

**Procurement Notice**

**Supply, Installation, Testing & Commissioning of 50 MT Butter Deep Freeze**

**REQUEST FOR QUOTATION (RFQ)**



**December-2024**





# West Assam Milk Producers' Co-operative Union Ltd.

## PURABI DAIRY

**REQUEST FOR QUOTATIONS**  
**Procurement of Goods under RFQ**  
**E-Procurement Notice**  
*(Two-Envelope Single stage bidding process)*

**Purchaser: West Assam Milk Producers' Cooperative Union Limited**  
**Contract title: Supply, Installation, Testing & Commissioning of 50 MT Butter Deep Freeze**  
**RFQ No: WAMUL/LMP/Deep Freeze/24-25/01**  
**Date: 17<sup>th</sup> December-2024**

West Assam Milk Producers' Coop Union Ltd (WAMUL) a Milk Union established under the Assam Cooperative Societies Act, 1949 and Managed by National Dairy Development Board Invites Quotations in sealed envelope from eligible bidders for "Supply, Installation, Testing & Commissioning of 50 MT Butter Deep Freeze" at WAMUL Premises as per specifications and other terms and conditions as below:

Sl. No.	Description of Work	Plant Layout	Butter Deep Freeze Heat Load	KC Compressor Capacity Report	Technical Specifications	BOQ
1	Supply, Installation, Testing & Commissioning of 50 MT Butter Deep Freeze	At Annexure-I	At Annexure-II	At Annexure-III	At Annexure-IV	At Annexure-V

**Time line for submission of the bid documents**

Sl. No	Item	Start date & Time
1	Bid Publishing Date	17-12-2024
2	Bid Submission end date	31-12-2024, 12:00 hrs.
3	Bid opening date(Technical)	31-12-2024, 12:30 hrs.

This Procurement notice is governed by

1<sup>st</sup> Cover:

1. Terms and conditions applicable for submission of quotations i.e. criteria and qualification etc.
2. Seal & Signed Bid Document – Technical Part
3. Technical Specification & Scope of Work

2<sup>nd</sup> Cover

1. BOQ (Annexure-V)

Website of publication: [www.purabi.coop/tenders.php](http://www.purabi.coop/tenders.php)

- Clarifications, Amendments & Corrigendum's: If the Purchaser receives any request for clarification of this RFQ Document, it will upload its response together with any amendment to this document, on the portal for information of all Bidders. Bidders should check on the portal i.e. [www.purabi.coop/tenders.php](http://www.purabi.coop/tenders.php) for any amendments to the terms and conditions
- Other details can be seen in the RFQ document. The Purchaser shall not be held liable for any delays due to failure beyond its control. A Bidder requiring any clarification of the RFQ Document may notify the Purchaser through electronic mail or may visit the office of the Purchaser at the address given below.

West Assam Milk Producers Cooperative Union Limited, WAMUL (Purabi Dairy)

Contact Person: Smt. Sandhya Kalita

Postal Address: WAMUL Juripar, Panjabari, Guwahati-37

Mob: 9707013600

Email Address: [Sandhya@purabi.coop](mailto:Sandhya@purabi.coop)

Web: [www.purabi.coop](http://www.purabi.coop)

**Sd/Managing Director  
WAMUL**





RFQ No: WAMUL/LMP/Deep Freeze/24-25/01

Date: 17<sup>th</sup> December-2024**1. Terms and Conditions:****1.1 Eligibility Criteria of the Bidder****A. If the bidder is a manufacturer:**

- The bidder should be manufacturer (relevant document which proves that the bidder is a manufacturer e.g. Incorporation Certificate, MSME or any other relevant documents proves that the party is a manufacturer).
- The bidder's average Financial Turnover should be minimum of Rs. 300 Crore in the last three financial years ending 31<sup>st</sup> March (FY 21-22, 22-23, 23-24 years should be consecutive). Relevant document required: Audited Balance Sheet or Chartered Accountant certified copy having valid UDIN no.
- The bidder should have completed of minimum 10 contracts for same works in the last three financial years mentioned herein 2021-22, 22-23, 23-24 having value of equal or more than 60 Lakh (Relevant documents required: relevant P.O. copies along with satisfactory work completion certificates or equivalent)
- The bidder should have valid GST registration certificate (certificate required).
- MSME documents if applicable.

**B. If the Bidder is a Dealer (authorized by manufacturer: - the authorizing manufacturer should meet the requirement as specified above):**

- If the bidder is a dealer Authorization Certificate from principle manufacturer will be considered.
- The bidder's average Financial Turnover should be minimum of Rs. 3 Crore in the last three financial years ending 31<sup>st</sup> March (FY 2021-22, 22-23, 23-24 years should be consecutive). relevant document required: Audited Balance Sheet or Chartered Accountant certified copy having valid UDIN no.
- The bidder should have completed a total of minimum 5 contracts for the same works in the last three financial years mentioned herein 2021-22, 22-23, 23-24 having value of equal or more than 60 Lakh (relevant documents required: relevant P.O. copies along with satisfactory work completion certificates or equivalent)
- The bidder should have valid GST registration certificate (certificate required).
- MSME documents if applicable.

**1.2. Earnest Money Deposit (EMD):** Rs. 65,000.00/- (Rupees Sixty-Five Thousand) shall be submitted in the form of Demand Draft (DD) in the name of "West Assam Milk Producers' Cooperative Union Ltd" Payable at Guwahati. The EMD can be forfeited by the purchaser, if the bidder is not earnest about their bid and withdraw it before the validity period is over.

**1.3 Performance security:** The successful bidder shall furnish to WAMUL a performance security @10% of the contract value in the form of Bank Guarantee or a Bank Draft from any Nationalized/Scheduled Bank in favour of "**West Assam Milk Producers' Cooperative Union Limited**" Payable at Guwahati" within 30 days of award of contract. The PBG will be valid till the warranty obligation period. The Performance Security furnished by the successful bidder will be retained by the office up to the warranty obligation period and returned within 60 days of expiry of the contract. The PBG held by the office till it is returned to the successful bidder will not earn any interest.

Failure of the successful bidder to furnish Performance Security within the period stipulated shall constitute sufficient ground for annulment of award and the Office may make the award to the next lowest evaluated bidder. The Performance Bank Guarantee Format is enclosed.

**1.4. Validity of the Quotation:** Quotation must be valid for 120 days from the last date of submission of bids. The rates quoted by the bidder shall be fixed for the duration of the contract and shall not be subject to adjustment on any account.



**1.5. Delivery/Completion Time:** Work to be completed within 60 days from the date of issue of work order at West Assam Milk Producers' Cooperative Union Limited (Purabi Dairy), Panjabari, Guwahati-781037.

**1.6. Price Bid**

- a) The Prices shall be quoted in Indian Rupees only
- b) Freight: To be arranged by the supplier.
- c) Packing, Forwarding, GST, Freight, Insurance and other incidental charges will be part of the evaluation.
- d) Each bidder shall submit only one quotation. Bidder shall not contact other Bidders in matters relating to this Quotation
- e) The contract shall be for the full quantity as described above.

**1.7. Terms of Payment:** 30% advance against advance bank guarantee and balance payment will be made within 20 days from the date of successful Delivery, Installation, Testing & Commissioning of the material site and due submission of bill along with warranty certificate to be certified by competent authority of WAMUL. However, payment will be made within a variation of +/- 10% of the actual work done.

**1.8. Warranty:** 12 months from the date of Supply, Installation, Testing & Commissioning of the material.

**1.9. Liquidated Damages:** If the bidder fails to deliver any or all the goods or perform the services within the time period(s) specified in the work order/contract, the WAMUL shall, without prejudice to its other remedies under the work order/contract, deduct from the work order/contract price, as liquidated damages, a sum equivalent to the following clauses which is applicable as per Order.

- a) 0.5% of the full contract value for each completed week of delay

**OR**

- ~~b) 0.5% of the value of delayed items/services only, for each completed week of delay.~~

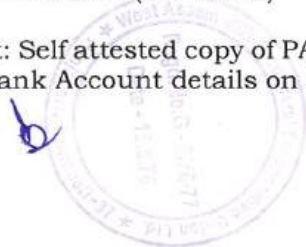
The total amount so deducted shall not exceed 10% of the work order/contract value. Once the maximum is reached, the WAMUL may consider cancellation/termination of work order/contract, and forfeiture of performance/ deposit bond

**1.10. Documents:** *The Quotation shall comprise two Parts, namely the Technical Part and the Financial Part. Both Parts shall be submitted simultaneously.*

**i) The Technical Part of Quotation shall comprise the following**

- a) Letter of Quotation – Technical Part
- b) Delivery schedule –within 60 days from the date of issue of purchase order.
- c) Technical specification
- d) Complete address and contact details of the Bidder having the following information:  
Name of Firm  
Address for communication  
Telephone No(s): Office  
Mobile No.  
Electronic Mail Identification (E-mail ID)

Bidder shall submit: Self attested copy of PAN, Self-attested copy of GST, Self-attested copy of Trade License, Bank Account details on letterhead of the firm and the RFQ document.



- (a) Price Schedule as per specified format (BOQ)

#### **1.11. Opening and Evaluation of Technical Parts of Quotations:**

The 'Technical Part' of the Quotations will be opened on the specified date and time. The Financial Part of the Quotations shall remain unopened until the subsequent technical opening.

a) The Purchaser shall examine the technical part of the quotation to determine whether the quotation has been properly signed meets the eligibility criteria conforms to all terms, conditions, Technical specifications, warranty/guarantee etc.; and the bidder has accepted the delivery schedule

b) Only Quotations that are both substantially responsive to the RFQ document, and meet all Qualification Criteria shall qualify for opening of the Financial Parts of their Quotations at the second Opening.

c) Purchaser shall notify to those Bidders who have failed to meet the Qualification Criteria or whose Quotations were considered non-responsive to the requirements in the RFQ document, advising them that their Technical Part of Quotation failed to meet the requirements of the RFQ document; and that their Financial Part of the Quotation shall not be opened.

Simultaneously Purchaser shall notify to those Bidders who's Technical Parts of Quotations have been evaluated as substantially responsive and meeting the Qualification Criteria that their quotation has been evaluated as substantially responsive to the RFQ document and that their financial part of bid will be opened online and date will be intimated.

**1.12. Opening and Evaluation of Financial Parts of Quotations:** The 'Financial Part' of the Quotations will be opened on the specified date and time.

The Purchaser shall examine and confirm that Letter of Quotation – Financial Part and Price Schedules/BOQ are in accordance with the requirements specified in the RFQ document. If any of these documents or information is missing, the offer shall be rejected.

- (a) The Quotations would be evaluated for complete set of items under this RFQ.
- (b) The evaluation shall be based on the total price of Goods including GST and any other taxes, freight Transit insurance which will be payable on the finished goods at the time of invoicing as FOR delivery.

#### **1.13. Award of contract:**

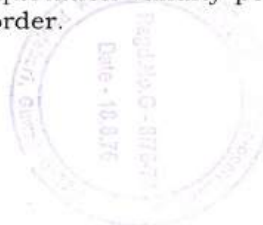
(a)The Purchaser will award the contract to the bidder whose quotation has been determined to be substantially responsive and who has offered the lowest evaluated quotation price.

(b) Negotiation will be done only with L1 bidder. The purchase order will be issued to the lowest responsive bidder

(c)Notwithstanding the above, the Purchaser reserves the right to accept or reject any quotations and to cancel the bidding process and reject all quotations at any time prior to the award of contract.

(d)The bidder whose bid is accepted will be notified of the award of contract by the Purchaser prior to expiration of the quotation validity period. The terms of the accepted offer shall incorporate in the supply order.





(d)The bidder whose bid is accepted will be notified of the award of contract by the Purchaser prior to expiration of the quotation validity period. The terms of the accepted offer shall incorporate in the supply order.

**1.14. Cancellation of Contract:** WAMUL shall be free to cancel the order either in full or in part, in the case of non-delivery of material/non completion of installation within the stipulated delivery period.

**1.15. Rejection:** WAMUL reserves the right to reject the goods either in part or full if at the time of delivery, it is noticed that the goods supplied do not conform to the specifications/description given in the purchase order.

**1.16.** For any dispute/legal issues, the jurisdiction is at Guwahati Only

**Sd/-  
Managing Director-WAMUL**





**Letter Pad of CA Firm**

Standard format

**TO WHOMSOEVER IT MAY CONCERN**

We..... based on audited books of accounts for the financial year 2020-21, 2021-22, 2022-23, 2023-24 or current financial year and verification of documents, records and information provided to us by the Management of .....  
 ....., having its registered office at.....

Confirm the following:

Sl No	Financial Year	Turnover (Rs.)
1	21-22	
2	22-23	
3	23-24	

Date:

Signature:

Place:

Seal/Stamp of CA Firm




**Performance Security - Bank Guarantee**  
*[Guarantor letterhead or SWIFT identifier code]*

Performance Guarantee No..... *[insert guarantee reference number]*  
 Date..... *[insert date of issue of the guarantee]*

To: \_\_\_\_\_ *[name of Purchaser]*  
 \_\_\_\_\_ *[address of Purchaser]*

WHEREAS \_\_\_\_\_ *[name and address of Supplier]* (hereinafter called "the Applicant") has undertaken, in pursuance of Contract No. \_\_\_\_\_ dated \_\_\_\_\_ to execute \_\_\_\_\_ *[name of Contract and brief description of Goods and related Services]* (hereinafter called "the Contract");

AND WHEREAS it has been stipulated by you in the said Contract that the Applicant shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his obligations in accordance with the Contract;

AND WHEREAS we have agreed to give the Applicant such a Bank Guarantee;

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Applicant, up to a total of \_\_\_\_\_ *[amount of guarantee]* \_\_\_\_\_ *[in words]*, such sum being payable in the types and proportions of currencies in which the Contract Price is payable, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of \_\_\_\_\_ *[amount of guarantee]* as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Applicant before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract or of the Goods and related Services to be supplied thereunder or of any of the

*[Handwritten signature]*



Contract documents which may be made between you and the Applicant shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee shall be valid until ..... (i.e.) 60 days following the Completion date of the Contract including any warranty obligations, and any demand for payment under it must be received by us at this office on. / or before that date.

