nut, gland body, 3 nos. metal washers, and outer seal rubber ring and compression nut. Cable connectors, lugs/sockets, to be of copper / aluminum alloy, suitably tinned solder less, crimping type.

Cable route markers to be galvanized Cast Iron plate with marking (LT/HT) diameter 150 mm with 600 mm long 25 x 25 mm MS angle riveted / bolted with this plate. Sample must be got approved before use at site.
Cable indicator to be self-sticking type and of 2 mm thick lead Strap for overall cable. PVC ferrules with identification numbers shall be used for each wire.Pipes for Cables. Cables to be layed under floor to be used with GI Class 'A' pipes

All Junction box for motor and controls to be made of Aluminium cast housing, completely dust, vermin and weather proof (IP 55), suitable for 25 A, 415 volts, 50 Hz, with heavy duty bakelite connector, complete with cable/conduit gland.

Remote Push Button Stations shall be used for remote ON-OFF operation of Star-Delta started motors, away from MCC. These shall be fabricated from 1.6 mm thick Stainless Steel sheets (SS-304). In case of floor-mounted stations, these shall be supported either on 51 mm 'A' class MS pipe cladded with SS or 51 mm □ SS 304 pipe. Front cover shall be removable type with suitable rubber gaskets to make them dust, vermin and moisture proof. All outer SS surfaces shall be polished to 150 grit finishes.

Each feeder of station shall be provided with name plate (white bakelite), LED type indication lamp, one 'ON' (Green) push button and one 'OFF' (Red) mushroom push button turn to lock. Green and Red push buttons shall have contact elements having 1 NO + 1 NC. Number of feeders shall be specified in schedule of quantities/drawings. All power, control as well as lighting cables to be laid in underground trenches, hume pipes, open trenches cable trays, GI pipes or on building structure surfaces as per site condition and approval of Federation site in charge the scope of the Supplier.

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All the cables installing through GI pipes, conduits, RCC pipe, ensure that size of pipe is such that, after drawing cables, minimum 35 % area is free. After drawing cable, the end of pipe shall be sealed with cotton/bituminous compound. However, all 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.

All Cables to be laid in ground should not interfere with other underground structures and cables to be protected from damages/ injuries. Cables shall be laid at minimum depth of 750 mm in case of LT & 1200 mm in case of HT, from the existing ground level. The width of the trench will be decided on number of cables. Also provide 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.

For all underground cables, route markers should be used. Power cables shall be identified with red, yellow & blue PVC tapes for trip circuits' identification, additional red ferrules shall be used only in the particular cores of control cable at the termination points in the switchgear/control panels and control switches.

In case of control cables, all cores shall be identified at both ends by their wire numbers by means of PRINTED ferrules ONLY. Wire numbers should be match with schematic / connection drawing.

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

The entire earthing installation shall be done in accordance with the earthing drawings and comply with the Indian Electricity Act and Rules.

Earth Plate with earth pit shall be provided for this work. Earthing electrode and pit shall be as per IS: 3043-1987 (Code of Practice for Earthing). All earth

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electrodes shall preferably be driven to a sufficient depth to reach permanent moist soil. Earth pit centre shall be at a minimum distance of 3 m from nearest building, unless otherwise advised. The minimum 3 m distance shall be maintained between centres of 2 earth pits.

Earthing electrodes or Main Lighting Panel shall be Plate type with double eathing. Size of earthing lead / wire shall be as per the trailing tables.

Control Switches/Remote Push Button Stations GI Wire 14 SWG/PVC insulated Copper 2.5$M^2$ flexible wire.

Motors / Isolators up to 10 HP GI Wire 8 SWG / PVC insulated Copper 4 mm2 flexible wire.

Motors above 10 HP up to 125 HP GI Strip 25 X 3 mm.

Motor above 125 HP GI Strip 25 X 6 mm.

