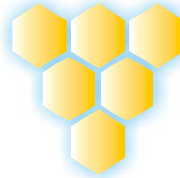




**M/s. KERALA STATE DRUGS &  
PHARMACEUTICALS LTD. (KSDPL),  
ALAPPUZHA, KERALA.**



**HVAC TENDER**



**TENDERNO.  
KSDP/PR/T-HVAC-OI/2010-11**



**TECHNICAL SPECIFICATION**

**FOR**

**HVAC WORKS**

## INDEX

<b>SR.NO.</b>	<b>DESCRIPTION</b>	<b>PAGE NOS.</b>
1.	Tender Notice	1
2.	Project Information	3
3.	Instruction to Tenderers	4
4.	Letter of Submission of Tender (Format)	6
5.	Bank Guarantee (Proforma)	7
6.	Hypothecation Deed (Proforma)	9
7.	Agreement (Stamp Paper)	13
8.	Project Site Rules	17
9.	Contractors Obligation under statutory rules	22
10.	Technical evaluation criteria	26
11.	Techno-Commercial Deviation statement	28
12.	Contractor's Staff & Equipments	29
13.	Definition of terms in contract	31
14.	Conditions of contract	32
15.	Basis of design	51
16.	Information to be provided along with tender	53

## INDEX

SR. NO.	DESCRIPTION	PAGE NOS.
17.	Information to be provided after award of contract for approval	57
18.	Specifications of Equipments	58
19.	Applicable Standards	74
20.	Testing of Air conditioning System	76
21.	Mode of Measurement	78
22.	List of approved makes	83
23.	HVAC Design Sheet	85
24.	Bill of Quantities (BOQ)	89
25.	Drawings :	
A.	Zoning Layout for Stores-Gr. Floor	96
B.	Zoning Layout for Production-First Floor	97
C.	BOX Type HEPA filter module – Top Opening	98
D.	HEPA filter module – Bottom Opening	99

**KERALA STATE DRUGS AND PHARMACEUTICALS LTD**  
(A Government of Kerala Enterprise)  
KALAVOOR, ALAPPUZHA-688522, KERALA STATE, INDIA, Ph: 0477-2258184  
Fax: 0477-2258162, Email:ksdp ltd@gmail.com  
website: www.ksdp.co.in

**TENDER NOTICE**

Tender No. KSDP/PR/T – HVAC – 01/2010-11

Sealed Item rate Tenders are invited in Two Bid system (Technical Bid and Price Bid) from eligible, competent and experienced Manufacturers /Contractors for Supply, Erection, Testing and Commissioning of HVAC System in our new Betalactam Unit at Kalavoor Alappuzha.

Name of Item	Cost of tender form	EMD	Delivery Schedule
	Rs	Rs	
HVAC WORKS	1125/- inclusive of tax	1,00,000.00	3 Months

1. Tender Document available from Company office or can be downloaded from website www.ksdp.co. in
2. Method of payment: By cash or By D.D in favour of the Company payable at Alappuzha.
3. Last date and Time for Receipt of Tender: 16.07.2010, 15.00 Hrs.
4. Date and Time of Opening of Tender (Technical Bid): 16.07.2010, 15.30 Hrs.

**Firms who full fill the criteria as given in the Technical Evaluation criteria Sheet are eligible to submit the Tender .**

For the Tender documents downloaded from website, separate Demand Draft For Rs1125/- favouring KERALA STATE DRUGS AND PHARMACEUTICALS LTD payable at ALAPPUZHA towards cost of Tender Documents is to be enclosed.

5. The Tenders should be accompanied by crossed Demand Drafts for an amount Rs1,00,000/(Rupees One Lakh only) towards Earnest Money Deposit (EMD) drawn in favour of Kerala State Drugs & Pharmaceuticals Ltd. and payable at Alappuzha. Tender Documents received with out

EMD shall be summarily rejected. The EMD also may be accepted in the form of Bank Guarantee from any of the Commercial Banks.

6. Completed Qualification documents and Tenders received in time will be opened at 15.30 Hours on 16-07-2010 in the presence of tenderers or their authorized representatives.
7. Tender for the Supply shall remain open for acceptance for a period of 90 days from the date of opening of tender. Any tenderer withdraws his tender before the said period or issue of acceptance, whichever is earlier or makes any modification in the terms and conditions of the tender which are not acceptable to KSDP Ltd., then the KSDP shall without prejudice to any other right or remedy, be at liberty to forfeit 50% of the said earnest money aforesaid.
8. The Supplier whose tender is accepted shall be required to deposit an amount equal to 5% of the tendered value of work as performance guarantee/Performance Security in the form of an irrevocable bank guarantee bond of any Scheduled Bank in accordance with the time prescribed.
- 9 For any clarification contact office of the Managing Director at I<sup>st</sup> floor of Administrative building,

KSDP Ltd., Kalavoor, Alappuzha. Fax No 0477 2258162 , Ph 0477 2258184.

#### **10. Submission of the Tender**

The Tender should be submitted in two envelopes as detailed below

##### **10.1 Envelope – 1 - marked as – TECHNICAL BID'**

This shall contain the following

- A. (1) Draft/BG for EMD in a cover super scribed as EMD with tenderers name.  
(2)Draft for Rs1125/- towards cost of Tender Form if downloaded from website.
- B. The various Details regarding experience, financial standing etc as detailed in the Technical Evaluation Criteria Sheet.

##### **10.2 Envelope – 2 – marked as – ' PRICE BID (FINANCIAL BID)'**

This shall contain the Price for the supply and Commissioning of the Items.

- 10.3 Both envelopes shall be placed in a third envelope and name of work, date of opening etc shall be written on the cover.
11. Kerala State Drugs & Pharmaceuticals Ltd. reserves the right to accept or reject any or all the tender offers without assigning any reason thereof.

Sd/-  
**MANAGING DIRECTOR**

## PROJECT INFORMATION

1.	Owner	:	M/s. Kerala State Drugs & Pharmaceuticals Ltd.
2.	Project Title	:	Betalactum
3.	Project Location	:	Alappuzha, Kerala.
4.	Project Office	:	Kerala State Drugs Pharmaceutical Ltd. A Government Of Kerala,Enterprise Kalavoor, Alappuzha -688522 Kerala State, India
5.	Consultants Office	:	M/s. Knack Technocrats 42, Avinash, 7 Bungalows, J.P. Road, Andheri (W), Mumbai - 400 053
6.	Nearest Railway Station	:	Alappuzha, Kerala
7.	Nearest Airport	:	Cochin
8.	Climatic Condition	:	Tropical
9.	Ambient Air Temperature		
	a. Maximum	:	.....
	b. Minimum	:	.....
	Relative Humidity		
10.	c. Maximum	:	.....
	d. Minimum	:	.....
11.	Approx. cost of project	:	Rs 7 crore (Approx)
12.	Time allotted for completion	:	12 Months.

## INSTRUCTIONS TO TENDERERS

1. The sealed tenders should be addressed to The Managing Director.
2. The tenders received after the due date and time shall not be accepted under any circumstances whatsoever.
3. The tenderer must accompany copies of latest Income Tax Clearance Certificate, Annual Turnover, details of similar works executed by the tenderer during last five years giving the names and addresses of clients, consultants and the value of individual work executed including the time taken for completion of individual projects.
4. Financial offer(Price Bid) shall be opened only for those tenderers who are techno-commercially qualified.
5. Each page of the tender document is required to be signed by the authorized signatory of the tenderer.
6. Original tender document duly signed and filled up should be submitted.
7. **NOTE :**
  - a. Letter of submission of Tender should accompany the envelope containing EMD only.
  - b. The prices should be quoted in the original BOQ given in the tender document. These sheets should be detached from the tender document and sealed in the envelope for financial bid.
  - c. All the other sheets of the tender document duly signed should be enclosed in the envelope for techno-commercial bid.
8. The initials of the authorized signatory must attest all erasures, cuttings and alterations made while filling the tender document. Over-writing of figures is not permitted.
9. Tenderers must visit the site and see the means of access to the site, study the drawings and specifications and acquaint him fully about the works to be carried out and all other factors governing the works before quoting his rates.
10. Earnest money of unsuccessful bidder shall be returned within one month of finalization of the contract. Earnest money of successful bidder shall be returned only after successful completion of job. No interest shall be paid on the Earnest Money Deposit.

11. Tenderer should quote the rates for all the items.
12. The rate quoted by the tenderer shall be the total landed value of any item inclusive of royalties, rents and octroi, excise duty, sales tax or any other duties / taxes / levies applicable on the material obtained.
13. If any discrepancy / misprint is noticed in any drawing / specification or B.O.Q., it should be clarified from the consultant before quoting the rates.
14. Following procedures shall be adopted incase of difference in quoted rates in figures and words and extensions :
  - a. Where there is difference between rates in figures and in words, the rates quoted in words shall be considered as correct.
  - b. Where the amount of an item is not worked out or it does not correspond to the rate either in figure or in words, the rates quoted in words shall be considered as correct and necessary extension made.
  - c. Where the rates quoted by the tenderer in figures and in words tally, but the amount is not worked out correctly, the rates quoted by the tenderer shall be considered as correct and amount shall be corrected accordingly.
15. The Consultant / Owner, do not bind themselves to accept the lowest or any other tender and reserves the right to accept or reject any or all the tenders either in full or in part without assigning any reason.
16. The drawings given with the Tender Document are as per our present requirement. The working drawing which shall be issued after the award of the contract may vary in shape, size and quantity from the tender drawings and BOQ and no claim shall be entertained later on this behalf.
17. The tenders shall be opened and evaluated by the Project committee and the successful bidder shall be informed.
18. The tender shall be accompanied with Earnest Money Deposit in the form of Bank Gurantee OR Cross Demand draft drawn on any schedule bank.
19. Jobs to be carried out in phases according to the client's requirement.

## LETTER FOR SUBMISSION OF TENDER

To,

The Managing Director,  
Kerala State Drugs & Pharmaceuticals Ltd.(KSDPL)  
Alappuzha, Kerala.

Dear Sirs,

Having examined the tender document relating to the works comprising of the tender notice conditions of contract specification schedule of quantities etc. and having understood the provision and requirements relating to Betalactum project, having conducted a through study of the job location of site, soil strata, climatic conditions, transportation and communication facilities, availability and accessibility of materials and all other factors governing the project, I/we hereby submit our offer for the execution of the proposed work, in accordance with the terms and conditions and within the time period specified, in the tender document at the rates quoted by me/us in the accompanying schedule of quantities.

I/We undertake to do all extra works which may be assigned to us as a part of this contract at rates quoted in tender document.

If after tender document is accepted I/we fail to commence the execution of the works within 15 days, I/we agree that M/s. KSDPL shall have full authority to forfeit the earnest money.

I /We confirm having deposited earnest money of Rs. .... (Rs. .... only) by Demand draft no ..... dated ..... drawn on ..... Bank ..... branch attached hereto.

I/We further confirm that: -

- i) I/We have successfully carried out various project of similar nature and I/We have vast experience in handling large project of this nature.
- ii) I/We have sufficient qualified manpower and necessary materials and equipments to execute the project efficiently.
- iii) The quoted rates shall be valid up to the completion of the project.
- iv) I/We further confirm that all chapters of the tender documents have been read understood and signed and there is no deviation/ discrepancy except that specification mentioned in deviation sheet enclosed with the tender.

.....

Signature of Tenderer

Name of firm :

Seal of firm :

## **BANK GUARANTEE (PROFORMA)**

Bank Guarantee No.

Date: -

This GUARANTEE BOND made on this ..... day of ..... 2010 by the ..... and having its registered office at ..... (hereinafter called the 'Bank' which expression shall include its successors and/or assignees) in favour of M/S. Kerala State Drugs & Pharmaceuticals Ltd.(KSDPL), Alappuzha, Kerala,

(Hereinafter called the 'Owner' which expression shall include its successors and/ or assignees in pursuance of an Agreement entered into (hereinafter called 'The Agreement') between the owner and the ..... (hereinafter called 'The Contractor') for completion of HVAC construction and maintenance of works as specified and as per terms of agreement , the bank agrees to ..... following: -

01. We ..... (Hereinafter referred to as bank) do hereby undertake to pay the owner an amount not exceeding Rs..... (Rs.....only) against any loss or damage caused to or suffered or would be caused to or suffered by M/s. ----- by reasons of any breach by said contractor of any of terms of conditions contained in said agreement.
02. We ..... do at the request of said contractor (s) hereby undertake to pay the amount due and payable under this guarantee, without any demur, merely on demand from the owner stating that amount claimed is due by way of loss or damage caused to or suffered or would be caused to or suffered by owner by reason of any breach by the said contractor(s) of any of terms or conditions contained in said agreement or by reasons of contractor's failure to perform said agreement. Any such demand made on the bank shall be conclusive as regards the amounts due and payable by and liability of bank under the guarantee and we ..... do hereby undertake to pay the owner the amount demanded notwithstanding any dispute or disputes raised by the said contractor (s) on any grounds whatsoever and notwithstanding any proceedings pending in any court or tribunal relating to the said agreement or this Guarantee. The liability of the Bank under this Guarantee being absolute and unconditional. However our liability under this guarantee shall be restricted to an amount not exceeding Rs..... Only).

03. We ..... further agree that the guarantee herein contained shall be remain in full force and effect during the period that would be taken for the performance of said agreement and it shall continue to be enforceable till all the dues of the owner under or by virtue of said agreement have been fully paid and it's claim satisfied or discharged or till owner certifies that the terms and conditions of said agreement have been fully and properly carried out by the said contractor (s) and accordingly discharge from all liabilities under this Guarantee thereafter.
04. We ..... further agree with owner that the owner has fullest liberty, without our consent and without affecting in any manner our obligations, hereunder to vary any of the terms and conditions of , said agreement or to extend time of performance by the said contractor(s) from time to time or to postpone for any time or from any time to time any of the powers exercisable by the owner against the said contractors and to forbear or enforce any of the terms and conditions relating to said agreement and we shall not be relieved from our liabilities by reason of any such variation or extension being granted to the contractors or for any forbearance act or omission on the part of the owner or any indulgence by the owner to the said contractor (s) or by any such matter or thing whatsoever which under the law relating to sureties would but for this position have effect of so relieving us.
05. We ..... lastly undertake not to revoke this guarantee during it's currency without the previous consent of the owner in writing and that our liability under this guarantee shall not be impaired or extinguished on account of any change in the constitution of the said contractors.

Dated the ..... day of ..... 2010 for ..... Bank Ltd.

Signature of Banker

## **HYPOTHECATION DEED (PROFORMA)**

**THIS INDENTURE** made this ..... day of ..... between .....of the one part and the ...../ ..... hereinafter called "the company which expression shall unless the context requires otherwise include his successors and assigns of the other part;

Whereas under the general conditions of contract relating to the contract ..... entered into between company and the contractor, the contractor has applied to the company for payment of Rs..... (Rs.....) against material brought at site as described in the schedule here to specifically acquired by the contractor for the works and brought to site.

And whereas one of the conditions on which the said payment of Rs..... is to be granted by the company to the contractor is that contractor shall hypothecate the materials described in the schedule here to in favour of the company as security.

Now this indenture witnesseth that in pursuance of the said agreement and in consideration of the premises the contractor doth hereby hypothecate, assign and transfer to the company the materials described in the schedule hereto to the intent that the same shall remain and form security to the company.