Signature and seal of the guarantor \_\_\_\_\_

Name of Bank \_\_\_\_\_

Address \_\_\_\_\_

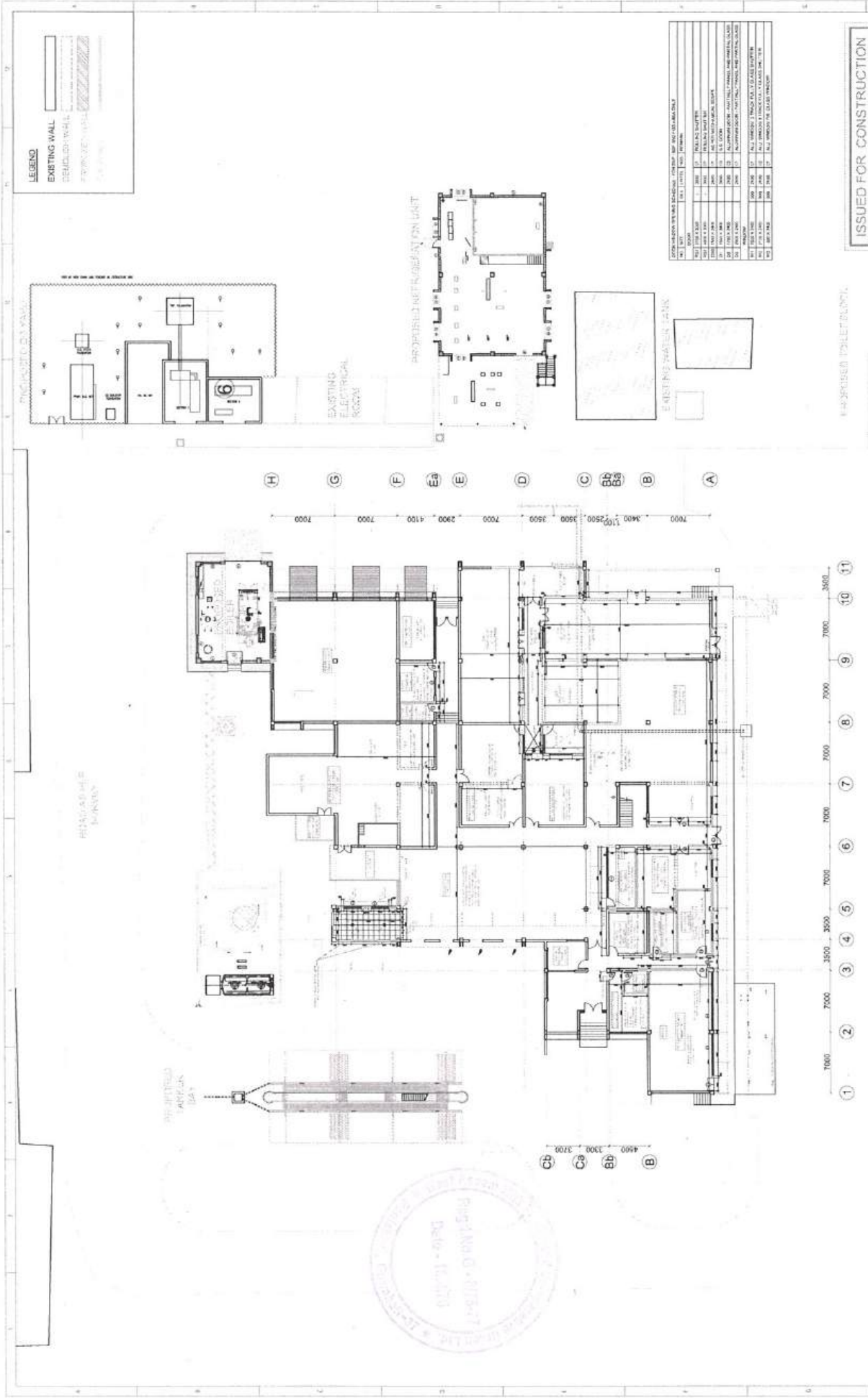
Date \_\_\_\_\_

***Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.***





Annexure-I



<b>ISSUED FOR CONSTRUCTION</b>	
<b>EXTENSION OF PURABI DAIRY EXISTING BUILDING</b>	
<b>EXISTING PRODUCTION BLOCK SITE PLAN</b>	
Project Name: INFRASTRUCTURE EXPANSION WORKS AT PURABI DAIRY, GUWAHATI	Client Name: WEST ASSAM MILK PRODUCERS CO-OPERATIVE UNION LTD.
Project Consultant: NATIONAL DAIRY DEVELOPMENT BOARD, ANAND-GUJARAT-INDIA	Architect & Structural Consultant: RUSHABH CONSULTANTS
Drawn: PULICE	Check: PAB
Designed: INDU	Verified: PAB
Approved: PAB	Date: 27.08.2020
Scale: 1:100	Drawing No: 1390
Date: 27.08.2020	Consultant Drawing No: PD_AR_EXB_01

*[Handwritten signature]*



N.D.D.B.  
E.S. GROUP

## HEAT LOAD CALCULATION FOR COLD ROOM

DATE	12 / 05 / 2024				
PROJECT	# PURABI Dairy, WAMUL	DESIGN CONDITIONS SUMMER			
ROOM	Butter Deep Freeze		DB (C.)	WB (C.)	Enthalpy (kJ/kg.)
HEIGHT	3.70	Outside	36.50	26.40	80.51
BREADTH	8.27	Room	-18.00	-	0.00
LENGTH	6.95	Diff	54.50	-	80.51

### CONSTRUCTION

Ceiling	North Wall	South Wall	West Wall	East Wall	Floor
PUF 120 + RCC CEILING	PUF PANEL 120	PUF PANEL 120	PUF PANEL 120	PUF PANEL 120	PUF 120 + RCC Floor
Sr No.	Product	Area/Weight	U.Value/ Sp. Ht.	Temp. Diff.	Load K.Cals/Hr

### Heat Gain

1	HEAT GAIN BY CEILING	57	0.12	54.50	376
2	HEAT GAIN BY FLOOR	57	0.15	49.50	427
3	HEAT GAIN BY NORTH WALL	26	0.16	54.50	224
4	HEAT GAIN BY SOUTH WALL	26	0.16	59.50	245
5	HEAT GAIN BY EAST WALL	31	0.16	54.50	267
6	HEAT GAIN BY WEST WALL	31	0.16	59.50	291
7	Infiltration Load				1585

### Product Heat Load After Freezing (Load/Hr.)

8	BUTTER-Bulk	30000	0.34	8.00	81600
---	-------------	-------	------	------	-------

### Moisture Freezing Load (Load/Hr.)

9	BUTTER-Bulk	5370	1.00	80.00	429600
---	-------------	------	------	-------	--------

### Packing Material Heat Load (Load/Hr.)

10	_POLY-FILM	4500	0.55	49.50	122513
11	_PAPER BOX	4500	0.48	49.50	106920

### MISC. LOAD

12	Lighting Load	0.50	KW	860	430
13	Electrical Load	3.00	KW	860	2580
14	Workers Load	4	PEOPLE	375	1500
	Total Load				748558

Print Date 05-12-2024

Page 1 of 2

Calculated for SUMMER climatic conditions

*Handwritten signature*



N.D.D.B.  
E.S. GROUP

## HEAT LOAD CALCULATION FOR COLD ROOM

	Add Allowance (5.00 % )				37428
	Grand Total				785986



*20/11*



## Annexure - III



KIRLOSKAR PNEUMATIC COMPANY LTD  
A Kirloskar Group Company

Enriching Lives

### Selection Program for Air-conditioning & Refrigeration Compressors – [SPARC]

Reference Name: PURABI WAMUL  
2024

Date :05-12-

Input Data	Output Data
Compressor Group: Booster Duty Compressor Model : KCX3 Refrigerant: NH3 Required Capacity: AUTO Compressor Speed: 750 rpm Sat.Suction Temp: -38 °C Sat. Suc. Pressure: 164 mm of Hg vacuum Sat. Cond. Temp: -5 °C Sat. Cond. Pressure:2.59 kg/cm2 (g) Suction Super Heat:0 °K	Compressor Capacity: 15.14 TR Compressor Speed: 750 rpm Compressor Shaft Power: 13.95 kW

\* It is recommended to select driver power approximately 10% (for Single Stage) or 20% (for Two Stage and Booster) above full load power.

- For compressor full load power and capacity will have a tolerance of +/- 5%.
- Kirloskar Pneumatic Co Ltd is not liable for any loss or damage caused directly or in consequence of using this program.
- Kirloskar Pneumatic Co Ltd reserves the right to make modifications in this program without prior notice.
- Kirloskar Pneumatic Co Ltd remains the owner of this program, which are not allowed to be copied or sold.

Regd. Office: Hadapsar Industrial Estate, Pune 411 013 INDIA Tel. :-91-20-26727000  
Email: acr-compressors@kpcl.net Website:-www.kirloskarkpcl.com

*Purabi*





KIRLOSKAR PNEUMATIC COMPANY LTD  
A Kirloskar Group Company

Enriching Lives

KIRLOSKAR

Regd. Office: Hadapsar Industrial Estate, Pune 411 013 INDIA Tel. :-91-20-26727000  
Email: [acr-compressors@kpcl.net](mailto:acr-compressors@kpcl.net) Website: [www.kirloskarkpcl.com](http://www.kirloskarkpcl.com)

*Handwritten signature in blue ink.*



#### **Annexure-IV: Technical Specifications**

- 1** Applicable Indian Standards / other standards
- 2** Project Information and basis of design
- 3** Schedule of major items proposed
- 4** List of approved makes for major components
- 5** Standard specification for Motor Control Centre
- 6** Special Instructions to suppliers
- 7** Technical data on the major refrigeration equipment
- 8** List of Technical document to be furnished with Bid



*Handwritten signature in blue ink.*



## TECHNICAL SPECIFICATION

### 1. INTRODUCTION

This section of the tender document outlines the technical specifications for **Design, supply, installation, testing & commissioning of Ammonia based butter deep freeze store pumped feed cooling units, associated insulation works at Purabi Dairy, WAMUL**. The specific information on the proposed refrigeration plant, project site location and the basis of design has been furnished at **Appendix-2**.

The technical specification is for the guidance of the suppliers and not intended to bring out all the details of design and fabrication of the plant and system components. The successful Supplier shall be fully responsible to undertake 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 purchaser/client.

Supplier shall accept to undertake the complete work and there shall not be any exclusion whatsoever of any PART. It shall be understood that any minor work, which may not be explicitly detailed but is necessary for the proper functioning of the individual equipment or automated plant as a whole, is included in the scope of work without any additional cost. The total work has been divided into three parts viz.

**Part-A:** Design and supply of new refrigeration plant items as per schedule.

**Part-B:** Labour charges for installation, testing & commissioning of respective items as per schedule.

All the equipment for the plant shall be designed, supplied and installed in accordance with the prevailing and applicable standards.

The supplier shall be responsible for arranging approval from various applicable Indian Statutory authorities on behalf of the Purchaser. The Purchaser on production of documentary evidence shall reimburse the statutory fees, if any applicable.

The quantity of pipes, fittings, valves, cables, cable trays, earthlingSSS, instruments, insulation, etc. are to be offered based on the actual requirement at site. The site layout and equipment layout enclosed are for guidance of the supplier. However, supplier has to work out the exact details based on the system offered.

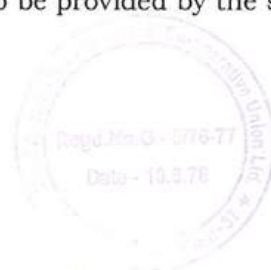
Completion period shall be **03 (Three) months** from the date of purchase order inclusive of all holidays and monsoon periods.

Water for installation: Shall be provided at one point within the site, free of charge.

**Electricity for installation:** To be provided by the supplier

### 2. PLANT ARRANGEMENT

#### 2.1. System proposed:



The existing refrigeration system shall use Ammonia **R-717**, as refrigerant. The refrigeration plant shall cater to the refrigeration/process cooling load requirements of the entire Dairy Plant, by means of:

The schedule of major items required for the proposed works are listed in Appendix-3. The operation of the plant shall be centralized with basic interlocks for safety and to optimize the capacity utilization and improve overall plant efficiency.

## **2.2. Scope of work:**

The scope of this contract shall include, but not limited to design, manufacture, supply, install, test and commission the equipment under the scope of this tender as per requirement indicated in the basis of design and Schedule of major items required for the proposed plant as listed at the proposed location, within the battery limits.

The scope of work also includes following;

- Design, supply, installation, testing and commissioning of Forced draft coolers for butter deep freeze as per the schedule of requirements and specification.
- Design, supply, fabricate, install, test and commission all the pipelines, valves, fittings and ancillaries required for the entire ammonia refrigeration system piping, make-up/drain water lines, condensate system piping, insulation of piping/vessels etc. as per the schedule of requirements and specification.
- Design, supply, installation, testing and commissioning of all electrical equipment including the LCPS / RCPs, control instruments, safety systems, interlocking, etc. as per requirement and specification
- Design, supply, fabricate and install all the pipe supports, maintenance platform, access ladders, railing, etc. wherever required for the entire work.
- Providing required the charge of refrigerant and all consumables as required for initial testing, commissioning and subsequent trial runs of equipment under scope of the tender. Minimum ammonia charge considered for modified works in the offer is to be supported with the calculation.
- Conduct performance trial of the plant as per requirement after commissioning and establish the rated performance of the plant.
- Providing as-build drawings, detailed operation and maintenance manuals.
- Impart training to the operating personnel in systematic operation and maintenance of the complete plant and its components in efficient and safe manner.

## **2.3. Design basis:**

The basis for design of the plant is provided in Appendix-2. The refrigeration plant shall be designed for reliable and continuous, round the clock operation for all 365 days of the year, in accordance with following requirements;

- Comply with relevant codes and standards indicated in Appendix -1





- Energy efficient, cost economical and simple to operate and maintain
- Comply with highest level of safety standards.
- Comply with statutory requirements.
- Useful working life of over 20 years.

### **3.0 ALTERNATIVES**

No alternatives proposed and hence no deviations are accepted in this contract.

### **4.0 COMPRESSORS**

Existing compressors system will be used and in case the system gets disturbed during Modification then the same has to be re-stabilized as per the required functioning.

### **5.0 AMMONIA CONDENSEORS**

Existing evaporative condenser will be used and in case the system gets disturbed during modification then the same has to be re-stabilized as per the required functioning.

### **6.0 HIGH PRESSURE LIQUID RECEIVER**

Existing HP receivers shall be used.

### **7.0 LOW PRESSURE LIQUID ACCUMULATOR**

Existing LP accumulators shall be used.

### **8.0 OIL RECTIFIER**

Existing oil rectifier shall be used.

### **9.0 AIR PURGER**

Existing air purger shall be used.

### **10.0 FORCED DRAFT COOLERS**

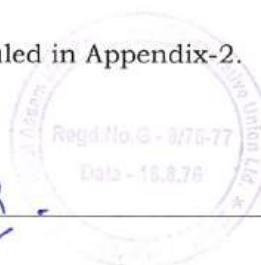
#### **10.1 Function:**

Evaporators or Forced draft cooler is of direct dry expansion type evaporator. The evaporators is used to maintain the desired temperature of butter deep freeze with the help of high velocity fans which shall ensure proper and complete circulation of air within the room.

#### **10.2 Duty:**

The duties of respective units are scheduled in Appendix-2.

*Handwritten signature*





### 10.3 Construction:

Forced draft coolers shall be supplied by a specialist manufacturer as fully assembled units. The manufacturer shall warrant performance. The make and type of units are subject to approval, and shall be detailed in the tender.

The coolers required are of ceiling suspended cross- draft type specifically intended to operate with pumped liquid supply.

**Cooling coils shall be made of stainless steel tubes with aluminium fins.**

Fin spacing shall be:

Airlock/Ante-room	- Not less than 4 mm. (6 FPI)
Cold store	- Not less than 6 mm (4 FPI)
Deep freeze	- Not less than 12 mm (2 FPI)

Parallel coils shall be supplied with refrigerant liquid through fixed metering orifices from the liquid supply header to ensure even distribution.

Water defrosts spurge pipes and header shall be provided, arranged to be self-draining. This provision is required for cold room units (above 0 Deg. C). For cold rooms, water defrosting arrangement shall be provided with controls.

For units meant for Deep Freeze application shall be provided with fully automatic hot gas defrost arrangement. The system includes solenoid valves, pressure regulation valves, safety features, pressure gauge, timers and other necessary items required. Also the Deep freeze FDC units shall be provided with heater elements for drain tray. Heater elements for the coils & tray shall be easily accessible. The system includes solenoid valves, pressure regulation valves, pressure gauge, timers and other necessary items required.

The casing shall be of made of PCGI sheet. Refrigerant coils and defrost piping shall be fixed to substantial bearers. The manufacturer is responsible, through the Supplier, to ensure that no rattles /vibrations occur when the unit is operating.

Induced draft (draw through) fans shall be axial, directly coupled to motors. Belt drives are not acceptable. Fans and motors shall be dynamically balanced. Fans made of Polyamide glass fibre reinforced material are acceptable. Fan and motor assemblies shall be resiliently mounted and effectively guarded. The fan design/RPM shall be in such a way that the operating noise level is bare minimum. Motors and bearings shall be suitable for operation at an ambient temperature of -5 Deg. C and motors shall have degree of protection IP55 or better and of **premium efficiency (IE3) (for motors of & above 0.55 kW while IE2 for motors below 0.55 kW)**

The drain tray shall be of heavy gauge galvanized sheet, cross broken to provide falls, and arranged to intercept condensation from the casing and designed to avoid splashing of water inside cold room defrosting, as well as with adequate slope towards drain water outlet. The tray shall be insulated to intercept condensation from the casing. The outlet shall be vertical.