Switch Board/ Motor Control Centre/ DG Set Control Panel GI Strip 50 X 6 mm

Power Control Centre/ LT Panel of Sub Station GI Strip 50 X 6 mm

**Bureau Of Indian Standard Codes To Be Followed For Electrical Erection Works**

| | |
|---|---|
| 1. PVC insulated cables (light duty) for working voltage up to & including 1100 volts - | 694-1990 Part I & II |
| 2. PVC insulated cables (heavy duty) for Voltage up to 1100 volts | 1554-1988 Part I |
| 3. -- do -- for voltage 3.3 KV to 11 KV | 1554-1988 Part II |
| 4. Guide for marking of insulated conductors | 5578-1984 |
| 5. Code of practice for installation and maintenance of power cables up to and including 33 kV rating | 1225-1983 |
| 6. Code of practice for earthing | 3043-1987 |
| 7. Recommendations on Safety Procedures and Practices in Electrical Work - Part I: General | 5216-1982 Part - I |
| 8. Recommendation on Safety Procedures and Practices in Electrical Work - | 5216-1982- Part II |
| **Life Saving Techniques** | |
| 9. Code of practice for installation and maintenance of induction motors | 900-1992 |

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| | |
|---|---|
| 10. Code of practice for selection, installation and maintenance of Switchgear and Control gear | 10118-1982 Part I,II,III,IV |
| 11. Code of practice for selection, installation and maintenance of Transformers | 10028-1985Part-I, II, III |
| 12. Code of Practice for Electrical Wiring Installations | 732-1989 |
| 13. Guide for Testing Three-Phase Induction Motors | 4029-1967 |
| 14. XLPE Cables for working voltage up to and including 1100 Volts | 7098- 1988 Part - I |
| 15. ----do--- up to 33 Kv | 7098 – 1988 Part - II |
| 16. General Requirements for Enclosures for Accessories for Household and similar Fixed Electrical Installations | 14772 – 2000 |
| 17. Specification for Electric Power Connectors | 5561- 1970 |
| 18. Methods of Test for Cables | 10810 - 1984 |
| 19. National Electrical Code | - SP: 30 |

**Motor Starter Selection Table**

The following selection table shall be generally followed for starters of motor feeders unless otherwise specified. However, technical requirements/ specifications, if any, mentioned under Section VI, will supersede the table given above.

| Sr. No. | 415 V Motor HP | Contactor Rating AMPS | MCCB Rating AMP | MPCB Rating Amp | Type of Starter |
|---|---|---|---|---|---|
| 1 | Up to 3 HP | 9 | - | 9 | DOL |
| 2 | 5 to 10 HP | 16 | - | 16 | -Do- |
| 3 | 12.5 to 15 HP | 25 | - | 25 | Star Delta |
| 4 | 20 to 25 HP | - | - | 40 | -Do- |
| 5 | 30 to 35 HP | - | - | 50 | - Do - |
| 6 | 40 HP | - | 63 | - | - Do - |
| 7 | 45 HP | - | 100 | - | - Do - |
| 8 | 50 to 60 HP | - | 125 | - | - Do - |
| 9 | 65 to 70 HP | - | 200 | - | - Do - |

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| | | | | | |
|---|---|---|---|---|---|
| 10 | 75 to 90 HP | - | 200 | - | - Do - |
| 11 | 100 to 125 HP | - | 250 | - | - Do - |
| 12 | 150 to 180 HP | - | 400 | - | Soft starter |
| 13 | 200 to 250 HP | - | 400 | - | - Do - |
| 14 | 275 to 400 HP | - | 630 | - | - Do - |