**01.** The contractor hereby agrees declares and covenants with the company as follows;

- a) That the said payment be recovered by the company by making deductions in the manner provided in the general conditions of contract and other conditions of the contract from the claims made by the contractor against the company for on account payment.
- b) The contractor has paid in full the purchase price of the materials described in the schedule hereto and each and every one of them and that the same are the absolute property of the contractor and that the same have not been sold, pledged, mortgaged or transferred or in any way dealt with by the contractor.
- c) So long as any amount remains payable to the company by the contractor in respect of the said amount of Rs..... the contractor shall not sell, pledge, hypothecate, transfer part with or in any way deal with the material described in the schedule hereto.

- d) If the said payment of Rs. .... shall not be repaid by the contractor or recovered in the manner described above by the said ..... day of .....due to any reason whatsoever or the said contract has been determined earlier or cancelled or if the contractor shall sell, pledge, mortgage, transfer part with or in any way deal with said material or any part thereof or the contractor or any of the partners in adjudged insolvent or the contract is to be wound up or makes any composition or arrangements with its creditors or the contractor shall commit breach of any of the terms and conditions or covenants as herein contained or if any of the said plant and equipment or if any other property whatsoever belonging to the contractor has been sold or attached for a period of not less than 21 days in execution of the decree of any court for payment of money, the whole of the said amount Rs..... or such part thereof as may have remained unpaid or unrecovered together With interest thereon shall forth with become due and payable.
- e) The company may on the happening of any of the events mentioned in the preceding clause (d) or in the event of the said amount or any part thereof becoming due and payable and has not been paid or recovered or cannot be recovered as provided in the said conditions, seize and take possession or the said plant and equipment and materials (and either remain in possession thereof without removing the same or else may remove the same) and sell the said material or any of them either by public auction or private contract and may out of the sale proceeds retain the balance of the said amount and interest them maintaining unpaid and unrecovered and all costs, charges and expenses and payment incurred or made in maintaining defending or protecting the rights of the company hereunder and shall pay over the surplus, if any, to the contractor.
- f) The contractor shall at all times during the continuance of the security and at the expenses of the contractor insure and keep insured the materials described in the schedule hereto for the full value there of in the joint names of the contractor and the company with an insurance company to be approved by the Engineer-in-charge against the risk of loss or damage from whatever cause arising other than the expected risks. During the continuance of the security the contractor shall pay all prima and sums of money necessary for keeping such insurance on foot and the insurance policy and receipts in original for prima paid shall be deposited with the Engineer-in-charge. The contractor shall assign all his right title and interest in the policy to the company.

- g) The contractor shall not permit or suffer the said materials of any part thereof to be destroyed or damaged or used or to be used or to deteriorate in greater degree than it would deteriorate by reasonable wear and tear thereof in performance of the contract.
  - h) In the event of any damage or loss happening to the said material or any part thereof from whatever cause other than the expected risks the contractor shall forthwith have the same repaired or replaced as the case may be or arrange for payment of the entire amount recovered or to be recovered from the insurance company to the company towards the payment of the said amount of Rs.....
- 02.** Upon repayment or recovery in full of amount secured on account of the hypothecation deed the said material secured hereunder shall be released from hypothecation but this is without prejudice to the right of the company under any other conditions of the contract.

**SCHEDULE ABOVE REFERRED TO**

<b>Sr no</b>	<b>Particulars of plant &amp; equipments &amp; materials</b>	<b>No's/ Qty</b>	<b>Purchase price/Price considered reasonable by Engineer-in-charge</b>	<b>Total Price</b>	<b>Advance</b>

**AGREEMENT  
(STAMP PAPER)**

An agreement .... Made this the ..... day of ..... between M/S ..... here in after called the contractor/s which expression shall include its executors, administrators, legal representative and assigns of the first part and **M/s Kerala State Drugs & Pharmaceuticals Ltd.** (Here in after called the owner) of the second part. Whereas ..... the owner is desirous of construction of pharmaceutical factory building and other HVAC works at ..... as per drawings & specification prepared by **M/s. Knack Technocrats** - the consultants and the contractor/s has/have by his/their tender dated ..... as amended by the contractor's – contractor's letter no. .... dated ..... offered to execute and fully complete the above work in the owner's premises for the owner as set forth in the tender or as amended and the schedule bill quantities particular specifications, ISI specifications, drawings special conditions of the contract, scope & performance schedule and general conditions of the contract, according to the terms and conditions contained there in for an approximate total sum of Rs. .... Rs. ....) and the owner has accepted such item rate/percentage rate/ Lump sum tender in terms of its letter no. dtd. ....

**NOW THIS AGREEMENT WITNESSETH AS FOLLOWS**

1. The contract/s covenant/s and agree/s with the owner that the contractor/s with in the time of ..... months from the date stipulated in the acceptance letter shall execute and fully complete all the works specified described or referred to in and by the said tender or as amended according to the true intent and meaning of the said tender or as amended and as per the schedule bill of quantities particular specifications ISI specification drawings & Instructions issued from time to time special conditions of the contract scope & performance schedule general conditions of the contract.  
The contractor/s covenant/s and agree/s with the owner to truly observe perform fulfill & submit to the said terms obligations and conditions referred above. Incase the contractor fails to execute the work in the manner described in the condition of contract or stop the execution of work or fails to carry out the works to the satisfaction of the consultant with respect to quantity quality and time schedule or abandons the work or becomes bankrupt then the owner will have right to terminate the contract and get the remaining work executed at the risk and cost of the contractor. It is agreed that time is of the essence of this contract.
2. Incase the work is not completed in the manner mentioned above to the complete satisfaction of the owner in every respect within the aforesaid time limit of 10 months from the date stipulated in the work order the contractor/s agree/s to pay compensation of ½% of the value of the contract sum for each week of delay beyond the date stipulated for completion subject however to a maximum of 4% of the value of the contract sum. Incase the contract completes the work earlier than stipulated time he will be entitled to receive bonus at the rate of ½% of value of contract sum of each week of early completion.
3. In consideration of the satisfactory work executed by the contractor/s with the provisions as stated above the owner covenant/s with the contractor/s that it will pay to the contractor/s from time to time in accordance with the schedule bill of quantities and various terms/ conditions as contained in general conditions of the contract and special conditions of the contract, provided always that whether or not a work is satisfactory shall be decided by the consultant and its decision in this behalf shall be final and binding.
4. The rates for items whether termed as extra items or deviations or by whatever name called and which are not covered by the tendered rates will be worked out in accordance with clause 4.7 of the general conditions of the contract only.
5. Sales tax by whatever name and in whatever from it may be in all cases shall be

the contractor's /contractor's responsibility. Income tax work contract tax & taxes in pursuance of U.T. sales tax amendment and validation ordinances and or the Act thereof and or other amendments as may be made from time to time or taxes as results of subsequent orders/ ordinances/acts as issued by the state or central govt. from time to time shall be borne by the contractor/s.

6. The contractor shall abide by shall be responsible for all statutory provisions of the law such as labour laws & safety regulations etc.
7. This agreement further witnesseth that the contractor/s hereby covenant/s with the owner that in the event of the non-fulfillment in any respect by the contractor/s of the said covenant/s terms, agreements, obligations and conditions on the part of the contractor/s, the contractor shall pay on demand to the owner all losses, damages, costs, charges and expenses as the owner may be directly or indirectly put to in consequence of such non fulfillment of contract by the contractor/s.
8. In the event of any dispute arising out of or in connection with arbitration proceedings, or any proceedings being taken subsequent to the arbitration proceedings, it is further agreed that only the courts in Alappuzha, Kerala State shall have the sole jurisdiction in the matter.
9. The following documents are deemed to form part of the agreement, namely the tender, the price bill of quantities, the drawing issued for the work, schedule 'B' particular specifications, special conditions of the contract and general scope performance schedule conditions of the contract, all of which for the purpose of identification have been signed on behalf of the owner and by the contractor/s. The relevant ISI will also form part of this agreement. The letter of acceptance and their amendment etc. shall also form part of the agreement.

9.

The agreement further witnesseth that the contractors is are responsible for any accident or other compensations payable to the workmen employed by and working under the control of contractors, that the owner has no liability in the matter and that if any payment would have to be made by the owner, the same shall be re-imbursed by the contractors on demand and or recovered from the dues of the contractors. In witnesses whereof the said parties here to have here unto set their hands.

**For & On behalf of**

.....

.....

**Owner/Employer**

**SIGN OF THE CONTRACTOR**

\_\_\_\_\_

\_\_\_\_\_

**Date:-** \_\_\_\_\_

**Witnesses:-**

1) \_\_\_\_\_

2) \_\_\_\_\_

## PROJECT SITE RULES

### 1. GENERAL DEFINITION

Contractor: The Person or Party who has entered into a contractor for undertaking certain jobs or work as may have been specified in relation to the bounds of the project or in connection therewith & includes their sub-contractors, if any.

Engineer: The Construction Manager of the Project or his nominee.

### 2. GENERAL CONDITIONS

The Contractor shall start work on the site only after obtaining permission / clearance certificate from the Engineer.

The Engineer will issue a Clearance Certificate for all jobs, its duration & the specific precautions necessary will be made known to the Contractor. The Contractor shall comply with the Clearance Certificate & will signify his acceptance by signing the same.

He shall inform all the employees & sub-contractors, if any, regarding the content of the clearance Certificate, and ensure compliance.

### 3. LOCATION OF TEMPORARY SHEDS / STRUCTURE

No temporary shed / structure, as workshop or stores otherwise, shall be put up by the Contractor without obtaining permission from the Engineer regarding the location of the shed & the type of construction of the shed, and the purpose for which it is to be used.

### 4. EXCAVATION

No excavation shall be started without the written permission of the Engineer.

The contractor should check with Client / engineer on any information of running underground utilities if any & shall also explore for the same on his own so as to avoid any damage to the utility and mishap.

### 5. INSPECTION OF CONSTRUCTION PLANT

The Engineer shall have the right to inspect any construction plant & to forbid its use if, in his opinion, it is unsafe or dangerous to use, no claim arising therefrom shall be made by the Contractor. Any such rejected constructional plant shall be removed forthwith from the site by the Contractor if directed to do so by the Engineer.

#### Lifting Gear

- a. Lifting Machines, chains, ropes & lifting tackles used by the Contractor on site must conform to the following
- b. All parts must be of good construction, sound material & adequate strength & free from defects.
- c. Must be properly maintained, thoroughly examined & load tested and certified by the Contractor's competent person regularly. The same shall be submitted to the Engineer.

- d. No lifting machine & no chain, rope or lifting tackle should, except for the purpose of test, be loaded beyond safe working load, and this safe working load must be plainly marked on the gear concerned.

**6. WORK ON ROOFS**

The Contractor shall not have access to existing roofs, if any, without the written permission of the Engineer. Work on roof shall be carried out by observing necessary safety precaution including using safety belts & catwalks.

**7. SUSPENSION OF WORK**

If the Contractor is found by the Engineer / Owner not complying and / or persisting in non-compliance with safety requirements or with statutory obligations, the Engineer may suspend his work at any time by notice in writing, and the work shall not be resumed unless and until the Engineer shall have cancelled in writing his suspension order. The Engineer / Owner decision in this matter shall be final. No claims arising from such suspension shall be made by the Contractor.

**8. FIRE**

- a. The Contractor shall take every precaution and use all reasonable means to prevent an outbreak of fire and shall tender immediate assistance in case of fire.
- b. All inflammable & combustible materials shall be stored at site strictly as directed by the Engineer.
- c. No fires shall be lit nor welding done in respect of specified areas without the written permission of the Engineer.
- d. The Contractor shall report immediately to the Engineer any outbreak of fire in or near the Contract site after ensuring use of fire fighting equipment.
- e. Smoking on site is not permitted, but may be allowed in restricted areas as may be authorized by the Engineer.
- f. There should be reasonable number & appropriate types of, working / operable fire extinguishers available at the site.
- g. The contractors must have adequate number of fire fighting trained staff on site.

**9. ACCIDENTAL DROPPING OF MATERIAL**

- a. The Contractor shall take all reasonable steps to safeguard all persons and plant from the accidental dropping of tools or materials.
- b. No material shall be dropped deliberately from a height except with the permission of the Engineer, who will require the contractor to rail off the area and display suitable notices and post a man whose sole duty is to see that no person enters the danger areas.

**10. STAGING**

- a. Properly completed staging with safe means of access shall be provided by the contractor for all work that cannot be done from the ground or with other safe means of support.

- b. The Engineer shall have the right to reject any staging or scaffolding considered by him as unsafe and require the Contractor to effect necessary improvement before using such staging or scaffolding.
- c. No claim arising from the Engineer's rejection of any staging or scaffolding shall be made by the Contractor.

**11. SAFETY HELMETS, BELTS, SHOES & GOGGLES (Personal Protective Equipment)**

The Contractor must provide all his employees / workers working overhead or in other hazardous jobs, with safety belts, Safety helmets, goggles, safety shoes or other footwear as and when directed by the Engineer and ensure their regular use by their employees/ workers to prevent accidents. The safety belts and other equipment as stated above must be subject to inspection and approval by the Engineer.

**12. FIRST AID**

The Contractor must have arrangement for rendering necessary first-aid in case of accidental injuries. They must provide with first-aid boxes containing items as specified in the Factories Act and Rules framed there-under and keep them in a conspicuous place where it is easily accessible.

**13. REPORTING OF ACCIDENTS**

The Contractor shall report immediately to the Engineer any accident or dangerous occurrence involving his men or equipment.

**14. BARRIERS**

All construction areas in or near the existing plant, building access routes or thoroughfare, lift well entrance etc. shall be adequately protected with barriers.

**15. IONIC RADIATIONS**

The Contractor shall not consign or bring to the Site any radioactive substance, nor use thereon such substance, or any X-Ray apparatus until he has obtained written instructions with regard to such use from the Engineer.

**16. ELECTRICAL SAFETY CONDITION**

The Contractor shall appoint a competent person holding PWD Electrical Licence as Electrical Supervisor and this appointment is subject to the satisfaction of the Engineer. This supervisor will be responsible for the control of all maintenance and repairs to any electrical switchboard, distribution board, handtools etc., and no other unauthorized person must be allowed to touch these. All the electrical equipment must have appropriately rated plug pins, naked wire will not be allowed.

a) Supplies

If the Authorities supply electricity, it will be provided at a point, which would be determined by the Engineer. The supply would be at 380V, 50Hz, single phase or at

380V/ 60HZ, 50Hz three phase and the Engineer would decide which one of the two should be provided to Contractor. The provision of all connections and equipment required beyond this point shall be the responsibility of the Contractor and be in accordance with these Safety Conditions and comply strictly with the current Indian Electricity Rules.

b) Electrically operated Hand Tools

All electrically operated hand tools will be periodically inspected by the Contractor and properly earthing / Grounding prior to their use.

c) Fuses and Equipment belonging to the Project

In no circumstances shall be Contractor tamper with the fuses and electrical equipment belonging to the Project Authority.

d) Connections to project Authority's Power Sources (Not Applicable since the vendor is providing electricity, However, safety norms shall be followed)

Before the Contractor connects any electrical equipment to any power source belonging to the Project Authority he shall:

- Satisfy the Engineer that the equipment is in good condition.
- Inform the Engineer, in writing, of the maximum current required and the voltage and phase of the equipment.
- Obtain the written permission of the Engineer detailing the power sources to which the equipment may be connected.
- Satisfy the Engineer that the cabling to all equipment are of adequate sizes for the power required, have earth conductors in addition to metallic armouring overalls and fitted with suitable connections.
- Satisfy the Engineer that any electrical distribution system which he proposes to install and any electrical instrument he proposes to use, will not endanger persons or property.

e) Care of cable

No electric cable, which is used by the Project Authority, shall be disturbed without prior permission of the Engineer. No weight of any description shall be imposed on any such electric cable nor any staging, ladder or similar equipment shall rest against or be attached to it.

f) Drilling Holes etc

Contractors shall not drill or cut plant, structure or building floor for fixing Ocable racks etc., without the permission of the Engineer.

g) Road and Rail Crossing

While taking underground cables under roads and rail tracks already completed, the job shall be made complete the same day without leaving it to be followed up the next day. Exemption from such restriction shall only be allowed by the Engineer, in exceptional cases.

h) Danger Notice

While working or circuits having voltage over 380V suitable warning labels should be posted, such as "Danger-440V – Work in Progress" etc.

i) Care of equipment

No totally enclosed electrical equipment shall be left open or unsecured at the end of the day's work.

j) Work at Night

Contractor's employees will not be allowed to work on energized circuits at night unless special permission to the contrary has been obtained from the Engineer.

k) Electricity - "Power & water for erection & commissioning by OWNER as free issue".