### 10.4 Installation:

Suspension members for the units shall incorporate a thermal break within the thickness of the insulation. The detailed arrangement and supply of this is the responsibility of the

Handwritten signature: *Indu*  
Circular stamp: Regd No. G- 576-77, Date - 18.8.76

Supplier, subject to approval, who shall co-operate with the insulation fixer in installing these items. Suspend the evaporators, level and lock suspension nuts.

**Pipe Connections:**

To each evaporator supply and install a liquid feed assembly with service valves as per the functional requirement and shall ensure proper oil return.

Wall penetrations: Piping and electrical services penetrating the wall shall be designed and installed:

- To avoid forming a thermal bridge from outside to inside that could cause sweating on the outside.
- To prevent infiltration of air.
- To preserve the integrity of the insulation vapour barrier.

The arrangements for this shall be subject to approval, and the work shall be executed in co-operation with the insulation fixer.

**11.0 PUMPS**

**13.1 Requirement:**

The pumps for refrigerant liquid are described in this section. The Bidder shall propose suitable pumps for these items to match the actual duty requirement.

**13.2 Duties:**

The respective performances of all pumps are scheduled in Appendix-4. These performances are based on reasonable allowances for equipment, valve and system resistance and are intended as a guide to facilitate bidding. The Bidder shall, before execution, verify duty requirements against actual equipment and systems. The Bidder is responsible to ensure that the pumps installed are matched to actual duty requirements. Details of the proposed revised pump duties shall be furnished to the Purchaser, and shall be subject to approval.

**13.3 Construction:**

Pumps for specific services shall meet requirements:

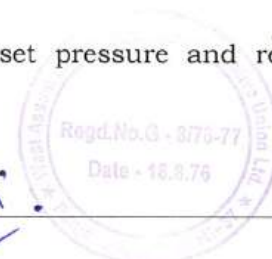
**13.4 Refrigerant liquid:**

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 canned/hermetic type or centrifugal pump(s) 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.**

Pressure differential controller for desired set pressure and recirculation shall be provided.

*[Handwritten signature]*





### 13.5 General:

The rotating parts of centrifugal pumps shall be dynamically balanced. Unless otherwise approved, drives shall be direct, through flexible couplings of appropriate type and rating. Coupling guards shall be fitted.

### 13.6 Motors: Driving motors shall have continuous ratings in IP55 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.

### 13.7 Installation:

#### 13.7.1 General:

Install pump sets as shown in the drawings, grout as necessary. The building bidder employed by the Purchaser will construct foundations to the Bidder's requirements. Bidder shall provide drawings for approval, showing all requirements for arrangement and positioning, including holding down bolt pockets.

#### 13.7.2 Refrigerant pumps:

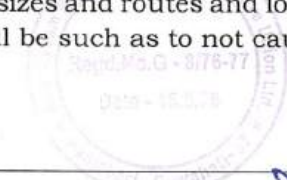
Refrigerant pumps must be installed on raised foundations, and shall be on galvanized structural steel sub-bases. The floor at these pumps will be provided with raised herbs and will be laid with falls to drain. The layout of the herbs shall be shown in the drawings. For the refrigerant liquid pumps, the drawing shall include the details described in clause 8.7.

## **12.0 MATERIAL OF CONSTRUCTION FOR PIPING AND EQUIPMENT VESSEL:**

### 12.1 Requirement:

Supply and install all required piping such as refrigerant, oil drain, defrost water, cooling water lines for condensers, chilled water, make up water, overflow, drain lines, etc. within the battery limit and necessary for the operation of total refrigeration system are included in the scope of Refrigeration Supplier. Required valves and NRV's, bends, support materials, etc. as needed, are included in the scope of the supplier and also to be supplied and installed by the Supplier within the contract value. Wherever, the operating valves are located above normal operating height suitable approach & platform should be incorporated.

Determination of pipe sizes is the responsibility of the Supplier and duly approved by the Purchaser as per norms/guidelines given below. Suction and delivery main headers of Main Compressors should be sized for simultaneous operation of all the main compressors specified in the specification plus one more compressor of similar capacity proposed to be installed at site in future. Also, the 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 tapings and isolating valves duly dummied and suitable for connecting the future compressors, condensers, ammonia pumps, chilled water pumps, etc. Drawings showing installation details including but not limited to pipe sizes and routes and locations of valves and anchors shall be approved. Pipe velocities shall be such as to not cause unreasonable pressure loss or noise, and in





refrigerant lines shall ensure effective liquid and oil entrapment.

While selecting the pipe size for various applications, the velocity of the fluids must be considered as under:

a) Suction gas line (NH <sub>3</sub> )	15.0 to 17.5 m/sec
b) Discharge line (NH <sub>3</sub> )	17.5 to 20.0 m/sec
c) Liquid line (NH <sub>3</sub> ) condenser to receiver	0.5 to 0.6 m/sec
d) Liquid line (NH <sub>3</sub> ) receiver to system	1.0 to 1.5 m/sec
e) Wet return line (NH <sub>3</sub> )	10 - 12 m/sec
f) Suction line (H <sub>2</sub> O)	1.0 to 1.2 m/sec
g) discharge line (H <sub>2</sub> O)	2.0-2.5m/sec

#### Design:

The detailed design and material of construction of the piping for various applications shall be the responsibility of the Supplier. The alternate material as proposed by the Refrigeration Supplier shall be approved by the Purchaser during the detailed engineering stage subject to Supplier provides certificate from the supplier/Manufacturer that all material selected are satisfactory for the duty requirement/relevant codes.

#### 12.2 **MOC for Piping:**

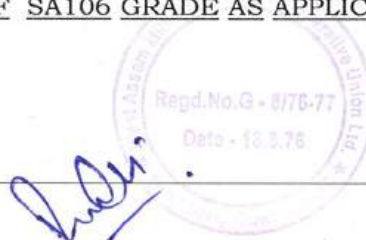
Piping for the respective services as required by the Purchaser shall be:

Service	Material	Specification
PIPING:		
Refrigerant, including oil, Purger, vent, line (above -19 Deg. C )	Steel pipe (Seamless)	SA106 quality Scheduled pipe, heavy duty
Refrigerant piping (for minus 20 Deg. C and below)	Steel pipe (seamless)	ASTM A 333 Grade seamless
Evaporative condenser tube	Steel pipe (seamless)	ASME B31.5 compliant
Water circulating pipelines / chilled water lines (up to 150 NB )	Galvanised steel (ERW) medium duty Class B	IS 1239 ( ERW – GI class "B")
Water circulating pipe-lines / chilled water lines (up to 200 NB and higher )	Galvanised steel (ERW) medium duty Class B	IS 3589 – ERW GI class B
Make up water supply, bleeds, drains, defrosting water, etc.	Galvanised steel (ERW) medium duty Class B	IS 1239 / 3589, Medium duty /GI class B

#### NOTE:

ALL REFRIGERANT, OIL PIPING, THE SUPPLIER MUST USE "SEAMLESS HEAVY DUTY CLASS SCHEDULED 80/40 PIPES" AS PER INTERNATIONAL STANDARD DEPENDING ON SIZE OF PIPE, OF SA106 GRADE AS APPLICABLE.

#### 12.3 **MOC for Valves:**



Manually operated isolating valves and check valves shall be of types:

Service	Material	Specification
Refrigerant	Ferrous, globe, lift check.	IS:11132 or relevant ASME/DIN/IIAR standards
Cooling water: Over 75 mm 50mm & Below	CI, butterfly CS ball valve	IS :778, 1703
Water supply, bleeds, and drain	Cast steel ball valve	IS:778
Chilled water –supply and return lines	Butterfly Valve Swing check	IS :778
Defrost water –supply and return	Cast steel ball valve	IS :778

ALL water line VALVES ABOVE 50 MM SHALL BE OF FLANGED CONSTRUCTION.

ALL WATER VALVES OF 50 MM. AND BELOW MUST BE BALL VALVES WITH CAST STEEL BODY, SS WORKING PARTS, 3 SECTION TYPE, WELDABLE END TYPE.

#### 12.4 **MOC for Vessel:**

Service	Material	Specification
HP receiver, oil separator, economizer, priority vessel, LP accumulator (NH3), Oil rectifiers, Oil collection vessels & tanks, (up to minus 10 Deg. C application)	Steel plates	IS:2002/SA516,Gr 70 and IS:2825 class-I
LP accumulator, oil vessels, etc. for below Minus 20 Deg. C application	Steel Plates	SA 516, Gr 70, and IS:2825 class-I


NOTE: IN AMMONIA LINES WHENEVER FLANGED TYPE VALVES ARE NOT ESSENTIAL, WELDED TYPE VALVES MUST BE USED AND LOCATION OF WHICH IS SUBJECT TO APPROVAL BY THE PURCHASER.

#### 12.5 **Installation:**

Special Conditions of Contract Part IIIA clause 3.0 shall apply.

Pipe supports supplied and installed within the plant room shall be adequate to accommodate other services piping, if any, entering the room. Installation drawings shall be approved. ***All outdoor supports shall be MS duly galvanized while that inside product plant shall be SS 304.***

In lines subject to thermal expansion, anchors shall be provided at approved locations and hangers and supports adjusted to be fair when the line is in working condition.


  
 Regd.No.G - 275-77  
 Date - 15.8.76



## 12.6 **Particular Requirements:**

### 12.6.1 Refrigerant suction

The wet return line shall be laid to fall to the respective "liquid accumulators" (pump separator) wherever a rise in the direction of flow is necessary, it shall be achieved with a "lifting trap" at the low point. Any rise of over 3m shall "include a lifting trap/leg at each 2m interval" branches entering the suction main shall do so only at the top.

The size of the main headers such as suction, wet return and discharge line of high stage and suction and discharge line of low stage shall be selected for operation of all the compressors mentioned in the specification including standby compressor as well as one more compressor of similar capacity proposed to be installed in future in the high/low stage.

### 12.6.2 Refrigerant hot gas

Shall grade from a high point in the compressor branch down to the condensers. ALL BRANCHES SHALL HAVE TOP ENTRY TO THE MAIN.

### 12.6.3 Liquid drain

The refrigerant liquid drain system from the condensers to the liquid receiver shall grade down to the liquid receiver. Relative height at which the condenser installation to achieve gravity flow is to be determined by the Supplier.

### 12.6.4 Refrigerant valves

UNLESS OTHERWISE DIRECTED OR APPROVED, ALL VALVES SHALL BE INSTALLED WITH SPINDLES HORIZONTAL.

### 12.6.5 Cooling water and chilled water drains

Drain lines will be installed from the locations to the nearest drain. Connections shall be made to connect Overflow, Drains of FDCs etc.

### 12.6.6 Outdoor piping:

Piping comprising: Refrigerant lines to condensers/Priority vessel/receiver, cooling/make-up water piping.

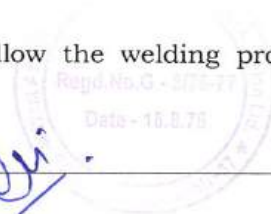
ALL OUTDOOR PIPING SHALL BE MOUNTED AND SUPPORTED ON STRUCTURAL STEEL MEMBERS, HOT DIP GALVANISED AFTER FABRICATION. DRAWINGS SHALL BE APPROVED.

### 12.6.7 Insulation

Pipelines operating below ambient temperature shall be insulated and aluminium cladded.

### 12.6.8 Welding of refrigerant lines

For all refrigerant lines, the Supplier must 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.

#### 12.6.9 Oil drain /purge valve :

All oil drain valves, vent/purge valves open to atmosphere shall be of spring loaded self-closing valves.

#### 12.6.10 Access platforms

Access platforms with ladder shall be provided for easy access of instruments, valves and actuators, where the same were not located at convenient locations.

### 13.0 PIPING INSULATION

Insulation for pipelines and equipment shall be carried out as per special conditions of contract with suitable thickness.

#### 13.1 Ammonia Piping Insulation (Suction, wet return lines and Cold Liquid Lines):

The procedure described in clause 5.1 of the above-referred Special Conditions shall be followed. However, testing prior to insulation shall be as clause 3.4.4 of the same Special Conditions, and insulation thickness shall be as under:

MINIMUM THICKNESS OF POLYURETHANE FOAM INSULATION (in-situ injection) in mm FOR AMMONIA PIPE / CHILLED WATER PIPE INSULATION

NOM. PIPE F (In mm)	15	20	25	32	40	50	65	80	100	125	150
TEMP. MINUS 10 °C & ABOVE	30	30	30	30	40	40	50	50	65	65	80
TEMP. BELOW MINUS 10°C	50	50	50	50	65	75	75	100	100	100	100

For pipeline of size above 150 mm Dia, the thickness of insulation is subject to approval.

Above data is based on Average condition and shall be modified to suit the individual technical requirement.

The insulated pipelines shall be supported using high density PUF block (minimum 80 kg/cu.mt). These insulating supports shall be enclosed in the vapour barrier.

The pipe surface should be thoroughly de-rusted and cleaned followed by 2 coats of approved primer prior to insulation.

AN OUTER VAPOUR SEAL ON AMMONIA PIPELINES SHALL COMPRISE AN APPROVED SHEET MATERIAL (preferably aluminium coated polyester film of 50 micron thick) WITH JOINTS LAPPED AND SEALED WITH SELF ADHESIVE TAPE.

*Handwritten signature*



Aluminium cladding of 22 SWG over the insulation on the lines shall be done in an approved manner such as not to puncture the vapour barrier.

#### **14.0 ELECTRICALS**

##### **14.1 GENERAL**

The electrical installation works is listed below but not necessary limited to the items specified. Everything essential to have safe operation is deemed to be covered within the scope of this contract even though same is not described in detail.

##### **14.2 Supplier's Scope:**

The following works broadly describe the scope of electrical installation pertaining to supplier(s) of Refrigeration contract:

PRIOR TO THE COMMENCEMENT OF ERECTION OF WORKS, THE SUPPLIER SHALL PREPARE DRAWINGS OF ELECTRICAL INSTALLATION AND OBTAIN APPROVAL ON THESE DRAWINGS FROM THE PURCHASER AS WELL AS STATUTORY BODIES SUCH AS CEIG, ELECTRICITY BOARD.

Design, supply, erection, testing and commissioning of remote control panels in adequate numbers for smooth operation.

Cutting block-out in concrete floor, brick-work preparation of chassis, etc. wherever required including making good of the surface chipped during installation.

Sealing of cable-entries through wall/trenches by mastic compound or equivalent including supply of compound and other building materials, duly finished.

The complete electrical installation and distribution system of refrigeration plant including associated earthing system shall be as per prevailing Indian electricity rules, state inspectorate regulations.

All earthing mains shall be galvanized. The earthing to the equipment will be with the help of PVC coated/ insulated aluminium wire/cable.

Electronic equipment, automation and control equipment shall be fully protected against electrical voltage fluctuations, voltage surges and transitory spikes, by the inclusion of adequate protective equipment/system.

Pre-commissioning of all protective relays/devices i.e. testing and calibration of all protective relays to be done through separate testing agency and the same shall have to be arranged by Supplier.

Checking of connections (power and controls), testing and commissioning of all equipment erected and or connected under this contract and complete distribution system as a whole as per testing procedure and instructions of Engineer In-charge.

THE SUPPLIER SHALL CONSIDER THIS JOB AS A TOTAL JOB. HENCE, ALL ITEMS INCLUDING ELECTRICAL CONTROL EQUIPMENT, INSTRUMENTATION AND





INTERLOCKING REQUIRED FOR SAFE OPERATION OF THE PLANT IS INCLUDED IN THE SCOPE OF THE WORK EVEN THOUGH SAME IS NOT DETAILED IN THE DESCRIPTION/SPECIFICATION.

Electrical installation to be carried out as described in Special Conditions of Contract – Electrical installation (IV-IV)

#### 14.3 WORKS EXCLUDED

Masonry/concrete trenches in the plant room will be provided by the building supplier based on the requirement shown in the approved drawing prepared and submitted by the Refrigeration Supplier including for refrigeration MCC. However, refrigeration supplier shall furnish the trench details/requirement for execution.