**Power Cable Selection**

| 3 PHASE, 415 V MOTOR H.P. | XLPE INSULATED | | ALUMINIUM ARMOURED CABLES, 1.1 KV GRADE, SIZE IN $MM^2$ | |
|---|---|---|---|---|
| | DOL/ SOFT STARTER | | STAR-DELTA STARTER | |
| | SUPPLY SIDE | MOTOR SIDE | SUPPLY SIDE | MOTOR SIDE |
| Up to 7.5 HP | 4 | 4 | 4 | 2 x 4 |
| 10 | 6 | 6 | 6 | 2 x 4 |
| 12.5 | 6 | 6 | 6 | 2 x 4 |
| 15 | 10 | 10 | 10 | 2 x 6 |
| 20 | 16 | 16 | 16 | 2 x 6 |
| 25 | 16 | 16 | 16 | 2 x 10 |
| 30 | 25 | 25 | 25 | 2 x 10 |
| 40 | 35 | 35 | 35 | 2 x 16 |
| 50 | 50 | 50 | 50 | 2 x 25 |
| 60 | 70 | 70 | 70 | 2 x 35 |
| 75 | 95 | 95 | 95 | 2 x 50 |
| 100 | 120 | 120 | 120 | 2 x 70 |
| 125 | 185 | 185 | 185 | 2 x 95 |
| 150 | 240 | 240 | 240 | 2 x 120 |
| 180 | 300 | 300 | 300 | 2 x 150 |
| 200 | 2 x 150 | 2 x 150 | 2 x 150 | 2 x 150 |
| 250 | 2 x 185 | 2 x 185 | 2 x 185 | 2 x 185 |
| 275 | 2 x 240 | 2 x 240 | 2 x 240 | 2 x 240 |
| 300 | 2 x 240 | 2 x 240 | 2 x 240 | 2 x 240 |
| 425 | 2 x 400 | 2 x 400 | 2 x 400 | 2 x 400 |

- Above cable selection table is for general guidance only, approved cable schedule/drawings shall be followed for specific applications/ projects.

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Following selection table shall be followed for XLPE insulated, Copper armoured cables for motors, unless otherwise specified. However, technical requirements/ specifications, if any, mentioned under Section VI, will supersede the table given above

| 3 PHASE, 415 V MOTOR H.P. | XLPE INSULATED | | COPPER ARMOURED CABLES, 1.1 kV GRADE, SIZE IN $MM^2$ | |
|---|---|---|---|---|
| | DOL/ SOFT STARTER | | STAR-DELTA STARTER | |
| | SUPPLY SIDE | MOTOR SIDE | SUPPLY SIDE | MOTOR SIDE |
| Up to 7.5 HP | 2.5 | 2.5 | 2.5 | 2 x 2.5 |
| 10 | 4 | 4 | 4 | 2 x 2.5 |
| 15 | 6 | 6 | 6 | 2 x 2.5 |
| 20 | 10 | 10 | 10 | 2 x 4 |
| 25 | 16 | 16 | 16 | 2 x 6 |
| 30 | 16 | 16 | 16 | 2 x 6 |
| 40 | 25 | 25 | 25 | 2 x 10 |
| 50 | 35 | 35 | 35 | 2 x 16 |
| 60 | 50 | 50 | 50 | 2 x 25 |
| 75 | 70 | 70 | 70 | 2 x 35 |
| 100 | 95 | 95 | 95 | 2 x 50 |
| 125 | 150 | 150 | 150 | 2 x 70 |
| 150 | 185 | 185 | 185 | 2 x 95 |
| 180 | 240 | 2 x 120 | 240 | 2 x 120 |
| 200 | 2 x 120 | 2 x 120 | 2 x 120 | 2 x 120 |
| 250 | 2 x 150 | 2 x 150 | 2 x 150 | 2 x 150 |
| 275 | 2 x 185 | 2 x 185 | 2 x 185 | 2 x 185 |
| 300 | 2 x 850 | 2 x 185 | 2 x 185 | 2 x 185 |
| 425 | 2 x 240 | 2 x 240 | 2 x 240 | 2 x 240 |

9.3. In case LAPP/Concab/Equivalent design of steel braided Copper Cables are used then, minimum size of cables for various rating of motors, to be laid between MCC and Motors shall be as given in table below

| SR. NO. | MOTOR RATING HP | FULL LOAD CURRENT AMP | TYPE OF STARTERS | POWER CABLE RATING FOR LAPP/ CONCAB CABLES (AT 45 °C) |
|---|---|---|---|---|
| 1 | 0.5 | 1 | DOL | 3 C or 4 C x 1.5 sq. mm |
| 2 | 0.75 | 1.3 | DOL | 3 C or 4 C x 1.5 sq. mm |
| 3 | 1 | 1.9 | DOL | 3 C or 4 C x 1.5 sq. mm |
| 4 | 1.5 | 2.6 | DOL | 3 C or 4 C x 1.5 sq. mm |
| 5 | 2 | 3.7 | DOL | 3 C or 4 C x 1.5 sq. mm |
| 6 | 3 | 4.8 | DOL | 3 C or 4 C x 1.5 sq. mm |
| 7 | 4 | 5.2 | DOL | 3 C or 4 C x 1.5 sq. mm |