**17. RULES FOR CONTRACTORS WORKING AT THIS SITE**

Observance of rules

The Contractor shall explain to each of his employees / sub-contractors, the Site Rules in a language understood by the employees. The Contractor shall be responsible for the compliance by his employees and those of his sub-contractors with the Site Rules and must ensure their compliance without fail.

**18. ACCESS TO SITE**

a) Control at Gates

Access to the Site shall be through specified gates only. All Contractor's employees shall be checked by watchmen engaged on behalf of the Project Authority and posted at the gates.

b) Identification of Contractors / Sub-Contractors and their employees

The Contractor shall arrange to issue a token to be specified by the engineer to each of his workers. The Contractor shall also issue an identification card with photograph affixed to each of his employees/ workers as per approved specimen. Access to the Site will be allowed only on production of the token and the identification card, as the case may be. The Contractor must ensure that their employees/ workers display the tokens on their person and carry their identity cards at all times at all times while in the Project Site.

c) Withdrawal of identification Cards

When a person ceases to be employed by the Contractor, or his entry into the site becomes forbidden, the Contractor shall withdraw the token and the identification card from such person and confirm to the Engineer his having done so far security reasons, so that the Engineer may in turn inform the Project Authority's security.

## **CONTRACTORS OBLIGATION UNDER STATUTORY LAWS**

### **1. COVERING EMPLOYMENT OF WORKERS**

- a) The Contractor shall comply with all applicable statutes, as applicable in respective countries, like :
  - Contractor Labour (Regulation and Abolition) Act, 1970
  - Employees' State Insurance Act, 1948
  - Employees' Provident Funds & Miscellaneous Provision Act, 1952
  - Factories Act, 1948
  - Payment of Wages Act, 1936
  - Minimum Wages Act, 1948
  - Workmen's Compensation Act, 1923
  - Such other regulations as may be applicable to their workers.
- b) The Contractor shall indemnify and keep the Owner indemnified against all claims, damages, losses and expenses that may arise on account of non-compliance of any of the aforesaid regulations.
- c) The Owner reserves the right to withhold payments to Contractor [including sub-contractor of Contractor] in the event of the Contractor [including sub-contractor of such Contractor] not complying with the provisions of any of the aforesaid regulations."
- d) Consistent with the requirement of Contract Labour (Regulation and Abolition) Act and Rules framed thereunder or otherwise when required by the Engineer, the Contractor shall deliver to the Engineer or at his office a Return or returns in such form/ forms and at such intervals as may be prescribed showing in detail the names of the individuals and the numbers of the several categories of labour engaged by the Contractor/ Sub-Contractor on the Project Site from time to time and such information in respect of the construction of the plant as the Engineer may require, besides statutory and other information as may be required from to time. In this connection the Contractor shall maintain such Register and issue such Employment Card and Service Certificate to its works, as also maintain such Muster Roll and Register of wages etc., in such forms as may be prescribed and required of him by law or otherwise by the Engineer.

### **2. HOURS OF WORK**

The Contractor must ensure that their employees conform to such timings (starting, finishing and meal breaks) as prescribed by law for time being in force and observe such norms and rules of discipline on Site as may be specified by the Engineer. While working outside the normal working hours prior written permission of the Engineer is required even though such working may be within the framework of law for the time being in force.

**3. STORAGE & CARE OF MATERIALS**

The Contractor shall store his plant and materials only in areas allowed to him by the Engineer.

The Contractor shall make no claim on PROJECT Authority for any loss or damage thereto caused by whatever source or reason.

The Contractor shall be responsible for keeping the site clear and tidy to the satisfaction of the Engineer. Pieces of wood, packing box, timber, shuttering planks, brickbats, excavation spoil, etc. will not be allowed to remain scattered on the site. Such and any other rubbish must be disposed of as they arise in manner as approved by the Engineer. In disposing of the waste, the Contractor shall comply with all applicable regulations at their own cost & all Owner/ Company identifiers shall be removed before the waste is to be transported to the disposal site.

**4. REMOVAL OF MATERIALS ETC. FROM SITE**

No plant, tools or materials, whether belonging to the Contractor or otherwise, shall be removed from the site unless a pass for it has been issued by the Engineer.

All material leaving the factory shall be subject to examination by security staff deployed on Project Authority's behalf, even if this necessitates unloading and re-loading, at Contractor's cost.

The Contractor shall not take away from the site any samples, plans or drawings which are the property of Project Authority

**5. PARKING OF VEHICLES**

The Contractor or his employees shall park their vehicles, including personal cars, only in areas allocated by the Engineer. Parking of vehicles at any other place shall not be permitted.

All the Trucks, trawlers shall have blocks to their wheels when parked.

**6. WASTAGE OF WATER**

If Project Authority provides water to the contractor, the Contractor shall ensure that no water is wasted in any manner. He shall use press-type taps, if the Engineer so directs, to prevent loss of water arising from his employees leaving the taps open.

**7. FEMALE WORKERS**

Contractor shall not engage under any circumstances a woman worker except between 6.00 am to 7.00 PM.

**8. EATING AT SITE**

The Contractors shall ensure that their employees take their food only at specified places to be notified by him. Eating on the job site shall not be permitted.

## **9. LIVING ON SITE**

Contractor's employees will not be allowed to live on the site. The overall security of the entire site will rest in Watch and Ward deployed on Project Authority's behalf and no employee of the Contractor shall be allowed to remain on site without the prior permission of the Engineer/Client.

## **10. INFECTIOUS DISEASE**

The Contractor shall report to the Engineer any cases of infectious disease amongst his employees and shall immediately remove such cases from the Site.

## **11. ACCIDENTS**

All accidents to Contractor's employees or to any other person in the project Site must be reported to the Engineer immediately by the Contractor. The Contractor shall be responsible for complying with all statutory requirements in case of any accident involving his employees.

## **12. RULES FOR CONTRACTOR'S EMPLOYEES**

### **a. Materials taken from the Site**

A Contractor's employee must not take any material out of the site, except with the written permission of the Engineer.

### **b. Searching by Security Staff deployed on Project Authority's behalf**

Members of the Security Staff at the gate and elsewhere have been authorised to search any person entering or leaving the site or during working hours, and also examine any vehicle, locker, bag, basket, can, parcel, or other container in the possession of any person on the Site.

### **c. Photographs**

Taking of photographs of anything in the Work Site is strictly prohibited. However photographs showing progress of works may be taken by Contractor unless noted otherwise with official permission in writing from site engineer.

### **d. Intoxicating liquor or Drugs and disorderly behaviour forbidden at the project site.**

Anybody observed under the influence of intoxicating liquor or drugs shall be refused admittance or may be ordered for eviction from site, and the Contractor shall ensure his removal.

### **e. Traffic Rules**

A Contractor's employee must, while on site, observe the ordinary rules of the road. These are the same as those in general use outside the site, including the use of lights at night. He must observe speed limits and traffic rules imposed inside the site. He must, when cycling, keep to the roadway. A bicycle shall not carry more than one person at a time.

## **13. PRIVATE TRADING**

A Contractor's employee must not conduct any form of private trading including money lending on the Site.

**14. GENERAL**

- a. Unless otherwise specified and agreed to in writing by the Engineer, all expenses etc., involved in observing the provisions/ conditions laid down in these Site Rules and/ or covered by statutory requirements, will be to the account of the Contractors and no reimbursement etc., will be made by the Project Authority.
- b. The Project Authority will fully stand indemnified against any statutory or other lapses on Contractor's part, claims arising from his employees, statutorily allowed interval after termination of the contract/ work.
- c. The Project Authority reserves the right to amend or delete any of the above clauses or add new clauses, as and when deemed necessary by them and these will be binding on the Contractor.

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## **TECHNICAL EVALUATION CRITERIA SHEET TECHNO-COMMERCIAL**

1. The Contractor / Firm should possess PF registration with Regional Provident Fund Commissioner in force.
2. The Contractor / Firm should have ESI registration with Regional Director ESI Corporation in force.
3. The Contractor / Firm should have previous experience in design, engineering, manufacturing, testing, commissioning and validation at site of modular pre-fabricated clean room HVAC systems for the similar applications.
4. The Contractor / Firm should have earlier experience for atleast 5 years in designing, manufacturing, installing and validating the Pharmaceutical formulation such as OSD, Parenteral, Oncology facilities etc., and they should have the facility for manufacturing HEPA Filters, Industrial Air Filters, Modular Clean Rooms, Cold Bridge Free Air Handling units, UDAFUs & RLAFUs, etc. The client or his authorized representative will visit such manufacturing facilities and will certify the authenticity. The Contractor should produce certificates / purchase orders to this effect along with the tender.
5. The Contractor / Firm should have executed similar jobs during the last 3 years with a Average turnover of Rs. 2.0crores. The relevant Assessment order / IT certificate should be attached.
6. The Contractor / Firm should have completed as a Prime Contractor at least one similar work of not less than Rs.80 Lakhs OR Two Similar Works of not less than Rs.60 Lakhs OR Three Similar Works not les than 40 Lakhs during the last Five years. The required proof purchase order shall be attached. The experience certificate and Statement showing the value of existing commitments and on-going works as well as stipulated period of completion, remaining for the each of the works listed shall be issued by the firm.
7. The Contractor / Firm should have the capability for validating the facility as per the USFDA / MHRA guidelines and should possess Own instruments like Particle Counter; DOP Photometer with Generator Velometer, Vibration Meter, LUX level Meter & Sound level Meter etc., The Contractor should have documentation ability as per DQ, IQ, OQ & PQ standards.
8. A Practicing Bio-technologist should head the Project Team on behalf of the Contractor if they are awarded with the Contract.
9. The Contractor / Firm should have adequate technical, quality control and quality assurance staff for executing the contract. They should provide the following data along with the tender.

<b>Sl.No.</b>	<b>Designation</b>	<b>Name of the Person</b>	<b>Total years of experience</b>	<b>Year of experience in current firm</b>
1	Head-Biotechnologist			
2	Vice President – Technical			
3	Project Manager – Technical			
4	QA Manager			
5	QC Manager			
6	Project Engineers – E & M			
7	Safety Engineer			
8	Site supervisor & Technicians			
9	Validation Engineers			
10	Documentation-Engineers			
11	Service Engineer			

10. The Contractor / Firm should submit the last 3 years Balance Sheet, Profit & Loss Account duly attested by the Chartered Accountant.





**TECHNICAL STAFF**

1. NUMBER OF QUALIFIED GRADUATE ENGINEERS
2. NUMBER OF QUALIFIED GRADUATE ENGINEER INTENDED TO BE POSTED ON THIS PROJECT
3. NUMBER OF QUALIFIED DIPLOMA ENGINEERS
4. NUMBER OF QUALIFIED DIPLOMA ENGINEERS INTENDED TO BE POSTED ON THIS PROJECT (FULL TIME)
5. NUMBER OF EXPERIENCED SUPERVISOR
6. NO. OF EXPERIENCED SUPERVISORS INTENDED TO BE POSTED ON THIS PROJECT.

.....  
**BIDDER'S SIGNATURE**  
(WITH STAMP AND SEAL)

**SKILLED, SEMI-SKILLED AND UN-SKILLED LABOUR**

Manpower for M/s..... site only to be deputed at site. Also specify qualification of skilled man power.

S. NO.	CATEGORY	NO. AVAILABLE	NO. INTENDED TO BE DEPLOYED IN THIS PROJECT
1.	Skilled		
2.	Semi Skilled		
3.	Un Skilled		

.....  
**BIDDER'S SIGNATURE**  
(WITH STAMP AND SEAL)

## DEFINITIONS OF TERMS IN CONTRACT

In this contract, the following words and expressions shall have the meanings as stated below :

1. **'OWNER'** shall mean M/s...Kerala State Drugs & Pharmaceuticals Ltd and shall include their successors and assigns, as well as their authorized representatives.
2. **'CONSULTANT'** shall mean and shall include their authorized representatives of the Engineering Consultants appointed by owner for the project.
3. **'ENGINEER-IN-CHARGE'** shall mean the engineer appointed by the owner to supervise all activities of the project.
4. **'TENDERER'**, shall mean the company / agency who quotes against the tender enquiry for undertaking the work.
5. **'CONTRACTOR'** shall mean the successful bidder whose tender has been accepted by the owner and to whom the order is placed by the Owner and shall include his heirs, legal representatives, successors etc..
6. **'PERMANENT WORKS'** shall mean all the works included in the schedule of quantities and shall include additions, alterations etc.. communicated in writing.
7. **'SITE'** shall mean the actual place, i.e. Alappuzha, Kerala where the project is to be executed.
8. **'PROJECT'** shall mean entire work specified in the contract documents inclusive of extra items / extra quantities (if any) executed during the contract period.
9. **'ACCEPTANCE LETTER'** shall mean written consent by a letter of owner to the tenderer intimating him that his tender has been accepted.
10. **'CONTRACT'** shall mean written the articles of Contract Agreement, the conditions of contract, schedule of quantities, specifications, drawings attached and duly signed by the Owner and the Contractor.
11. **'DATE OF CONTRACT'** shall mean the date on which the Owner has issued acceptance letter.
12. **'CONTRACT PERIOD'** shall mean the period (including rainy season) specified in the tender documents during which the contract shall be executed.
13. **'COMPLETION CERTIFICATE'** shall mean the certificate issued by the Owner to the contractor after successful completion of the project. This certificate will be issued on the basis of consultant's certificate to owner about the completion of job.
14. **'EXTRA ITEMS'** are those items which are not appearing in the B.O.Q. but are required to be executed during the project period and for which rates are to be derived as per the formula given in the conditions of contract.

## CONDITIONS OF CONTRACT

### 1.0 PROJECT INFORMATION

#### 1.1 General :

The detailed information of the project given below is as per our present requirement. However, it is not binding on the owner in any way and shall not govern the scope of works.

#### 1.2 Location of Site :

The project site is located at Kalavoor, Alappuzha, Kerala.

#### 1.3 Clearing of Site :

- a. After completion of the project, the contractor shall remove all the temporary structures constructed by him and clear the site as per instructions of the Consultant / Owner. In case, if the contractor fails to do so, the Owner has the right to remove the temporary structures and clear the site. The expenses incurred shall be recovered from the contractor from the payments due to him.
- b. The contractor has to remove all left over, excess, scrap material from the site and restore the site to fully clean condition as and when required. In case he fails to do so, the Owner reserves the right to remove such materials from the site and expenses incurred in this case shall be deducted from the payments due to the contractor. However, no claim for any loss of material in this case shall be acceptable.

### 2.0 COMMITMENT OF CONTRACTOR

#### 2.1 Interpretation of contract documents :

- 2.1.1 All the documents forming part of the contract are to be taken as mutually explanatory, supplementary and complementary to each other. If there is any error, omission or discrepancy in any of them, it shall be brought to the notice of the Owner / Consultant. The decision of the owner shall be final and binding. The contractor shall execute the work accordingly.
- 2.1.2 The contractor shall examine all the contract documents thoroughly including the scope, nature and magnitude of works he has to execute in accordance with the contract documents.
- 2.1.3 The contractor shall visit the project site so as to study the site conditions, means of access to the site and other factors governing the works.
- 2.1.4 There may be change in layout of site as per technical requirements and the tenderer shall not be entitled for any claim due to such changes.

2.2 Delay :

Delay in work execution due to reasons beyond Contractor control.

2.3 A Force majeure :

If the execution of work is delayed due to force majeure, then owner as per the affected period may extend the time period.

2.4 Time Schedule :

The successful tender shall submit time schedule within 7 days from the date of Letter Of Intent (L.O.I.) in the form of BAR/PERT charts before commencing the work and shall execute the work strictly as per the schedule submitted by him and approved by the Owner / Consultant.

The schedule of job is Mechanical completion in 20 weeks from the date of award of job and validation to 4 weeks after mechanical.

2.5 Compensation for delay :

Time is the essence of contract. If the contractor fails to complete the work and clear the site on or before the dates fixed for the completion, he shall without prejudice be liable to pay liquidation damage (LD), i.e. half percent of the contract value for every week that the whole or the part of work remains incomplete. For the purpose of this condition, the contract value shall be total value of quantities of items in the contract at contract rates plus algebraic sum of the subsequent work ordered. However, the total amount of LD to be paid under this condition shall not exceed five percent of the contract value.

2.6 Default of Contractor :

If the contractor fails to maintain progress and quality of work proportionate to time period allotted for the work inspite of notices or complete the work within stipulated time period or extended time period, the the Consultant/ Owner shall have the right :

- a. To determine the contract: In this event the contract shall be terminated by giving written notice to the contractor and the unfinished works shall be completed by labourers engaged by the owner or through other agency at the cost of the contractor.
- b. Without determining the contract : In this event, the remaining works shall be got executed through a fresh contractor in which case the contractor shall not have any objection or claim on this account.

- c. Before determining the contract : In this event, if the owner finds that the defaults of the contractor can be rectified, then an opportunity shall be given to the same contractor to rectify the defects / defaults in the specified time.
- d. Termination of contract for death : If the contractor is an individual of a proprietary firm and proprietor of the firm dies and if the contractor is an Attorney of partnership firm and dies, then the owner has the right to terminate the contract unless and until the owner is satisfied that the surviving partners are capable of executing and completing the remaining contract. In case of termination of contract, the legal representatives of the deceased contractor are not entitled for any compensation or claim. Also, the owner shall not levy any penalty against the damage caused by incomplete work.
- e. Termination of contractor in part or in full for contractors default. If the contractor fails to execute the work in the manner described in the contractor documents or if he at any time, in the opinion of the owner :
  - i. Fails to carry out the works in accordance with the contract conditions or as per the specifications mentioned in the documents.
  - ii. Stops the execution of works without giving prior information of the owner.
  - iii. Fails to carry out the works to the satisfaction of the owner / Consultant both with respect to qualities and time schedule.
  - iv. Fails to supply sufficient or suitable construction plant, materials and labourers etc.
  - v. Commits breach of any of the provisions of the contract.
  - vi. Abandons the work.
  - vii. Becomes bankrupt during the continuance of the work. Whenever the employer shall exercise his authority to cancel the contract under the above condition, the employer shall be at liberty to hold and retain in their hands materials, tackles machinery and stores of all kinds on site as they may think proper and may at any time sell any of the materials, tackle, machinery and stores and apply the proceeds of sale in or towards the satisfaction of any loss which may arise from the cancellation of contract as aforesaid. The employer shall also be at liberty to use materials, tackle machinery and other stores on the site of contractor, as they think proper in completing the work and the

contractor will be allowed the necessary credit. The value of materials and stores and amount of credit to be allowed for tackle and machinery belonging to contractor and used by the employer in completing the work shall be assessed by the consultant and amount assessed shall be final and binding on the contractor.

- viii. In case employer completes or decides to complete the work under the provision of this condition, the cost of completion to be taken into account in determining the excess cost to be charged to the contractor under the condition shall consist of the cost of materials purchased or required to be purchased, labour provided or required to be provided.

2.6 Variation in scope of work :

- a. Variation in quantity: The consultant / Owner have the right to increase or decrease the quantity of work or delete/add certain items of work. However such changes shall not entitle the contractor for any compensation, claim regarding the change in scope of work.
- b. Variation in drawings and specifications :
  - i. The variation in scope may be by way of changes in drawings regarding dimensions but specification remaining the same. In such a case, the contractor shall not be entitled for any claim due to change.
  - ii. In case of change of specification, the difference of amount (on either plus or minus side) shall be established on unit rate by owner in consultation with consultant and the same shall be acceptable to the contractor.
  - iii. For variation in quantities, unit rates as per tender for the item will apply

2.7 Staff and Workers

The contractor shall depute qualified engineers for execution of the project. The technical staff employed by the contractor shall be responsible for the quality and workmanship of the work as per the specification of the Consultant / Owner. The instructions given by the consultant or his authorized representative should be followed by the contractor's supervisory staff. If any of the contractor's staff members is incapable or in-experienced, in the opinion of the consultant/owner, then he should be removed immediately and contractor should do suitable substitution. Technical staff employed should be degree holder from a government recognized institution or equivalent with at least 3 years practical experience of work in addition to Diploma holder and other experienced supervisory staff.

If the workers or the supervising staff of the contractor are involved in riotous or illegal activities to such an extent that it becomes necessary to hand over the matter to the police then the contractor would be solely responsible for the case and all the expenses incurred in the legal proceedings shall be borne by the contractor.

2.8 Subletting of Contract : No subletting of contract is permitted

2.9 Co-operation with other agencies at site :

The contractor or his authorized representatives must work in close co-operation with the agencies executing other works forming the part of the project and also with the representatives of the Consultant/Owner for the execution of works which are not included in the contract. Contractor shall permit free access and generally afford reasonable facilities to other agencies or departmental workmen etc..

The contractor's quoted amount/ rate shall be deemed to cater for all the above contingencies and nothing extra shall be admissible on this account.

Contractor should keep his working site clean and the materials brought for work shall be kept in a properly stacked/stored way. The work site should be swiped at the end of each working day after removal of debris / left over materials. The contractor has to take full care so as not to spoil or damage other contractor's /owners job/material.

2.10 Safety of adjoining properties : The contractor or his authorized representatives should conduct all the operations necessary for the execution of works in such a manner that no inconvenience / damage is caused to the properties of other persons and owner.

2.11 Arbitration Act :

All disputes regarding the specifications, designs drawing instructions and quality of work or quality of materials used for the work or any other matter relating to the work shall be referred to the sole arbitration to be appointed by Owner.

The party invoking arbitration shall specify the dispute or disputes to be referred to arbitration under this, together with the amount or amounts claimed in respect of each such dispute.

The arbitrator may from time to time with consent of the parties extend the time, for making and publishing the award.

If possible, the work under the contract shall be continued during the arbitration proceedings and no payment due or payable to the contractor shall be with held on account of such proceedings.

The arbitrator shall be deemed to have entered on the reference on the date he issues notice to both the parties fixing the date of the first hearing. The arbitrator shall give a separate award in respect of each dispute of difference referred to him.

The venue of arbitration shall be Alappuzha, Kerala

The award of the Arbitrator shall be final, conclusive and binding on all parties relating to this contract.

The cost of arbitration shall be as decided by arbitrator.

2.12 Escalation

The rates quoted by the contractor in this contract documents shall be final and shall not be subjected to any change due to the increase in labour wages or inflation in the cost of materials or any other price variations due to any reason during the stipulated time period of the contract or during the extended time period of completion.

2.13 Insurance

The contractor shall at his own expense carry and maintain insurance with reputed insurance companies to the satisfaction of the owner as under :

a. Insurance of works :

The contractor shall take full responsibility for loss, damage and care of plant and works until it is delivered to site, constructed, erected, commissioned and taken over by the owner. Without limiting such responsibility, the contractor shall in the interest of the work insure the plant and work for their full value plus ten percent until they have been taken over. Such insurance shall cover the equipments and works against loss, damage or destruction by fire, earthquake, theft or any other cause, throughout the duration of the contract period or extended contract period.

b. Insurance of employees

The contractor shall accept full and exclusive liability for the compliance of all obligations and responsibilities imposed by the Employee State Insurance Act, 1948 and any liability or penalty which may be imposed by the Central, State or Local Authorities due to the reason of violation by the contractor or sub-contractor of the Employees State Insurance Act, 1948. the contractor shall agree to fulfill the requirement of the Employee State Insurance Corporation and maintain the declaration forms and all such forms which may be required in respect of the contractor's, sub-contractor's employees

who are employed in the work provided for or those covered by E.S.I.C. from time to time under the agreement. The owner shall retain such sum as may be necessary from the total contract value until the contractor shall furnish satisfactory proof that all contributions as required by the Employees State Insurance Act, 1948 have been paid by him.

c. Workmen's Compensation :

Insurance shall be effected for all the contractor's employees engaged for this contract. The contractor shall also carry and maintain all other insurance which may be required under the law or regulations from time to time. He should also carry and maintain any other insurance which may be required by the Owner.

d. Transit Insurance :

The cost of transit insurance relating to the items to be transported by the contractor to the site of work shall be borne by the contractor and the quoted price shall be inclusive of this cost.

e. Loss or damage and indemnity Agreement :

The contractor shall be responsible during the progress of work as well as maintenance period for any liability imposed by law for any damage to work or any part thereof or to any of the material or other things including those of owner used in performing the work or for injury to any person or persons for any property damaged in or outside the site. The contractor shall indemnify and hold the owner and the Engineer harmless against all liabilities, claims, loss or injury including costs, expenses and attorney's fees incurred in the defense of same, arising from any allegation whether groundless or not, of damage or injury to any person or property resulting from the performance of the work or work site or from any cause whatsoever during the progress and maintenance of the work.

f. Third Party Insurance :

Before commencing the execution of the works the Contractor, but without limiting his obligations and responsibilities, shall insure against his liability for any material or physical damage, loss or injury which may occur to any property, including that of the owner, or to any person, including any representative of the owner, by or arising out of the execution of works or in the work being carried out by the owner, by or arising out of the provision of clause. 2.14. hereof.

Such insurance shall be affected with an insurer and in terms approved by the Owner and for at least the amount stated in the Appendix of the tender.

Note: The contractors payment shall be cleared only after his compliance of all insurance formalities as given above. He shall have to deposit the photocopies of various policies and payment receipts with the owner's site engineer for this purpose.

**3.0 EXECUTION OF WORK :**

3.1 General :

All the works shall be executed in accordance with the detailed drawings, specifications, and instructions given by the consultant or mentioned in the contract document.

3.2 Drawings :

The drawings given in the tender document are as per the present requirement and are meant for the purpose of giving idea of the type and quantum of work to be executed.

All working drawings / Shop drawings prepared by contractor and approved by Consultant shall be marked "Release For Execution" and duly signed by the Consultant. All the old drawings shall be discarded and marked with "Superseded by Drg. No. ...."

If during the execution of the work, any discrepancy occurs in the drawings or between the drawings and specification then the same should be clarified from the Consultant prior to the execution of work. The decision given by the Consultant / Owner would be final.

3.3 Inspection Of Works :

- a. The Owner / Consultants shall have the full authority to inspect the works at any time, at any stage. The contractor shall provide adequate facilities to carry the inspection work. The contractor should be present himself or his authorized representative during the inspection so that the Consultant can convey the instruction regarding the works.
- b. The contractor shall give information to the consultant before covering up the works so that the same can be inspected and measured jointly & correctly to true dimensions.
- c. If the contractor fails to get the work inspected before covering it up, then the owner/consultant has full authority to get the work uncovered at the expenses of the contractor and if any fault is found then the same should be rectified by the contractor without claiming any extra payment.

3.4 Inadequate/substandard works and materials:-

- a. If any material brought by the contractor is found unsuitable or of sub-standard quality after testing, then the contractor shall remove those faulty materials immediately from the site as per the instructions of the consultant.
- b. If any work executed by the contractor is found to be of bad workmanship or not as per the drawings, then the same is to be dismantled and re-executed by the contractor without claiming any extra payment or extension in time period.

3.5 Default of contractor in compliance:- If the contractor or his authorised representative fails to follow the instructions given by the consultant/owner regarding any of the works, then the same shall be got executed by other persons employed by the owner and the expenses incurred shall be borne by the contractor.

3.6 Discrepancies between instructions:- If any discrepancy occurs between the various instructions conveyed to contractor or his authorised representative or if any misunderstanding arises between the contractor's staff and owner's staff, the contractor shall report the matter immediately to the consultant/ owner. The decisions of owner shall be final and binding. Moreover, no claims for losses due to discrepancies between instructions, doubts or misunderstandings shall be admissible.

- 3.7 Change in specifications and valuation of extra items:- If there is any variation in specification for any change in make of item, then it has got to be approved from the owner/consultant prior to installation or execution and the financial effect, plus or minus, or impact shall be incorporated accordingly by the owner/consultant. If any of the items to be executed is not included in the schedule of quantities, then the contractors shall submit the rate analysis of the item specifying the actual landed cost on basis of prevailing rates of material and labour and allowing 20% to cover overhead & profit. The rates of such items shall be recommended by the consultant and approved by the owner and shall be binding on the contractor.
- 3.8 Work not specified in the specification:- If, for any work, no specification has been given in the tender document, then the work will be executed as per the IS specifications, and if the work is not covered by IS specifications also, then it should be executed as per standard engineering practice, subject to approval of the consultant.
- 3.9 Testing:-  
The contractor shall agree for testing works as mentioned in the specifications of various items of works involved in the project.
- a. If the various tests prescribed in the specifications at specified intervals for ascertaining the quality of the work done prove unsatisfactory, the consultant/owner shall the authority to instruct the contractor to re-execute the work done or make alterations as per the orders of the owner/consultant.
  - b. The contractor shall furnish to the owner/consultant, for approval adequate samples of all materials to be used in the works free of cost. Such samples shall be submitted before the work is commenced, giving ample time to permit the tests.
  - c. All materials furnished in actual works shall be of the same quality of that of approved samples.
  - d. The testing of various materials to be used in works shall be tested in standard laboratories as directed by the owner/consultant and the expenses incurred shall be borne by the contractor.
- 3.10 Progress Report:- During execution of the contract, the contractor shall furnish fortnightly progress reports to the consultant and in the format as specified by the consultant indicating the progress achieved during the fortnight and the

total progress up to the fortnight as against scheduled and anticipated completion dates in respect of key phases of the work. The contractor shall also furnish any other information in order to ascertain progress, if called for by the consultant.

- 3.11 Liabilities for defects and rectifications:- If it shall appear to the owner/consultant that any work has been executed with imperfect or unskilled workman or with materials of any inferior description, or of quality inferior to that contracted for, or otherwise not in accordance with the contract, the contractor shall on demand in writing from the owner/consultant or his representative specifying the work, materials or articles complained of, notwithstanding that the same may have been inadvertently passed, certified and paid for, forthwith rectify or remove and reconstruct that work so specified and provide other proper and suitable materials or articles at his own charges and cost, and in the event of failure to do so within a period to be specified by the owner/consultant or his demand aforesaid, the owner/consultant may on expiry of notice period rectify or remove, re-execute the work at the risk of contractor and the cost shall be recovered from the contractor. The decision of the owner/consultant as to any question arising under this clause shall be final and conclusive.
- 3.12 Period of liability:- The liability period of the work shall be 12 months from the date of completion of the work as certified by the owner and this date will be as indicated in the provisional completion certificate. If any damage or defect occurs in the work during this period then the contractor shall rectify the damage or defect at his own expense to the satisfaction of the consultant/owner. If the contractor fails to do so, then the owner shall have the authority to get the work done by other means and the expenditure incurred shall be recovered from the contractor.
- 3.13 Suspension of work:- The contractor shall suspend the progress of work, on receipt of the written order from the owner / consultant for any of the following reasons: -
- a. On account of any default on the part of the contractor. In this case the contractor shall be entitled for the extension of time, but the contractor shall have no claim for payment of compensation for re-execution of faulty works.
  - b. For execution of the works for reasons other than the default of the contractor.

c. For safety of the works.

In case of suspension of work:- The contractor shall during such suspension, properly protect and secure the works carried out according to the instructions of the consultant.

If the suspension is ordered for the reasons 3.13 (b) and (c) as stated above, the contractor shall be entitled for extension of time equal to the period of every such suspension but no compensation for damages etc. shall be admissible on account of suspension of work.

3.14 Possession prior to completion:- The owner shall have authority to take possession of any completed or partially completed works. Such possession shall not be deemed to be acceptance of any work completed in accordance with the contract. If such prior possession delays the progress of works then the adjustment in the time of completion shall be done accordingly. The decision of the consultant / owner regarding the extent of delay shall be final and binding.

3.15 Care of works :

From the commencement to the completion of works, the contractor shall take full responsibility for the care of all works including all temporary works and in case any damage or loss occurs then the contractor shall at his own cost repair and make good the same so that on completion of the work, the same shall be in good order in every respect in accordance with the contract and to the satisfaction of the consultant/owner.

#### **4.0 CERTIFICATES AND PAYMENT TERMS**

4.1 Schedule of rates :

a. The payments to be made to the contractor for various items of works shall be as per the finalized rates in tender document and the rates of extra items finalized from time to time.

b. The rates finalized in the tender document shall remain firm till the completion of the work including extension of time, if any.

c. After the completion of work, the contractor will have to submit the clearance certificate for all statutory payments like royalties, octroi etc.

4.2 Measurement :

Joint measurements of the various items of the work shall be taken by the contractor's authorized representative in presence of the owner's and

consultant's authorized representative from time to time for maintaining the records and preparing the bills. If the contractor fails to send his representative then the measurements taken by the owner's and consultant's authorized representatives shall be final and no claim shall be entertained in this regard.

- 4.3 Mode of measurement : All measurement shall be in the metric system and in accordance with Indian standard specifications and in accordance with standard engineering practice. If the contractor has any objection regarding the measurements then he shall inform the owner/consultant immediately. The decision given by the owner/consultant shall be final and binding on the contractor. In case of mode of measurement of any items is not specified, then I.S.I mode of measurement (as applicable during contract period) shall be followed.
- 4.4 Billing :
- a. The running account bills to be submitted by the contractor should be of a minimum reasonable amount as decided by the Owner/consultant depending upon the quantity of work allotted. The bill should be in the proforma approved by the consultant/ owner giving abstract and detailed measurements of various items of works executed and material brought by the contractor for execution of work.
  - b. The billing shall be cumulative billing given details of previous bill amount advance paid & deducted, security deduction and clearly showing the amount due against the submitted bill.
- 4.5 Lumps sums in tender :For the items in tender where it includes lump sum in respect of parts of works, the contractor shall be entitled to payment in respect of the items at the same rates as are payable under this contract for such items. If in the opinion of the consultant, any part of the work is not susceptible to measurement, the consultant/owner may at their discretion pay the lumpsum amount for the work and the decision of the consultant/owner shall be final and binding on the contractor.
- 4.6 Running account payments to be regarded as advances : All running account payments shall be regarded as payments by way of advances against the final payment only and not as payment for work actually done and completed, and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be removed and taken away and reconstructed or re-erected or be

considered as an admission of the performance of the contract or nor shall it conclude, determine or affect in any way the powers of the owners under these conditions or any of them as to the final settlement of the accounts or otherwise, or in any other way vitiate or affect the contract. The final bill shall be submitted by the contractor within one month from the date of actual completion of the work, otherwise the consultant's and owner's certificate of the measurement and of the total amount payable for the work accordingly shall be final and binding on the contractor. The payment of final bill shall be done within three months after the submission of final bill by the contractor, including period of one month of clause no.5 (a) f terms of payment.

4.7 Payment of Contractor's bills:

- a. The payment due to the contractor shall be made only in Indian currency by crossed account payee cheques. In no case, will the owner be responsible if the cheque is misled or miss-appropriated by the contractor or his representatives. The cheque shall be released only against submission of duly signed and revenue stamped receipt.
- b. The owner reserves the right to carry out post payment audit and technical examination of the bills and work executed including all supporting voucher etc. The owner further reserves the right to enforce recovery of over-payment when detected. Similarly, if any under payment is discovered, the amount shall be paid to the contractor.
- c. Wherever any claim for payment against the contractor arises as per the contract, the same may be deducted from the bill of the contractor or from his security deposit.

4.8 Provisional completion certificate:- When the contractor successfully completes the works as per the contract, he shall be eligible to apply for provisional completion certificate in respect of the works. The owner shall issue to the contractor the provisional completion certificate after verifying from the completion documents submitted by the consultant and satisfying himself that the work has been completed in accordance with the construction drawings and the contract document. The contractor, after obtaining the provisional completion certificate, is eligible to present the final bill for the work executed by him under the terms of the contract. The work will not be considered as complete and taken over by the owner until all the temporary works, labour hutments etc. Are removed and the work site cleared to the satisfaction of the consultant.

If the contractor fails to comply with the requirements of the above on or before the date for the completion of the works, the owner may, at the expense of the contractor, remove the tools and plants and surplus materials and dispose off the same and the contractor shall pay the amount of all expense incurred.

**5.0 Terms of payment:-** The contractor shall submit running bills along with detailed measurement book as supporting documents to the Owner/consultant. The consultant after verification shall forward the bill for payment to the owner and the owner shall release the payment within 20 days from the date of receipt of verified bill from the consultant and retain 10% as Performance Guarantee from each bill. On completion of work the contractor shall submit the final bill with revised total measurement sheet, at one time and payment shall be released within one month from the date of receipt of verified final bill from the consultant after checking and necessary corrections and clarifications if any required.

**6.0 Labour laws and safety regulations:-**

**6.1 Labour Laws:-**

- a. Labour below the age of 18 years shall not be employed on the work.
- b. The contractor shall not pay less than what is specified by the law to labourers engaged by him on the work.
- c. The contractor shall, at his own expenses, comply with all labour laws and the owner shall not be responsible for any recovery/penalty imposed by the representative authorities for violating the labour laws.
- d. If the contractor is covered under the contract labour (Regulation & Abolition) Act, he shall obtain a license from the licensing authority (i.e. the Office of Labour Commissioner), by payment of the necessary prescribed fee and deposit, if any, before starting the work.
- e. The contractor shall furnish to the consultant/owner, the details of the workers employed on the works.
- f. The contractor shall comply with the provisions of the existing rules and regulations relating to labour laws.
- g. The consultant shall on a report having been made by an inspecting officer as defined in contract labour (Regulation and Abolition) Act, have the power to deduct from the amount due to the contractor any sum required or estimated to be required for making good the losses suffered by a worker or workers by reasons of non-fulfillment of the conditions of the contract for

h. the benefit of the workers, or if deductions made from his or their wages which are not justified by the terms of contract or non-observance of the said regulations.

6.2 Minor accident on duty:- For cases of minor accident on duty not covered under compensation by insurance, the contractor shall have to compensate the affected person by reimbursing this medical expenses against submission of actual expenditure document. The absence from duty, if takes places, due to such accident shall be considered as special leave and full payment shall have to be made for duration of such absence.

6.3 Provident Fund:- It shall be solely the contractor's responsibility to complete all provident fund formalities as per statutory regulations.

## **7.0 Safety Code :-**

7.1 Safety and protection:- The contract shall adhere to safe construction practice and guard against hazardous and unsafe working conditions. While carrying out the work, the contractor should provide for :

- a. Safety of personnel engaged in the construction.
- b. Protection and safety of works and materials during their progress.
- c. Sanitary and hygienic conditions of working and living for his workers, as required by the consultant.

7.2 Use of safety gadgets:- The contractor shall have to ensure availability and use of all desire safety gadgets like safety belts, helmets, goggles, hand gloves etc

7.3 Unsafe working condition:- If any activity is found to be progressing without proper and complete safety measures(including use of safety gadgets) being implemented, the contract may be asked to stop the work unless he fulfills the desired safety norms. Such delays shall not be allowed to be considered for extension in duration of the allotted time period.

7.4 First Aid :- The contractor shall provide first aid facilities for his employees and those of his sub-contractors. The requisite first aid box and medicines should always be available at work site.

- 7.5 Contractor's Barricades:- The contractor shall erect and maintain barricades required in connection with his operations to guard or protect:-
- a. Excavations
  - b. Hoisting areas
  - c. Areas adjudged hazardous by the contractor's or consultant's representatives.
  - d. Charged electrical panels.
  - e. Owner's existing property liable to get damaged by contract's operation.
- 7.6 Preservation of Peace :-  
The contractor shall take precautions to prevent any riotous or unlawful behavior by his workers, for the preservation of peace and protection of inhabitants and the security of property in the neighborhood of the work.
- 8.0 Details of work execution:-**
- a. The work shall be done in such a manner so as to clear work front availability for other agencies working at side.
  - b. Finish of work shall be as per drawings & details given by owner/consultant.
  - c. In general the complete work is to be done as Indian standard and esthetical norms as specified and detailed in tender.
- 9.0 Site :** The site is located at Alappuzha, Kerala---- The contractor shall be responsible for the movement of his men, material and equipment at no extra cost.
- 10.0 Electricity & Water :** Electricity & Water shall be free of cost at a single point only.
- 11.0 Contractor's scope of supply :** All material required for executing the jobs specified in the bill of quantities, inclusive of all tools, tackles, scaffolding, consumables & testing equipments shall be procured and supplied by the contractor at his own cost except for any items specified as owner supplied.
- 12.0 Recovery from the contractor:-**
- a. If the contractor or his employees damage or destroy property of the owner, then same shall be replaced /refunded by the contractor, otherwise the expenses may be recovered from his bill or security deposit.
  - b. All compensation & recoveries to be made as per terms of contract shall be deducted from the contractor's bill or security deposit.
  - c. Forfeiture of security deposit :- Whenever any claim against the contractor is to be recovered then the same may be made from the security deposit.

If the contractor abandons the work or leaves the work incomplete, then the owner/ consultant has the right to forfeit the security deposit.

**13.0 Special Instructions:-**

- a. All materials to be used in execution of project shall be first class quality, I.S.I. marked and shall be approved by owner/consultant before its application.
- b. The contractor shall be paying all testing charges required for testing of materials and samples as and when taken by owner /consultant. The contractor shall arrange necessary labour and transportation to facilitate testing of samples/ materials. Frequency of testing materials/ samples shall be as per related I.S. codes.
- c. The work should be carried out in truly professional manner, neatly finished with proper line, level and plumb. Cleanliness and finishing of the job is of utmost importance. Hence the job should be done most carefully with best workmanship. For all finishing jobs samples should be approved from the consultant before completely executing the work.
- d. The owner/consultant should be immediately informed for any discrepancy in drawings, specifications and instructions in the execution of job at site before actual execution of particular item having discrepancy.
- e. Any item found to be having been executed with poor workmanship or materials of inferior quality then the contractor shall have to rectify/ reconstruct the work as specified by owner/consultant. No extra charge will be admissible in such case. If contractor fails to do so, the owner/consultant reserved the right to rectify reconstruct the through some other agency at the expenses of contractor.
- f. The schedule of activities as submitted by the contractor shall have to be strictly adhered to. Regular progress reports shall have to be submitted by the contractor giving all details for monitoring of the schedule.
- g. The contractor shall take charge of site and if site clearance is involved, he

shall attend to it. (If such type of unforeseen and unavoidable situation occurs, in that case actual labour employed for such job shall be paid including overheads and profit).

- h. The work shall be carried out in a manner so, as not to damage the existing structure and the working should be such that there is minimum disturbance in the adjoining working area.
- i. Special care is to be taken for cleanliness of the site. After the end of day's work the site should be cleaned immediately.
- j. The materials to be used for work are to be stacked at location as shown by the site engineer. For handling of materials, temporary scaffolding may be constructed (if required)
- k. The contractor shall have to co-operate with the agencies executing other work in the same area.
- l. While executing the work, the contractor shall ensure safety and security of the property of the owner so as to avoid theft etc.

.....



Maximum fresh air inlet velocity	: 244 M/min.
Maximum supply air, main duct velocity	: 480 M/min.
Maximum supply air, branch duct velocity	: 360 M/min.
Maximum return air, main duct velocity	: 360 M/min.
Maximum friction	: 0.1 M/meter of duct length

d. PIPING DESIGN

Maximum flow velocity	: 2.5 M/sec
Maximum friction	: 4.0M / 100 meter

e. Filters :

Room Terminal absolute filters (HEPA)	: 1.06 m/sec. $\pm$ 20%
Microvee filters	: 2.12 m/sec. $\pm$ 20%

f. The Ventilation System :

Details of spaces covered under ventilation system shall be as given in Design qualification chart and as shown on the drawing.

**INFORMATION  
TO BE PROVIDED BY THE TENDERER  
ALONG WITH THE TENDER**

**Double Skin Air Handling Units: (Tender to provide following data for each AHU separately.)**

**A.**

1. Manufacturer
2. Model No.
3. Type of Unit Horizontal/Vertical
4. Overall dimension mm. ..... mm
5. Operating weight ..... Kgs.
6. Material of construction
7. Thickness (external sheet)
8. Thickness (internal sheet)
9. Insulation material
10. Insulation thickness

**B. Fan Section**

1. Type of Fan
2. No. of fans
3. Air quantity : CFM ..... cfm
4. Total static pressure .....mmwc
5. Fan outlet velocity .....m/sec.
6. Fan speed .....RPM
7. Fan motor .....HP
8. Fan dia ..... mm
9. Balancing (static and/or dynamic)
10. Material of Construction

**C. Cooling Coil**

1. Total heat cap. TR
2. Air quantity through coil CFM
3. Water quantity through coil USGPM
4. Tube material
5. Tube O.D.

6. Tube thickness
7. Fin material
8. Fin thickness
9. No. of fins/inch
10. Entering water temperature
11. Leaving water temperature
12. Entering air temperature.DB.
13. Entering air temperature.WB.
14. Leaving air temperature. DB
15. Leaving air temperature.WB
16. Apparatus Dew Point
17. Bypass factor
18. Face area Sq.Ft.
19. No. of rows deep
20. Type of control
21. Inlet/outlet size & end connection
22. Drain sizes & end connection
23. Air side pressure drop
24. Water side pressure drop

**D. Filter Section (Prefilter)**

1. Manufacturer
2. Type
3. Gross Filter area ..... Sq.ft.
4. Thickness ..... mm
5. Initial pressure drop ..... mmwc
6. Maximum pressure drop
7. Efficiency %
8. Velocity through filter ..... fpm
9. Filter media
10. Frame work material

**E. Microvee Filters**

1. Manufacturer
2. Type

- 3. Gross filter area .....Sq.ft.
- 4 Thickness ..... mm
- 5. Initial pressure drop ..... mmwc
- 6. Maximum pressure drop
- 7. Efficiency %
- 8. Velocity through filter ..... fpm
- 9. Filter media
- 10. Frame work material

**F. HEPA Filters**

- 1. Manufacurer
- 2. Gross filter area .....Sq.ft.
- 3 Thickness ..... mm
- 4. Initial pressure drop ..... mmwc
- 5. Maximum pressure drop
- 6. Efficiency %
- 7. Velocity through filter ..... fpm
- 8. Filter media
- 9. Frame work material

**G. Electric Motor**

- 1. Manufacturer / Type
- 2. Rated output HP
- 3. Range of working voltage
- 4. Rated speed RPM
- 5. Full load current amps
- 6. Class of insulation
- 7. Temperature rise
- 8. Degree of protection

**II. DUCTING, MODULES, DIFFUSERS,  
GRILLS & INSTALLATION**

**A) Ducting**

- 1. Material of construction
- 2. Thickness
- 3 Pre – Fabricated. Yes / No
- 4. Ducting Flanges out of Painted angle as Yes / No

Per Table – 1 – Section IV-C

(Sheet No- 5 Of 9)

**B) INSULATION**

1. Material
2. Thickness
3. Density
4. Manufacturer

**C) SUPPLY/RETURN AIR MODULES**

1. Material
2. Thickness
3. Size

**D) RETURN AIR RISER**

1. Material
2. Thickness
3. Size

**E) SUPPLY/RETURN AIR RISERS**

1. Type
2. Material
3. Size
4. Face Velocities
5. Grills

**F)** Written confirmation that the achievement of temperature, RH, requisite no. of air changes per hour, specified pressure gradient, air flow pattern as per the intent of specification.

**G) DEHUMIDIFIER**

1. Make
2. Model.No.
3. Dehumidifier capacity(CFM)
4. Dehumidifier flow diagram

**NOTE**

**Technical catalogues and performance tables/curves for all equipment's and machines must be submitted with the offer.**

## **INFORMATION TO BE PROVIDED AFTER AWARD OF CONTRACT FOR APPROVAL**

- a) List of Drawings and Documents to be submitted for review, approval and information shall be listed by BIDDER in his offer. The minimum requirements are indicated below.
- b) Dimensioned general arrangement drawing of AHU showing all equipment with accessories, mounting details, blower details, cooling coil details, filter details, damper details, nozzle locations, etc.
- c) Dimensional general arrangement drawings showing filter assembly, mounting details, materials and construction details, etc.
- d) Dimensioned duct layout drawing showing all risers modules, diffusers, grilles, dampers, fire dampers, flexible connections, plenums, access doors and all other accessories.
- e) Dimensional G.A. Drawing of cooling towers with foundation details & data sheet for approval.
- f) Dimensional & foundation detail of all pumps including the performance curves with operational logic write-up for approval.
- g) Operation and Maintenance Manual.
- h) Design Qualification (DQ)/Inspection Qualification (IQ)/Performance Qualification (PQ)/Operation Qualification (OQ) as per the system requirement of M/s. Knack Technocrats and to the satisfaction of Owner/Consultant.
- i) All electrical wiring diagrams for all equipment supplied by Vendor shall be furnished to Owner in order to facilitate the Owner to provide electrical works accordingly.
- j) Heat load calculations with TR summary, chilled water & Hot water flow rate calculations & Room Data Sheet for approval of consultant.

## SPECIFICATIONS

### AIR HANDLING UNIT

<b>Sr. No.</b>	<b>Item description</b>	<b>Recommended specification</b>
1.	Make of AHU	.....
2.	Material and thickness of outer skin	0.6mm PVC sheet pre-painted GSS
3.	Material and thickness of inner skin	0.6mm PVC sheet plain GSS
4.	Panel thickness approx.	43 ± 2mm for air treatment units
5.	Material of frame	Self supporting extruded aluminum with Thermal break for air treatment unit and standard profile
6.	Insulation material	Injected HFC and CFC free PUF 38 kg/cum density
7.	Drain Tray	Stainless steel externally insulated with 12mm thick closed cell polyethylene
8.	Type of fan	Backward curved centrifugal fans (AMCA certified)
9.	Type of drive	V-belt driven
10.	Make of fan	Nicotra/Kruger
11.	Motor	TEFC squirrel cage induction motor
12.	Coil Fin material	Aluminum
13.	Coil Fin Spacing	12 fpi to 13 fpi
14.	Coil Tube material	Copper
15.	Coil Tube diameter	12.5mm
16.	Row deep	CHW-6 row deep and 2 row deep HW coil.
17.	Nature of bonding	Mechanical
18.	Mixing Chamber	Mixing box with FA and RA opening fitted with Aerofoil blade VCD in GI construction
19.	Pre filter / Fine filter section	Pre filter G4 class / F7 class fine filter
20.	Coil sections	a. Chilled water coil with copper header b. Hot water coil with copper headers. c. Bypass damper above coil for min 20% air bypass.
21.	Mixing section	Mixing section for RA and treated air with aerofoil blade VCD.
22.	Fan section	Belt driven
23.	Control Panel	Microprocessor based control panel
24.	VFD panel	VFD panel along with bypass starter arrangement.
25.	Dampers	SA, FA and fire dampers with actuator
26.	Chilled water in / out	6-7°C / 10-12°C

General Description of Air Handling Unit :

The scope of this article comprises of the design, manufacture, testing at manufacturer's works, in installation, testing and commissioning of Air Handling units. The schedule of equipment, packaged modular **Air Handling Units of Horizontal or Double Decker Type** as required, each capable of the duty as specified in the schedule of equipment.

Codes and Standards :

The design, manufacture, inspection testing of AHU shall comply with all currently applicable statutes, regulation and safety codes in the locality where AHUs to be installed. The equipment shall also conform to the latest applicable Indian / International Standards. Nothing in this specification shall be construed to relieve the contractor of his responsibility.

Type :

- The air handling unit shall be in double skin construction with 50 mm/43mm thick PUF insulation and thermal break profile comprising of various sections described below sequentially in the direction of air flow.
- Mixing section with manual, extruded aluminum, aerofoil return air and fresh air dampers.
- Pre filter section suitable for flanged G4 filters.
- Coil section with SS 304 insulated condensate tray, condensate drain connection complete with necessary chilled water cooling and hot water heating coils.
- Fan section with belt driven centrifugal, DIDW backward curved fans complete with fan motor base frame, slide rail for motor, belt drive arrangement and diffuser plate at fan outlet.
- Fine filter section suitable for flanged F7 filters.
- Discharge plenum with manual, extruded aluminum, aerofoil dampers at supply air outlet.
- All dampers should be suitable for motorized operation and should have modulating arrangement for modulating motor.
- Wing nut should be used for fixing of filters.
- Capacity :
- The air handling capacities, static pressure, cooling and heating capacities shall be as indicated in the enclosed AHU summary.

Housing / Casing Construction :

The unit casing construction shall have double skin to allow access without damaging the installation. The frame work shall be of extruded aluminum hollow sections. The frame shall be assembled using pressure die cast aluminum joints to make a sturdy, strong and self supporting frame work for various sections. The whole unit shall comprise of galvanized sheet double skin casing with 43mm thick PUF insulation with Aluminum extruded frame work with thermal break profile.

Double skin panels shall be 43mm thick fabricated out of best quality pre-plasticized GSS on outer side and plain galvanized sheet on inner side with PUF insulation injected in between. Polyurethane foam of density not less than 38 kg/m<sup>3</sup> shall be sandwich between inner and outer sheet. The panels shall be fixed on Aluminum extruded section in such a manner that fixing screw head does not project on outer face on the panel and sharp end of the screw does not project inside the unit through double walled rib. The screw hole on panel will be blocked with nylon sleeve with cap. The screw cavity on panel will be blocked with nylon sleeve with cap.

Drain tray will be fabricated out of 18G stainless steel sheet with necessary slope to facilitate fast removal of condensate. The tray shall have sufficient depth and proper size drain connection. The tray will be insulated from outside with nitrile rubber foam sheet having thickness not less than 20mm. Gasket sleeves at coil header outlet shall be provided to avoid any obstruction when pulling the coil at the time of removal.

Motor and Drive :

Fan motors shall be 415 +/- voltage, 50 cycles, 3 phase squirrel cage, totally enclosed fan cooled with IP-54 protection. Motor shall be specially designed for quite operation.

Drive to fan shall be provided through belt driven arrangement. Belt shall be of the oil-resistant type. AHUs serving flame proof areas will have flame proof motors.

Fan :

The fan shall be backward curved, double inlet double width type. The wheel and housing shall be fabricated from heavy gauge galvanized steel. The fan impeller shall be mounted on a solid shaft supporting to its scroll on angle iron flame and pillow block heavy duty ball bearings.

The impeller and fan shaft shall be statically and dynamically balanced. The fan outlet velocity shall not be more than 660m/min. Fan housing with motor shall be mounted on a common steel base mounted inside the air handling unit housing on anti vibration springs, mounts or cushy foot mounts.

Blower section will consists of extruded sections of proper size to facilitate the mounting of fan and motor bracket. Direct contact of fan base frame and AHU casing will be eliminated through vibration isolator. Also flexible connection will be provided at the fan outlet. Suitable panel of blower section will be provided with hole for cable entry with required arrangement to cover the sharp edge GI sheet. If required, a proper size box cover will be provided on cable entry location. A provision for earthing will be provided on main frame near the cable entry hole.

Cooling / Heating Coils :

Chilled / Hot water coils shall have 12.5mm to 15mm dia tubes minimum 24G thick with aluminum fins firmly bonded to copper tubes assembled in zinc coated steel frame. Face and surface areas should ensure rated capacity from each unit and be such that air velocity across each coil shall not exceed 3m/s. The coil shall be pitched in the unit casing for proper drainage. Each unit shall be factory tested at 21kg/sq.m. air pressure under water. Tube shall be hydraulically / mechanically expanded for minimum thermal contact resistance with fins. Fin spacing shall be 11 to 13 fins per inch (4 to 5 fins per cm). The coil shall be sized for full airflow capacity of the Air Handling Unit.

Filters :

Each unit shall be provided with a filter section shall have rigid construction filter frame fabricated out of GI sheet to house required size filters.

Filter section suitable for flanged, panel type G4 filters and flanged type, F7 filters. Filter face velocity shall not exceed 2.5m/s per minute. Perpendicularity of the filter frame must be maintained within a tolerance of  $\pm 1.5$ mm.

Accessories :

Each Air Handling Unit shall be provided with automatic air vent at the highest point in the cooling/heating coil and drain plug in bottom of the coil.

Inspection doors at required location will be provided with elegant design hinges made out die cast Aluminum alloy. Two or more number of hinges per door will be provided depending upon the size of the door to provide required rigidity to the door panel. One or more number of door handles will be provided with cam type tightening arrangement. The handle and can will be made out of files nylon having galvanized iron spindle. The inspection door for blower section will be provided at such a location that the motor and drive package and fan bearing can be assessed for easy maintenance. An additional guard made out of GI wire mesh of required strength will be provided at inner side of blower section inspection door. The inspection doors of the sections accommodating filters will be of sufficient size to take care of filter removal. Double inspection door should be as per pressure gradient to avoid air leakage.

The entire AHU assembly will be mounted Necessary arrangement with required plastic / nylon fittings / provision for probes will be provided at required locations to facilitate the mounting of temperature, humidity and pressure sensors as per the requirement of Control Scheme.

Properly designed nipples will be provided at required locations to facilitate the connection of manometer tubes / pressure transmitter on a common skid fabricated out of HDG MS channel of required size. The skid will be secured with AHU frame structure through threaded fasteners. The skid will be duly painted after fabrication with the best quality rust preventive primer followed by two coats of enamel paint.

All nuts, bolts, sheet metal screws, fasteners will be Zinc/Nickel – plated having resistance against rusting. Each air handling unit shall be installed on Neoprene rubber pads or isolation springs

Safety Features :

Each air handling unit shall have safety features as under :

The fan access door shall be equipped with micro switch interlocked with fan motor to enable switching off the fan motor automatically in the event of door opening.

Fan and motor base shall have proper provision for earthing from the factory.

All screws used for panel fixing and projecting inside the unit shall be covered with PVC caps to avoid human injury.

Fusible link type fire dampers in return ducts.

Performance Data :

Air Handling units shall be selected for the lowest operating noise level of the equipment. Fan performance rating and power consumption data with operating points clearly indicated shall be submitted and verified at the time of testing and commissioning of the installation.

Testing :

Cooling / Heating capacity of the various air handling unit models shall be computed from the measurement of air flow and dry and wet bulb temperatures of air entering and leaving the coil. Flow measurements shall be by an Anemometer and thermometers. Computed results shall conform to these specified capacities and quoted ratings. Power consumption shall be computed from measurements of incoming voltage and input current.

Painting :

Air Handling Unit shall be factory painted. Factory paint that has become marred during shipment or erection shall be cleaned with mineral spirits, wire brushed and spot primed over the affected areas, then coated with paint to match the finish over adjoining shop painted surface.

**SINGLE SKIN AIR HANDLING UNIT FOR VENTILATION SYSTEM**

Air handling units shall be sectionalized construction consisting of fan section, filter section as required. Casing of all the sections shall be constructed of best quality 16G powder coated / pre-painted GP sheet.

Fan Section :

Fan section with belt driven centrifugal, DIDW backward / forward curved fans complete with fan motor base frame, slide rail for motor and belt drive arrangement. This shall also be complete with manual aluminum extruded aerofoil dampers at the fan outlet. For fans with static less than 50mmwg, forward curved fans may be used.

Access Door :

The air handling unit shall be with facility of access door of sufficient size.

Accessories :

The air handling units shall be complete with all accessories.

Air Filters :

General: This specification covers design, manufacture, constructional features, installation, testing and commissioning at site of Air filters.

Filters cells shall be of standard sizes and shall be obtainable from a number of manufacturers. The filters shall be sealed against the filter frame using a permanently elastic gasket to a standard compatible with the filter efficiency.