#### 14.4 Motor Control Centre (MCC):

The existing MCC in refrigeration plant is to be checked for availability of required feeders. In case feeders aren't present then either of the 250 Amps or 160 Amps MCCB feeder can be used to feed new feeder panel for proposed deep freeze units.

In case the feeders aren't present a new feeder panel supply is included in scope of works whose power is to be tapped from 250 Amps or 160 Amps MCCB.

#### 14.5 Motors:

Supply is at 415 V,  $\pm 10\%$ , 50 Hz, 3 phase. ALL MOTORS SHALL BE SQUIRREL CAGE, TEFC, IP-55 PROTECTION of ratings to suit continuous operation of the driven equipment at the specified ambient conditions, but not less than scheduled. COMPRESSOR-DRIVING MOTORS SHALL BE EQUIPPED WITH WINDING THERMISTORS.

All motors shall have large terminal boxes suitable to receive armoured copper cables. All poly phase motors shall have a minimum acceptable nominal full load motor efficiency confirming to premium energy efficient motors IE 3 type.

The provisions of clause 4.4 of Special Conditions of Contract –Electrical installation (IV-IV) apply.

#### 14.6 Earthing system:

Proper earthing to be provided

#### 14.7 Ancillary Items:

- .1 Isolating switches : Provide and install a local isolating switch at each motor or other item of connected equipment where :
  - The motor or equipment is not in the plant room.
  - The distance from the switchboard is more than 25 meters.
  - Required by the Indian Electricity Act and Rules.

*Handwritten signature*





ISOLATORS SHALL BE in cast aluminium housing (alternatively heavy duty polycarbonate enclosure), AND IF OUTDOORS OR IN COLD ROOMS, WEATHER-PROOF -IP65 refer Special Conditions of Contract –Electrical installation (IV-IV) clause 3.10

.2 Junction boxes:

On motors, final connection shall be from an adjacent metal clad (cast aluminium) junction box (alternatively heavy duty polycarbonate enclosure) weather-proof, IP65, from which final connection shall be made with flexible multi-core copper conductors in heavy duty flexible conduits with water tight adopter/cable gland.

Refer Special Conditions of Contract –Electrical installation (IV-IV) clause 3.11.

Subject to approval, the junction box may be omitted if an isolating switch is provided.

14.8 Cabling:

- .1 General: Provide and install all cabling and accessories including but not limited to conduit, cable trays, glands and lugs for termination at ends, circuit markers and insulating materials.

All cables from MCC to outgoing field equipment like respective LCPs, plug-socket/isolator junction boxes near motors etc. shall be of armoured Copper conductor, connection from plug & socket/isolator junction boxes to motor junction boxes shall be with braided flexible Copper conductor with water tight cable gland. Further, external sheath of all copper braided cables (power/control/ communication) shall be of rodent proof.

The following selection table shall be followed for cables of motors unless otherwise specified:

3 Phase 415 V Motor H.P.	Copper conductor Cable Size in mm <sup>2</sup>	
	For Soft Starter /VFD	
	Supply side	Motor side
Up to 7.5	2.5	2.5
10	4	4
15	6	6
20	10	10
25	16	16
30	16	16
40	25	25
50	35	35
60	50	50
75	70	70
100	95	95
125	150	150
150	185	185
180	240	2 X 120
200	2 X 120	2 X 120
250	2 X 150	2 X 150

*Indi*



3 Phase 415 V Motor H.P.	Copper conductor Cable Size in mm <sup>2</sup>	
	For Soft Starter /VFD	
	Supply side	Motor side
275	2 X 185	2 X 185
300	2 X 185	2 X 185
425	2 X 240	2 X 240

- .4 Cold room evaporators connection: Power to cold room evaporators shall be supplied from the power panel for placed in MCC room in existing refrigeration plant. Cabling shall be by:
- In the plant room - overhead trays, following pipe routes.
  - On the pipe gantry connecting the buildings trays
  - Within the production block - in GI trays, GI screwed conduit as appropriate.
- .5 Cool rooms: Within the rooms cable shall be insulated and sheathed. These cables shall not be enclosed in conduit. Entry to cold room shall be through sleeves, thermal bridging and air infiltration shall be prevented.
- .6 Earthing: The main system earth will be installed by the Supplier. An earth conductor from this will be provided to the plant room control panel location. Each item of equipment required to be earthed shall have two separate earth connections.

The following selection table shall be followed for earthing of electrical loads:

- Control switches/glands and Motor up to 10 HP : PVC insulated Copper conductor wire 4 mm<sup>2</sup>
  - Motor above 10 HP up to 125 HP : GI strip 25 x 3 mm
  - Motor above 125 HP : GI strip 25 x 6 mm
  - Switch board /MCC/Earthing main in trenches : GI Strip 40 x 6 mm
  - Cable trays - GI strip 25 x 3 mm
- .7 Signal cables: Control and metering cabling to as per the requirement is included in the contract. These cables shall be segregated from the power cables and routed in GI conduits. End terminations shall be with suitable water tight cable glands.
- .8 Fan coil unit/Air-conditioning unit: Power to cold room evaporators shall be supplied from the MCC panel for cold store placed in MCC room in new product plant. Cabling shall be by:
- In the plant room - overhead trays, following pipe routes.
  - On the pipe gantry connecting the buildings - trays.
  - Within the production block - trays or GI screwed conduit as appropriate.

#### 14.9 Statutory Requirements:

Provide and fix cable route markers, danger plates, shock charts, and supply all items and perform all services necessary to meet the requirements of the Electricity Authority. Providing of Elastomeric electrical grade mat for the Motor control centres/Electrical control panels included. Necessary statutory approvals shall be obtained by the supplier.

*Handwritten signature*



#### 14.10 Testing and Commissioning:

Test the electrical installation, as provided in Special Conditions of Contract –Electrical installation (IV-IV) and to the requirements of the Electricity Authority.

This work shall be carried out in advance of mechanical testing and commissioning, sections 24 and 25, and in co-operation with other suppliers.

Adjust the settings of motor overload protection devices, including those in switchboards.

### **15.0 CONTROLS SYSTEM**

#### **15.1 Scope:**

Supply, installation and commissioning of the instruments and control systems for the convenient and safe operation of the plant shall be the responsibility of the Refrigeration bidder.

#### **15.2 Control Equipment:**

Existing control equipment of the plant consists of following CCPU having following equipment.

#### **15.3 Central Control Processing Unit-1 (CCPU-1):**

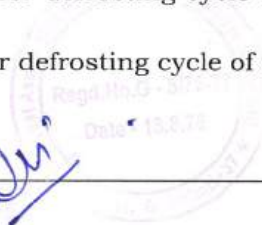
- a. The entire system to be housed in a panel and to be positioned in the refrigeration plant room along with main MCC.
- b. Central Control Processing Unit shall consist of a suitable min. 12" HMI Touch screen display with necessary microprocessor of approved make to incorporate for below mentioned interlocks-
  - Interlocks mentioned Under Clause-19.2.2 for High stage compressor starting
  - Interlocks mentioned Under Clause-19.2.3 for Low stage compressor starting
  - Interlock mentioned under Clause-19.2.4 for condenser water pumps
  - Interlock mentioned under Clause-19.2.5 for Ammonia pumps
  - Interlock mentioned under Clause-19.2.6 for IBT
  - Interlock mentioned under Clause-19.2.7 for Chilled water pumps

Separate face plates or screen pictorial representation have been provided for each of the above. All the desired parameters to be displayed.

Login options of the above mentioned HMI shall be provided where in the Operator login will have only access for operation of plants while Manger login shall be password protected and through that the "Set Values" of parameters can be modified/set.

**Similarly, a new face plate shall be added to this existing CCPU itself with following details-**

- Interlocks mentioned Under Clause-19.2.11.1 for FDC's of cold stores and deep freeze
- Interlocks mentioned Under Clause-19.2.12.1 for defrosting cycle of deep freeze rooms
- Interlock mentioned under Clause-19.2.12.2 for defrosting cycle of cold stores





The existing set-up is in operation mode and is running satisfactorily. In case during modification for addition of new face plate the system shouldn't be de-stabilized and in case the system gets disturbed during modification then the same has to be re-stabilized as per the required functioning.

#### 15.4 Cold stores / Deep Freeze:

##### 15.4.1 Forced draft coolers:

Fans operate in unison from On-Off selector switches in the related control panel. A pilot light for each fan indicates that the starter is on.

Interlocking:

Opening of the solenoid valve is possible only if the fan is running (i.e. starters are closed).

Activation: A 3-position selector switch on the local control panel provides functions:

- Manual - (Solenoid valve opens & closes manually with PBs)
- Auto - Based on the signal from temperature Transmitter placed in the Room & status of fan in FDC sequence to be controlled automatically
- Remote - Over ride of Auto actuation from plant room

For automatic operation, liquid ammonia supply to Solenoid valve (SV) of each liquid feed assembly is controlled by means DTIC (Digital Temperature Indicator cum Controller). DTIC will have following parameters:

- SV - Set Value: it is the required temp. of respective cold store, deep freeze etc.
- PV - Process Value: it is the actual temp. of respective cold store, deep freeze etc.

Above mentioned values are being measured & transmitted by means of Temperature sensor(s) (TS) & Temperature Transmitter(s) (TT) installed on locations generally between two FDC's (if room is having more than one FDC) or area probable to be a hot pocket inside room as agreed on site.

The make and type of DTIC, TS & TT shall be subject to approval.

Process value or Actual value of cold store/deep freeze temperature (respective) at any point of time are to be indicated right outside each cold store/deep freeze and the same DTIC shall be used for the same.

##### 15.4.2 Cool room Air curtains & Deep Freeze Door Frame Heaters:

Air curtains clause 20.3 are energized by switches in the evaporator control panels. Pilot lights in the panels show the ON condition.

Door frame heater with thermostatic control for the Deep Freeze & Hardening room doors if any shall be provided.

#### 15.5 Defrosting system: For deep freezers

For various deep freeze rooms maintained at the temperature **below zero degree Celsius**,

A handwritten signature in blue ink is written over a circular purple stamp. The stamp contains the text 'Regd. No. G- 975-77' and 'Date - 18.8.75'.

fully automatic hot gas defrost shall be provided. The defrost cycle will be controlled/monitored and can be initiated by CCPU-1 for proposed butter deep freeze. The defrost cycle shall be as per the below indicated algorithm-1.

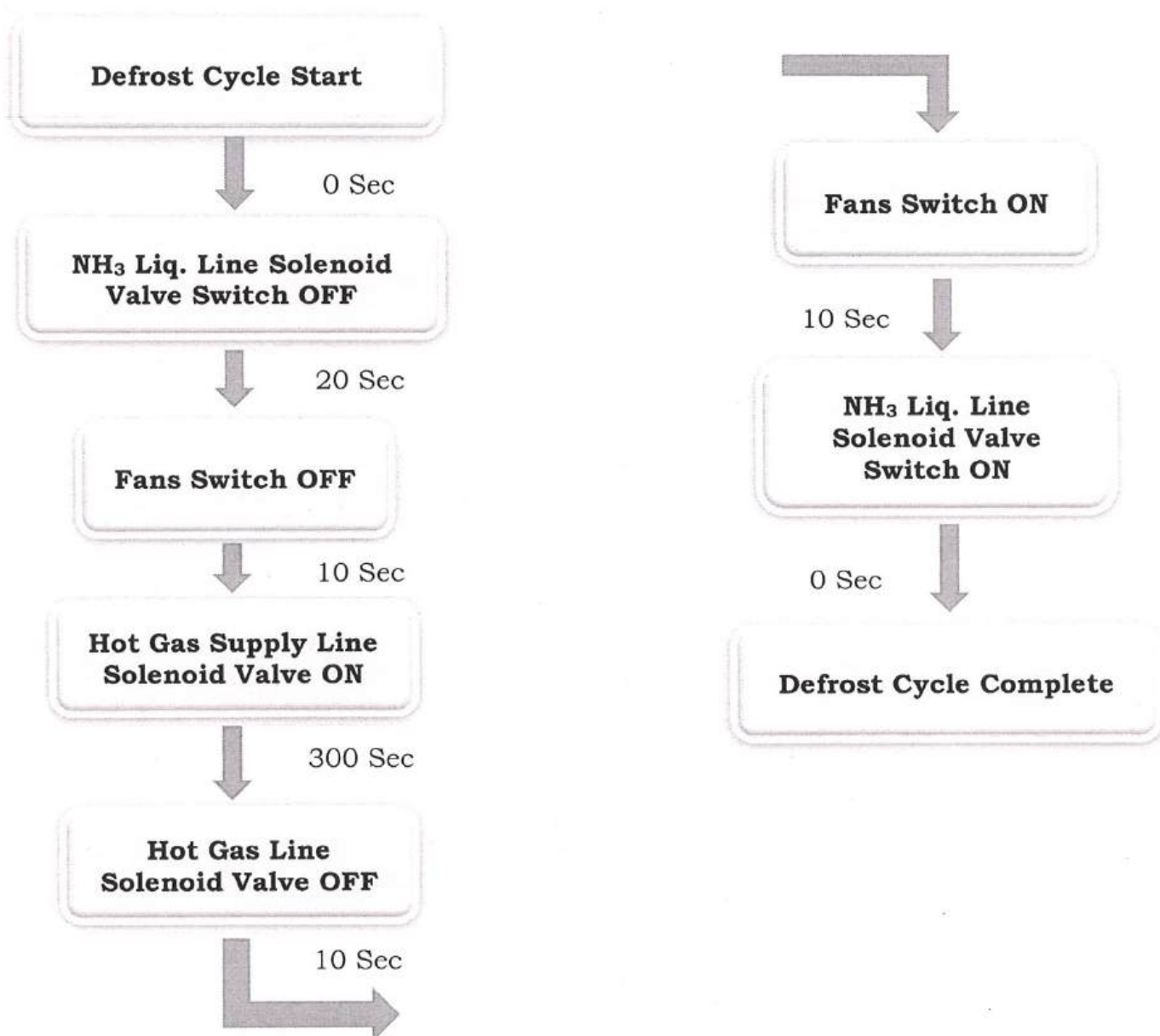
Defrosting cycle shall be operated in following Mode: the defrosting cycle is to be initiated by operator from the dedicated face plate of desired room and then the cycle as per programming starts & completes defrosting of that particular room.

The required electrical controls for heat tracing units with thermostatic controls, etc. for the defrost water lines inside deep freeze shall be provided.

*Signature*



**Algorithm-1**  
**Defrost Cycle of Deep Freeze Rooms**



NOTE: All indicated time delays shall be settable type and the values can be modified by operator only through plant manager login as per actual defrost cycle requirements of respective deep freeze rooms.

*Handwritten signature*





## **16.0 INSTRUMENTATION**

### **16.1 General requirement:**

Indicating, controlling and recording instruments necessary for operation of the plant shall be provided and installed to requirements detailed. This is in addition to the digital instrument as specified in the respective equipment. The make and types of instruments shall be subject to approval.

Field Instruments shall be suitable for area in which these are located. In general, field instruments shall be weatherproof, dust tight and corrosion resistant with Protection Class IP-65.

Measuring ranges of transmitters shall be selected in such a way that best accuracy & resolution of measured value (in the measurement range) is achieved.

Field instruments shall be suitably mounted, supported and terminated in local junction boxes. Stainless steel (SS) of reputed makes shall be used as case material in general.

Temperature stub to be welded on process pipe / vessel and shall match with thermos-well process connection and size. Thermo-well shall be drilled out of bar stock and the length & construction shall comply with process requirement/ relevant standards. Material of construction of thermos-well shall be suitable for the application.

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

All gauges on the refrigerant system, whether in contact with refrigerant or oil, shall have steel elements and shall withstand pressure of 1.5 MPa without any adverse effect. Gauges elsewhere shall have bronze elements.

Control & Instrument (C&I) equipment furnished shall incorporate necessary techniques for protection against electrostatic discharge and radio frequency interface, as per international codes and standards.