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| | | | | |
|---|---|---|---|---|
| 8 | 5 | 7.8 | DOL | 3 C or 4 C x 1.5 sq. mm |
| 9 | 7.5 | 11.2 | DOL | 3 C or 4 C x 2.5 sq. mm |
| 10 | 10 | 16 | Star Delta | 3 C or 4 C x 2.5 sq. mm |
| 11 | 12.5 | 19 | Star Delta | 3 C or 4 C x 4 sq. mm (2 runs) |
| 12 | 15 | 20.8 | Star Delta | 3 C or 4 C x 4 sq. mm (2 runs) |
| 13 | 20 | 28 | Star Delta | 3 C or 4 C x 6 sq. mm |
| 14 | 25 | 34 | Star Delta | 3 C or 4 C x 10 sq. mm |
| 15 | 30 | 40 | Star Delta | 3 C or 4 C x 10 sq. mm |
| 16 | 40 | 53 | Star Delta | 3 C or 4 C x 16 sq. mm |
| 17 | 50 | 65 | Star Delta | 3 C or 4 C x 25 sq. mm |
| 18 | 60 | 78 | Star Delta | 3 C or 4 C x 35 sq. mm |
| 19 | 75 | 96 | Star Delta | 3 C or 4 C x 50 sq. mm |
| 20 | 100 | 131 | Star Delta | 3 C or 4 C x 70 sq. mm |
| 21 | 125 | 156 | Star Delta | 3 C or 4 C x 120 sq. mm |
| 22 | 150 | 189 | Soft Starter | 3 C or 4 C x 150 sq. mm |
| 23 | 180 | 227 | Soft Starter | 3 C or 4 C x 185 sq. mm |
| 24 | 215 | 271 | Soft Starter | 3 C or 4 C x 240 sq. mm |
| 25 | 250 | 325 | Soft Starter | 3 C or 4 C x 300 sq. mm |
| 26 | 275 | 360 | Soft Starter | 3C or 4C x 185 sq.mm- 2 runs |
| 27 | 300 | 390 | Soft Starter | 3C or 4C x 185 sq.mm- 2 runs |
| 28 | 335 | 400 | Soft Starter | 3C or 4C x 240 sq.mm- 2 runs |
| 29 | 375 | 455 | Soft Starter | 3C or 4C x 300 sq.mm- 2 runs |

- Above cable selection is for guidance only, approved cable schedule shall be followed for specific applications/ projects.
- Cables for motors above 20 HP have been indicated considering soft starters.
- Un-armoured flexible Copper Cables may be provided only if specifically mentioned in Technical specifications at Section VI or approved drawings for specific applications/ projects.

**Annexure – V**

**List of Approved Makes For Major Components**

| Sl. No. | Item Description | Preferred Make |
|---|---|---|
| 1. | Screw Compressor Package | FRICK India/ Mycom / york / Grasso |
| 2. | Motor for Compressor | cgl / Siemens |
| 3. | VFD | Danfoss/Allen Bradley |
| 4. | Evaporative type Condensers | Evapco/ Baltimore |
| 5. | Plate Heat Exchanger for Pre Chiller | Gea/ Alfa Laval /HRS |
| 6. | Liquid Ammonia Pumps | Frick / Th.witt/ Hermetic/ Hydrodine |
| 7. | Chilled Water Pump | Grundfos /Wilo/ CRI |
| 8. | Automatic Air Purger | Frick/ Manik / Hansen |
| 9. | Water Pipes | Tata / Jindal /Zenith |
| 10. | LP Receiver ,HP Receiver | Frick /GEA/ Kirloskar/ idmc |