The filter material shall be pleated to provide a large effective area and shall be supported by a rod and frame in case of Pre and Fine filters.

The filter material shall be pleated to provide a large effective area and shall be supported by aluminium foil separators and frame in case of Final (HEPA) filters.

Codes and Standards :

The design, manufacture, installation, inspection and testing of Air filters shall comply with all currently applicable statutes, regulation and safety codes in the locality where the air filters are to be installed. The equipment shall also conform to the requirement of the latest applicable Indian / International standard. In particular, the equipment shall conform to the latest edition of the following standards.

EN 779	: Manufacturing and Testing of Pre and Fine filters
EN 1822	: Manufacturing and Testing of HEPA and ULPA filters
IEST-RP-CC-006	: Procedure for Filter Installation leak test using cold DOP.
ISO 14644	: Standard for the filter Integrity test

In case of any conflict in the standard and this specification, the decision of the employer shall be final and binding.

**Design and Constructional Requirements :**

PREFILTER(G4) :

Filter medium is washable synthetic fiber media and it is pleated onto the rods which are placed at specific distance inside the filter frame work. The media and the frame work are sealed with poly urethane sealant or equivalent. Filter frame work shall be in Aluminium construction.

The depth of the filter medium is decided based on the designed airflow and the pressure drop across the filter.

The efficiency and pressure drop of the pre filters shall be as follows :

- Efficiency : The average arresance of > 90% when tested in accordance with EN 779.
- Initial Pressure Drop : Not to exceed 5 mmwc at rated flow under test bed conditions.
- Final Pressure Drop : Upto 15 mmwc at rated flow under test bed conditions.
- FINE FILTER (F7) : Upto 10 mmwc at rated flow under test bed conditions.

Filter medium is washable synthetic fiber media and it is pleated onto the rods which are placed at distance inside the filter frame work. The media and the frame work are sealed with poly urethane sealant or equivalent. Filter frame work shall be in Aluminium construction.

The depth of the filter medium is decided based on the designed airflow and the pressure drop across the filter.

The efficiency and pressure drop of the FINE filters shall be as follows :

- Efficiency : Average efficiency of 80% - 90% when tested in accordance with EN 779
- Initial Pressure Drop : Not to exceed 10 mmwc at rated flow under test bed conditions.
- Final Pressure Drop : Upto 25 mmwc at rated flow under test bed conditions.
- HEPA FILTER (H-13) : Upto 25 mmwc at rated flow under test bed conditions.

### **HEPA Filters & HEPA Filter Boxes**

#### **HEPA Filters:**

HEPA filter in aluminium construction having efficiency as specified in the individual air flow diagrams / Bill of Quantity, down to 0.3 microns (test at the factory as per US FED 209 E), having a filter media of sub micronic glass fibre filter paper.

Filters shall be supplied to site in sealed enclosures with all relevant details provided on the external surface of the enclosure. Filter elements shall not be removed from the sealed packing until all of the ductwork is complete, cleaned, pressure tested and decontaminated.

**HEPA Filter Box / Housing :**

Slab type HEPA Filter Housing – Service floor serviceable.

HEPA filter shall be housed in terminal filter housing constructed in 16G / 18G G.I having a powder coated / epoxy paint finish. These boxes will be equipped with pressure cleats, mounting bolts, filter tightening bolts and provision for fitting perforated diffusion screen. HEPA Filter frame shall be provided with suitable handles for locating inside the housing. The housing shall be suitable for loading / unloading standard box type HEPA filter from service floor area. The slab type housing shall be in 2 parts, viz., filter housing & filter release module. The module shall have parts for air sampling/upstream/downstream pressure measurement and DOP concentration measurement. The filter housing shall be grouted in the slab. The release module shall be complete with manual volume control damper and connected to housing on one side and air ducting on the other side.

**HEPA filter housing - Room side serviceable:** The HEPA housing shall be suitable for loading / unloading of Box type HEPA filter from clean room side. The housing shall be complete with manual / gear type volume control damper operated from the room side and also with differential pressure measurement / upstream DOP measurement port. The housing shall be suitable for fixing Aluminium / S.S perforated grille as specified in the Bill of Quantity.

All terminal HEPA filters should be ducted individually to supply air duct. The filters should be provided with DOP test ports and volume control dampers. All gaps in ceiling should be thoroughly sealed with pharmaceutical grade RTV caulking and entire ceiling should be tested for leaks.

The efficiency and pressure drop of the HEPA filters shall be as follows :

Efficiency : 99.97% down to 0.3micron when tested in accordance with EN 1822.

Initial Pressure Drop : Not to exceed 25 mmwc at rated flow

Final Pressure Drop : Upto 40 mmwc at rated flow

Inspection and Testing : Upto 40 mmwc at rated flow

All pre/final filters shall be tested for type and routine test as per the requirement of EN 779 & EN 1822.

All Hepa filters shall be tested for the following :

- a. Pressure drop vs flow rate
- b. Cold DOP scanning leak test.

Individual test certificates must be provided for all HEPA filters. Type test certificates for all other filters must be submitted.

#### Filter Face Velocity

For 50mm thick Pre Filters, maximum face velocity shall be 1.25 m/s.

For fine filters, maximum face velocity shall be 2.5 m/s.

For 150mm thick HEPA filters, maximum velocity shall be 1.25m/s, while that for 300mm thick shall be 2.5 m/s.

However for separator less minipleat type HEPA filters lower thickness and / or higher velocities may be provided based on manufacturer's recommendation, supported by performance curves and test results.

#### Inline Fans :

Inline fans shall be complete with centrifugal impeller, casing, direct driven motor, vibration isolators. Direction of discharge and rotation position shall be as per the job requirement and shall be marked on the fan assembly.

Housing shall be constructed of hot rolled GSS sheet metal construction. Housing metal parts shall be either spot-welded or screwed or mounted together with rivets. Indication showing rotation arrow and make, model number and duty conditions of the fan shall be available on the housing.

Fan Wheel shall be forward / backward curved type, fan wheel shall be statically and dynamically balanced.

Ball bearings are completely maintenance free and can be used in any mounting position, at maximum indicated temperature. The bearing lubricant is suitable for a minimum ambient temperature of minus 15<sup>o</sup>C (admissible for a short time without reaching dew point at -30<sup>o</sup>C) For applications at maximum indicated ambient temperature life expectancy 10 is 40,000 hours maximum.

Drive of fan shall be direct driven.

Painting : Complete fan assembly and other steel components shall be either GSS or epoxy painted.

Exhaust Fan : Exhaust fan will be heavy duty industrial type, suitable for single/three phase power supply and continuous operation with epoxy painting and direct driven motor unless specified otherwise.

All exhaust fans and roof extractor shall provide with cowl bend, in take louvers, bird screen etc.

The exhaust fan, cowl, bend, take louvers, bird screen etc. shall be measured as on under exhaust fan / roof extractor.

## **DUCTING**

### **Scope**

This specification covers the general design, materials, construction features, manufacture, testing, delivery, installation, testing, commissioning and carrying out performance test at site of Air Distribution System and its components.

### **Code and Standards**

The design, manufacture and performance of ducting, dampers & grilles shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be installed. The equipment shall also conform to the following latest Standards. Nothing in this specification shall be construed to relieve Vendor of his responsibility.

IS:277	Galvanised Steel Sheets
IS:655	Metal Air Ducts
IS:737	Wrought Aluminium and Aluminium Alloy Sheet and Strip for General Engineering Purposes.
SMACNA	HVAC Duct Construction Standards, Air Duct Leakage Test Manual, Testing Adjusting & Balancing.
ASHRAE 70	Method of Testing for Rating the performance of air Outlets and Inlets.

All sheet metal ducting work for various air systems shall be supplied, installed, completely connected, tested and adjusted. All main ducting shall be factory fabricated and only assembled at site. All ducting shall be

provided with M.S duly painted angle frames only. The Contractor shall arrange at site all necessary equipments like lock forming machine, drilling machine, welding machines, etc for carrying out duct fabrication of site adjustment ducting, minor branching, collar connection pieces etc.,

The Contractor shall make working drawings of all duct work and the same shall include details of all fittings, dampers, elbows, grilles, return air risers, etc. required for the proper operation of the system.

All diffusers, duct lengths, grille necks / boxes must be kept duly covered during construction to keep out dust and rubbish.

All ducting flanges shall be out of M.S angles and duly nut bolted with gaskets. The nut bolting shall be within the maximum spacing of 150 mm. All duct angle flanges and duct supports shall be epoxy painted by VENDOR.

### **Construction Features**

All duct work shall be fabricated from good quality prime finish galvanized steel sheets conforming to IS:277, Duct sheets used shall be minimum 120 GSM Zinc coated. All duct work shall be fabricated in accordance with the standards described in the latest duct construction standards as per IS:655 and also to conform to GMP for clean room industry.

All ducts above 1500 mm shall be cross-broken.

Longitudinal seams shall be Pittsburgh lock type at corners. All ducting shall be built with approved joints and seams shall be made smooth on the inside and neat on the outside. The duct joints shall be made as air tight as possible. The laps shall be made in the direction of air flow and no flange shall project inside the ducting.

Flanges used for transverse joint shall be joined with each other with galvanized steel bolts, washers and nuts. Bolts shall be of minimum M8 size and spacing between bolts shall be maximum 150 mm. Neoprene/equivalent gaskets of 5 mm thickness shall be installed between duct flanges and for all connections of duct to walls, floor, equipment

casings, etc. Flanges of all sizes of ducting being interconnected shall be out of M.S and no G.I. flanges are allowed.

Wherever necessary in the duct work suitable access doors and frames shall be provided to permit inspection, operation and maintenance of filters or any other instrument / apparatus concealed behind the sheet metal work.

All such doors shall be of double construction of not less than 20 gauge sheet metal and shall be provided with neoprene rubber gasket around the entire perimeter to make the joint air tight.

Ducts shall be adequately supported from ceiling trapeze hangers firmly fixed and generally suspended from the building structure with the help of welded joints / anchor fasteners / embedded plates. Ducts shall rest on supporting angle or channel and the angle or channel shall be supported by CS rods on both sides of ducts with weld or bolts. The hangers and supports shall not pierce the insulation. The hangers shall be spaced on average 2.4 m centres with a hanger no further than 0.6 m on each side of any change in direction. Ducts passing through any building expansion joints shall be supported on either side of the joint. All anchors, hanging rods and other metallic exposed parts must be galvanised or painted with a rust protecting paint.

For ducts having HEPA filters, food grade silicon sealant must be applied on all duct joints.

Transformations in main ducts and in branches must be tapered. The cross section of the duct must be gradually decreased at a rate of 1 mm / 5 mm of length.

Wire mesh of maximum opening of 10 mm shall be provided for all external opening to avoid entry of Birds.

In general the following points to be noted while fabricating/installing of ducts:

- i) Duct sealant to be applied in all transverse joints. Exposed duct to be sealed on the inner surface only.
- ii) Provide full radius tees and elbows for change in direction, except where square elbows are required due to space restrictions.
- iii) Provide balancing dampers, splitter dampers as per approved drawings
- iv) Isolate equipment with connections.
- v) Duct support shall be as per IS:655 standards / approved drawings / standard clean room practices. The support structure shall confirm to Table-1 below irrespective of the standards & shall be a minimum requirement .

	<b>Support Angle</b>	<b>Support Rod</b>	<b>Duct Frame Angle</b>	<b>Max. Span of support</b>
For 24 G	40 x 40 x 3 mm	Ø 8 mm	25 x 25 x 3 mm	2400 mm
For 22 G	40 x 40 x 3 mm	Ø 10 mm	40 x 40 x 3 mm	2400 mm
For 20 G	40 x 40 x 5 mm	Ø 10 mm	40 x 40 x 5 mm	2400 mm
For 18 G	50 x 50 x 5 mm	Ø 10 mm	50 x 50 x 5 mm	2400 mm

- vi) Irrespective of the standards, only angle flanges to be used for duct connection. Sheet flanges are not acceptable.
- vii) All the support angle and rods shall be painted with approved colour on one coat of red oxide.

## **MARKING OF THE DUCTS**

The ducts and other equipment must be marked after insulation by arrows to indicate the direction of air flow and also the serial number of the system corresponding to the AHU distribution chart enclosed.

### **8) DAMPERS**

Contractor shall supply and install all dampers where necessary for proper control of volume and balancing of air distribution system. These dampers shall be separate from any other dampers provided with supply and return air diffusers, registers and grilles.

A multi leaf opposed blade type damper shall be installed in each supply air duct / return air duct / fresh air entry near the air handling unit outlet to adjust the total supply air cfm.

Dampers shall be of rigid construction free of all rattling and vibrations with edges crimped or creased for stiffness. It should be possible to adjust and lock the damper in any position. Fully open and fully closed position shall be clearly marked for ease in operation.

All dampers shall have through rods, not less than 1/2" diameter fastened to blade with two or more yokes with set screws. There shall be a steel washer at each end of damper rod.

Dampers shall be provided with Teflon or brass bushings for blade shaft.

#### **Fire Dampers**

Fire dampers shall be installed on all supply and return air ducts near all air handling units and wherever required as shown in the drawings. The damper shall be multi blade type with return spring & locking device. Dampers and frame shall have standard fusible links normally holding them open but releasing upon contact.

All fire dampers are required to have a fire resistance rating of 90 minutes.

### **Caulking**

Wherever duct passes through wall or slab, all the openings between Masonry and duct work shall be neatly caulked or sealed by the CONTRACTOR to prevent movement of air from one space to the adjoining space.

### **GRILLE, REGISTERS, DIFFUSERS AND LOUVERS**

The type and quantity of diffusers and grills shall be provided as specified and approved.

The Contractor shall check and confirm with the air devices manufacturer that proposed grilles, registers and diffusers shall meet the capacity, throw and terminal velocity requirements without draft, dead spots and noise.

All air devices shall be a neoprene rubber gasket around the perimeter for tight fit against adjoining structure.

All diffusers shall be furnished with multi leaf type volume damper in neck, controlled from face of the diffuser.

All wall / ceiling type supply air grilles and registers, unless specified or approved otherwise, shall have opposed blade volume control dampers adjustable from front face. Registers and grilles shall have a minimum of 75% free area.

All air devices shall be constructed from aluminium extruded sections in approved style, colour and finish.

Frames for fixing air device in the false ceiling / boxing shall be arranged by the false ceiling agency. The frames shall be of same material and appearances as the main framing of false ceiling / boxing. Frame requirement detail will be co-ordinated by the VENDOR with concerned agency. The grille to be fitted in slab shall be fixed in separate grille modules supplied by the CONTRACTOR and grouted in the slab.

## **INSULATION**

### Duct Thermal Insulation :

Al. foil faced Nitrile Rubber Class 'O' Insulation - Amaflex / Vidoflex,  
Polyethylene – Supreme Industries / Trocellen.

The surface shall be thoroughly cleaned and allowed to dry. Pressure / leakage tests shall be carried out before application of insulation.

The ducts shall be insulated with TF quality thermocole (density > 16 Kg/m<sup>3</sup>) or Nitrile rubber / Polyethylene insulation. The insulation thickness shall be as per Bill of Quantities. The insulation must be glued on the ducts. The joints between two strips of insulation must be air tight to prevent condensation.

No insulation shall be applied to any duct work or to any surface until all foreign matter has been removed from the surfaces to be insulated and until the duct work has been tested and cleaned.