Safety earthing and C&I System earthing shall be separate. Safety earth bus shall be connected to main plant earth pit. For C&I system, separate earth pit/s and earth bus (electronic earth) as per standards shall be provided. Electronic earth shall be cabled directly to the corresponding earth bar.

All instruments shall have clear access for maintenance, removal, lay-down, calibration etc.

All readable instruments shall be clearly visible unassisted.

### **16.2 Pressure gauges:**

Pressure gauges shall be of Bourdon tube type, conforming to the requirements of IS: 3624.

All gauges on the refrigerant system, whether in contact with refrigerant or oil, shall have

*[Handwritten signature]*  
Regd. No. 3-17137  
Date - 10.1.19

steel elements and shall withstand without effect pressure of 1.5 MPa. Gauges elsewhere shall have bronze elements.

Calibration of gauges shall be in SI metric units: refer IS:10005. The scale range shall be approximately 1.5 times the normal working pressure. Gauges reading refrigerant pressure shall be calibrated additionally with saturated refrigerant temperature.

Connection of gauges to the related equipment shall be through an isolating valve or cock of appropriate type. When on low temperature items, the connection shall be of sufficient length to ensure that the gauge does not incur condensation.

Types of gauges to be fitted in the situations noted are:

Refrigerant compressors For LP, OP, HP etc.	100mm dial, oil-filled.
Condensers, liquid receivers purger, oil rectifier,	100mm dial, weather-proof casing oil filled.
Liquid pump discharge, Liquid accumulators, Liquid feed assemblies	100mm dial. Oil filled. in weather proof casing
Chilled water pump discharges	150mm dial, weather-proof casing, Oil filled

### 16.3 Temperature measurement

Digital thermometer shall be provided for all cold rooms & air conditioned rooms (large display, clearly visible in day light at reasonable distance) shall be provided.

Display unit shall be mounted/positioned on loading entry side of each of the cold stores. The supplier shall have to provide necessary technical details of the system offered, such as number of digits, colour, digit size, accuracy, housing details, etc.

## 17.0 **COLD ROOM INSULATION AND ASSOCIATED ACCESSORIES**

### 17.1 **SANDWICHED PANELS FOR CEILING AND WALL /COLUMN**

The wall and ceiling of the insulated cold stores are to be constructed using pre-fabricated, self-supported, sandwich panels insulated with rigid polyurethane foam of required thickness. Sandwiched Panel should be CFC free, manufactured using high-pressure foam injection equipment in a precise ratio and proportion. The properties of the polyurethane insulation should be as under:

Injected density	: min. 40 kg/m <sup>2</sup>
Thermal conductivity	: 0.023 W/mt/Deg. K (tested @ 10 °C)
Thermal conductivity	: 0.030 W/mt/Deg. K (tested @ 50 °C)
Compressive strength	: 115 Kpa
Closed cell contents	: min. 85 %
Operation temperature range	: minus 60°C to 80°C

Test certificates should be produced to support above properties. The skin material for the wall and ceiling panels shall be of galvanized steel sheet (minimum grade 120 GSM) of minimum 0.5 mm thick with grooved profile to enhance strength and aesthetics. The external surface of sheet should be pre-painted with minimum 25-micron thick silicon modified polyester coating. In case supplier proposes any alternatives for the type of pre-

*Handwritten signature*  
Regd. No G-876-77  
Date - 18.8.78



coating indicated above, the same should be clearly brought-out in the bid with details & advantages, etc. Such alternatives may be considered in appraisal of the bid, provided the same is equivalent or better than the one indicated.

The joining system of the panels shall be designed to ensure a quick and secure assembly at site, with the help of tongue and groove joints with eccentric cam locks. ***The insulated panel of continuous type is also acceptable having tongue and groove type joining system.*** The joints shall be made hermetic and perfectly vapour tight by use of silicone sealants. The wall panels should be in single lengths to match the room height, and width of ceiling/wall panels should be 1.2 m, in order to minimize the number of joints. The configuration should incorporate factory made standard L shape panels for corners and TEE shape panels for partitions.

The system should be complete with all ancillary items like, ceiling panels suspension system complete with insulated beam, suspension chain/ hardware, suitable corner pieces, pre-painted steel/aluminium profiles for inner/outer junctions and joint corners, pressure relief valves, silicone sealants, foam chemicals and all other components & accessories as required. The costs of these ancillary items are to be included in the respective rates for installation of ceiling/wall panels and no separate payment should be made for this items.

#### 17.2 **FLOOR INSULATION:**

The floor insulation should be made of rigid polyurethane foam slabs in two layers of required thickness. The properties of polyurethane foam insulation should be as mentioned above. The insulation should be carried out in the following manner:

- Coat of bituminous primer should be applied over the finished PCC floor, after thorough cleaning and drying.
- Tarfelt of 2 to 2.2 mm thick or cross linked laminated polythene sheet of 200 micron thick shall be applied on the concrete surface below the insulation layer as vapour barrier with bitumen as adhesive. The joints should be staggered having minimum 150 mm overlap thoroughly sealed to make it perfect vapour barrier. The ends should be turned up the outer wall above the height of protective curb and completely sealed with silicone sealant.
- A coat of bitumen should be applied on the outer surface of tarfelt and fix the first layer of rigid polyurethane foam insulation slabs (of required thickness) with the joints staggered. All joints sealed completely using hot bitumen.
- A coat of bitumen should be applied on the surface of first layer of insulation and fix the second layer of rigid polyurethane foam insulation slabs with cross-wise joints staggered. Seal all joints completely using hot bitumen.
- Provide tarfelt of 2.4 mm thick or cross linked laminated polythene sheet of 200 micron thick provided above the insulation layer using bitumen as adhesive. The joints should be staggered and should have minimum 150mm overlap thoroughly sealed to make it waterproof barrier. The ends should be turned up the inner wall above the height of protective curb (approx. height 500 mm above finished floor level) and completely sealed with silicone sealant.

The purchaser would arrange to provide only the concrete flooring and RCC protective





curbing.

### 17.3 COLD STORE /AIR LOCK DOORS

#### 17.3.1 Sliding type (Manual):

The doors shall be of PUF insulated with both side covered with **stainless steel** sheet of minimum 0.6 mm thick complete with all accessories properly engineered and made by specialist manufacturer broadly meeting following requirements.

The insulated doors shall be manually operated, horizontally sliding/hinge type, easy to mount, mechanically reinforced for heavy duty usage complete with all required fittings, sliding rails/hinges, bottom guide, rollers etc. mounted on a suitable frame. Necessary heavy-duty handle for easy opening and closing of doors shall be provided. Door pad Locking arrangement, emergency exit lock release knob/wheel shall be provided.

Brief specifications of door shall be as given below:

PUF insulation by injection under pressure of polyurethane with density of minimum 40 kg/cum. Gasket to ensure air tightness and for prevention of refrigeration losses.

The door slide rail arrangement shall be made of high quality aluminium extrusion and with indentations for a 3D movement of the door, so that the door drops a little down and towards the frame uniformly while closing to achieve a hermetic seal. Top rollers shall be heavy duty made of self-lubricating nylon which ensures smooth and noise free movement of the door, without friction.

The door shall be surrounded by a four side rubber sealing gasket that ensures hermetic sealing, which reduces the risk of loss of cooling and controls the temperature. The gasket material shall be durable and shall not harden at low temperature.

The doors shall have padlocking arrangement from outside. Safety release provision shall be made for opening door from inside, even with padlock in place.

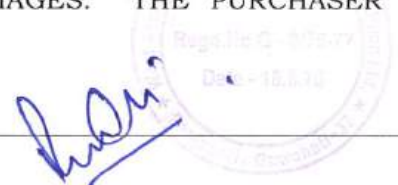
Kick plate made of SS chequered shall be provided up to a height of about 900 mm from bottom for mechanical impact protection on both sides.

Sil portion of main insulated door openings and hatch door openings shall be finished with pre-coated sheet as per the requirement. Sil insulation shall be provided for the three sides of opening for main door openings and all the four sides in case of hatch door openings. The refrigeration supplier shall be responsible to finish the SIL portion of the Hinge/sliding door area with PUF insulation of appropriate thickness and clad with pre coated sheet, flashing, angles at the corner, etc.

The detailed design and performance of sliding doors for cold store is under Refrigeration Supplier's responsibility. The drawing shall have to be got approved from the Purchaser.

#### GI Pipe Protecting Guard:

IN FRONT OF EACH SLIDING DOOR (ON CLOSING AND OPENING CONDITION) A SET OF METALLIC GUARD MADE OUT OF GI HEAVY DUTY 'C' CLASS PIPE OF 100 MM DIA (STAND TYPE) AND 50 MM DIA 'C' CLASS PIPE FOR BRAZING TO PROTECT THE SLIDING DOORS FROM THE EXTERNAL DAMAGES. THE PURCHASER SHALL

A handwritten signature in blue ink is written over a circular purple stamp. The stamp contains the text 'Regalia & Co. Pvt. Ltd.' and 'D.C. - 12200'.

APPROVE THE DRAWINGS.

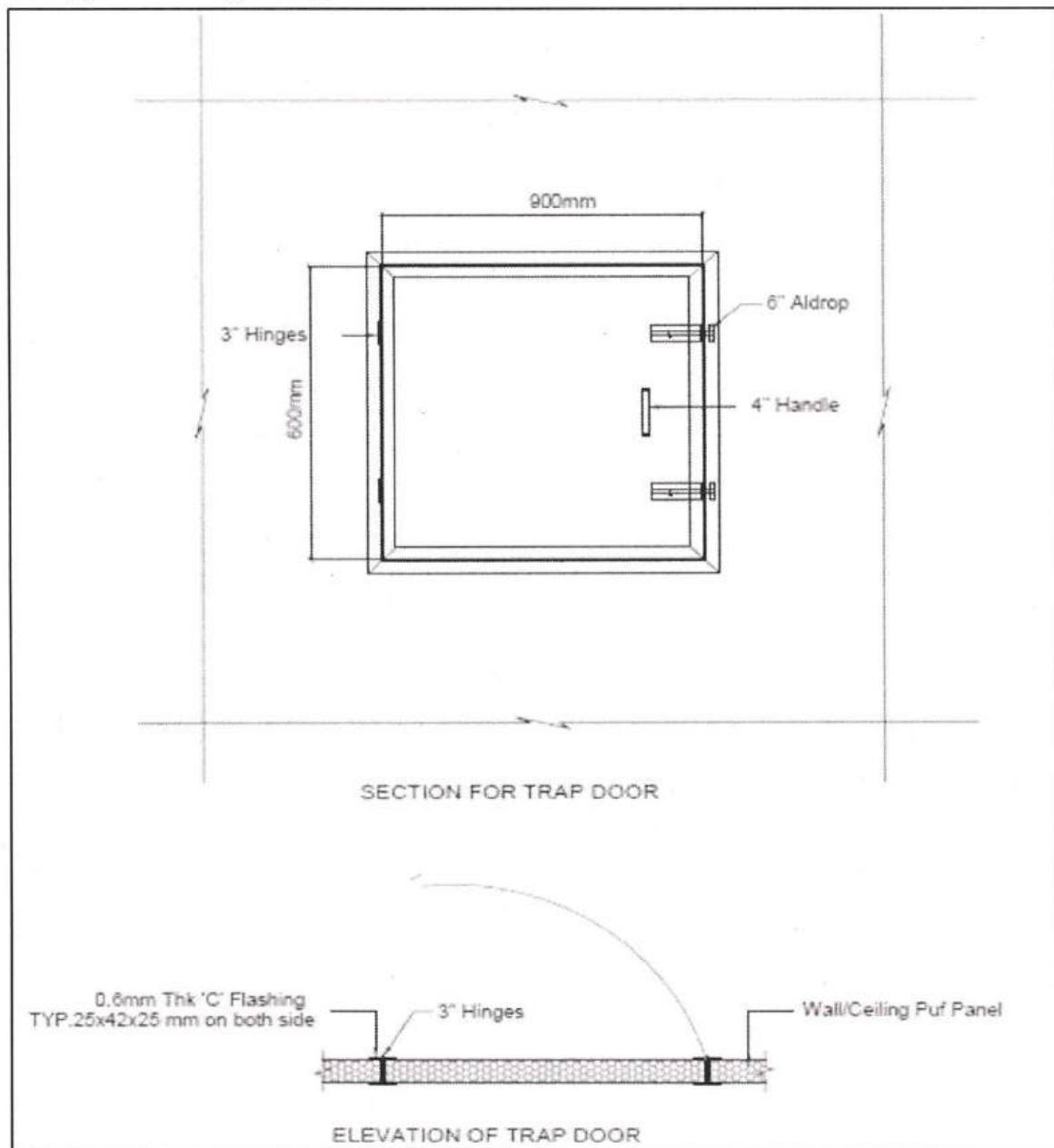
**Painting of the protection guard shall be carried out with strips pattern using "Black & Yellow colour".**

#### 17.3.2 Trap Door:

Trap doors shall be provided for having access to area between PUF ceiling and slab, for maintenance purposes and shall be made of PUF ceiling itself.

The hatch door shall be complete with heavy-duty hinges, handles and locking arrangement. Necessary gasket to ensure air tightness for prevention of refrigeration losses. **Quantity and location of same shall be finalized during detail engineering and will be subject to approval.**

Typical drawing of trap door is attached below-



#### 17.4 Air Curtains & Air shield curtains:

Page No. 5- 878-77  
Date: 18.8.76  
*[Signature]*



Application: Dust, thermal and insect barrier.

The air curtain shall be heavy duty, extra high velocity type, installed on doors (indicated on the drawing) consists of a case for air canalizing, conveniently shaped permitting a rational arrangement of the outgoing air. It shall consist of a set of deflectors for good distribution of the jet of air of adequate velocity on the whole door span surface to avoid loss of refrigeration. The material of construction would be SS 304 for internals and outer body of PCGI.

The capacity of the blowers is to be designed by the Supplier to achieve best performance. The fan shall be and dynamically balanced and free from vibration and low noise level. The fan motor shall be suitable for 3 phase, 50 HZ AC supply. The bearing should be pre-lubricated & sealed for life and maintenance free, suitable for low temperature application.

There shall be a proximity sensor/limit switch with required accessories, contactors, etc. in weatherproof enclosure for automatic operation of Air curtain blowers whenever the door is opened. Electrical power & control cabling to be done from MCC (Clause 19)

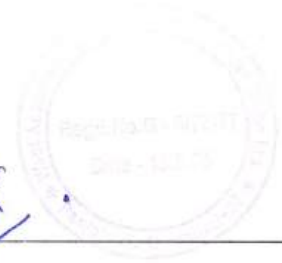
#### 17.4.1 **Air Shield curtains:**

With each air curtain; provide a transparent PVC air shield curtain having flaps (rounded edge) of minimum thickness 3 mm with 50% overlap between adjacent flaps. The strip curtain should be complete with all accessories made of material suitable for low temperature application and the PVC strips should remain soft up-to operating temperature of minus 25 Deg. C.

#### 17.5 **Internal lighting:**

Cold stores and pre-cooling room etc. are to be provided with suitable moisture proof fittings as per the enclosed layout. Necessary wiring from the DB to the fittings as per requirement.