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| | | |
|---|---|---|
| 11. | Refrigerant / Oil Pipes | Tata /MSL/ Kalyani/ Jindal |
| 12. | Ammonia System Valves | Danfoss/Hanson/ Herl-Kirloskar |
| 13. | Water Valves | Audco/ inter/ saunder |
| 14. | Flow Switch | Honeywell /switzer /danfoss |
| 15. | Pressure Switch / Pressure Transmitter / Liquid Level Controller / LP/HP/OP Cut-outs / Solenoid Valves / Back Pressure Regulating Valve / Thermostat / Humidistat | Danfoss/Hanson/ switzer |
| 16. | Automation System | Rock Well / Siemens /Tata honeywell |
| 17. | Reflux type Ammonia Liquid Level Gauge | Revathi / R.K.Dutta |
| 18. | Dial type Pressure / Temperature Gauges | 'H' Guru / pricol |
| 19. | Digital Temperature Sensors / Indicator / Controller | Tata Honeywell / Yokogawa |
| 20. | ACB / MCCB | Siemens / Schneider |
| 21. | Switch Fuse Units | Siemens / Schneider |
| 22. | MCB | Siemens / Mds |
| 23. | HT XLPE Cable | Polycab/ cci / Nicco / Universal |
| 24. | LT XLPE / PVC Cable | Polycab/ cci / Nicco / Universal |
| 25. | Control Cables | Polycab/ Nicco / Finolex |
| 26. | Protective Relays / Overload Relays / Contractors / timer | Siemens / Schneider |
| 27. | Push Button | Vaishnav / Technic |
| 28. | LED type indication lamp | Vaishnav / Technic |
| 29. | Terminal Block | Elemex / Connectwell |
| 30. | HRC Fuse | Siemens / C & S |
| 31. | Measuring Instruments | Meco / L & T / Imp |
| 32. | Current Transformer | Meco / Kappa |
| 33. | Rotary Switches | Salzer / Technic |
| 34. | Lugs / Gland | Dowells / Lotus |
| 35. | Capacitor | Meher / Unistar |
| 36. | LT Energy Meter / Digital Voltmeter / Ammeter | Enercon / L & T |
| 37. | Structural channel and angles | Tisco/ sail |
| 38. | Water line solenoid valve | Audco /Danfoss |
| 39. | Booster compressor | Frick |

The makes specified above shall supersedes the makes, if any specified else where in the tender. **If the tenderer quoted with any alternative make other than specified above approved make, then it will be treated as non-responsive and rejected.**

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**Annexure – VI**

**Technical Data on the Major Equipments**

| Sl. No. | Description | –5 /38 °C Application |
|---|---|---|
| | **A. Compressor** | |
| 1. | Make | |
| 2. | Type | |
| 3. | Model | |
| 4. | Capacity (Without economizer) | |
| 5. | Capacity (With economizer) | |
| 6. | Saturated Suction temperature | |
| 7. | Saturated Discharge temperature | |
| 8. | Consumption of power at shaft (without eco.) | |
| 9. | Consumption of power at shaft (with eco.) | |
| 10. | Speed of the compressor | |
| 11. | Super heat considered | |
| 12. | No. of compressors | |
| | **B. Oil Separator** | |
| 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 | |
| | **C. Oil Cooler** | |
| 1. | Type (Horizontal / Vertical) | |
| 2. | No. of coolers | |
| 3. | Heat Rejection Capacity | |
| 4. | Shell Diameter in mm | |
| 5. | Shell height / length in mm | |
| 6. | Tube diameter in mm | |
| 7. | Tube thickness in mm | |
| 8. | Material of Construction (Shell) | |
| 9. | Construction of tubes | |
| 10. | Oil Flow | |
| 11. | Oil inlet & out let temperature | |
| | **D. Economizer** | |
| 1. | Type (Horizontal / Vertical) | |
| 2. | Heat Rejection Capacity | |
| 3. | Shell Diameter in mm | |
| 4. | Shell height / length in mm | |
| 5. | Material of Construction (Shell) | |
| 6. | Material of Construction (Tube) | |