All access doors and removable panels shall be insulated and jacketed separately.

When insulating VCDs and dampers, Vendor to ensure to make the handle clear so as to permit opening and closing of dampers.

All air conditioning supply air ducts must be insulated with 19 / 20 mm thick Aluminium foil faced nitrile rubber or Aluminium foil faced polyethylene insulation whereas the return air ducts shall be insulated with 9 / 10 mm thick Aluminium foil faced nitrile rubber insulation or Aluminium foil faced polyethylene insulation. When using expanded polystyrene for insulation, 50mm thick for supply & 25 mm thick insulation for return shall be used. For ducting not exposed to ambient, insulation shall be finished with 42 SWG Al. foil. For ducting exposed to ambient, the insulation shall be finished with 12 mm thick sand cement plaster. Joints between insulation shall be sealed with minimum 50 mm wide Aluminium tape.

## APPLICABLE STANDARDS

Product manufacturer should have experience of preparing IQ/OQ document for each product.

Preferably ISO9001 and ISO 14001 certification.

Damper leakage less than 0.5% as per CEN Standard

Air Handling Units should meet strict hygienic demands.

AHU panel insulation should be PUF

Cooling coil in accordance with ARI 410 standard.

Fans in accordance with AMCA 300 and 301 standards.

Ducting in accordance with "SMACNA / DW 142" standard besides that specified in the tender.

### I.S. CODES :

Following IS codes will be applicable for the project.

GP sheet	: IS : 277
Ducting	: IS : 655
Safety code for Air-Conditioning	IS : 659 - 1964
Specifications for 3 phase induction motor.	: IS : 325 – 1970
Also confirm to IS : 1231 for foot mounted and for flanged mounted motors	: IS : 2223
Degree of protection provided by enclosures for low voltage switch gear and control gears	: IS : 2147 - 1962
Code of practice for installation and maintenance of switch gear	: IS : 3012 – 1965
Code of practice for fire	: IS : 3016 – 1982
Glossary of terms used in refrigeration and air-conditioning	: IS : 3615 – 1967

### IS STANDARDS FOR INSULATION WORK

Expanded polystyrene for Thermal insulation purposes : IS : 4671 - 1984

Code of practice for thermal insulation of cold storage : IS : 661 – 1974

Code of practice for application and finishing of thermal insulation material at temperature from 80 <sup>o</sup> to 40 <sup>o</sup> C	: IS : 7240 – 1981
Code of practice for application and finishing of thermal insulation material at temperature from 40 – 700 <sup>o</sup> C.	: IS : 7413 – 1981
Specifications for bonded mineral wool	: IS : 8183 – 1976
Installation of motor	: IS : 900
Switch fuse unit	: IS : 4064 & 4047
Air circuit breaker (ACB)	: IS : 2516
MCCB	: Relevant IS
Glossary of items symbols and units relating to Thermal materials	: IS : 3069
Industrial Bitumen	: IS : 702
Bonded Mineral Wool	: IS : 8183
Standard for positive displacement refrigeration compressor and condensing unit	: IS : 520

## TESTING OF AIR CONDITIONING SYSTEM

The performance test to determine whether or not the full indent of the specification is met shall be conducted by the contractor. After notification to the employers that the installation has been completed and the system has run continuously for a period of atleast two weeks, the contractor shall conduct under the direction of the consultants and in the presence of Employer's representatives, such tests as specified to establish the performance of various equipment supplied and installed by the contractor.

The contractor shall operate test and adjust and balance the air conditioning system.

All test equipment, labour, operating personnel required for this test shall be furnished by the contractor to enable the system to be put in continuous running test for a period of 3 days for recording room temperature, RH, Clean class & pressure gradient as applicable.

### AIR BALANCING :

Airflow rate air through every outlet/inlet more so for the cleanliness classified areas for achieving the specified room air charges for hour.

### **VI. Air Handling Units**

1. Air Quantity :  $\text{m}^3/\text{Hr. (Cfm)}$
2. Air Velocity :  $\text{m/hr (FPM)}$
3. Coil face area :  $\text{m}^2 (\text{Ft}^2)$
4. Entering Air Temperature (DB) :  $^{\circ}\text{C}$
5. Entering Air Temperature (WB) :  $^{\circ}\text{C}$
6. Leaving Air Temperature (DB) :  $^{\circ}\text{C}$
7. Leaving Air Temperature (WB) :  $^{\circ}\text{C}$
8. Motor
  - a. Rated Horse Power : HP
  - b. Rated Volts : Volts
  - c. Rated Current : Amps.
  - d. Actual Current : Amps.

- e. Actual Volts : Amps.
- f. Actual Current : Volts
- g. Actual Power : KW
- h. Room Conditions :

Time	Room	Outside Conds.			Inside Conds.			Grill Conds.		
		DB	WB	RH	DB	WB	RH	DB	WB	RH

**VIII. Supply Air Grills**

- 1. Area of Grill : M<sup>2</sup> (Ft<sup>2</sup>)
- 2. Velocity : m/hr. (FPM)
- 3. Air Flow Rate : M3 (FPM)
- 4. Temperature DB : °C (°F)
- 5. Temperature WB : °C (°F)

**IX. Filters**

- 1. Total Area : M<sup>2</sup> (Ft<sup>2</sup>)
- 2. Effective Area : M<sup>2</sup> (Ft<sup>2</sup>)
- 3. Velocity of Air : m/hr. (FPM)
- 4. Quantity of Air : M3 / hr. (CFM)

**Controls, Interlocks etc.**

The observation of the test shall be recorded for each item separately.

All Testing /Validation should as per MCA / USFDA requirement and necessary formatting with required protocol should be prepared in consultation with KSDPL. Apart from above testing all documentation, should be prepared by contractor such as

Design Qualification

Installation Qualification

Operation Qualification

Installation, Operation & Maintenance Manual.

## MODE OF MEASUREMENT

### For AHU

AHU with filters, fan and coil section, without motor, with base frame motor, drive and guard suitable for motor, mounting frame, vibration mounts as specified in BOQ shall from one unit of measurement.

Each motor of AHUs shall be considered one unit of measurement.

Installation, testing and commissioning is a part of above points.

### 5. Sheet Metal Work :

#### Ducting :

- i. All sheet metal ducting work will be measured in terms of final sheet area installed in square meters.
- ii. No measurement of vanes, splitters, duct dampers, deflectors, access doors etc. which are required to be installed in the duct work will be made as the same shall be deemed to be part of ducting work.
- iii. Duct fittings such as bends, elbows, tap offs, collars, transformation pieces etc. shall be treated as ordinary duct pieces with their length measured along their centre line.
- iv. No duct support, stiffening, members etc. shall be measured separately. All such supports / hangers shall form part of duct work.
- v. Equipment connections such as canvas/Rexene shall be deemed to be part of the duct work and no separate measurement will be allowed.

#### Grills / Diffusers :

All grills will be measured in terms of effective area.

Example : 600mm x 150mm grill will be measured as 0.09 sq.mt. Minimum unit of measurement shall be 0.1 sq.mt. in case the specific grill / diffuser size is less than 0.1 sq.mt.

#### Dampers :

- i. All duct dampers shall be measured separately in terms of cross - sectional area.
- ii. Fresh air/exhaust air dampers will be measured as above  
Example : 600mm x 150mm grill will be measured as 0.09 sq.mt. Minimum unit of measurement shall be 0.1 sq.mt. in case the specific damper size is less than 0.1 sq.mt.

### 6. Insulation :

#### Ducting Insulation

- i. Duct insulation will be measured on the basis of centre line of insulation and not the outer line of insulation.  
Example : (Perimeter of duct) x 1 meter length
- ii. Insulation of bends, transformation pieces, taps offs, elbows etc. shall be treated as standard insulation of duct / pipe pieces.
- iii. Insulation items shall include all accessories and finishes as specified. No separate measurement will be made for such item.
- Iv Insulation measurement shall be as per applicable IS standard.

#### **Equipment Insulation**

Application of insulation on equipment such as Modules, risers will be paid basing on the surface area of the insulation applied. No extra measurement will be paid where insulation is mentioned as part of the equipment specification unless specified otherwise.

#### **8. Electrical Work :**

- i. All cables shall be measured in running lengths as finally installed at site. No wastage measurement will be allowed.
- ii. Control cable / wiring for AC plant inside the plant room shall be treated as a lump sum item.
- iii. All measuring instruments, indicating lamps etc. shall form part of the equipment specified and no separate measurement shall be made for such items.
- Iv All cabling & earthing (power & control) & MCC Panel for the AHU's are excluded from the scope of this tender. Vendor shall however clearly specify the requirements / furnish relevant drawings to enable PURCHASE arrange the same through main Electrical agency.

#### **9 Civil Works**

Roof slab/wall cutout openings required for ducting, risers, modules, piping, foundations/platforms for AHUs shall be made by other agencies as per the requirement of VENDOR. VENDOR to confirm the CUTOUT requirements with locations and size during detailed engineering stage. Such cutouts shall be indicated by VENDOR considering the specification requirements of achieving all the room parameters as specified in this document.

For grouting of terminal HEPA filter modules, ceiling modules, raisers, Owner shall provide the necessary civil services. However, VENDOR shall be responsible for proper installation of the same and shall supervise and guide the Civil agency for satisfactorily carrying out the job.

**10 Instrumentation**

Instrumentation other than that required in AHUs, pumps and chiller for safe operation shall be provided by PURCHASER unless otherwise specified in the tender. However, suitable provision shall be made as directed by PURCHASER/CONSULTANT to mount the instruments. Further provision of Sensors, cabling, Display units, data loggers, BMS etc. will be by OTHERS and is not included in VENDOR/CONTRACTOR's scope.

**11 Dust Extraction System**

The supply and installation of complete dust extraction system will be by OTHERS and is excluded from this specification scope. However, VENDOR shall take cognizance of the process exhaust flow rates as indicated in Table & Basis of Design of this specification. Also vendor shall take cognizance of the cutouts between various process areas as detailed in the the ZONING drawing/Basis of Design indicated in this specification while guaranteeing the performance of HVAC system to the intent of this specification.

**12 HOT WATER SYSTEM**

Hot water generator with piping, pumping and associated accessories shall be provided by PURCHASER thru other agencies for providing hot water at a temperature of 45°C to 50°C. The Hot water coil in the AHUs are to be provided by VENDOR considering the temperature drop across the coil in the water side of 6°C to 8.5 °C

**13 GENERAL REQUIREMENTS**

Vendor to obtain approval of the calculations of the systems being provided prior to procurement. VENDOR shall submit all detailed drawings to PURCHASER/CONSULTANT for approval in both soft and hard copies prior to commencement of respective work.

The required inside parameters to be achieved by the VENDOR in terms of Room dry bulb temperature, room RH level, cleanliness level are indicated as Table-1 to this section. The pattern of pressure gradient required to be achieved by the VENDOR is enclosed in this specification. The proposed air flow rates, AHU zoning and air handling capacities for achieving the same

considering the room equipment loads and occupancy levels are indicated for Bidder's Guidance purpose only.

The supply and installation of all Air Handling Units required for the system. These shall be supplied as complete units, including chilled water coils, damper systems, supply and wherever required exhaust fans and all other essential components.

The supply and installation of AHU's include the complete system of air filtration equipment, including magnehelic gauges wherever required, Pre, final and HEPA filtration systems, etc. as specified shall be provided.

The supply and installation of complete system of ducts for all the systems. This includes supply and installation of necessary support systems for the duct work, branches and outlets and all other components of the duct work system. The actual duct routing shall be the responsibility of the contractor. However, all duct routing drawings shall be submitted for the PURCHASER/CONSULTANT's approval before actual fabrication of the ducts.

The complete balancing of air quantities for the equipment installed as part of this contract.

Testing and commissioning of the entire system

The work specifically includes preparation & submission of all documentation required such as Design Qualification (DQ)/Inspection Qualification(IQ)/ Operation Qualification (OQ) to the entire satisfaction of PURCHSER/CONSULATANT. The DQ shall be submitted in advance of commencement of work and approval obtained from CONSULTANT. The same shall be reviewed and revised incorporating changes of any at the end of installation and submitted for record purpose to the PURCHASER.

All equipment & instruments supplied under this TENDER shall be accompanied by Factory Test Certificates, Material of Construction certificates & calibration certificates. All calibration certificates shall have traceability to relevant National / International standards. In addition to the above, VENDOR shall offer his equipment for inspection at WORKS prior to despatch. Specific waiver shall be taken from CONSULTANT prior to dispatch if the need arises & such WAIVER

shall be at the sole discretion of CONSULTANT.

The works envisaged in this TENDER are to be completed within 20 weeks of award of order.

**Note :**

Contractor should note that, all the measurement should be carried out strictly as per mode of measurement stated above. However all the work should be carried out as per relevant IS code's specified.

**LIST OF APPROVED MAKES**  
**FOR MAJOR ITEMS AND QUALITY**  
**OF MATERIAL TO BE USED IN THE HVAC WORK**

The following makes of equipment and materials shall be accepted, but the Contractor shall specify which material he would be using. In case any make, besides the list given, is to be used, prior approval of the Client / Consultant is must.

SR. NO.	MATERIAL	MANUFACTURER / SUPPLIER
1.	Screw Chiller Package	Kirlosakr/ Mcquay / Trane / York / Ciat
2.	Air Handling Units (Double Skin)	CRP / Citizen / Flaktwoods / Zeco
3.	Air Handling Units (Single Skin)	CRP / Flaktwoods
4.	Coil	Flaktwoods / Citizen / CRP / Zeco
5.	Centrifugal Fan	Nicotra / Kruger
6.	Cooling tower	Himgiri / Paharpur / Advance/ Mihir
7.	Pumps	Kirloskar / Beacon / Crompton
8.	Insulation :	
	Fibre Glass	FGP/UP Twiga / Khimco
	Polythylene	Trocellen / Supreme Industries
	Expanded Polystyrene (Thermocole)	Beardsell / Llyod / Torcelline
	Nitrile Rubber	Armflex / Vidoflex.
9	Controls / Measurement Instrument	
	Thermometers/ Pressure Gauges	Fiebig / H. Guru
10.	Proportionate Controller	
	Thermostat	Siemens / Johnson / Honeywell / Sauters
	Humidistat	Siemens / Johnson / Honeywell / Sauters
	3 way motorized valves	Siemens / Johnson / Honeywell / Sauters

	Motorised Actuator	Siemens / Johnson / Honeywell / Sauters
	Variable Frequency Drive	Siemens / ABB / Danfoss / Schneider
11.	Grills / Diffusers	Carrier / Dynacraft / Cosmos/ Airmaster / Anvin CRP
12.	Damper / Fire Damper	Carrier / Airflow/Anvin CRP
13.	Pre Filter / Fine Filter	Pyramid / CRP Group
14.	HEPA filters	CRP / Klenzaid
15.	MS Pipe	TATA / Jindal/Inter Sales Corp.
16.	Valves (Butterfly / NRV)	Intervalve / Intersales Corporation/ JB Sawant Engg / Advance Valves / Audco
20.	G.I. Sheet	Jindal / Tata

Note : Make of individual item shall be preferred in sequence given, any alterations in the sequence or supply of equivalent make is to be approved by the consultants.

***Items available locally which are equivalent to the specification can be considered with prior specific approval of consultant.***