- The light fittings suitable for the cold stores/ deep freezers shall be 4 ft LED upto 40W with minimum 3500 lumen output weather proof and should maintain min. 70% of lumen output at 50000 burning hrs (minimum IP65 protected) fixture.
- The lux level to be maintained in a particular cold room/deep freeze is minimum 200 Lux.
- The luminaire should have neutral white light colour. Housing & optical cover of the luminaire should be made of virgin polycarbonate body with double gasket, UV stabilized polycarbonate diffuser with transparent prismatic interior and smooth exterior, poly carbonate cable gland, with built-in switch gears and all accessories including lamps with necessary mounting arrangement.
- Following to be ensured -
  - THD < 15%, PF > 0.90.
  - Surge protection of min.-2KV.
  - Operating voltage range 140-270V AC.
  - Fixture catalogue
  - LM80 & LM79 report





- Technical test certificate of the fixture in accordance with IS & IEC standards and detailed driver report to be submitted
- Conduits inside the cold stores shall be made of heavy duty PVC conduit with ISI mark. Wiring shall be using 3 core 2.5 sq.mm flexible copper cables. The conduits shall be suitably concealed using Pre-coated flashing of matching shade with panel.
- All end terminations shall be vapour tight with proper cable gland to prevent ingress of moisture inside light fitting.
- All conduit entries, cutouts made in insulation panel shall be thoroughly sealed to make it vapour proof, by in-situ injection of PUF/silicone sealants.
- Power supply for the lighting shall be taken from new MCC for colds store equipment placed in process area. The supplier shall carry out the complete internal wiring including providing necessary MCB control panel as required for the light points.
- Suitable nos. of light fixtures shall also be provided above PUF ceiling whose switch shall be near to the trap doors such that to switch on these fixtures trap needs to be opened.
- **In case of power failure suitable nos. of light fittings in each cold store to have 240 V AC, 50 Hz uninterrupted power supply, made available from UPS complete with voltage and frequency regulators. Suitable KVA (capacity / rating subject to approval) –online- UPS power supply shall be considered On total failure of the incoming A.C. supply to the plant, sufficient battery back-up has been envisaged to allow light points and safety system to operate for at least 30 minutes to allow safe evacuation from the cold store.**

**NOTE- Supplier to indicate his selection and suggest the number of points in the bid.**

#### 17.6 **Cold store Safety System:**

Provision for safety of personnel shall be made by the Supplier in accordance with the relevant factory act and Indian/International standards.

Each cool room shall have a safety pilot light outside indicating the presence of people in distress in the room and electric bells shall be provided for distress signalling.

**Industrial electric sirens (audible upto 100m) are to be provided and shall be installed at approved following locations-one on despatch dock side and other inside process plant area (ground floor, as per approval on site condition). For first floor paneer cold rooms siren shall be installed in paneer processing area.** The siren push switch shall be of self-illuminated type.

**Moisture proof 'EXIT' light** (preferably Red in colour) suitable for the application in IP 65 enclosure (made by specialist manufacturer) provided inside each cold store and shall be mounted above to the exit door.

The circuits for sirens, safety pilot lights, and safety illumination shall be independent of the mains power supply and shall work on 240 V AC through the uninterrupted power supply, made available from UPS complete with voltage and frequency regulators/ shall have in-built power source (in form of replaceable batteries).



#### 17.6.1 Safety System Function:

Lights to indicate presence of people in distress inside the cold store are to be provided both inside and outside the cold store and shall be red in colour. These lights shall be switched ON by heavy duty toggle switch in suitable boxes adjacent to siren push bottom. The lights provided inside the cold store shall be inside of acrylic material suitable low temperature application indicating 'EXIT'.

Self-illuminated push buttons of "press to stay" and "rotate to release" are to be provided inside each cold store connected with the electrical sirens.

Any person entrapped inside the cold rooms shall be able to locate the 'EXIT' since the 'EXIT' lights inside shall always 'ON'. In case of distress, the person entrapped can approach the 'EXIT' point and press the self-illuminated push button. This shall put 'ON' the siren in both the refrigeration plant room and the process hall indicating that personnel are trapped inside the cold room. The self-illuminated push button shall also be continuously 'ON' and the siren will be 'ON' the moment the person presses the button. Only after the personnel are rescued the self-illuminated push button can be released by rotating the push button.

The emergency illumination system shall incorporate extra-long life lamps, preferably LED type of approved make.

#### 17.6.2 Ammonia Leakage Detection System:

New leak detection sensor for proposed deep freeze is to be supplied and is to be installed and connected to existing leak detection system in refrigeration plant room.

The existing audio-visual annunciators/sirens are installed at following locations-

- One in Refrigeration Plant room
- One outside cold store corridor/dock (as finalized at site during detail engineering)
- One outside ice cream deep freeze area corridor/dock (as finalized at site during detail engineering)

***The audio of Ammonia leakage detection system shall be different from that of Distress signal audio.***

#### 18.0 DRAWINGS FOR APPROVAL

Refer Special Conditions of Contract Section -IV, Part-II

#### 18.1 Time Schedule:

Refer Special Conditions of Contract Section -IV, Part-II

#### 18.2 Number of Copies:

Refer Special Conditions of Contract Section -IV, Part-II

#### 18.3 Works by Other Suppliers:





Where work is to be executed, or services provided, by other suppliers employed by the Purchaser, it shall be the responsibility of the Supplier to ensure that such works are satisfactory to his requirements, and to check and report discrepancies to the Purchaser, sufficiently in advance, before taking over. Final responsibility for correct positioning of equipment (refer Special Conditions of Contract Part-III clause 2.1) rests with Supplier. The Supplier is responsible for rectification of deficient work resulting from incorrect or insufficient information.

#### 18.4 TESTING:

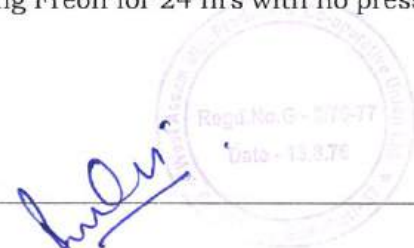
Each individual system component must be satisfactorily tested prior to commissioning of the system, in the presence of the Purchaser's engineer, and a complete record maintained:

- 18.4.1 All piping shall be tested after erection, and before insulation, refer Special Conditions of Contract Part-III clause 3.4.
- 18.4.2 Electrical panels, switchgear, motors, cables and earthing, local control panels, central processing units, etc. shall be tested as provided in respective Clause of this document.
- 18.4.3 Test certificates required from statutory authorities shall be obtained by the Supplier sufficiently in advance to ensure as not to hinder the progress of work.
- 18.4.4 The Supplier shall demonstrate proper working of all mechanical and electrical, control, safety and protective devices.

#### NOTE: SPECIAL REQUIREMENTS:

The details of the testing pressure for the cold store system are mentioned below:

- 1. Before going for testing the system, the internal surfaces of all equipment including piping shall be thoroughly cleaned and flushed out.
- 2. After flushing all the piping (ammonia) shall be tested before insulation. The Draft format for Pressure & Vacuum testing is attached in Appendix-13 and report while actual testing of system at site is to be drafted as per this.
  - a) Suction lines (low side) at 16 kg/sq.cm. with Nitrogen (OFN-Oxygen Free Nitrogen) for 24 hrs with no pressure drop.
  - b) Discharge lines (high side) at 24 kg/sq.cm. with Nitrogen (OFN-Oxygen Free Nitrogen) for 24 hrs. with no pressure drop.
  - c) Vacuum test at Absolute vacuum for 48 hrs. without any rise in pressure.
- 3. After flushing all the copper piping (Freon) shall be tested before insulation.
  - a) Suction lines (low side) at 10 kg/sq.cm. using Freon for 24 hrs with no pressure drop.
  - b) Discharge lines (high side) at 20 kg/sq.cm. using Freon for 24 hrs with no pressure drop.





- c) After the pressure testing Vacuum test at Absolute vacuum to be carried out where in for 48 hrs. without any rise in pressure.

#### **19.0 COMMISSIONING**

Special conditions of the contract Part-III A clause 9.0 and 10.0 shall apply, with the following:

- 19.1 The Supplier shall supply the refrigerant as required for charging for new augmented direct expansion equipment. ***Calculation for the amount of ammonia being charged and required shall be submitted in advance.***
- 19.2 Spares shall be supplied as per terms of general conditions of contract, Part-III, clause 14 and special conditions of contract Part-I (IV-I) clause 14. The Supplier may be permitted use of these at the purchaser's discretion subject to replacement as a prerequisite for release of final payment.
- 19.3 Comprehensive training shall be imparted to the personnel deputed by the purchaser, in accordance with clauses 10.7 and 12.0 of special conditions of contract Part-III A.
- 19.4 Maintenance Schedules, Manuals & Drawings:

Detailed Preventive maintenance schedule as well as operational manuals of equipment should be provided by the Supplier at the time/after commissioning:

The manual shall cover the following aspects:

- Brief description of the system and flow sheet
- Unit-wise function and description
- Equipment-wise details, operational instruction, maintenance procedures and schedules.
- Plant start up, commissioning, normal operation, emergency operation.
- Trouble shooting chart covering operational status, reasons (causes) and actions to be taken (remedy)
- Preventive Maintenance schedule for all major system components.
- As-built drawings of the equipment, P&I for refrigerant circuit, water/chilled water, electrical schematic, controls wiring drawings, etc.

Manuals and drawings are to be supplied as follows:

- 4 Sets of As built-drawings, literatures and manuals - Hard Copy
- 4 Sets soft copies of As-built drawings (Auto-Cad format) and manuals and literatures in Pen-drive.
- Original copies of various system software with manual.



## **20.0 BATTERY LIMITS**

<b>Item</b>	<b>Purchaser's Scope</b>	<b>Refrigeration system supplier's Scope</b>
<b>Civil works</b>	<p>Necessary foundations for equipment based on the details provided by the equipment supplier.</p> <p>Patch up/finishing works, specifically for the cut-openings in the wall, ceiling etc.</p> <p>Masonry cable trench in plant room.</p>	
<b>Water lines</b>	Nearest/suitable location of soft water main header inside processing plant.	Tapping of soft water from the main header and distribution to all the equipment considered under refrigeration work as per the requirement.
<b>Drain lines</b>	Drain points in the building.	The drains from all equipment shall be extended and terminated at the nearest drain point available at site
<b>Power</b>	Power supply available at Refrigeration MCC panel at Refrigeration plant	<p>Distribution of power and controls from existing refrigeration MCC panel to various field equipment shall be included in scope work.</p> <p>Supply &amp; distribution of UPS power to various equipment/systems, as per requirement shall be included in the scope.</p>
<b>Refrigeration piping &amp; Refrigerant</b>	-38 deg. C LP receiver along with two nos. liquid ammonia pumps (1W+1S) available at site	<p>Modifications in existing liquid ammonia supply and wet return header for supplying liquid to deep freeze for direct expansion purpose in new proposed butted deep freeze.</p> <p>Valve, fittings etc. for header modifications is also included in scope of work.</p> <p>Refrigerant piping for the new equipment and provisions for future expansion with complete initial charge of refrigerant as per the requirement included in the scope of this tender.</p>
<b>Control Function</b>	PLC panel for existing refrigeration system available at refrigeration.	All necessary hardware/software/driver etc. complete to comply all control functions as mentioned under clauses of technical specifications is included in scope of works.



Regd. No. G-4/76-77  
Date - 16.8.75

Item	Purchaser's Scope	Refrigeration system supplier's Scope
<b>Structural</b>	Pipe Bridge-2 available at site	<p>All pipe line supports, supports for equipment inside the building as well as outdoor equipment and GI structural platform for operation &amp; maintenance.</p> <p>All supports inside product plant for piping and cable trays shall be of SS 304 and outside product plant can be of GI.</p> <p>Necessary cable trays &amp; supports required inside the trenches including grouting and chequered plates for trench cover.</p>



*[Handwritten signature]*



## APPENDIX 1 – APPLICABLE INDIAN STANDARDS

### 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.
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

### ELECTRICAL

IS:	325	Three-phase induction motors
IS:	1248	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

Other standards to be followed for electrical work are listed in

**Special Conditions of Contract** Part-IV, Annexure IV. Latest revisions shall be followed in all cases.

**DUCTING, DUCT INSULATION FOR AIR-CONDITIONING SYSTEM**

IS:	655	Specification for metal air duct.
IS:	227	Specification for galvanized steel sheet.
SMACNA		Sheet metal and air-conditioning suppliers, National Association Standard for low velocity and high duct construction.

**Note: Relevant standards/ codes of ASHRAE / IIAR or other equivalent International standards/ codes are also acceptable, subject to approval.**



## **APPENDIX 2**

### **PROJECT INFORMATION AND BASIS OF DESIGN**

#### **1.0 Project Information**

Plant name: PURABI DAIRY\_\_\_\_\_

Address: West Assam Milk Union Limited ,Panjabri Guwahati ,Assam  
Pincode- 781037\_\_\_\_\_

**2.0 Electricity Supply Voltage** : 415 V,  $\pm 10\%$ , 3 phase &  
Neutral, 50 HZ  $\pm 2.5\%$ , AC Supply

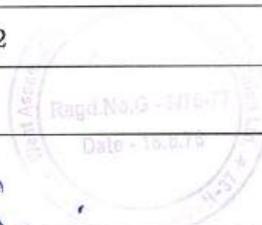
#### **3.0 Site ambient conditions**

	<b>Summer</b>	<b>Monsoon</b>	<b>Winter</b>
Ambient Dry bulb temperature in Deg. C	36.5	33.3	11.1
Ambient Wet bulb temperature in Deg. C	26.4	29.6	8.3

#### **4.0 Direct Expansion Refrigeration Load details:**

<b>Name of the room:</b>	<b>Butter Deep Freeze</b>
Room size (L, B, H, in mts)	8.27 x 6.95 x 3.7
Roof exposed to sun?	No
Compressor operating duty	-38 Deg. C SST/ -5 Deg. C SDT (with Back pressure valve)
Name of Product Stored	Bulk butter received in 20 kgs block
Product stored per day	30,000 kgs
Pull down time (in Hr)	20 Hrs
Temp. of incoming product	Minus 10 °C
Product Temp. to be maintained	Minus 18 °C
Packing material temp.	Minus 10 °C
Insulation Type- Ceiling, Floor & Walls	PUF 120 mm
Door details	Sliding door-01 nos.
Electrical equipment	FDC fans + Internal Lighting
Number of workers	02

*[Signature]*





Name of the room:	Butter Deep Freeze
Room orientation	Refer the layout drawing



*20/01*

4.1 The following tentative drawings for the proposed refrigeration plant are attached for the reference of the suppliers.

- Tentative Plan & deep freeze layout- PD\_AR\_EXB\_01-R4 (also indicating location).

4.2 IMPORTANT NOTE:

The suppliers also are requested to study the basis of design and check the refrigeration load requirements on their own, so as to guarantee the required performance of the augmented refrigeration plant as a whole. The Suppliers shall allow 10% safety margin towards unforeseen/ miscellaneous loads while estimating the refrigeration load.

The Schedule of major items required for the proposed refrigeration plant is furnished in Appendix-3. The capacity/sizes/rating of the 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 Appendix-3 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 in accordance with clause 3.0.

However, in case the actual requirement works out lower than that specified in Appendix-3, then supplier shall provide the equipment as per capacity stipulated in Appendix-3, without any deviation.

The quantities of Floor, Ceiling and wall insulation panels are only indicative and the supplier has to make a joint measurement prior to supply of the materials. Payments (for supply and installation) shall be made for the actual work done based on the final joint measurement.

The plant shut-down for tapping of new proposed system with existing system will have to be planned meticulously, as the plant is in operational mode 24x7 and production is always in progress.



A handwritten signature in blue ink, appearing to be 'R. Srinivas', located at the bottom center of the page.

**APPENDIX-3**

<b>Schedule of major items proposed</b>			
<b>Refrigeration system work</b>			
<b>Sl. No.</b>	<b>Item</b>	<b>Capacity in Tender</b>	<b>Qty.</b>
1	Forced draft cooler for pump feed system with controls and accessories for <b>Butter deep freeze cum CS</b> (with 12 mm fin spacing)	<b>Min. 20,000 kcal/hr</b> designed suitable for liquid ammonia pumped system with evaporating temperature of -25°C and room temperature -18 to -20°C (Δt of 5 Deg. C to be considered for selection of FDC)	2 Nos.
2	Refrigerant liquid pumps for the -38°C Low Pressure Liquid Accumulator	Suitable for -38°C (SST) liquid ammonia pumping of flow rate minimum 1.3 cu.mt/hr at 40 MWC	1 Nos.
3	Insulation of floor for Butter Deep Freeze	Conventional Insulation - PUF slabs in two layers (each layer having 60 mm thick) of 120mm thickness	60 Sq. M
4	Insulation of ceiling with prefab panels for Deep Freeze / Airlock	Pre-engineered pre-fabricated sandwiched rigid Poly Urethane Panel (both side PCGI) 120mm thickness	130Sq. M
5	Insulation of ceiling with prefab panels for deep freeze	Pre-engineered pre-fabricated sandwiched rigid Poly Urethane Panel (both side PCGI) 120mm thickness	60 Sq. M
6	Sliding type cold store door for deep freeze & Hatch door for air lock room	SS 304 skin - 120 mm PUF insulated door for clear opening size 1.5 m (Width) x 2.1 m (Height) / Hatch door size 1.5m (width)*2.1 m (Height)	2
7	Air curtain with limit switch	For all sliding/hatch	2 Nos.
8	Air shield curtain PVC type	For all sliding doors-1.5 x 2.1 m	1 Nos.
9	Air shield curtain PVC type	For hatch doors-1.5m (width)*2.1 m (Height)	1 Nos.
10	Cold room safety system	As per requirement	1 SET
11	Internal electrification of all cold stores, incubation rooms, air lock, between PUF ceiling and slab area including supply & fixing of all required items.  All junction boxes and cable terminations shall be water tight, MCB controls shall be provided with moisture proof (IP-65) enclosure.	As per requirement (Tentative number of light points : minimum 4 nos. W LED moisture proof light fittings complete with necessary wiring, control MCBs and all accessories.  Contractor to indicate his selection and suggest the number of points in the bid.	1 Lot







**Schedule of major items proposed****Refrigeration system work**

Sl. No.	Item	Capacity in Tender	Qty.
12	Pipes, valves & fittings for refrigerant, oil & safety etc.	Suitable for the system as per Battery limits	1 Lot
13	Pipes, Valves & Fittings for Water, Drain Etc.	As per requirement	1 Lot
14	Insulation for pipes & equipment	As per requirement	1 Lot
15	Electrical Work	As per requirement	1 LOT
16	Power cables	As per requirement	1 Lot
17	Control, signal and instrumentation cables	As per requirement	1 Lot
18	Cable trays and accessories including, clamps, cable glands, lugs, cable route markers, identification tags, GI conduits, etc.	As per requirement	1 Lot
19	Earthing system including Earthing pit, earthing conductors, and all earthing accessories.	As per requirement	1 Lot
20	Existing Control Panel modification works	As per requirement	1 Lot
21	Instruments & Controls	As per requirement	1 Lot
22	Ammonia	As per requirement	1 Lot



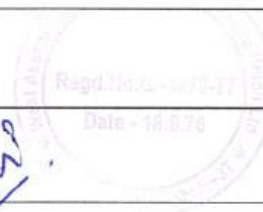
*Handwritten signature*

**APPENDIX- 4****LIST OF MAKES FOR MAJOR COMPONENTS**

<b>Description</b>	<b>Make</b>
Screw compressor package	GRASSO / MYCOM / HOWDEN/ JOHNSON CONTROLS
Reciprocating compressor package	VILTER / MYCOM / KIRLOSKAR
Skid mounted Package Screw Chiller	BITZER/HITACHI/VOLTAS/CARRIER/YORK
Motor	SIEMEN / ABB / KIRLOSKAR / BHARAT BIJLEE/ CROMPTON GREAVES / SEW / WEG
Electronic soft starter /VFD	SIEMENS / ALLEN BRADLEY /LK (FORMERLY L&T) / DANFOSS / SCHNEIDER / ABB
Evaporative Type condensers	EVAPCO / BALTIMORE / GUENTNER
Plate heat exchanger for pre-chiller, condenser	ALFA LAVAL / KELVION / DANFOSS
Falling Film Chiller	OMEGA ICEHILL / BUCO / PAUL MUELLER
Liquid ammonia- Canned motor pump	HERMETIC / HYDRODYNE / WITT
Chilled water pump	GRUNDFOS / XYLEM / EBARA
Automatic air Purger	ARMSTRONG / HANSEN /GRASSO / YORK / DANFOSS
Water Pipes	TATA / JINDAL / ZENITH / MST / KALYANI
Cassette Type Air Conditioners	DAIKIN/ TOSHIBA/ HITACHI/ VOLTAS/ LG/ BLUE STAR/ MITSUBISHI
Forced draft coolers	GUENTNER / HELPMAN / GOEDHART / ALFA-LUVE / STARCOOLERS / FRICK
Decorative Fan coil unit	CARRIER / VOLTAS / BLUE STAR
Industrial Heavy-Duty Fan coil unit	STAR COOLERS / FRICK / ETHOS
Air curtains	RUSSEL /RADEN /ALMONARD / SIMURG/ MITZVAH
Cold store & deep freeze door (sliding)	METAFLEX / SALCO / GANDHI AUTOMATION
Cold store door (hinged)/ Hatch door	METAFLEX / SALCO / GANDHI AUTOMATION
Dock-shelter & Seals	GANDHI AUTOMATION / METAFLEX / AVIANS
Pre-fabricated insulating panels	LLOYDS / RINAC / BEARDSSELL / FRICK / KINGSPAN JINDAL / METECNO / SUCHIFOAMS



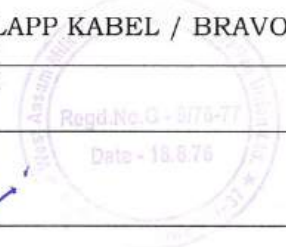
Description	Make
EPS/PUF slab insulation material	LLOYDS / BEARDSSELL / FRICK / RINAC / KINGSPAN JINDAL / SUCHIFOAMS
Elastomeric Foam	AEROFLEX / ARMAFLEX / K FLEX
Saddles for cold insulation	SUPERTHERM (LLOYDS) / BEARDSSELL
Refrigerant / Oil pipes	TATA / JINDAL / KALYANI / MSL / ISMT
Ammonia system mechanical valves (Hand expansion, straight/angle shut-off, single & double head pr. relief, self-closing oil drain valves)	PARKER / HERL-KIRLOSKAR / HANSEN / REVALCO / DANFOSS / SUPER FREEZE / MANIK
Ammonia system solenoid or motor operated valves, control valves (like expansion, shut-off valves, wet return line pilot operated valve), liquid level floats/controllers, LP-HP- OP Cut-outs etc.	PARKER / HERL-KIRLOSKAR / HANSEN / REVALCO / DANFOSS
Ammonia control valves/ Pressure transmitter/Liquid level controller/ LP-HP-OP Cut-outs/ Solenoid valves	DANFOSS / ALCO / HANSEN / PARKER / AMERICAN SPECIALITIES, USA / E&H
Refrigerant leak detection system & sensors	DANFOSS / EVIKON / SUBTRONICS
Ammonia Purifier/Dehydrator	JOHNSON CONTROLS / MANIK / H.A.PHILIPS, USA
Water valves	SAUNDERS / LK (FORMERLY L&T) / AUDCO / BDK / INTERVALVE / CRESCENT / LEADER/ GEMU
Structural channels & angles	SAIL / TATA STEEL / RINL / ESSAR
Flow Switch	DANFOSS/ SWITZER / IFM / E&H / IFB / ANDERSON NEGELE / BAUMER / HONEYWELL
Vortex / Magnetic Flow meter	E&H / EMERSON / ANDERSON NEGELE
Automation system	SIEMENS / ROCKWELL / SCHNEIDER
Human Machine Interface (HMI)	ALLEN BRADLEY (ROCKWELL) / SIEMENS / SCHNEIDER
Reflux type ammonia liquid level gauge	REVATHI / RK DUTTA
Dial type Pressure/ Temperature gauges	H. GURU / PRICOL / FIEBIG/ WARREE
Digital temperature sensors/ indicator / controller	E&H / EMERSON / IFM/ RADIX / DANFOSS
Digital temperature indicating controller with defrost control for packaged refrigeration units	DANFOSS / JOHNSON CONTROLS/ DIXELL-EMERSON/ HONEYWELL





Description	Make
Air Circuit Breaker	SIEMENS/ LK (FORMERLY L&T)/ SCHNEIDER / ABB
Harmonic Filter	LK (FORMERLY L&T) / SIEMENS / SCHNEIDER / ABB / EMERSON / SCHAFNER
MCCB	LK (FORMERLY L&T) / SIEMENS / ABB/ SCHNEIDER / MDS LEGRAND
Switch fuse units	SIEMENS/LK (FORMERLY L&T)/SCHNEIDER / ABB
MPCB	LK (FORMERLY L&T) / SIEMENS / SCHNEIDER / ABB
MCB	HAGER/SIEMENS/MDS-LEGRAND/SCHNEIDER/ABB
Contactors	LK (FORMERLY L&T) / SIEMENS / SCHNEIDER / ABB
LT armored Power Cables	KEC (RPG) / FINOLEX / RR KABEL / APAR / POLYCAB/ GLOSTER / LAPP / KEI / THERMOCABLE
LT armored Copper Control Cables	KEC (RPG) / FINOLEX / RR KABEL / APAR / POLYCAB / GLOSTER / LAPP / KEI / THERMOCABLE
LT steel braided copper power & control cables	LAPP KABEL / SBEE / RR KABEL
Signal & Instrument cable	LAPP KABEL / FINOLEX / POLYCAB / RR KABEL / THERMOPAD/SBEE
Protective relays / Over-load relays / Timer / MPCB	L & T/SIEMENS/ SCHNEIDER/ABB
Push button	LK (FORMERLY L&T) / SIEMENS / SCHNEIDER / ABB / TEKNIC / VAISHNAV / GE
LED type indication lamp	LK (FORMERLY L&T) / SIEMENS / SCHNEIDER / ABB / BINAY/ TEKNIC
Terminal block	WAGO / LAPP INDIA /CONNECTWELL
HRC fuse	L & T/SIEMENS /EE/GE POWER / C&S
Measuring instruments	LK (FORMERLY L&T) / SIEMENS / IMP/ MECO / AE / RISHAB
Resin Cast / Poly Carbonate Current transformer	KAPPA / BHARTI / LK (FORMERLY L&T) / NEWTEK / PRECISE / AE / SCHNEIDER
Rotary selector switches	LK (FORMERLY L&T) / SIEMENS/ SALZER /TEKNIC / KAYCEE
Power Capacitors	EPCOS / SCHNEIDER / NEPTUNE DUCATI / LK (FORMERLY L&T) / KHATAU JANKAR / UNISTAR
APFC Relay	BELUKE / EPCOS / LK (FORMERLY L&T) / SIEMENS
Cable Lugs	DOWELLS/ COMET / LAPP KABEL
Cable Gland	DOWELLS/ COMMET / LAPP KABEL / BRAVO

*[Handwritten Signature]*



Description	Make
LT Energy meter/ Digital Voltmeter & Ammeter	SIEMENS / LK (FORMERLY L&T) / SCHNEIDER / RISHABH / ENERCON/ INDIAMETER / CADEL
Analog Ammeter & Voltmeter	RISHABH / IMP / MECO / AE
Digital Energy Meter	SIEMENS / LK (FORMERLY L&T) / SCHNEIDER / HPL SOCOMEC
Digital Power Factor Meter	SIEMENS / LK (FORMERLY L&T) / SCHNEIDER / RISHABH / EPCOS
Programmable Protection Relay	MINILEC / LK (FORMERLY L&T) / SCHNEIDER
Isolating Switches	SIEMENS / LK (FORMERLY L&T) / SCHNEIDER / ABB
Motor isolator/junction box	HENSEL / RITTAL / R STAHL/HANSU
PVC Conduit & accessories	PRECISION / CLIPSAL / POLYCAB/ P - PLAST
Cable Tray	INDIANA / MEK / PILCO / ELCON / METALICA PRESSINGS / OM ENGINEERING / OBO/ SWASTIK
Vapour proof Light fittings for cold store /deep freezes	PHILIPS / WIPRO / BAJAJ / CROMPTON GREAVES
Personal Computer	HEWLETT-PACKARD / DELL / LENOVO / IBM
UPS	EMERSON / HI-REL / DB ELECTRONICS/ SOCOMEC / REILO
SMF Battery	AMCO / EXIDE / AMARA RAJA / AMCO YUASA
Plug & Socket	LEGRAND / CLIPSAL / BCH /HENSEL
Servo Voltage Stabilizer	LOGICSTAT / SUVIK / VOLTAMP / CRYCARD / NEEL
Cooling Tower	PAHARPUR / MIHIR / ADVANCE / TEKNI
Ice Silo	TANKKI / IDMC

**The makes specified in this Appendix-4 shall supersede the makes, if any specified elsewhere in the tender.**



*[Handwritten signature]*

## **APPENDIX - 5**

### **Motor Control Centre (Sheet steel)**

1. Tapping from the existing MCC panel to be provided.

2. **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.

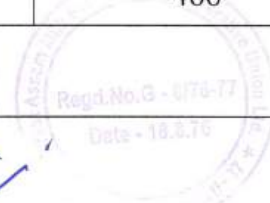
Inside the panels, stickers should be provided for all components giving identification no. as per detailed wiring diagram.

- 1.2 **Special Requirements :**

1. All motor feeders above 10 HP rating shall have soft starter upto 10 HP shall have DOL starters unless specified otherwise.
2. All motor feeders up to 20 HP shall be provided with switch fuse unit or MPCB as specified in the feeder details and motor feeders above 20 HP shall be provided with MCCB having a minimum breaking capacity of 50 KA.
3. All the power contactors of Star-Delta starters shall have same current rating.
4. The following selection table shall be followed for switches & contactors of motor feeders unless otherwise specified :

Sr. 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

*Handwritten signature*





For motors of smaller ratings, MPCB with suitable thermal release may also be provided as per the requirement given in the feeder details. The following selection table shall be followed for MPCB of motor feeders unless otherwise specified:

Sl.no	415 V Motor HP	Contactor ratings (Amps)	MPCB Rating
1	0.5 to 1	16	16
2	1.5	16	3.2
3	2	16	5
4	3	16	6
5	5	16	8
6	7.5	16	13
7	10	16	16
8	12.5	16	20
9	15	16	20
10	17.5	16	25

**For capacitors, rating of contactors/switch shall be double of rated current of capacitor.**

5. For incoming feeder of rating higher than 600 A, ACB shall be provided unless otherwise stated in the feeder details.
6. If the outgoing feeder rating is higher than 63 Amps., MCCB shall be provided unless stated otherwise and preferably these shall be located at the lower portion of the panel. These feeders shall also have isolating link for neutral in case 3 pole MCCBs are to be supplied as per the requirement given in feeder details.
7. Electrical interlocking shall be provided between various feeders as required by the process and specified in feeder details.
8. **If the total operating load on MCC is more than 600 kW, MCC shall be provided with two incoming feeders with a bus coupler unless specified otherwise.** Each incoming feeder shall have independent instrumentation and protection.
9. Induction motors (above 15 H.P) having 3000 RPM shall require higher rating for fuses, contactors and electronic timers due to very high starting current. MCC supplier has to specially check this requirement from purchaser.
10. Supplier has to submit GA & power circuit drawing for approval to purchaser before starting manufacturing of MCC.
11. All the major components of an MCC shall be of same "Make"



## **APPENDIX- 6**

### **SPECIAL INSTRUCTIONS TO SUPPLIERS**

#### **1.0 MAJOR RESPONSIBILITIES OF SUPPLIER & CLIENT**

##### **Responsibilities of supplier**

It is not the intent of these technical specifications to specify completely all details of design and fabrication of any plant/equipment, nevertheless, the equipment shall confirm in all respects to high standards of engineering design & workmanship and be capable of performing in continuous commercial operation up to agreed performance standards in a manner acceptable to the purchaser/client.

The purchaser/client will interpret the meaning of various equipment specification and drawings and shall have the power to reject any material/ equipment which in their opinion is not in full accordance to tender specifications.

The successful Supplier shall be responsible to undertake all work involved in implementing the project within their battery limits. This shall include but not limited to design, manufacture, supply, installation and commissioning of the entire project component including process equipment, process pipe-work, utilities equipment, services pipe-work, electrical equipment, power cabling, instruments and controls, control cabling, pneumatics, and automation. Also all necessary supports, support structures, cable ducts, trenching, conduits etc. required to complete the installation and to meet the NDDB/Client's high standards are included. No exclusions of any nature are acceptable, other than those detailed in this Tender document to be in the supply of NDDB/Client, or in the scope of one of the other Tender Packages.

##### **In particular the Supplier shall be responsible for:**

Developing complete engineering design manufacture and/or supply of all goods and services and ensuring best performance of individual equipment/system/process plant as a whole. The supplier shall avail the assistance of reputed specialists in their respective fields, wherever required.

Development of Automation/control schemes, soft wares, interfaces, etc. and their incorporation in the project to the entire satisfaction of the Purchaser/clients.

Providing Client with technical data, technical Literature, production and service load calculations.

Arranging for approvals from various statutory authorities on behalf of the client. The statutory fees shall be reimbursed by the client/NDDB on production of receipts.

Execution of the project in accordance with the prevailing Indian Standards, Indian Electricity Rules, Indian Explosives Act, Indian Factories Act, Indian Pollution Act and any other Act which may be relevant to the project and obtaining approvals thereof. Wherever Indian Standards are not available the supplier shall follow International Standards.



Regd. No. G- 175/77  
Date - 10.1.75

Ensuring satisfactory performance and After-Sales service of all items included in the scope.

Test equipment, test kits, instrumentation & materials required for establishing performance parameters.

Necessary man-power and tools.

Ancillary services like spares inventory, maintenance schedules, special tools/tackles etc.

Testing, commissioning and operation of the plant during production trials to the satisfaction of the Client and NDDB. Performance guarantees with regard to the following:

- Rated performance of section(s) and complete system(s).
- Consumption of utilities section-wise and for the complete system.
- Training of clients personnel in use of the control systems, plant operation and control, maintenance and repair of systems and equipment.

**Responsibilities of Client/NDDB:**

Details of civil design, building layout and drainage and sewage details.

Document on local site conditions related to climate, access and communications.

Temporary water and power supply at one point within the dairy premises.

Lighting and domestic wiring system including the switch boards for lighting.

Provision of workshop facilities.

Engineering personnel to liaison with the supplier, Project Manager and the execution team.

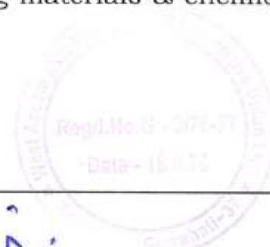
Lightning protection system.

Permanent water and power supply at the time of commissioning of the plant.

Adequate staff including operator's supervisors and engineers for product trials.  
All buildings including roads, drainage and minor civil works after and during plant execution.

Provision of and cost of services, raw products, packaging materials & chemicals (if available in the country).

**2.0 GENERAL GUIDELINES**





## **2.1 General Specification:**

The following shall apply to all the equipment in various sections of the Plant.

All MS structures shall be fabricated out of Rectangular/Square Hollow sections and to be given one coat of epoxy primer paint followed by two coats of epoxy paint of approved shade.

All motors in production units shall be covered with SS shrouds. Shrouds shall be easily removable and shall allow free air circulation as well as entry of electrical cables. All motors installed outside the building shall have GI shrouds.

Suitable safety guards shall be provided wherever required.

Makes of various equipment/components shall be clearly indicated by the Supplier

All weld joints shall be ground smooth. All corners shall be well-rounded. In case of SS surfaces, external & internal surfaces shall be polished to 150 grits. DP tests shall be carried out for all welds after polishing for all holding vessels/tanks.

All equipment surfaces coming in contact with milk shall be made of SS 304 or SS 316 depending on the application as subsequently desired.

All SS joints shall be argon-arc welded only.

Stainless steel tables of required size and at appropriate locations shall be provided for work-in- process inventory and other such activities. Platforms and hoists for general operation and maintenance of equipment shall also be provided.

**Wherever a "Lot" has been indicated a detailed list shall be provided by the Supplier.**

All instruments, controls, and Automation system shall be manufactured by an internationally recognized Indian manufacturer or foreign manufacturer with suitable agency representation and service support in India.

Detailed preventive maintenance schedules as well as operational manuals of all equipment shall be provided by the Supplier in the form of computer software after commissioning along with printed copies.

The manual shall cover the following aspects:

- Brief Process Description & Flow sheet.
- Unit-wise function and description.
- Equipment-wise details, operational instructions, maintenance procedures and schedules.
- Plant start-up, commissioning, normal operation, and emergency operation.
- Trouble-shooting.
- As built drawings of the equipment as build drawing connection diagrams.
- Spares inventory and services of supply.

The manuals and drawings are to be supplied as follows:



A handwritten signature in blue ink, likely of the authorized signatory, is located at the bottom right of the page. The signature is stylized and appears to be 'R. D. Singh' or similar.

- 4 sets of manuals and drawings in hard copy.
- 3 sets of above in soft copy in Pen-drive(s).

### **3.0 Bid Structure of Technical Section:**

#### **A. General:**

This part of the tender document defines the way the suppliers are required to structure the presentation of the technical section of the bid.

All the technical data required by the tender is to be provided in the format given in this section. If no format is given for any specific item the supplier may request formal approval of their own format at the suppliers meetings.

Any supplier not following the required bid document structure or presenting technical data that is not the required format is liable to be deemed as non- responsive.

#### **B. Proposed Structure**

The technical section of the bid is to be structured in the same order as the tender document. Each statement is to be numbered with the same sub-section & paragraph number as in the tender document. Every page of the document of the bid is to be numbered using the pre-fix of the sub-section and the suffix of the page no. The general structure is, therefore, to be as below:

Sub-section: Subject: Table of contents.

- 1.0 Introduction.
- 2.0 Responsibilities.
- 3.0 General guidelines.
- 4.0 Design Basis.
- 5.0 Project Management.
- 6.0 List of equipment and specifications.
- 7.0 Deviations from technical requirements.
- 8.0 Additional items.
- 9.0 Drawings and tables.
- 10.0 Battery limits.

The supplier shall cover each requirement of the tender document by statements technical data & descriptive material and, in particular to detail the following:

#### **1. Introduction**

The supplier is to describe his technical proposal in detail, stating the processes and systems which he has applied in designing the plant. Also to highlight any special technical innovations that the supplier proposes to include in the plant that will improve the performance, reduce the operating cost, or improve product quality. Any such highlights shall be cross referred with the bid sub-section and paragraph number as applicable.

*Handwritten signature*  
 Registered - Draft  
 Date: 10.8.76  
 (Stamp)

## **2. Responsibilities**

### **Responsibilities of the Supplier**

The supplier is required to specifically state his acceptance or non-acceptance of each clause in this subsection. Non-acceptance shall be deemed a deviation from the tender, and shall be mentioned in the sub-section. 7.0 Deviations from technical requirement.

### **Responsibilities of Client**

The supplier is required to state here any additional responsibilities that he considers or to be borne by Client besides those described in the tender.

## **3. General Guidelines**

The supplier is required to provide information asked for in this sub-section.

## **4. Design Basis**

The supplier is required to follow the design basis in the tender, and indicate clearly where additional processes or alternative processes or equipment are considered to be necessary for achieving the optimum plant operating efficiency and optimum product quality within the standards specified.

Under the utilities quantify the peak and daily load of each utility & cross refer this to service load histograms that are to be provided with this bid.

## **5. Project Management**

### **Time Schedule**

The supplier is to state in this sub-section the proposed programme of implementation from receipt of order to commencement of product trials, in the form of project bar chart or PERT network.

### **Management Team**

The supplier is to detail the make-up of the management team in terms of designation, qualifications & proposed man months of attendance in accordance of this section of the tender. Also it is to quantify the support that will be given by foreign collaborators, with designation and man-months attendance in India & at site. The supplier is to ensure that the following sections are fully detailed and quantify the duration and man-power applied to each.

- Execution
- Commissioning.
- Product trials.
- Training.
- Stand-by operation.



*[Handwritten signature]*



- Service cover.

#### **6. List of equipment and specifications**

The supplier is required to follow the sequence of tender document in each of the sections/sub-sections for which he bids, & make a statement on each paragraph. No item is to be left without a clarifying statement.

#### **7. Deviation from technical requirements**

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

#### **8. Additional Items**

The supplier shall include additional items as anticipated by him, however, acceptance of any/all the items shall be at the discretion of Client.

#### **9. Drawings & Tables**

The list of drawings and technical documents required for technical evaluation are included in this subsection. This includes a number of data sheet formats to be completed by the supplier. The completion of these formats is mandatory, and failure to comply will make the bid liable to be deemed non responsive.

#### **10. Battery Limits**

Any point in the battery limits that are not clear to the supplier shall be raised for clarification.

### **3.1 PROJECT MANAGEMENT**

#### **3.1.1 Time Schedule:**

The project execution shall be time-bound as per the mutually agreed and attached schedule submitted by the supplier, from the date of signing the contract to commissioning of the plant i.e., up-to commencement of product trials and service load trials.

The Project Manager will provide the Project in charge with monthly progress reports which clearly indicate the actual Vs. planned progress and the new likely completion dates of supply, erection, commissioning and product trials.

The project staffing pattern shall be submitted with the offer and shall include sufficient personnel to meet the execution time schedule.

Details of documentation to be submitted shall be according to the overall project programme.

#### **3.1.2 Approvals:**

A handwritten signature in blue ink is written over a circular stamp. The stamp contains the text 'Signature', 'Date: / /', and 'Sheet-31'.

Approval on technical documentation (with or without specified amendments) shall be given by Client within ten working days after submission. The amendments which are not in the original scope of work or due to changes in concept, shall be taken up by the supplier as per mutually agreed rates to be decided before execution, and shall be binding on the supplier.

Supplier shall obtain approval for purchase of specific makes of equipment whose makes are not mentioned in his offer.

All the detailed design calculations regarding the selection of equipment sizes, system types, etc. shall be submitted to NDDDB/Client for their specific observation and record.

### **3.1.3 Inspection:**

For indigenous items, the supplier shall invite Client for inspection and preliminary testing. The inspection may be required at various stages of manufacture/assembly for some items. However, for imported items where the inspection has to be done abroad, the supplier shall do the inspection at his cost and submit the necessary test certificate.

### **3.1.4 Site work & Installation:**

Protection of electronic equipment: It is the responsibility of supplier to ensure that all the electronic equipment & control systems are fully protected against hostile environment, humidity, heat & dust that will be encountered during storage & installation.

### **3.1.5 Commissioning:**

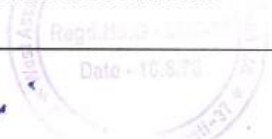
After satisfactory erection & testing a competent team shall be deputed to commission the plant & to run product trials & to establish performance parameters.

### **3.1.6 Product Trials & Performance Guarantees:**

The plant will be operated at full capacity to the satisfaction of Client for a period of **07 days**, during which the entire plant including the utilities shall run simultaneously & the plant shall fulfil all the performance criteria. These operation tests shall be simultaneous & consecutive. Normally twenty hours of operation for the service equipment & sixteen hours of operation for the process & packing sections shall be considered as a day's operation. However, if the shut-down occurs due to external Force Majeure reasons, after sixteen hours of operation for services & twelve hours of operation for the process & packaging, this shall be considered as full day of operation.

### **3.1.7 Training:**

Training shall form an important component of Project Management and shall be undertaken by the supplier for a period of **10 days**. The Supplier would train all levels of staff of the client in operating the plant and automation



systems including managers, engineers, supervisors, operators and maintenance personnel.

Training would be given at site and a schedule shall be proposed by the supplier, together with the content of training programs, their duration and venue.



---

*Handwritten signature in blue ink.*



**APPENDIX- 7****TECHNICAL DATA ON THE MAJOR REFRIGERATION EQUIPMENT****TO BE FURNISHED BY THE SUPPLIER**

	<b><u>FORCED DRAFT COOLER</u></b>		<b><u>BUTTER DEEP FREEZE</u></b>
1.	Make		
2.	Model		
3.	Dimensions (L x B x H)	mm	
4.	Weight of Each Unit	kg	
5.	Heat Transfer Capacity ( Minimum)	TR	
6.	Total Surface Area	m <sup>2</sup>	
7.	LMTD	Deg. K	
8.	Coil Diameter	mm	
9.	M.O.C. (Coil)		
10.	M.O.C. (Fins)		
11.	No. of Rows & Deep		
12.	Fin Spacing	mm	
13.	Defrosting Arrangement		
14.	No. of Axial Fans in Each Unit		
15.	Motor Rating for Each Fans	kW	
16.	Fan Air Flow Rate and Static Head		
17.	Air throw	M	
18.	Fan impeller material		
19.	Fan RPM		
20.	No. of FDC's		
21.	Design Pressure of Coils (Pneumatic)	kg/cm <sup>2</sup>	
22.	Working Pressure of Coils (Pneumatic)	kg/cm <sup>2</sup>	
23.	Test Pressure of Coils (Pneumatic)	kg/cm <sup>2</sup>	
	<b><u>REFRIGERANT PUMPS</u></b>	<b><u>UOM</u></b>	<b><u>- 38 °C APPLICATION</u></b>
	Make		
	Type		
	Model		
	Capacity	CMH	
	Head	MLC	
	No. of Pumps		
	Power Consumption	kW	
	Overall Efficiency (Hydraulic + Elect.)	%	
	Motor Rating	kW	



*Handwritten signature in blue ink.*

**APPENDIX - 8**

**LIST OF TECHNICAL DOCUMENTS, DETAILS AND DRAWINGS TO BE FURNISHED ALONGWITH THE BID**

**The supplier is required to furnish following drawings, technical and documents along with the bid, to facilitate technical evaluation of the bid.**

- 1.0** Electricity consumption data with operating time schedule for all the equipment and histogram (hourly basis showing peak demand, on 24 hour scale)
- 2.0** Consumption details for other utilities (power, etc.)
- 3.0** Estimated quantity of Ammonia charge in the system offered



---

A handwritten signature in blue ink, located at the bottom right of the page, below a horizontal line. The signature is stylized and appears to be "R. D. S." or similar.

**BOQ (Annexure-V)**

Sl. No.	Description of item	QTY	UOM	Unit Price (Rs)	Net Total Price (Rs)
1	Forced draft cooler for pump feed system with controls and accessories for <b>Butter deep freeze cum CS</b> (with 12 mm fin spacing)	2	Nos		
2	Refrigerant liquid pumps for the -38°C Low Pressure Liquid Accumulator	1	Nos		
3	Insulation of floor Butter for Butter Deep Freeze	60	Sqm		
4	Insulation of walls with prefab panels for Deep Freeze / Airllock	130	Sqm		
5	Insulation of ceiling with prefab panels for deep freeze	60	Sqm		
6	Sliding type cold store door for deep freeze & door for air lock room	2	Nos		
7	Air curtain with limit switch	2	Nos		
8	Air shield curtain PVC type	1	Nos		
9	Air shield curtain PVC type	1	Nos		
10	Cold room safety system	1	set		
11	Internal electrification of all deep freeze, air lock, between PUF ceiling and slab area including supply & fixing of all required items. All junction boxes and cable terminations shall be water tight, MCB controls shall be provided with moisture proof (IP-65) enclosure.	1	Lot		
12	Pipes, valves & fittings for refrigerant, oil & safety etc.	1	Lot		
13	Pipes, Valves & Fittings for Water, Drain Etc.	1	Lot		





14	Insulation for pipes & equipment	1	Lot		
15	Power supply panel	1	Nos		
16	Power cables	1	Lot		
17	Control, signal and instrumentation cables	1	Lot		
18	Cable trays and accessories including, clamps, cable glands, lugs, cable route markers, identification tags, GI conduits, etc.	1	Lot		
19	Earthing system including Earthing pit, earthing conductors, and all earthing accessories.	1	Lot		
20	Control Panel modification works	1	Lot		
21	Instruments & Controls	1	Lot		
22	Ammonia	1	Lot		
23	Basic Total (Rs)				
24	Other charges incl transportation, insurance, freight etc				
25	Total including other charges				
26	GST @ 18%				
27	<b>Grand Total Including GST &amp; All (Rs)</b>				



*[Handwritten signature]*