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| | | |
|---|---|---|
| 7. | Design pressure shell side | |
| 8. | Intermediate temperature shell side | |
| 9. | No. of economizers compressors | |
| 10. | Controls and fittings provided | |
| | **E. Low Pressure Liquid Accumulator** | |
| 1. | Type | |
| 2. | Shell diameter | |
| 3. | Shell height / length | |
| 4. | Material of Construction (Tube) | |
| 5. | Liquid Temperature | |
| 6. | Controls | |
| 7. | Fittings & Mountings | |
| | **F. Refrigerant Pumps** | |
| 1. | Make | |
| 2. | Type | |
| 3. | Model | |
| 4. | Capacity | |
| 5. | Head | |
| 6. | No. of Pumps ( W + S ) | |
| 7. | Overall Efficiency | |
| 8. | Motor Rating | |
| | **G. Evaporative Condenser** | |
| 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 & rating | |
| 14. | No. of Fan & rating | |
| 15. | Total Weight (Shipping Weight) | |
| | **H. Chilled Water Pump** | |
| 1. | Make | |
| 2. | Model | |
| 3. | Capacity | |
| 4. | Head | |
| 5. | No. of Pump | |
| 6. | Power Consumption | |
| 7. | Efficiency | |
| 8. | Motor Rating & RPM | |

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| | | |
|---|---|---|
| 9. | Motor RPM | |
| 10. | Impeller | |
| | **I. PHE PRE CHILLER** | |
| 1. | Make | |
| 2. | Model | |
| 3. | Quantity | |
| 4. | Heat Rejection Capacity | |
| 5. | Water Flow | |
| 6. | Water inlet temperature | |
| 7. | Water outlet temperature | |
| 8. | Controls provided on water side | |
| 9. | Controls provided on refrigerant side | |
| 10. | Pressure drop on water side | |
| 11. | Design pressure | |
| 12. | Test Pressure | |
| 13. | Design temperature of Gasket | |
| 14. | MOC of plate | |
| 15. | MOC of Gasket | |
| 16. | No. of Plate | |
| | **J. IBT & coil** | |
| 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 | |

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**Annexure – VII**

**Battery Limits**

| Scope of Area | Purchase Scope (Tirunelveli Dairy) | Supplier Scope (Bidder) |
|---|---|---|
| Civil Works | New Building with complete foundation for all proposed equipments and for certain existing equipments including patch up work | Supply of necessary foundation bolts along with the template, sub base, motor slide rails and all other associated erection materials. |
| | Access platform and stair case up to new bulling terrace for condenser and softening plant storage tank | Rectification of defective work resulting from the incorrect / delayed / in sufficient information provided by the supplier. |
| | Civil work pertaining to cable trench, MCC Panel , earthing pits. Patch p and filling work for cut opening in the walls. | |
| Water Line | Soft water plant and soft waterlines up to one point of Refrigeration plant. | Tapping of soft water from nearest header. |
| | | Distribution to all the equipment considered under refrigeration work as per the requirement of the process. |
| Chilled Water Lines | Existing Chilled water supply and return line from existing Machine room door to process and return up to Machine room. | Starting from outlet of proposed & l existing Ice Bank Tank, the supplier shall provide suction header, strainers, valves, NRVs, discharge header and line up to corridor & Return line from there tapped with a valve to Ice Bank Tank inlets, through the Pre chiller) with necessary isolation valves and by-pass arrangement. |
| Power | Scope includes main incoming cables of minimum form PCC to | Distribution of power and control cables Panel from Refrigeration Main MCC to various proposed |

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| Scope of Area | Purchase Scope (Tirunelveli Dairy) | Supplier Scope (Bidder) |
|---|---|---|
| | new MCC Panel of suitable run | equipment including for all existing equipments which going to be retained. |
| Refrigeration piping | Nil | Additional refrigeration piping for the new equipments as well as certain existing equipments as described in Annexure-I and suitable provision for hooking up future equipment with necessary isolating valve |
| Structural | Platform for Condenser in RCC | All pipe line supports, supports for equipment inside the building as well as outdoor equipment and structural platform for new pipelines wherever required. |
| | | Necessary cable trays & supports required inside the trenches including grouting and chequered plates for trench cover. |
| Existing IBT | Existing IBT Tank sheets to be as it is with PAINTING . If required, Union will do it later on. | New IBT Coil Modification if any in the existing lines in of IBT Coils with inter connecting piping, new cables with Automation, control wiring. New IBT Cover. |
| CEIG & Any statutory approvals | | Successful bidder has to submit necessary documents and drawings to apply CEIG / Statutory approvals & to get approval. |

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**Annexure – VIII**

**List of Technical Documents, Details and Drawings to be furnished along with the Bid failing which tender will treated as non-response and rejected without any notice**

**The Bidder is required to furnish following Drawings, Technical Documents along with the Bid**

1. Layout drawings showing proposed refrigeration plant equipments like condenser, HP receiver, LP accumulator, pumps
2. Detailed machinery layout for the compressor room, control room, cold rooms.
3. P & I diagram for the ammonia refrigeration system, cooling water & Chilled water piping with line sizes
4. G A drawings for the electrical power distribution
5. Automation system configuration

**Also bidder has to furnish the following**

1. Chilled water load (indirect system)
2. 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)
3. Calculation for the condenser capacity required
4. List of technical Literatures covering general and technical information for all the major equipment offered. viz compressor, condenser, pumps, purger, PHE pre chiller, control valves, instrumentations, PLC automation system, VFD,
5. Bar chart for project execution
6. List of recommended spare for two years operation with break-up cost in commercial bid

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**Annexure – IX**

**Applicable Indian Standards**

***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 |
| 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. |

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| | |
|---|---|
| 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 |

**Refrigeration piping and Heat Transfer Components – aSMe B 31.5**

Noted and agreed to the above

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| | | |
|---|---|---|
| NAME OF ITEM / WORK | : | **SUPPLY, ERECTION AND COMMISSIONING OF IMPORTED HIGH STAGE SCREW COMPRESSORS COMPLETE SET WITH AUTOMATION OF REFRIGERATION SYSTEM FOR TIRUNELVELI DCMPU UNDER NADP SCHEME FOR THE YEAR 2019-20** |
| TENDER NOTICE REFERENCE NO | : | 14300/Proj.2/2019, Dated:23.10.2019 |

# 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 **Supply, Erection and Commissioning of Imported High Stage Screw Compressors Complete Set with Automation of Refrigeration System for Tirunelveli DCMPU under NADP Scheme for the year 2019-20** 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.

**SUPPLY, ERECTION AND COMMISSIONING OF IMPORTED HIGH STAGE SCREW COMPRESSORS COMPLETE SET WITH AUTOMATION OF REFRIGERATION SYSTEM FOR TIRUNELVELI DCMPU UNDER NADP SCHEME FOR THE YEAR 2019-20**

**ABSTRACT**
**PRICE QUOTE SCHEDULE**

**In Rupees**

| S.N. | DESCRIPTION | | | UNIT RATE |
|---|---|---|---|---|
| A | **SUPPLY:** | | | |
| 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 (percentage to be indicated) | | | |
| | **Sub-Total (A)** | | | |
| **B** | **ERECTION & COMMISSIONING :** | **Material cost if any** | **Labour Cost** | |
| 1 | Unpacking, shifting and positioning charges | | | |
| 2 | Erection & commissioning charges | | | |
| 3 | GST/IGST (percentage to be indicated) | | | |
| | **Sub Total (B)** | | | |
| | **TOTAL PRICE (A+B)** | | | |
| | **TOTAL PRICE IN WORDS** | | | |

SIGNATURE OF THE TENDERER WITH SEAL

## BREAK-UP DETAILS FOR ABSTRACT PRICE QUOTE SCHEDULE

**(In Rupees)**

| Sl. No. | Item Description | Qty. | Unit | Basic Price | P&F | Transport charges | Transit insurance | GST/IGST | Unit Price | Total Price |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | High Stage Screw Compressor package operating at –5 °C SST / 38 °C SDT with all associated accessories (Minimum 3,75,000 Kcal / Hour for each compressor (including economizer capacity)) | 2 | Nos. | | | | | | | |
| 2. | Motor for compressor (Minimum 110 KW , 415 Volt, 50 Hz, 2 Pole, 3000 RPM TEFC, IE-3, heavy duty high torque AC induction motor suitable for VFD compact ability) | 2 | Nos. | | | | | | | |
| 3. | VFD for the above motor (Suitable for the above compressor motor) | 2 | Nos. | | | | | | | |
| 4. | Harmonic filter for VFD's (Suitable as per requirement) | 1 | Set | | | | | | | |
| 5. | Common or Individual Economizer with all controls and accessories (Suitable for simultaneous operation of all high stage screw compressor plus one future) | 1 | Set | | | | | | | |
| 6. | Imported Evaporative type condenser with pump and all accessories (capacity 6,30,000 Kcal/ Hr) | 1 | No. | | | | | | | |
| 7. | Priority Vessel for Thermo Siphon Oil Cooling. (Suitable for all the above compressors plus one future compressor.) | 1 | No. | | | | | | | |
| 8. | Low pressure liquid accumulator (horizontal type) for IBT, Pre Chiller, (maximum upward vapour velocity 0.5 m/sec) | 1 | No. | | | | | | | |

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| Sl. No. | Item Description | Qty. | Unit | Basic Price | P&F | Transport charges | Transit insurance | GST/IGST | Unit Price | Total Price |
|---|---|---|---|---|---|---|---|---|---|---|
| 9. | Refrigerant liquid pumps with all accessories for IBT, Pre Chiller (flow rate minimum 14 Cu. Mt. Hour at 30 MWC) | 2 | Nos. | | | | | | | |
| 10. | PHE type pre chiller with valves, controls, instruments and all accessories (suitable for chilled water flow rate of 60 m^3 / hour with maximum allowable pressure drop of 0.5 kg/sq.cm. Minimum heat transfer capacity of PHE 2,25,000 Kcal / hour) | 1 | No. | | | | | | | |
| 11. | IBT Coil made of SA 106 Sch 40 pipes (IBT Coil of 1176 rmt per Tank complete with necessary controls) | 2 | Sets | | | | | | | |
| 12. | Agitator with frame (For existing IBT ) | 2 | Nos. | | | | | | | |
| 13. | FRP cover (80-mm thick suitable for existing IBT Tank size) | 1 | Lot | | | | | | | |
| 14. | Chilled Water Pumps –Vertical inline pump (Capacity 60 M3 at 34.5 MWC with overall efficiency not less than 70%) | 3 | Nos. | | | | | | | |
| 15. | M.S Seamless Pipes, valves, fittings and accessories for refrigerant, oil lines, etc. | 1 | Lot | | | | | | | |
| 16. | G.I.B Class Pipes, valves, fittings and accessories for new condenser water, chilled water, etc. | 1 | Lot | | | | | | | |
| 17. | Insulation for new pipes & new vessels, equipment, etc. | 1 | Lot | | | | | | | |
| 18. | Main Motor Control Centre for entire plant with including for some of existing equipments, VFDs for chilled water pumps, etc. complete as per specification | 1 | Set | | | | | | | |

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| Sl. No. | Item Description | Qty. | Unit | Basic Price | P&F | Transport charges | Transit insurance | GST/IGST | Unit Price | Total Price |
|---|---|---|---|---|---|---|---|---|---|---|
| 19. | Power cables, control cables, Cable trays, Earthings etc | 1 | Lot | | | | | | | |
| 20. | First charge of oil | 1 | Lot | | | | | | | |
| 21. | Erection charges for new system (including charging of Ammonia gas but not less than 4000 kgs) | 1 | Lot | | | | | | | |
| 22. | Others if any (Please Specify) | | | | | | | | | |
| 23. | Total | | | | | | | | | |

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**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** **Signature of the tenderer**

Witness:

1

2

Date: