

**PRASAR BHARATI**  
**(BROADCASTING CORPORATION OF INDIA)**  
**OFFICE OF THE ADG(E)(SOUTH ZONE)**  
**ALL INDIA RADIO & DOORDARSHAN**  
**SWAMY SIVANANDA SALAI, CHENNAI - 600 005**

No. ADG(E)(SZ)/PUR/ NIT-12/ACP/2011-12/

Date: 27-09-2011

**SUB.: ENQUIRY FOR THE NOTICE INVITING TENDER FOR THE SITC OF 4x33 TR, CHILLED WATER AND WATER COOLED CONDENSER AC PLANT FOR SPT BANGALORE.**

Sir,

Please find enclosed herewith the enquiry for the Supply, Installation, Testing and Commissioning (SITC) of 4x33 TR, CHILLED WATER AND WATER COOLED CONDENSER AC PLANT FOR SPT BANGALORE.

Tender documents can be collected from this office from 27.09.2011 to 18.10.2011 on all working days between 11.00Hrs to 16.00Hrs, on payment of required tender cost in the form of cash/demand draft or the tender documents can be down- loaded from the website mentioned below. Demand Draft for Rs. 530/- drawn in favour of the ADG(E) (South Zone) AIR & TV, Chennai-5, shall be enclosed in separate cover along with the tender otherwise the tender shall be rejected.

[www.cesairdd.org.in/tenders.html](http://www.cesairdd.org.in/tenders.html),  
[www.allindiaradio.org/tender.html](http://www.allindiaradio.org/tender.html),  
[www.tenders.gov.in](http://www.tenders.gov.in)

The tenders will be received at the Office of The ADG(E) (SZ), AIR & TV, Swamy Sivananda Salai, Chennai-5, up to 12.30 Hrs on **19.10.2011**. The Technical bid and E.M.D. will be opened on the same day at 15.00 Hrs. The Commercial bid of technically qualified tenders will be opened at a later date that will be intimated to the qualified tenderers.

Yours faithfully,

(T.SHANMUGARAJU)  
DY. DIRECTOR (ENGG)(PURCHASE)  
for Addl. Director General (E)(SZ)

PRASAR BHARATI  
(BROADCASTING CORPORATION OF INDIA)  
OFFICE OF THE ADG(E)(SOUTH ZONE)  
ALL INDIA RADIO & DOORDARSHAN  
SWAMI SIVANANDA SALAI  
CHENNAI 600 005

TENDER No. ADG(E)(SZ)/PUR/ NIT-12/ACP/2011-12/

Date:-27.09.2011.

SITC OF 4x33 TR, CHILLED WATER AND WATER COOLED CONDENSER AC  
PLANT FOR SPT BANGALORE.



PRASAR BHARATI  
(BROADCASTING CORPORATION OF INDIA)  
OFFICE OF THE ADDL.DIRECTOR GENERAL (E)(SZ)  
ALL INDIA RADIO & DOORDARSHAN  
SWAMI SIVANANDA SALAI  
CHENNAI 600 005

File No. ADG(E)(SZ)/PUR/ NIT-12/ACP/2011-12/

Dated:- 27.09.2011

To:

.....

.....

.....

.....

**INVITATION TO BID**

On behalf of the Prasar Bharti (B.C.I.), sealed tenders are invited by this Organisation in the prescribed Bid Forms at Appendices, 2 to 7 of "Instructions to Bidders" enclosed at Annexure-I. The details of tender are given in the schedule below:

1. Tender No. : **ADG(E)(SZ)/PUR/ NIT-12/ACP/2011-12/**
2. Description and quantity of stores : **NOTICE INVITING TENDER FOR SITC of 4x33 TR, CHILLED WATER AND WATER COOLED CONDENSER AC PLANT FOR SPT BANGALORE.**
3. Delivery Period: : **3 Months after the placement of Order.**
4. Tender Fee: : **Rs. 530/-**
5. Earnest Money: : **Rs.1,20,000 /-**
6. Bid Validity up to: : **120 (One Hundred and twenty) days from the date of opening of Technical Bid.**

**NOTE:** Tender documents may be downloaded from the following websites:

[www.cesairdd.org.in/tenders.html](http://www.cesairdd.org.in/tenders.html)

[www.allindiaradio.org/tender.html](http://www.allindiaradio.org/tender.html)

[www.tenders.gov.in](http://www.tenders.gov.in)

7. Warranty : Required as per clause 8 of Annexure-II, General Terms & Conditions & as per Specs.
8. Performance Security Deposit : Required as per Annexure-II, (General Terms & Conditions).
- (i) Amount : 10% of the order value in form of Demand Draft / Bank Guarantee / FDR
- (ii) Validity : 60 (sixty) days beyond the date of expiry of Warranty / Guarantee
9. Correspondence Address: Dy .Director (Purchase) O/o  
Addl. Director General (E)(SZ)  
All India Radio &  
Doordarshan  
Chennai-600005
10. Paying Authority : Addl. Director General (E)(SZ)  
All India Radio & Doordarshan  
Chennai-600005.
11. Tender Opening Date: **19.10-2011 Time 15:00 hr**
12. Terms of Delivery : Delivery at Consignees' place.

**Superintending Engineer/ Installation Officer,  
All India Radio, Transmitting Centre ,  
HPT, Hoskote, Bangalore, Karnataka.**

**13. Important Instructions:**

The tender will be governed by the "Instructions to the Bidder" as per Annexure-I; "General Terms & Conditions" placed at Annexure-II, and "Technical Specifications" placed at Annexure-IV.

Deviations/Exceptions to the clause, if any, should be explicitly recorded seriatim as a separate Annexure (Appendix 4 of Annexure-I), in your offer, failing which, all the clauses shall be deemed to have been accepted by you.

**Two Bid System** shall be followed for this tender. Tenderers should take due care to submit tenders in accordance with requirement in sealed covers as specified in clause 2 of **“Instructions to Bidders” (Annexure-I)**. Bid evaluation criteria at Annexure-III shall be the basis for evaluation of tenders.

**The Technical & Commercial Bid should be submitted in Separate Sealed Cover.**

**The EMD should be enclosed with the Technical Bid. (see annexure-I SI.No-15)**

The tenderer while submitting their bid, must adhere to the following instructions of Central Vigilance Commission, otherwise their offer is likely to be ignored.

1. One Agent / Dealer / Supplier shall not represent two manufacturers of quote on their behalf in a particular tender i.e. one bidder shall quote one type of equipment in a particular tender.

2. Tender documents submitted by the tenderer shall be neatly tied and each page numbered and signed and stamped by them.

**NOTE: The following documents must be submitted along with the tender failing which the offer may be liable to rejection and no further correspondence will be entertained in this regard.**

- (a) **Original Equipment Manufacturer’s Authorisation for equipment quoted.**
- (b) **Past Performance along with the user certificate in respect of timely and good quality supply of equipment / execution SITC / SETC ( Especially, the equipments should be supplied and installed at RF fields like AIR/DD Transmitter sites. ).**

Kindly refer item No.8 under Annexure-I.

[ ..... ]  
**Dy Director(Purchase)**  
**for Addl. Director General (E) (SZ)**

<b>LIST OF ANNEXURES</b>	<b>DETAILS</b>	<b>PAGES</b>
Annexure - I	Instructions to Bidders	6 - 14
Appendix - 1	Bid Document Acknowledgement	15
Appendix – 2 & 2A	Bid submission Form and Agreement	16 - 17
Appendix - 3	Exception / Deviations PROFORMA	18
Appendix - 4	Past Supplies / SITC / SETC Proforma	19
Appendix – 5	Bidders Information Proforma	20
Appendix – 6 & 6A	Price Bid Proforma	21 - 28
Appendix - 7	Authorization Letter for attending tender opening.	29
Annexure - II	General terms & Conditions (GTC)	30 - 41
Annexure - III	Bid Evaluation Criteria	42-43
Annexure - IV	Description of Stores / SITC / SETC & Technical specifications *Drawing will be issued on request	44-110

**\* THIS TENDER DOCUMENT CONSISTS OF -110- PAGES.**

**INSTRUCTIONS TO BIDDERS**

(Please sign each page of these conditions and send it with your offer)

**1. PREPARATION OF TENDER:**

i) The bid shall be submitted in the prescribed proforma as per Appendices 2 to 6. The bid document duly filled in and signed should be returned whether you are quoting for any item or not. When items are not being tendered for, the corresponding space should be defaced by some such words as "Not quoting".

ii) In the event of the space on the bid document being insufficient for the required purpose, additional pages may be added. Each such additional page must be numbered consecutively showing the Tender Number and duly signed. In such cases, reference to the additional page must be made in the tender form.

iii) The bid document referred to above, if not returned or if returned but not duly filled-in, will be liable to result in rejection of the tender.

iv) Bidders are advised in their own interest to ensure that all the points brought out in the checklist enclosed at Appendix 3 are complied with in their offer, failing which, the offer is liable to be rejected.

v) The Bids can only be submitted in the name of the bidder in whose name the bid documents were issued. The tender papers filled-in and completed in all respects shall be submitted together with requisite information and Annexures. It shall be complete and free from ambiguity, change or interlineations.

The tender submitted by bidders and any annotations or accompanying documentation submitted along with the tender, shall be in English language.

Bidders should indicate at the time of quoting against this tender their full postal/ fax / E-mail addresses.

Bidders shall sign their proposal with the exact name of the firm to whom the contract is to be issued. The tender shall be duly signed and sealed by an executive officer of the bidder's organisation.

Each page of the tender shall be signed by a duly authorised officer and in the case of a Corporation the same shall be sealed with the Corporation seal or otherwise appropriately executed under seal.

Bidders shall clearly indicate their legal constitution and the person signing the tender shall state his capacity and source of his ability to bind the bidder.

The Power of Attorney or authorisation, or any other document consisting of adequate proof of the ability of the signatory to bind the bidder, shall be annexed to the tender. This organisation may reject outright any tender unsupported by the adequate proof of the signatory's authority.

vi) It must be ensured that each page of the tender including terms and conditions, Bid Evaluation Criteria and specification (Annexures I, II, III and IV) are signed by bidder and returned to this office along with offer.

## 2. DELIVERY OF TENDER

2.1 The tender will be on the basis of **"Two Bid System"** and offers are to be submitted in separate sealed covers.

The first inner sealed cover will contain **"Technical Bid"** having all details including the list of equipment to be supplied / SITC / SETC to be executed, but with price column blanked out. There will be no mention of price anywhere in the **"Technical Bid"** and **EMD** will also be sent in the above first inner cover. This cover will clearly be super-scripted with **"Technical Bid"** along with tender number and item description.

The second inner-cover will contain the price schedule duly filled-in and signed and contain all the commercial details of the bid and will be clearly super-scripted with **"Commercial Bid"** along with tender number. These two covers shall be put into an outer cover and sealed. The outer cover should duly bear the tender number and date of closing / opening prominently underlined along with the address of this office.

All General Terms and Conditions (GTC) attached with the invitation to tender are sacrosanct for considering any offer as a complete offer. It is therefore, important that all documents duly completed and signed are returned with your offer.

2.2 The right to ignore any offer, which, fails to comply with the above instructions is reserved. Only one tender should be included in one cover.

2.3 Your offer must reach this office not later than 12:30 hr. on the notified date of closing of the tender. Offers sent by hand delivery should be put in the Tender Box in this office before 12:30 hr. on the specified date. All outstation tenders, if sent by post, should be sent under registered cover.

2.4 **Any change in quotation after opening of tender will not be considered.**

2.5 This organisation will not be responsible for the loss of tender form or for the delay in postal transit.

2.6 Tenderer is advised in his own interest to ensure that his offer reaches this office well before the closing date and time of the tender as **the offers received after the closing date and time of the tender, will not be considered.**

2.7 TELEGRAPHIC/TELEFAX/E-MAIL offers, received directly by this organisation, will not be considered.

## 3. VAGUE AND INDEFINITE EXPRESSION

Tenders qualified by vague and indefinite expressions such as "subject to immediate acceptance" or "Subject to prior sale" etc. will not be considered.

## 4. VALIDITY PERIOD OF OFFER

4.1 The tender shall be valid for acceptance for the period as indicated in the "Invitation to Bid" (hereinafter referred to as validity period) and shall not be withdrawn on or after the opening of tenders till the expiration of the validity period or any extension thereof.

The offers of those tenderers who have not kept the validity open till the period stipulated in the tender will be treated as un-responsive and will be ignored without making any reference to the tenderer.

4.2 The tenderer will undertake not to vary/modify the tender during the validity period or any extension thereof.

## **5. OPENING OF TENDERS**

5.1 The tenders will be opened at **15.00 hours** on the date of opening indicated in the "Invitation to Bid". The tenderer or his authorised representative may be present at the time of opening of tender on the specified date, but a letter in the form annexed as Appendix-7 hereto must be forwarded to this office along with tender document and a copy of this letter must be produced in the office by the person attending the opening of tender. Unless this letter is presented by him, he may not be allowed to attend the opening of tender.

5.2 In case of unscheduled holiday on the closing / opening day of tender, the next working day will be treated as scheduled prescribed day of closing / opening of tender, the time notified remaining the same.

## **6. PRICE:**

6.1 The price quoted must be net for per unit and must include packing and delivery charges.

6.2 The tenderers are requested to quote their firm prices. Any change or modification to the offer after opening of the tender will not be considered at all.

6.3 The bidder/tenderer is advised to quote rates keeping in mind that repeat order can also be placed upto 50% of the original quantity of any item(s) on the same terms and conditions as stipulated in the original purchase order during the validity of the order, or within six months of original supply order, whichever, is later. It will be obligatory on the part of the supplier / contractor to execute such repeat order (s) also.

6.4 Spares, Annual Maintenance Contract and Optional Items shall be quoted separately in the price bid, wherever asked for. Spares, AMC, and optional items will not form the part of commercial bid and will not count for deciding the lowest bidder.

### **6.5 Payment of excise duty and sales tax / VAT (on ultimate products)**

Payment of excise duty and sales tax/VAT (on ultimate products), as applicable on the closing date of tender will be to the supplier's / contractor's account. Any statutory variation (both plus and minus) in the rate of excise duty/sales tax/VAT after closing date of tender/revised price bid but before the expiry of the contractual delivery / completion period will be to the account of the office.

The bidder(s) will indicate, in their bid, the amount with exact rate of the Excise and Sales tax/VAT on ultimate finished product, as applicable at tendering stage, separately in the bid. In case the above information subsequently proves wrong, incorrect or misleading (a) this Organisation will have no liability to reimburse the excess in the difference in rates of the item under which the duty/tax assessed finally (b) this Organisation will have the right to recover the difference in case the rate of duty / tax finally assessed is on the lower side.

Any increase in excise duty, sales tax / VAT during extended period of the contract / supply order will be to supplier's / contractor's account where such extension in delivery of the materials/completion of the project was on the request of supplier / contractor. However, any decrease in excise duty/sales tax/ VAT during extended period of the contract / supply order, will be to the account of this Organisation.

6.6 As the material, which is to be transported to the consignee, belongs to the Government of India / Prasar Bharati and therefore is exempted from entry tax / octroi duty / toll tax. However, if the State Governments / Statutory Local Bodies are bound to levy such taxes, the taxes will be paid by supplier / contractor. Supplier/Contractor may raise its claim, for reimbursement of such duties / taxes paid, with Organisation, along with original receipt of the payment.

6.7 In case of SITC of / SETC tenders, prorata breakup details of cost of all the identifiable store items of supply and ITC / ETC charges shall be given along with a price bid.

6.8 The taxes like excise duty, sale tax / VAT, service tax etc. as applicable on the goods / services shall be quoted separately in the price bids.

## **7. Trade/Volume Discount**

Bidders will not indicate separate discount. Discount, if any, should be merged in the rates against the quoted item(s). Discount of any type indicated separately will not be taken into account for evaluation purposes.

## **8. Eligibility:**

Bids should be from actual manufacturers. Bid from sole selling agents / authorised distributors / Authorised dealers/ Authorised contractors can also be considered provided such bids are accompanied with necessary supporting documents / authority letter from concerned actual manufacturers who authorised them to market their products, provided further, such an authority letter is valid at the time of bidding. The supplier / contractor shall ensure that the required warranty cover is provided by the original manufacturer of the product. In case of SITC / SETC and specialised work, the contractor should also have sufficient experience and shall submit the experience certificate of satisfactory completion of atleast three similar works, each of value not less than 40% of the estimated cost put to tender, or two similar works, each of value not less than 60% of the estimated cost, or one similar work of value not less than 80% of the estimated cost, all amounts rounded off to the convenient full figure, in the last seven years ending on the last day of the month previous to the one in which the tenders are invited.

## **9. Purchase Preference for Product of Public Enterprises:**

The Organisation reserves the right to allow to the public enterprises, purchase preference facilities as admissible under the existing policy of the Government of India and not to accept the lowest rate quoted by the tenderer.

## **10. Scope of Supply of Equipments / SITC / SETC:**

The delivery of stores / execution of SITC / SETC is required as stated in Invitation to Bid on terms specified in clause 2 of General Terms & Conditions at Annexure-II. Any deviation must be clearly mentioned.

## **11. Samples**

11.1 Samples are not required unless specifically called for.

11.2 The samples when called for should be sent to the purchasing authority along with the offer. The cost and freight of sending the samples shall be borne by the tenderer and there will be no obligation on the part of receiving officer for their safe custody.

Samples received late are liable to be ignored. If the samples are sent by Railway Parcel, The Railway Receipt (RR) should be posted separately to the addressee to which the samples are sent (under covering letter giving the particulars of tender number and due date) well in advance to enable the addressee to get the parcel released before the date of opening of tender. The RR should not be sent along with the offer. Samples submitted with the tenders, which have not been accepted; will, if it has not been destroyed during testing, be delivered at your cost provided the application for return is made to the officer to whom the samples are sent, within one month of the date fixed for the opening of tender or after modification / cancellation of demand. This organisation will not be liable for loss, damage, or breakage in respect of samples. If no application is received within the due date, samples will be disposed of by public auction and the sale proceeds credited to this Organisation.

## **12. Consideration of offer in full or in part:**

This Organisation may reject / accept or prefer any tender without having to assign any reason whatsoever. This Organisation also reserves to itself the right to accept any tender in part or split the order between two or more bidders. Tenderers are at liberty to quote separate rates for the whole quantity as well as reduced quantity.

## **13. Acceptance of Offer by Telegram / Fax/E-mail**

Acceptance by the purchaser will be normally communicated by Telegram/Fax/E-mail. In case where acceptance is communicated by Telegram/Fax/E-mail, the regular order will be forwarded as soon as possible but the instructions contained in the Telegram/Fax/E-mail should be acted upon immediately. With the issue of Telegram/Fax/E-mail of acceptance, the contract shall be deemed to have concluded. Contract shall mean and include the invitation to tender / instructions to tenderers, acceptance of tender, supply of stores / SITC / SETC particulars and the general and special conditions specified in the acceptance of tender.

## **14. Specifications:**

i) Unless otherwise asked for, the offers of "Makers design or for alternative specifications, the tenderer must note that his offer, will be rejected in case the tender stipulations are not complied with strictly or the goods offered do not conform to the required specifications indicated therein. The lowest tender will be determined from among those tenders, which are in full conformity with the required specifications.

ii) In case the offers have been asked for "Makers design" or for alternative specifications, the tender will clearly indicate as to how the materials being offered will serve this Organisation's purpose and in what respect the offer differs from the required specifications.

iii) If this Organisation finds that materials supplied / works carried out are not of correct quality and are not according to required specifications or otherwise not satisfactory owing to any reason of which the Organisation will be the sole judge, The Organisation will be entitled to cancel the contract for supply of stores / SITC / SETC and meets its requirements of stores / SITC / SETC from the open market at the risk and cost of the supplier / contractor, reserving always to itself the right to forfeit the security deposit placed by the supplier / contractor for fulfilment of the contract.

## 15. Earnest Money Deposit / Performance Security Deposit

### 15.1 Earnest Money Deposit :

The bidders must enclose with their technical bid along with EMD in the form of Demand Draft in favour of Addl. Director General (E)(SZ), All India Radio & Doordarshan, Chennai-600 005, from a Commercial Bank . EMD by means of Bank guarantee or any other mode of payment other than DD shall not be accepted.

15.2 Offers without EMD will be ignored.

15.3 The Earnest Money deposited by the tenderer shall be forfeited by this Organisation in the following events:

(a) If tender is withdrawn during the validity period or any extension thereof.

(b) If tender is varied or modified in a manner not acceptable to this Organisation during the validity period or any extension of the validity duly agreed by the bidder.

(c) If a tenderer, whose tender has been accepted, fails to furnish Security Deposit within 2weeks from the issue of the acceptance offer of the tender, the offer is likely to be cancelled.

15.4 The EMD of unsuccessful bidders will be returned on finalization of the tender. The EMD of successful bidder will be returned on receipt of security deposit or it may be adjusted in the security deposit if requested by the tenderer.

### 15.5 Performance Security Deposit:

The contractor shall furnish the security deposit within 2 weeks of placement of order at the rate of 10% of the total contract value subject to a maximum of Rs.5 lakhs at the time of signing the contract. The Security deposit shall be furnished in favour of The Addl. Director General (E) (South Zone), AIR & Doordarshan, Chennai-5 in any one of the forms: Fixed Deposit Receipt from a Commercial Bank/DD Payable at Chennai / Bank Guarantee from a Commercial Bank valid up to the end of warranty period as per contract.

16. **Transfer of Tender Documents:** The tender is non-transferable.

### 17. Correspondence:

i) Our Fax / Email address is:

Fax: 044-25381147 Email : 1. [ceszpurchz@gmail.com](mailto:ceszpurchz@gmail.com)  
2. [purchase@ceszairdd.org.in](mailto:purchase@ceszairdd.org.in)

ii) All correspondence from tenderer / contractor shall be made to the Purchase Authority (by name), who has issued this tender.

iii) All correspondence shall bear reference to Tender No. / Purchase Order.

### 18. Order on Higher Tenderer:

It should be noted that if an order is placed for supply of stores / SITC / SETC on a higher tenderer in preference to the lowest acceptable offer in consideration of an earlier delivery, the tenderer will be liable to pay to the Purchaser, the difference between the contract rate quoted by the lowest acceptable tenderer, in case he fails to complete the supply of stores / SITC / SETC in terms of such contract within the specified date of delivery. This is without prejudice to other rights under terms of contract.

## **19. Payment Terms:**

### **(i) For Supply Contracts:**

(a) The supplier will submit its bill for 90% of the material cost along with copy of Inspection Certificate to the consignees. On receipt of stores in good condition, consignee will complete necessary formalities at his end and verify the bill and submit to the paying authority along with measurement book for making payment.

(b) The bill for balance 10% of material cost will be submitted by the suppliers along with proof of the deposit of performance security money for guarantee/warranty period to the consignee. Consignee will verify the bill and submit the same to the paying authority for release of payment.

### **(ii) For SITC/SETC (Supply, Installation /Erection, Testing & Commissioning) Contracts:**

(a) 80 % of the contract price for the equipments/materials inclusive of excise duty and Sales tax shall be paid on initial inspection and delivery of equipments at site in good condition. The consignee will complete necessary formalities at his end and verify the bill and submit to the paying authority along with measurement book for making payment.

(b) 20 % of the contract price for equipments and 100 % of installation charges on satisfactory completion of installation, testing, commissioning and handing over. The consignee will complete necessary formalities at his end and verify the bill and submit to the paying authority along with measurement book for making payment.

## **20. Unsolicited Post Tender Modification:**

In case certain clarifications are sought by this Organisation after opening of tenders, then the reply of the Bidder should be restricted to the clarifications sought. Any Bidder who modifies his Bid (including a modification, which has the effect of altering the value of his offer) after the closing date without specific reference by this Organisation shall render the bid liable to be ignored and rejected without notice and without further reference to the Bidder. Canvassing in any form by the Bidders shall also render the bid liable to be ignored and rejected without notice and without further reference to the Bidder.

## **21. Clarification in respect of Incomplete offer:**

This Organisation has to finalize its purchase within a limited time schedule. Therefore, it may not be feasible in all cases for this Organisation to seek clarification in respect of incomplete offers. Prospective Bidders are advised to ensure that their bids are complete in all respects and conform to our terms and conditions and Bid Evaluation Criteria of the tender. Bids not complying with this Organisation's requirements may be rejected without seeking any clarifications.

## **22. Income Tax/Trade Tax / Work Contract Tax Liability:**

(i) The Bidder will have to bear all Income Tax liability both corporate and personal tax. Income tax on the contract value, as applicable, will be deducted at source by the paying authority.

(ii) Some State Governments levy work contract tax/trade tax. These taxes are to be borne by the supplier / contractor, wherever applicable. These taxes will be deducted by the paying authority.

(iii) Bidder must give the TIN / PAN, VAT / Sale Tax, Service Tax, Registration no. in Appendix – 5, failing which the offer will not be considered.

### **23. After Sales Service and Training:**

The tenderer must furnish complete details of after sales service arrangement including training to be provided in respect of the equipment. After sales service arrangements should include details of infrastructure facilities available in the country. The training should be made available free of cost at sites. Failure to give this information, will lead to automatic rejection of the offer, without any reference to the Bidder.

### **24. Replacement/Rectification:**

In the event the stores supplied or SITC / SETC carried out against the contract are found to be defective, the supplier / contractor will have to take back the defective materials at his own cost and replace / rectify the defects of the Stores / SITC / SETC free of charge without loss of time. The supplier / contractor will not be entitled to dispose of the Store / Equipment / Material given for replacement / rectification without the prior permission of this Organisation. All charges concerned with the rectification including freight charges will be borne by the supplier / contractor.

### **25. Tender Fee: ( If applicable)**

- (i) Tender to be paid by Bidders is as indicated in the Invitation to Bid.
- (ii) The offers will not be considered without Tender Fee.

### **26. Evaluation / Security of bids:**

Technical / Commercial evaluation of bids shall be undertaken in accordance with the prescribed procedure by a Committee of the Organisation duly constituted for this purpose. The technical evaluation would be based on:

- (i) assessment of technical capability of tenderer to manufacture tendered items of stores / carry out SITC / SETC;
- (ii) capability of tenderer to effect supply of stores / carry out SITC / SETC in stipulated time as assessed on the basis of installed capacity for manufacturing and turnover of tendered items in preceding three years; and
- (iii) past record of timely and good quality supply of tendered items of store / execution of SITC / SETC by tenderer in preceding three years.

### **27. Employment by firms to officials of this Organisation:**

Firms / Companies, who have or had business relations with this Organisation, are advised not to employ serving employees of this Organisation without its prior permission or within the initial two years period after the retirement / resignation / severance from the service without specific permission of this Organisation. This Organisation may decide not to deal with such firms who fail to comply with the above advice.

## **28. Arbitration :**

If any dispute, difference, question or disagreement shall at any time, hereafter arise, between the parties hereto or the respective representatives or assignees in connection with or arising out of the contract or in respect of meaning of specifications, design, drawings, estimates, schedules, annexure, orders, instructions the construction, interpretation of this agreement, application of provisions thereof or anything hereunder contained or arising hereunder or as to the rights, liabilities or duties of the said parties hereunder or any matter whatsoever incidental to his contract or otherwise concerning the works of execution or failure to execute the same, whether during the progress or work of stipulated/extended period or before or after the completion or abandonment thereof, it shall be referred to the sole arbitration of the person appointed by the Addl. Director(E) (SZ), All India Radio & Doordarshan, Chennai. There will be no objection to any such appointment that the arbitrator so appointed is an employee of this Organisation or that he had to deal with the matters to which contract relates and that in the course of his duties as this Organisation's employees he had expressed views of all or any of the matters in dispute or difference. If an arbitrator to whom the matter is referred dies or refuse to act or resigns for any reason from the position of arbitrator, it shall be lawful for the Addl. Director(E) (SZ), All India Radio & Doordarshan, Chennai to appoint another person to act as arbitrator in the manner aforesaid. Such person shall be entitled to proceed with the reference from the stage at which it was left by his predecessor if both the parties consent to Addl. Director(E) (SZ), All India Radio & Doordarshan, Chennai to this effect failing which the arbitrator will be entitled to proceed de-novo.

It is a further term of this contract that no person other than the person appointed by the Addl. Director(E) (SZ), All India Radio & Doordarshan, Chennai as aforesaid shall act as arbitrator and that, if for any reason that is not possible, the matter is not to be referred to the arbitration at all. The arbitrator(s) may from time to time, with the written consent of all the parties to the contract enlarge the time for making and Publishing the award. It is a term of the contract that the party invoking arbitration shall specify the disputes to be referred to arbitration under the clause.

It is also term of the contract that the contractor shall not stop the work under this contract and work shall continue as expected to continue whether the arbitration proceedings have commenced or not.

The arbitrator shall give reasoned award in respect or each dispute or difference referred to him. The award as aforesaid shall be final and binding on all the parties to the contract in accordance with the law.

The Venue of the arbitration shall be at New Delhi (India). Subject to as aforesaid, the provision of the Indian Arbitration Act, 1940 and any statutory modifications or re-enactments thereof and rules made there under and for the time being in force shall apply to the arbitration proceedings under this clause.

**PROFORMA FOR BIDDERS TO ACKNOWLEDGE THE BID DOCUMENT**

Dated:

Dear Sirs,

We hereby acknowledge receipt of a complete set of Bid Documents pertaining to Procurement / SITC/SETC of \_\_\_\_\_ Against \_\_\_\_\_

We have noted that the closing date for receipt of the tender by you is the time specified in the tender document and opening at specified time and date.

We guarantee that the contents of the above said Bid Package will be kept confidential within our company and text of the said package shall remain the property of your Organisation and that the said documents are to be used only for the purpose intended by your Organisation.

Our address for further correspondence on this tender will be as under:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Fax No :  
Telephone No :  
E-Mail No :  
Personal Attention of (If required):

Yours faithfully

**BID SUBMISSION FORM AND AGREEMENT**

Tender. No ADG(E)(SZ)/PUR/ NIT-12/ACP/2011-12/

**The Addl. Director(E)(SZ),  
All India Radio & Doordarshan,  
Chennai - 600005.**

Dear Sirs,

1. I/We hereby offer to supply the stores detailed in schedule hereto or such portion thereof as you specify in the Acceptance of Tender at the price given in the said schedule and agree to hold this offer open till.....I/We shall be bound by the communications of acceptance dispatched within the prescribed time.
2. I/We have understood the "Instructions to Bidders", specifically the instructions to the tenderers in the booklet DGS&D-229 and accepted the "conditions of contract" and specifically the conditions of the contracts as contained in DGS&D-68 (R) for Supply/SITC/SETC and have thoroughly examined the specifications, drawings and/or pattern quoted in the schedule hereto and am/are fully aware of the nature of the stores required and my/our offer is to supply stores strictly in accordance with the requirements.
3. The following pages annexure-II-to-annexure-IV have been added to and form part of this tender.
4. Agreement at Appendix 2A on purchase of Tender documents and submission of Tender has been duly signed and returned herewith.

Yours faithfully,

Signature of witness

Address

Date

Signature of witness

Address

Date

**PRASAR BHARTI  
(BROADCASTING CORPORATION OF INDIA)  
OFFICE OF ADDL.DIRECTOR(E) (SZ),  
All India Radio & DOORDARSHAN  
CHENNAI – 600 005.**

**APPENDIX-2A**

**AGREEMENT**

Tender **No. ADG(E)(SZ)/PUR/ NIT-12/ACP/2011-12/**

To  
PRASAR BHARTI (B.C.I.)  
The Addl.Director(E) (SZ), All India Radio & Doordarshan,  
Chennai – 600005.

Sub:- Purchase Of Tender Documents

Ref:- Tender No. ADG(E)(SZ)/

The Addl.Director(E)(SZ), All India Radio & Doordarshan, Swami Sivananda Salai, Chennai – 600005, acting on behalf of Prasar Bharti (B.C.I.) and the Tenderer agree that the Tenders is an offer made on the condition that the Tender would be kept open in its original form without variation or modification for a period as the mention in the invitation bid ,the last date for the receipt of tenders stated in the SITC/SETC/NIT AND THE MAKING OF THE TENDER SHALL BE REGARDED AS AN UNCONDITIONAL AND ABSOLUTE ACCEPTANCE of this condition of the Tender. We further agree that the contract consisting of the above conditions of Tender as the offer and the submission of Tender as the Acceptance shall be separate and distinct from the contract which will come into existence when tender is finally accepted by this Organisation. The consideration for this separate initial contract proceeding the main contract is that this Organisation is not agreeable to sell the Tender to the Tenderer and to consider the tender to be made except on the condition that tender shall be kept open for ..... days after the last date fixed for the receipt of tenders and the Tenderer desires to make tender on this condition after entering into this separate initial contract with this Organisation. This Organisation promised to consider the tender on this condition and the tenderer agrees to keep the tender open for the required period. These reciprocal promises form the consideration for this separate initial contract between the parties.

If Tenderer fails to honour the above terms and conditions this Organisation shall have unqualified, absolute and unfettered right to en cash the earnest money submitted on this behalf.

Yours faithfully,

(BIDDER)

(PURCHASER)  
on behalf of the Prasar Bharti Corporation of India

(One copy of this agreement duly signed must be returned along with the Technical Bid)

**EXCEPTION / DEVIATION PROFORMA**

This organisation expects the bidders to fully accept the terms and conditions of the tender document. However, should the bidder still envisage some exception/ deviations to the terms and conditions of the tender documents, the same should be indicated here and put in unpriced bid i.e. "Technical Bids". The price effect for withdrawal of such exception(s) to be indicated in the price bids only. If this proforma is left blank, then it would be presumed that bidder has not taken any exception / deviations to the terms and conditions of the tender documents.

Clause No. of Tender document	Full compliance not agreed	Exception/ deviation taken by Bidder	Confirmation if price effect for withdrawal of this exception has been specified in the Price Bid	Remarks

Signature of the Bidder /Tenderer

Name

Seal of the Company

**BIDDERS PAST SUPPLIES PROFORMA**

Sl. No.	Name & Address of client	Period from..... To.....	Description of stores / works in details	Total quantity supplied successfully	Remarks

**Note:** Certificate from clients to be enclosed along with this proforma.

**BIDDERS INFORMATION PROFORMA**

Tenderer must give specific answers against each of the following questions.

Tender No. **ADG(E)(SZ)/PUR/ NIT-12/ACP/2011-12/** Due for opening -----  
-----

1. Whether stores offered / SITC/SETC conform to specification at Annexure-IV, if not, details of deviations must be stated here.
2. Date by which delivery of stores / execution of work can be completed.
3. Business name and constitution of tendering firm. Is the firm registered under?
  - (i) Indian companies Act, 1913.
  - (ii) The Indian Companies Act, 1932/1956
  - (iii) Any other Act, if not who are owners?  
(Please give a full name).
4. VAT / Sales tax Registration No.
5. Central Sales Tax Registration No.
6. Service Tax Registration No.
7. PAN No / TIN No.
8. Annual turnover for last 3 years.
9. Present worth of tendering firm.
10. Fax No.:
11. E-mail :
12. Valid Electrical License number of contractor, Attested copy of the License to be submitted. **(For Electrical Works)**

Signature of Tenderer

Date \_\_\_\_\_

PRICE BID

Schedule of Rates

(To Be Filled In By Tenderers)

Tender No. **ADG(E)(SZ)/PUR/ NIT-12/ACP/2011-12/**

Tender's Name \_\_\_\_\_

Due Date\_\_\_\_\_

Delivery Period:

Tenderer's Quotation No. ----- Validity of Quotation-----

**SECTION-II**

SCHEDULE OF REQUIREMENTS FOR SITC OF 4X33 TR, CHILLED WATER & WATER-COOLED CONDENSER AIR-CONDITIONING PLANTS FOR TRANSMITTER AT SPT, ALL INDIA RADIO, DODDABUALLALPUR, BANGALORE(KARNATKA).

SNo	Description of the equipment	Capacity of each Unit	Quantity	Reference to para of section-III for Technical specification	Remarks
2.1.	SITC of chilled water & water cooled condenser air conditioning plants (Eqpt.) consisting of the following	As mentioned against each unit of the plant.	4 sets of plants as per details below	As mentioned against each unit of the plant.	Three plants with its associated Chilled water circuit & common water pump & common cooling tower will work at a time.
2.1.1	Compressor Unit complete with motor and other accessories.	99,792 Kcal/Hr of refg.	4sets	Para 3.1.1 through 3.1.10 and para 3.2.1 through 3.2.8	The standard ambient conditions at which A/C Plants offered by the tenderer will give the rated capacity should be clearly quoted along with de-rating in tonnage with increase in ambient conditions.
	Ambient design conditions				
	<b>Summer:</b> Dry Bulb: 40 degree C Wet Bulb: 25 degree C <b>Monsoon:</b> Dry Bulb: 29 degree C Wet Bulb: 22 degree C				
2.1.2	Water –cooled condenser complete with pressure gauges, temperature indicators, etc.	Heat rejection capacity <b>not &lt; 1,29,730</b> Kcal/Hr.	4 sets	Para 3.3.1 to 3.3.13	
2.1.3	Air handling Unit each complete with:		2 sets	Para 3.7 3.7.6.3	One working + one standby
	i) Centrifugal blowers	22440 CMH at static pressure of 40 mm WG			
	ii) Cooling coil	Capacity 99,792 Kcal/Hr. SHF 0.85			
	iii) Air Filter Bank	To match the blower			
	iv) Expansion Valve	99,792 Kcal/hr.		Para 3.10.7	

2.1.4	Mechanical draft water re-cooling tower.	Heat rejection capacity not less than 3,89,190 K.Cal/hr.	2 no.	Para 3.6 to 3.6.13	One for two plants, other is standby
2.1.5	Water pump set complete with required accessories	Not less than 528 LPM at required head and Efficiency > 80%	4 nos.	Para 3.4.1 to 3.4.10 & 3.5.1 to 3.5.7	Three pump set will work at a time. The other shall be a standby
2.1.6	Make-up water tank	5,000- liters capacity as per IS-10661/Sintex	2nos.	Para 3.8.1 to 3.8.2	
2.1.7	Refrigerant Piping	To suit each Plant	1 lot as per assessment	Para 3.10.1 to 3.10.6	Rate / Unit for different type and size of the pipes and valves to be used in circuit to be quoted as per the tentative quantities given in the diagram (Refer to para 1.3.3(b) of section –I <b>SEE NOTE -1</b>
2.1.8	Water pipes and plumbing accessories	To suit each plant	1 lot as per assessment	Para 3.11.1 to 3.11.5 and Appendix-I	Rate/meter length of different size of pipes to be used in circuit to be quoted as per the tentative quantities given in the diagram (refer to Clause 1.3.3(b) of Section-I) <b>SEE NOTE -1</b>
2.1.9	Water Chiller Unit each complete with pressure gauges, temperature indicator, water meters and expansion valve etc.:	Not < 99,792 Kcal/Hr. (33TR)	4 sets	Para 3.9.1 to 3.9.18	<b>The chiller shall be rated for a fouling factor of not &lt; 0.0001M<sup>2</sup> Hr °C/ K cal.</b>
2.1.10	Chilled water pipes and plumbing accessories	To suit each plant and Transmitter's AHUs	1 lot as per assessment	Para 3.12.1 to 3.12.5 and Appendix-I	Rate/meter length of different size of pipes to be used in circuit to be quoted as per the tentative quantities given in the diagram (refer to Clause 1.3.3(b) of Section-I) <b>SEE NOTE -1</b>
2.1.11	Chilled water pump set complete with required accessories	Not less than 330 LPM at required head and Efficiency > 80%	4 nos.	Para 3.9.19 to 3.9.20 &	Three pump set will work at a time. The other shall be a standby
2.1.12	Expansion tank	200 litter	1 nos.	Para 3.11.14	Common for two sets of plants.

2.1.13	Electrical switch-gear and accessories	To suit each plant	1 lot as per assessment	Refer to Appendix-II	Requirement along With make and capacity/rating and number of panels/ sub-panels, ACBs/ MCCBs/FSUs/ Contactors etc.to be indicated by the tenderer(Refer to clause 1.3.2 (c) of section-I). <b>SEE NOTE -1</b>
2.1.14	Electrical Cables	To meet load requirements taking into consideration de-rating & overload conditions as per relevant IS	As per requirement	Refer to Appendix-I	Estimated requirement with cost along with Make and rating of Different power cables, Control wires is to be Indicated by the tenderer. Refer to clause 1.3.2 (c) of Section-I). <b>SEE NOTE-1</b>
2.1.15	Controls	To suit the design of the Plant	1 Lot	Para 3.13.1 to 3.13.5	
2.1.16	Remote Indication Panel	For status indication of Blowers, Pumps, Compressors, Cooling Tower etc.	1 No.	Para 3.11.6	The tenderer shall carry Out SITC of Remote Indication panel Including cabling from A/C plant room to Control Room.
2.1.17	On line water softening plant to prevent scale formation in condensor	As required	4 nos.	Para 3.3.12	The tenderer may study the water analysis report (Annexure-VI) to recommend and quote a suitable online scale preventor/water softening plant
2.2.	Spares	The spares required for open/semi-hermetically sealed compressor are to be quoted along with cost of each item.			
2.2.1	Fan Motor for cooling tower	Same as that of the motor in the circuit in the cooling tower.	1 No.		
2.2.2	Expansion Valve	Same as that in circuit	1 No.		

2.2.3	High Pressure cut-out switch	Same as that in circuit	1 No.		
2.2.4	Low Pressure cut-out switch	Same as that in circuit	1 No.		
2.2.5	Oil- Pressure cut-out switch	Same as that in circuit	1 No.		
2.2.6	Pressure Gauges for refrigerant & oil	Same as that in circuit	1 No. each of High Pr., Low Pr. & Oil Pr. Gauge.		
2.2.7	Pressure gauges for water pressure	Same as that in circuit	1 no. each of discharge and suction pressure gauges		
2.2.8	Dial type thermometer	Same as that in circuit	1 no. each for suction and discharge side		
2.2.9	Coil for Solenoid valve	Same as that in circuit	1 No. coil for each type of solenoid valve used in circuit.		
2.2.10	Empty Gas cylinder with regulating valve adopter & pressure gauge.		1 No.		
2.2.11	Lubricating Oil		As Required in one plant.		
2.2.12	Liquid line strainer	Same as that in circuit	1 No.		
2.2.13	Drier	Same as that in circuit	1 No.		
2.2.14	Nozzles	Same as that in circuit	1 No.		
2.2.15	Crank case heater	Same as that in circuit	1 No.		
2.3.	<b>Tools:</b> The tools will essentially consist of the following				The price /Charges Of each item of Tool shall be quoted Separately along With make. The Tools should be of Reputed make.
2.3.1	Flaring Tool	Imperial type with wide range	1 No.		

2.3.2	Tube cutter	Having a cutting range of all the size of tubes required to be used in the plant.	1 No.		
2.3.3	Pulley puller	Size 300 mm	1 No.		
		Size 150 mm	1 No.		
2.3.4	Valve Key	To suit the system	1 No.		
2.3.5	Ratchet Wrench	Size 12 (mm) <sup>2</sup>	1 No.		
2.3.6	Whirling Psychometer		1 No.		
2.3.7	Anemometer		1 No.		
2.3.8	Thermometer	Accuracy 0.1°C	1 No.		
2.3.9	Fuse Puller		1 No.		
2.4.	Erection, commissioning & testing of the plant at site.		Lump sum	Para 1.4 & 1.6 of Section-I Section-IV	
2.5.	Civil works				
2.5.1	<b>Foundation, staging etc for equipment etc for equipment &amp; other misc. civil works</b>	As per requirement & finalized drawings of the firm approved by zonal office	To be estimated by the tenderer.	Para 13.1 to 13.4 and 14 of section –III	Charges to be quoted separately for fixed & variable items of works.
2.5.2	<b>Dismantling of old AC Plants</b>		Lump sum		

#### NOTES

The items under paras 2.1.7, 2.1.8, 2.1.9 & 2.1.10 of this section are to be quoted by the tenderer on the basis of quantities assessed in the diagram/details submitted with the tender (Refer to clause 1.3.2(c) and 1.3.3(c) of section-I). After scrutinizing the technical bids the indenter will intimate the tenderer the various quantities of each item under aforesaid paras on the basis of which the financial bids would be scrutinized/evaluated for arriving at the lowest satisfactory (L1) offer. However, the rate per unit length or unit basis shall also be given in the financial bids so that the payment could be made on the basis of quantity of each such actually used in the installation.

The various motor starters offered by the tenderer should ensure that the motor starting current is within the limits stipulated by the concerned Electricity Supply Authorities.

The wiring in Air Conditioning Plants Room for installation of Air Conditioning Equipment shall be carried out in cable trays running at a height of not less than 2300 mm from floor level. The tenderer shall provide necessary conduits and cable trays for running the wiring.

The tenderer has also to give a written undertaking that the spare parts required for air-conditioning plant shall be available off-the-shelf for a period of at least 10 years from the date of commissioning of plants at sites. Sufficient advance intimation shall be given to the indenter before phasing out any spare component/part so that indenter is able to stock the same for future use.

Tenderer's Signature  
Date  
Seal

**Note**

1. Please indicate prorata break up details of all identifiable items of supply of stores and ITC / ETC cost in proforma Appendix - 6A enclosed.
2. The statutory charges like Excise Duty, VAT/Sale Tax, Service Tax etc which will not be borne by the bidder must be indicated with % rates as applicable in column 7 above, failing which this Organisation will not be liable for payment of any such charges.
3. State Entry Tax, Toll Tax and other taxes which are collected by statutory bodies on the way during transportation of materials **shall not be included in the price bid**. These taxes, if paid, may be reimbursed as per actual on claim with original receipt of payment.

**PRICE BID**  
**Prorata Break Up Details Of The Identifiable Items of Supply**  
**And ITC / ETC cost**

(To Be Filled In By Tenderers)

(SITC OF 33 TR, CHILLED WATER AND WATER COOLED CONDENSER AC PLANT FOR SPT BANGALORE.

Tender No **ADG(E)(SZ)/PUR/ NIT-12/ACP/2011-12/**

Tender's Name -----

Due Date-----

Delivery Period:-----

Tenderer's Quotation No. \_

Validity of Quotation\_\_\_\_

Sl No.	Description of items/works	Quantity	Unit	Rate per unit (both in figures and words)	Total (both in figures and words)	Taxes if any (rate & amount)
1.						
2.						
3						
4						
5						

**Grand Total (1+2+3+4+5) in Rs.**

(Both in words & figures)

Tenderer's Signature

Date

Seal

No.

To,

PRASAR BHARATI (BCI),  
The Addl. Director(E)(SZ),  
All India Radio & Doordarshan,  
Chennai – 600005.

SUBJECT : Tender No. \_\_\_\_\_due on  
\_\_\_\_\_

Sir,

Sri \_\_\_\_\_has been  
authorised to be present at the time of opening of above tender due on  
\_\_\_\_\_at Chennai-5 on my/our behalf.

Yours faithfully,

Signature of Tenderer

Copy to : Shri \_\_\_\_\_ for  
information and for production before the time of opening of tenders.

**General Terms And Conditions  
(GTC)**

(Each page must be signed and returned along with your offer)

**1. Definitions**

Unless inconsistent with or otherwise indicated by the context, following terms stipulated in this ORDER shall have the meaning as defined hereunder.

**1.1 Order**

Shall mean written purchase order issued by this organisation to the successful bidder including subsequent amendments to ORDER in writing thereof.

**1.2 The Organisation /Purchaser**

Shall mean PRASAR BHARATI (BCI), ADDL.DIRECTOR GENERAL(E) (SZ) All India Radio & DOORDARSHAN, CHENNAI -600005, acting on behalf of President of India shall include all their legal representatives, successors and assignees.

**1.3 Supplier/Contractor**

Shall mean any person or persons of firm or company in India whose bid has been accepted by this Organisation and the legal representation, representatives, successors and permitted assignee of such person, persons, firm or company.

**1.4 Sub-Contract**

Shall mean ORDER placed by the Supplier/Contractor for any portion, of the ORDER or work Sublette with necessary written consent of this Organisation on third party. Such sub-letting shall not relieve the contractor from any obligation, duty or responsibility under the Contract.

**1.5 Sub-Contractor**

Shall mean any person or persons or firm or their legal representatives, successors, assignees to whom part of ORDER has been sub-letter by the Supplier/Contractor after necessary consent of this Organisation.

**1.6 ORDER PRICE**

Shall mean the sum accepted or the sum calculated in accordance with the rates accepted by this Organisation and amendments thereof and shall include all fees, registration and other charges paid to statutory authorities without any liability on the Organisation for any of these charges unless specially agreed to, in writing by this Organisation.

**1.7 DELIVERY PERIOD**

Shall mean dispatch of the stores or receipt of the stores or installation and commissioning or erection and commissioning or fabrication and erection of the stores depending on the type of contract (Supply of Stores / SITC / SETC) by the date specified in the ORDER.

## **1.8 DESTINATION**

Shall mean the location of the consignees for which this ORDER has been issued.

## **1.9 EQUIPMENTS/MATERIALS**

Shall mean and include any equipment, instruments, stores and goods to be supplied for under the ORDER and amendments thereto.

## **1.10 DRAWINGS**

Shall mean and include all Engineering sketches, general arrangements, layout drawing, Sectional plans, all elevations etc., related to the ORDER together with modification and revision thereto.

## **1.11 SPECIFICATIONS**

Shall mean and include detailed description, statements to technical data, performance characteristic and standards (Indian as well as as applicable and as specified in the ORDER).

## **1.12 INSPECTION OFFICER**

Shall mean any person or outside Agency nominated by this Organisation to inspect equipment, materials and services, if any, in the contract stage-wise as well as final before dispatch at Suppliers Works and on receipt at destination as per the terms of the ORDER.

## **1.13 TESTS**

Shall mean such process or processes to be carried out by the Suppliers/Contractor as prescribed in the ORDER, are considered necessary by this Organisation or their representative in order to ascertain quality, workmanship, performance and efficiency of equipment or part thereof

## **1.14 APPROVAL**

Shall mean and include the written consent either manuscript, typewritten or printed statement under or over signature or seal as the case may be of this Organisation or the representative or documents or other particulars in relation to the ORDER.

## **2. SCOPE OF ORDER**

2.1 Scope of the order shall be as defined in the ORDER, specifications, drawings and annexure thereto.

2.2 Completeness of the EQUIPMENT/SITC/SETC shall be the responsibility of the Suppliers/Contractors. Any equipment fittings and accessories, which may be specifically mentioned in the specification or drawing (s) but which are usual or necessary for the satisfactory functioning of the EQUIPMENTS (successful operation and functioning of the equipment being Suppliers/Contractors responsibility shall be provided by the SUPPLIER without any extra cost).

2.3 The Suppliers/Contractors shall follow the best modern practice in the manufacture of high grade EQUIPMENT notwithstanding any omission in that, the Supplier/Contractor shall in all respect design, engineer, manufacture and supply the same within delivery period to the entire satisfaction of the Organisation.

2.4 **WORK TO BE CARRIED OUT UNDER THE ORDER**

All equipment to be supplied/SITC/SETC to be executed under the ORDER shall conform to and comply with the provision of relevant regulations/Acts (State Govt. or Central Govt.) as may be applicable to the type of equipment/work carried out and necessary certificate shall be furnished.

**3. SPECIFICATION, DRAWING, TECHNICAL MANUALS**

3.1 The Suppliers/Contractors shall furnish four copies and such additional no. of copies as required by this organisation of technical documents final drawing, preservation instructions, operation and maintenance manuals, test certificates, spare parts catalogue before dispatch of the equipment as under:

- (i) Inspection Officer
- (ii) Consignee (2 copies)
- (iii) Purchaser

3.2 The Suppliers/Contractors shall be responsible for any loss to this Organisation consequent to the furnishing of the incorrect data/drawings.

3.3 The Suppliers/Contractors shall provide Cross Sectional Drawing to identify the spare parts numbers and their location.

3.4 Specifications, design and drawings issued by this Organisation to the supplier/contractor along with tender specification and ORDER are not to be sold or given on loan. These documents continue to remain property of this Organisation. OR THEIR ASSIGNEE AND ARE SUBJECT TO RECALL BY this Organisation. The Suppliers/Contractors and its employees shall not make use of the drawings, specification and technical information for any purpose any time and shall not disclose the same to any person, firm or corporate authorities without written permission of the Organisation. All such details shall be kept confidential.

3.5 In order to facilitate quick disposal, copies of the drawing for approval shall be sent directly and simultaneously to the authorities specified in the order in addition to the sets submitted to authority issuing order.

**4. ACCEPTANCE OF ORDER**

4.1 Within fifteen (15) days from date of mailing of ORDER, SUPPLIER/CONTRACTOR shall confirm acceptance of the order in its entirety.

4.2 The ORDER is accepted unconditionally by Suppliers/Contractors by returning to this Organisation copy of the ORDER duly signed.

4.3 When Suppliers/Contractors has accepted the order with all its terms and conditions, tenderer's bid with general sales conditions and all his previous correspondences are considered superseded and void.

- 4.4 Should Suppliers/Contractors not respect the time limit for the Confirmation of the order or in case Suppliers/Contractors cannot accept the ORDER, this Organisation reserves the right to cancel in writing without prejudice to other terms, the entire ORDER or part of it, without notice. Under these circumstances the earnest money given by the supplier/contractor will be forfeited in full.

## **5. MODIFICATION IN ORDER**

- 5.1 All modifications leading to changes in the order with respect to technical and /or commercial aspects, including terms of delivery, shall be considered valid only when accepted in writing by this Organisation by issuing amendment to the ORDER.
- 5.2 This Organisation shall not be bound by any printed conditions, provision in the SUPPLIER BID, forms of acknowledgement of ORDER, invoice, packing list and other document, which purport to impose any condition at variance with or supplement to ORDER.

## **6. JOINT AND SEVERAL RESPONSIBILITY**

- 6.1 Where Suppliers'/Contractor's Equipment or any part thereof are to be used jointly with the equipment supplied by another manufacturer (the name of the manufacturer will be communicated separately to supplier) this Organisation will hold supplier and the manufacturer jointly and severally responsible for the perfect operation of the entire group or section of equipment as regard the technical and mechanical characteristics stipulated in the specification. Such responsibility shall include the mechanical coupling as well as dynamic and starting moment.
- 6.2 Consequently, Suppliers/Contractors shall establish and maintain all necessary contract with the manufacturer to be indicated by the organisation with a view to ensuring the exchange of all relevant data and information.

## **7. PERFORMANCE SECURITY DEPOSIT**

- 7.1 To ensure due performance of the contract, Performance Security is to be obtained from the successful bidder awarded the contract. The successful bidder, 2 weeks from the date of the issue of the letter of indent will be required to deposit Performance Security Deposit in the form of Fixed Deposit Receipt from a Commercial Bank/Demand Draft / Bank Guarantee from a Commercial Bank for an amount as indicated in the letter of indent. The Performance Security Deposit shall be 10 % of cost of the order / contract value.
- 7.2 The Security money may be deposited in the form of Fixed Deposit Receipt/Demand Draft/Bank Guarantee from a Commercial Bank. It should remain valid for a period of 60 days beyond the date of completion of all contractual obligations of the supplier, including warranty/guarantee obligations.
- 7.3 This Organisation shall not be liable to pay any Bank Charges, Commissions or interest on the amount of Performance security deposit.

- 7.4 Performance Security deposit shall be refunded to the supplier/contractor after completion of all contractual obligations of the supplier, including warranty/guarantee obligations. If the materials are supplied in the extended delivery period, the supplier/contractor will extend the validity of Demand Draft/Bank Guarantee/ FDR accordingly and the Security Deposit / Performance Guarantee will be released after extended validity expires.
- 7.5 For release of Performance security deposit, supplier/contractor shall submit a certificate from the consignee to the effect that the equipment has performed satisfactorily during the guarantee period as stipulated in the order and organisation has not suffered any loss or inconvenience on this account.

## **8. WARRANTIES AND GUARANTEES.**

### **8.1 MATERIALS AND WORKMANSHIP**

- 8.2 Unless some special warranty/Guarantee clause has been stipulated elsewhere in the invitation to the tender or any of its Annexure, the following warranty shall form part of the contract placed on successful tender:-
- 8.2.1 Suppliers/Contractors shall fully warrant that all the stores, Equipment and components supplied under the ORDER shall be new and of first quality according to the specifications and shall be free from defects (even concealed fault, deficiency in design, materials and workmanship).
- 8.2.2 Should any defects be noticed in design, material and/or workmanship within 15 months from the date of shipment/dispatch of last consignment or 12 months from the date of receipt/commissioning of the equipment, or the guarantee/warranty period as specified in specifications (Annexure IV) whichever is later, the organisation shall inform Supplier/Contractor and Supplier/contractor shall immediately on receipt of such intimation, depute their personnel within 14 days to investigate the causes of defects and arrange rectification /replacement/modification of the defective equipment at site without any cost to the Organisation within a reasonable period. If the supplier/contractor fails to take proper corrective action to repair/replace the defects satisfactorily within the reasonable period, this Organisation shall be free to take such corrective action as may be deemed necessary at contractor's risk and cost after giving notice to the Supplier/Contractor.
- 8.2.3 Damage to the machinery and/or equipment due to incomplete and erroneous instructions issued by Supplier/Contractor will be the responsibility of the supplier/contractor and will be treated according to the provisions of warranty clause. Normal wear & tear shall not come under purview of this clause.
- 8.2.4 In case defects are of such nature that equipment shall have to be taken to suppliers/Contractor's works for rectification etc. Supplier/Contractor shall take the equipment at his cost after giving necessary undertaking or security as may be required by the Organisation. This Organisation shall, if so required by the supplier/contractor, dispatch the equipment by quickest mode on "Freight-to pay" basis to the supplier's/contractor's works. After repairs suppliers/contractors shall deliver the equipment at site on freight pre-paid basis. All risks in transit to and fro shall be borne by the supplier/contractor.

- 8.2.5 Equipment or spare parts thereof replaced shall have further warranty for a period of 12 months from the date of acceptance.
- 8.2.6 The supplier/contractor shall guarantee that they will supply spare parts if and when required on agreed price. The agreed price should include but without any limitation to agreed discount on the published catalogue price or on agreed percentage of profit on the landed cost.
- 8.2.7 The supplier will warranty that before going out of production for any of spare parts, they will give adequate advance notice to the purchaser so that the latter may undertake to procure, if necessary, the balance of the life time requirements.
- 8.2.8 If the repairs, replacement or modification referred are of such nature as may affect the efficiency of the EQUIPMENT this Organisation shall have the right to give to the Supplier/Contractor within one month of such replacement / renewal notice in writing to carry out test as may be required for acceptance of the equipment.
- 8.2.9 If the supplier/contractor fails to honour his obligation to repair or replace defective goods within a reasonable period of time, or if supplier/contractor refuses to carry out work under the guarantee clause and implied guarantee condition, if danger is anticipated or in case of severe urgency, the Organisation shall be entitled to carry out, at Supplier's/Contractor's cost and risk, repair work or replacement deliveries or have it done by a third party. In case not all goods have been delivered by Supplier/Contractor, this Organisation is entitled to procure the remaining goods/services at Supplier's/Contractor's cost and risk. This does not relieve Supplier's/Contractor's of any of his guarantee obligations. Taxes and duties of any kind whatever imposed by the authorities of the country of the supplier or his sub contractors until delivery shall be borne by supplier//contractor.

## **9. PERFORMANCE GUARANTEE**

- 9.1 Supplier/Contractor shall guarantee that the performance of the Equipment /Material supplied under the order shall be strictly in conformity with specification and shall perform the duties specified under the ORDER.
- 9.2 The Supplier/Contractor shall guarantee that the materials / equipment that shall be purchased from the sub-contractor(s) shall be such as to fulfil the requirements laid down vide para 8.1 to 8.10 above and shall undertake to ensure fulfilment of these requirement.

## **10 REJECTION**

If the ORGANISATION finds that the goods supplied are not in accordance with the specification and other condition stated in the order or its sample (s) are received in damaged conditions (of which matters this Organisation will be the sole judge), this Organisation shall be entitled to reject the whole of the goods or the part, as the case may be and intimate to the Supplier/Contractor the rejection without prejudice to the Organisation other rights and remedies to recover from the Supplier/Contractor any loss which the ORGANISATION may be put to, also reserving the right to forfeit the performance security deposit if any made for the due fulfilment of the contract.

The goods shall be removed by the supplier/contractor and if not removed within 14 days of the date of communication of the rejection the Organisation will be entitled to dispose-off the same on account and at the risk of the Supplier/Contractor and after recovering the storage charges at the rate of 5% of the value of goods of each month or part of month and loss and expense if any caused to the Organisation pay balance to the Supplier/Contractor.

**11. FAILURE AND TERMINATION CLAUSE**

Time and date of delivery shall be essence of the contract. If the Contractor/Supplier fails to deliver the stores / execute SITC / SETC, or any instalment thereof within the period fixed for such delivery in the schedule or at any time repudiates the contract before the expiry of such periods, the purchaser may without prejudice to any other right or remedy, available to him to recover demurrages for breach of the contract:-

- a) Recover from the Supplier/Contractor as agreed, liquidated demurrages including Administrative expenses and not by way of penalty, a sum equivalent to 0.5% per week upto maximum limit of 10% of the contract value for such delay or part thereof (this is an agreed, genuine pre-estimate of demurrages duly agreed by the parties) which the supplier/contractor has failed to deliver thereof is accepted after expiry of the aforesaid period, provided that the total demurrages so claimed shall not exceed 10% of the contract price of the stores / SITC / SETC. After full period of extension, termination of the contract will be considered by the Organisation.
  - b) Purchase or authorise the purchase elsewhere on the account and at the risk of the contractor/supplier, of the stores not so delivered / SITC / SETC not carried out or other of a similar description (where stores exactly complying with the particulars are not in the opinion of the purchaser, which shall be final, readily procurable) by serving prior notice to the contractor/supplier without cancelling the contract in respect of the instalment not yet due for delivery or,
  - c) Cancel the contract or a portion thereof by serving prior notice to the Contractor/Supplier and if so desired purchase or authorise the purchase of the stores not so delivered / SITC / SETC not carried out, or others of a similar description (where stores not delivered / SITC / SETC not carried out, exactly complying with particulars are not in the opinion of the purchaser, which shall be final readily procurable) at the risk and cost of the Contractor/Supplier. If the Contractor/Supplier had defaulted in the performance of the original contract, the purchaser shall have the right to ignore his tender for risk purchase even though the lowest, where the contract is terminated at the risk and cost of the firm under the provisions of this clause, it shall be in the discretion of the purchaser to exercise his discretion to collect or not, the Security deposit from the firm on whom the contract is placed, at the risk and expense of the defaulted firm.
- (c) Where action is taken under sub-clause (b) or sub-clause (c) above, the contractor shall be liable for any loss which the purchaser may sustain on that account, provided the purchase or if there is an agreement, to purchase, such agreement is made in case of failure to deliver the Stores/Services, within 6 months from the date of such failure and in case of repudiation of contract the Contractor/Supplier shall not be entitled to any gain on such the entire discretion of the purchaser to serve a notice of such purchase on the Contractor/Supplier.

- (e) It may further be noted that clause (a) above provides for recovery of liquidated demurrages on the cost of contract price of delayed supplies (whole unit) at the rate of 0.5% per week up to maximum limit of 10% of the contract value for such delay or part thereof. Liquidated demurrages for delay in supplies thus accrued will be recovered by the paying authority on instruction as specified in the supply order, from the bill for payment of the cost of materials / works submitted by the supplier / contractor in accordance with terms of supply order on instruction from Purchaser regarding liquidated demurrages amount.
- (f) Notwithstanding anything stated above, equipment and materials will be deemed to have been delivered / SITC / SETC will be deemed to have been carried out only when all its components, parts are also delivered. If certain components of stores are not delivered in time / SITC / SETC not carried out in time, the stores / SITC / SETC will be considered as delayed until such time all the missing parts are also delivered.

## 12. **INSPECTING/TESTING OF MATERIAL**

The inspection of stores/services/works will be carried out by the authority specified in the purchase order. The stores/works will be accepted only after the same has been found satisfactory after inspection and duly marked and sealed by the inspection authority.

- 12.1 The Supplier/Contractor shall ensure that the stores/services/works to be supplied/executed against this order shall be individually inspected, tested and analysed in terms of the specifications attached to the tender and the relevant codes and practices specified therein by expression or implication. Necessary test reports shall be provided as required.
- 12.2 The Supplier/Contractor should make available to the Organisation and any other individual/agency authorised by the Organisation for the purpose of inspection all its records and results in respect of inspection, test and analysis conducted by it as part of their manufacturing and testing operation under the applicable codes and practices specified by expression or implication in the tender.
- 12.3 Inspection tests and analysis shall be carried out/conducted at the Supplier's/Contractor's works by the authorised representative of the Organisation and the cost of to and fro air fare, accommodation and cash allowances payable to the authorised representative of the Organisation shall be borne by the Organisation.
- 12.4 The Supplier/Contractor shall provide and deliver free of charge for tests/analysis by an independent authority at any such place or places as the Organisation or its authorised inspector may reasonably require such raw material (s) used or intended to be used for the contracted work by the Supplier/Contractor as the Organisation/Inspector shall consider necessary. The cost of such tests/analysis shall be borne by the Contractor.
- 12.5 This Organisation shall be entitled at all times, whether prior to, during or after the completion of inspection by itself and/or through inspectors appointed by the Organisation at the Organisation's cost, to inspect, test and/or analyses and/or to direct the Contractor in all respect of any store(s) or materials processes used or proposed to be used in the fabrication of the product of any of them.

The said inspection, tests and analysis as far as required, is to be conducted in the presence of the inspectors. The contractor shall ensure that the inspecting personnel referred to above are given free access to all the required places and information connected with their work, besides working facilities to carry out their function.

- 12.6 Should the supplier/contractor fail to comply with any of the provisions aforesaid relating to inspection, testing and /analysis the Organisation shall be entitled by itself and/or through inspectors to conduct or have conducted the inspection, test and/or analysis at the risk and expense of the supplier/contractor in all respects.
- 12.7 No rejected raw materials shall be used for the contracted work or re-tendered for inspection and/or test except with the prior permission of concerned Inspectors.
- 12.8 Unless otherwise specifically authorised by the Organisation in writing, the contractor shall not dispatch the stores under the contract entered into, any material which has not been properly inspected/tested marked and in respect of which a certificate of quality has not been issued or signed by the inspectors.
- 12.9 In addition to the general conditions of the inspection stated above, the supplier/contractor shall also satisfy all the specific conditions of inspection as enumerated in the specification attached.
- 12.10 In addition to inspector(s) the Organisation shall be entitled to nominate, depute or designate a representative to be stationed at the supplier's/contractor's factory in order to supervise and/or coordinate operations related to the contract. In the event of there being more than one factory involved in the work entrusted to the Supplier/Contractor, the Organisation shall be entitled to nominate/depute or appoint such representative(s) as necessary in respect of each such factory.
- 12.11 The Supplier/Contractor shall at his cost afford and ensure proper working facilities to the said representative(s) at the factory (i.e.) to enable him to perform his functions, and shall furnish him with all such information, data and assistance as he may require for the proper performance of his functions.
- 12.12 The posting of such a representative by the Organisation or his actions in any manner does not absolve the contractor of any liability, and/or responsibility under this contract. The representative's posting shall be treated as advisory to the Organisation.
- 12.13 For false calls for the cases where material is rejected on inspection the supplier will bear the actual cost of inspection incurred/suffered by the Organisation.
- 12.14 Place of inspections specified in supply order will not be changed without written confirmation from Purchase Authority.

13. **SUB-STANDARD MATERIAL/REPLACEMENT OF REJECTED GOODS**

13.1 If the Organisation finds that MATERIAL supplied / SITC/SETC executed are not of the correct quality or not according to specification required or otherwise not satisfactory owing to any reason of which the Organisation will be the sole judge, the Organisation will be entitled to reject materials, cancel the contract and buy its requirement in the open market at the risk and cost of supplier, reserving always to itself the right to forfeit the performance security deposit placed by the supplier for the due fulfilment of the contract.

13.2 Rejected goods should be removed and replaced within 14 days of the date of communication of rejection.

14. **SUBLETTING AND ASSIGNMENT**

The Supplier/Contractor shall not, save with the previous consent in writing of the purchase Authority, sublet, transfer or assign the contract or any part thereof or interest therein or benefit or advantage thereof in any manner whatsoever, provided nevertheless that any such consent shall not relieve the contractor from any obligation, duty or responsibility under the contract.

15. **BREAKAGE/SHORTAGE**

Claim in respect of breakage/shortages, if any, shall be preferred on the supplier within thirty days from the date of receipt of stores at destination by the consignee which shall be replaced/made good by the supplier at his own cost.

All risk or loss or damage to the material shall be upon the Supplier/Contractor till it is delivered in accordance with the terms and conditions of the supply order.

16. **DESIGNS, PATENTS AND ROYALTIES**

If any material used or methods or processes practiced or employed in the manufacture of items to conform with the requirement of the contract is/are covered by a patent(s) in respect of which contractor is not licensed, the supplier/contractor shall before using the material, method or process, as the case may be, obtain such license(s) and pay such royalty(ies) and license fee(s) as may be necessary. The supplier/contractor shall keep the Organisation indemnified from and against any and all claims, actions demand and proceedings whatsoever brought or made against the organisation on the basis of any patent or infringement thereof claimed or otherwise relating to and arising from any method or process employed or matter or thing done to or in connection with any work executed by the supplier/contractor shall at their own risk and defend any suit for infringement or patent or like suit brought against the Organisation (whether with or without the contractor being a party thereto and shall pay demurrages and costs awarded in such suit and keep the Organisation indemnified from and against all consequence thereof.

17. **FORCE MAJEURE**

In the event of either party being rendered unable by force majeure to perform any obligation required to be performed by them under the contract, if any concluded, the relative obligation of the party affected by such force majeure lasts.

The terms "Force Majeure" as implied herein shall mean acts of God, War, Civil riots, fire directly affecting the performance of the contract, floods and Acts and Regulations of respective Government of the two parties, namely the Organisation and the contractor. Both upon the occurrence of such cause and upon its termination, the party alleging that it has been rendered unable as aforesaid shall within seventy two hours of the alleged beginning and ending thereof giving full particulars and satisfactory evidence in support of its claim. If deliveries are suspended by force majeure conditions lasting for more than 2(two) months, the Organisation shall have the option of cancelling this contract in whole or part at its discretion without any liability on its part.

18 **LANGUAGE/TERMINOLOGY**

The Supplier/Contractor shall ensure the Language/Terminology/description of goods/Services/Works used in the Supply Order/Bill/Invoice/any other documents dispatched by the Supplier/Contractor is **verbatim in English**.

19 **REPEAT ORDER**

Repeat order can also be placed with the supplier up to 50% of the quantity of this order on the same terms and conditions as stipulated in the original supply order, during the validity of the supply order or within six months from the date of this supply order, whichever is later. It is a condition of this order and it will be obligatory on the part of Supplier/Contractor to execute such repeat order(s) also as the consideration for this option on favour of the purchase forms part of the main consideration under this order.

20 **PACKING & MARKING**

20.1 The supplier shall consign / Ship the stores in Sea worthy / Airworthy / Roadworthy packing confirming to the prescribed standards in force to withstand air / Ocean / Land journey and ensuring the safety of cargo en-route and also arrival of material at ultimate destination in good condition. The consignment shall be comprehensively insured against all risks by the Suppliers / Contractors from Supplier's / Contractor's warehouse up to destination . Each packing case should have proper identification like name of suppliers, name of consignee, gross weight, TOP / do not turn over / handle with care.

20.2 Each package shall have a detailed packing list.

21. **INSURANCE**

The contractor shall insure entire equipment during Transit, Storage, Installation, Testing, Commissioning until handing over to the consignee against losses, damages due to fire, earthquake, war, flood/ thefts etc. No claim will be admissible on this account.

22. **SHORT / DAMAGED / DEFECTIVE / NON RECEIPT OF MATERIAL**

The Supplier / Contractor is responsible for safe arrival of the material up to destination. Should there be any shortage / breakage of material found, the consignee, within a period of 30 days of receipt of material at destination, will lodge claim with the Supplier / Contractor and carriers under intimation to the Purchaser. The purchaser in question will also take up the matter with the supplier to make good the deficiency.

23. **Extension of Delivery Period**

In case where only portion of the stores ordered is tendered for inspection at the fag end of the delivery period and also in case where inspection is not completed in respect of the portion of the stores tendered for inspection during the delivery period ,the purchaser reserves right to cancel the balance quantity not tendered for inspection within the delivery fixed in the A/T at the risk and expenses of the contractor without further reference to him. If these stores for inspection during the fag end of the delivery period are not found acceptable after carrying out the inspection the purchaser is entitled to cancel the contract in respect of the same at the risk and expenses of the contractor. If, however the stores tendered for inspection and found acceptable, the purchaser may grant an extension of the delivery period subject to the following conditions.

- (i) The purchaser has the right to recover from the contractor under provision of clause 11 Annexure-II of the general condition of the contract liquidated demurrages on the stores which the contractor has failed to deliver within the DP/ refixed delivery period.
- (ii) That no increase in price on account of any statutory increase in or fresh imposition of customs duty, excise duty sales tax or on account of any other tax or duty leviable in respect of the stores specified in the A/T which takes place after the date of the delivery period stipulated in the A/T shall be admissible on such of the said stores as or delivered after the date of the delivery stipulated in A/T.
- (iii) That not with standing any stipulation in the contract for increase in price on any other ground, no such increase which take place after the date of the delivery stipulated in the A/T shall be admissible on such of the said stores as are delivered after the expiry of the D/P stipulated in A/T.
- (iv) But nevertheless, the purchaser shall be entitled to the benefit of any decrease in price on account of reduction in of remission of custom duty, excise duty, sales tax or on account of any other tax or duty or on any other grounds as stipulated in the price variation clause which takes place after the expiry of the date of delivery stipulated in the acceptance of tender.
- (v) The contractor shall not dispatch the stores, till such time an extension in terms of para (i) to (ii) above is granted by the purchaser and accepted by the supplier. If the stores are dispatched by the supplier before obtaining an extension letter from the purchaser, he would be doing so at his risk and no claim for payment shall lie against the purchaser either in respect of the cost of the stores dispatched or any other expenses which the supplier may have incurred. The purchaser shall however have a right to cancel the contract in terms of clause 11 Annexure II General terms & conditions . It shall be no defence that the consignee has taken delivery of the stores dispatched by the supplier without getting an extension letter and therefore the contract has been kept alive.
- (vi) In case where the entire quantity has not been tendered for inspection within the Delivery period stipulated in the A/T and the purchaser agrees to grant extension in the period the same would be subject to the conditions (i) to (iv) as mentioned paragraph above.

**BID EVALUATION CRITERIA**

1.	SALIENT FEATURES	BIDDERS CONFIRMATION
1.1	Open Tender No.	<b>ADG(E)(SZ)/PUR/ NIT-12/ACP/2011-12/</b>
1.2	Two Bid System	Yes
1.3	Tender Fee	As per clause 4 of Invitation to Bid
1.4	Validity period of Bid	120 days from the date of opening i.e. up to and inclusive of date of opening
1.5	Earnest Money	As per clause 5 of Invitation to Bid
1.6	Performance Security Deposit	Would be required on placement of Letter of indent i.e. 10% of the ordered value and shall be valid for 60 days from the date of expiry of guarantee / warranty
1.7	Delivery Period	As specified in the "Invitation to Bid"
1.8	Closing date of tender	<b>12.30 Hrs. on 19.10.2011</b>
1.9	Opening date of Technical bid	<b>15.00 Hrs. on 19.10.2011</b>
1.10	Opening date of Price bid	Date as may be separately notified later.

**2. VITAL COMMERCIAL CRITERIA FOR ACCEPTANCE**

The following vital commercial conditions should be strictly complied with failing which the bid will not be considered.

2.1 Bids should be from actual manufacturers, public sector undertakings, supply houses / representatives / distributors / dealers / authorised agents / contractors with required experience in the field.

## 2.2 SUBMISSION OF EARNEST MONEY ALONGWITH BID

The bidders must enclose with their technical bid along with EMD in the form of Demand Draft in favour of Addl. Director General(E) (SZ), All India Radio & Doordarshan, Chennai-600 005, from a Commercial Bank . EMD by means of Bank guarantee or any other mode of payment other than DD shall not be accepted. The amount of Earnest Money Deposit should be as per Clause 5 of "Invitation to Bid".The offers without earnest money will not be considered and summarily rejected.

2.3 Submission of Performance Security Deposit for execution of contract as well as for satisfactory performance of equipment during warranty period by the successful bidders

2.4 Acceptance of "Failure and Termination Clause", No. 11 (GTC) of Tender documents.

2.5 Acceptance of "Arbitration Clause", No.28 (Annexure-I) of tender document.

2.6 Acceptance of "Warranty and Guarantee Clause", No.8 (GTC) of tender document.

## 3. CRITERIA FOR LOADING OF BIDS

The following criteria will be adopted for evaluation of bid :-

3.1 For delivery/completion periods quoted longer than that specified in the bid document, the quoted price shall be loaded ½% per extra week or part there of. Offers with delivery/completion period longer than 3 months beyond the stipulated delivery completion period will be rejected.

3.2 Bidders will not indicate separate discount. Discount if any should be merged in the rates against the quoted items. Discount, if any, indicated separately will not be taken into account for evaluation purposes.

## 4. VITAL TECHNICAL CRITERIA FOR ACCEPTANCE OF BIDS

4.1 Quotation in original must be from the manufacturers/authorised supply house.

4.2 In case, the bidder is an authorised dealer/supply house/contractor with requisite work experience, he should name the original manufacturer. Bidder should furnish warranty from the original manufacturer and also furnish a certificate from the manufacturer that the bidder can quote items of the original manufacturer directly. Offers not complying with these requirements will be rejected, without any notice/back reference.

4.3 Past performance report of similar items earlier supplied / similar works earlier carried out for this Organisation will be taken into consideration while evaluating this bid. The bid shall be rejected, if the past performance of the similar item earlier supplied/similar work earlier carried out for the Organisation is found to be unsatisfactory.

**ANNEXURE-IV**

**DESCRIPTION OF STORES & TECHNICAL SPECIFICATIONS**

Tender No **ADG(E)(SZ)/PUR/ NIT-12/ACP/2011-12/**

Due Date\_\_\_\_\_

---

<b>SI.</b>	<b>Description of Stores/SITC/SETC Specification No. No.</b>	<b>Qty.</b>
------------	--	-------------

---

Kindly refer Technical Specification (66) pages enclosed.

**PRASAR BHARATI  
DIRECTORATE GENERAL: ALL INDIA RADIO  
PLANNING & DEVELOPMENT UNIT**

SPECIFICATION DOCUMENT FOR 33 TR ,Chilled water and water cooled Condenser AC plant for SPT Bangalore.

SPECIFICATION NO. : XTE- SW/1019  
 DATE OF APPROVAL : 21.07.2011  
 DATE OF ISSUE : 04.08.2011  
 APPROVAL FILE NO. : 14/7/Spec/2011/D(TD/SW)  
 NO. OF PAGES : 66

**SUMMARY OF CONTENTS:**

- |                           |  |                |
|---------------------------|--|----------------|
| 1. <b>Section I</b>       | : General conditions of Tender/contract                      | (P. No. 46-49) |
| 2. <b>Section II</b>      | : Schedule of requirement                                    | (P.No.50-54)   |
| 3. <b>Section III</b>     | : Technical specification of AC<br>Equipment and Accessories | (P.No.55-79)   |
| 4. <b>Section IV</b>      | : Inspection procedure and method of measurement             | (P.No.80)      |
| 5. <b>Annexure-I:</b>     |  | (P.No.81-87)   |
| 6. <b>Annexure-II :</b>   |  | ( P.No.88-92)  |
| 7. <b>Annexure-III :</b>  |  | (P.No.93-94)   |
| 8. <b>Annexure-IV :</b>   |  | (P.No.95-99)   |
| 9. <b>Annexure-V :</b>    |  | (P.No.100-101) |
| 10. <b>Appendix-I :</b>   |  | (P.No.102-106) |
| 11. <b>Appendix -II :</b> |  | (P.No.107-110) |

**N.B:**1. The tenderer should go through all the sections of this specification document carefully and should confirm clause-by-clause compliance of all the sections clearly. Tenders received without clause by clause compliance are liable to be rejected.

2. The tenderer should indicate the items offered as per schedule of requirements, Section-IV, without cost details in technical bid to assess the completeness of offer against AIR's requirement.

**(S.K.SAXENA)  
DIRECTOR ENGINEERING (TD)**

## SECTION -I

### GENERAL

#### SCOPE

**1.1.1** Supply, installation, testing and commissioning (SITC) of water-cooled 4x33 TR central air-conditioning plants for **SPT, All India Radio , Doddabullapur Bangalore ( Karnataka)**. The plants shall work on HCFC (R-22 or R134a) refrigerant. The plants shall deliver the specified tonnage, both in summer and monsoon seasons. The AC plants are to run 20 hours a day, 365 days in a year. Out of the four numbers of AC plants three shall be working and fourth shall be the relieving set/stand by. Detailed requirement are given in section-II and III.

**1.1.2** The following items of work will be carried out by the indenter :

- a. Main power-supply connection terminated in a cable box near the main switchboard in the plant room.
- b. Two independent electrical earths up to the tenderers switch boards.
- c. Water supply connection to make up water tank.

#### 1.2 GENERAL CONDITIONS OF CONTRACT

Payment terms, insurance cover, SITC schedule and time of completion, inspection, testing and commissioning of equipment and guarantee terms, penalty for delay etc. would be applicable as per AIR terms and conditions on the subject framed by the indenter, namely, **ADG(E) (South Zone), AIR & Doordarshan, Chennai**. The schedule of measurements would be applicable as given in section-IV.

#### 1.3 DESCRIPTIVE TECHNICAL LITERATURE AND DRAWINGS

##### 1.3.1. Site visit

In case the tenderers desire to have guidance regarding the electrical, refrigerant and water piping schematic and existing layout of equipment in plant room, they are **advised to inspect the site** before submitting their tender.

##### 1.3.2 Tender Documents

The tenderers shall submit the following in duplicate along with their tender **(as a part of technical bid)**. Commercial bid will be in a separate sealed cover.

- a) Descriptive and technical leaflets giving complete mechanical and electrical data about the equipment offered including detailed dimensions of the equipment.
- b) The statement of bill of quantities, technical particulars (see Annexure-I) and performance specifications of the equipment offered in the proforma as per Section-II and Section-III of the specifications.
- c) Details showing cable sizes and length, equipment capacities, switchgear rating and number, rating and number of control components.
- d) A schedule giving time period from start to finish of the complete work.

### 1.3.3 Installation Drawings

In the event of an order being placed, the tenderer shall supply to the indenter 3 copies each of the following for approval within 2 months from the date of placement of the order.

- a) Dimensional drawings (including sections) giving complete details for erection of plants including new foundation.
- b) A piping drawing showing layout for the entire piping with all diameters, lengths, sizes and number of valves etc. shown clearly.
- c) Electrical wiring diagram and control circuits of all electrical equipment showing cable sizes and electrical rating of the related equipment.
- d) Electrical Panel Layout/drawing showing various sizes of the Panel.
- e) Instruction manuals of various equipment of the A/C plants detailing all adjustment, operation & maintenance/servicing procedures.

Before taking up the installation work at site, the tenderer shall ensure that the indenter approves the installation drawings. **The plants are to be replaced one by one at a time in consultation with ADG(E) (SZ) and the Superintending Engineer, SPT, AIR , Doddabullapur Bangalore (Karnatka). so that there is no disruption in service due to replacement work and chilled water is circulated all the time when transmitters are functioning.**

### 1.3.4 COMPLETION DRAWINGS AND OTHER INFORMATION

Three sets of complete drawings comprising the following shall be submitted by the tenderer while handing over the installation:

- (a) Electrical drawings for the entire electrical equipment showing cable sizes, equipment capacities, switchgear ratings, control components, control wiring.
- (b) Schematic control drawings giving detailed notes to explain the sequence of operation of the control circuit.
- (c) Piping drawing showing layout for the entire piping with all diameters, lengths, sizes and number of valves etc. shown clearly. Isometric drawings showing each of the equipment/ units shall also be supplied.
- (d) Detailed drawings and specifications in respect of wearing parts.
- (e) Lists of components like thermostats, humidistats, other control components, relays, timers, contactors etc. giving their type, designation, function etc.
- (f) Schedule of items of which the tenderer is not the manufacturer/the manufacturer's authorized dealer. This should contain the specifications of each item and the agency from which these items are procured.

## 1.4 ERECTION

**1.4.1** This specification provides for dismantling the existing plants & the complete erection including all the associated civil works like equipment foundation, staging for M.U. water tank (s) cooling tower etc. of the air conditioning equipment at site by the tenderers. The tenderers may examine at site the condition of the existing staging for M.U. water tanks and cooling tower for reuse (for the new units) before quoting the rates. The entire work shall be carried out as per codes, regulations, detailed in Annexure-2 and as per following terms and conditions.

**1.4.2** The dismantling of old plants and erection of new plants should be planned in such a way as to have minimum interruption in the cooling system of Transmitters.

**1.4.3** The tenderer shall make his own arrangement for storage of all equipment and materials brought to site from time to time and their safe custody at site till the plants are taken over by the indenter/his representative. The tenderer shall make his own arrangements for providing accommodation for his workmen at site. Tents may, however, be pitched in the site compound at places to be decided upon by the indenter or his representative at site.

**1.4.4** The tenderer shall make his own arrangements for procuring necessary labour, skilled and unskilled. He should conform to all local government laws and regulations covering labour and their employment.

**1.4.5.** The tenderer shall indemnify and hold harmless the purchaser against all claims in respect of injury to any person howsoever arising out of the erection of the equipment in the course of such installation. The tenderer shall discharge all his obligations under the Indian workman's compensation act in as far as it affects workmen in their employment.

**1.4.6** The tenderer and his employees shall comply with the regulations in force for controlled entry into the premises where the air-conditioning equipment is to be installed.

## **1.5 TENDERER'S LIABILITY FOR DAMAGES CAUSED DURING INSTALLATION WORK AND IMPERFECTIONS NOTICED WITHIN THE GUARANTEE PERIOD**

If the tenderer or his/her workmen or servants shall break, deface, injure or destroy any part of the building in which they may be working or any building, road, road kerb, fence, enclosure, water pipe, cable, drains, electric or telephone posts or wires, trees, grass or grasslands in the premises on which the work or any part of it is being executed, or if any damage shall happen to the work while in progress from any cause whatsoever, or if any defect, shrinkage or other faults appear in the work within 12 months (after certificate, final or otherwise of its completion given by the indenter) arising out of defective or improper materials or workmanship, the tenderer shall, upon receipt of a notice in writing on that behalf, make good at his/her own expense, or in default, the indenter may get the same rectified and deduct the expenses from any amount that may be then due or at any time thereafter may become due to the tenderer or from his security deposit.

## **1.6 INSPECTION AND TESTS**

**1.6.1** Inspection: The equipment will be inspected by the indenter or his authorised representative at manufacturer's works before dispatch in accordance with various standards/procedures specified in Annexure-III in Section-IV or modifications thereof that may be carried out by the indenter in consultation with the tenderer before issuing A/T. The tenderer should intimate the indenter in advance about readiness of the equipment for inspection at a date mutually agreed upon by the indenter and tenderer, the equipment shall be inspected at the manufacturer's works before dispatch. The tenderer should furnish in advance photocopies of all the relevant test certificates as per IS/as applicable before giving inspection call.

The tenderer must satisfy themselves about the readiness of the plant as per AIR specifications before asking the indenter for carrying out inspection and tests.

During the inspection the tenderer shall have to repair/ replace any defective components / parts etc. which are noticed during inspection.

**1.6.2** Acceptance Tests: Soon after erection of the plants at site, inspection of the plants before carrying out Acceptance Tests shall be carried out jointly by the Inspecting Officer and the representative of Indenter/consignee in the presence of tenderer's representative. The acceptance tests are to be carried out as per Annexure-IV of Section-IV of the specification. Separate capacity tests shall be carried out during summer months (preferably during April to mid July) and monsoon (mid July to end of August). Before offering the plant for capacity test, the tenderer will conduct trial run of the plant for 20 days subject to minimum aggregate of 120 hours for each plant so as to be sure that

the plants are running satisfactorily. In case of a major problem being noticed during initial test run, the period of 20 days/120 hours will start afresh.

## **1.7 GUARANTEE**

The compressors and the Cooling tower shall be provided with on site guarantee for satisfactory working for a minimum period of five years. The remaining air-conditioning equipment shall be guaranteed for a minimum period of one year as per para 1.7.2 Various defects arising/reported within the guarantee period as stated above will be rectified by repairs/replacement at site by the tenderer free of charge. This shall also include free supply of the refrigerant and compressor oil etc., if required, by the tenderer for optimum running of the plant during the guarantee period of the compressor. In this regard, the tenderers may also refer to other conditions specified in clause 1.6 above.

## **1.8 QUOTATIONS IN MKS/S.I.UNITS**

Values for performance figure given in these specifications are in MKS/SI units. Full particulars of all figures of performance of the equipment offered shall be furnished in MKS/SI Unit. The technical data should be furnished in MKS/SI units only. The technical data should be typed or in capitals.

## **1.9 TRAINING**

The tenderer shall undertake to extend free training in operation & maintenance of air-conditioning plants offered by them to four technical personnel from **SPT, All India Radio , Doddabullapur Bangalore ( Karnatka)**. Details of the training offered with period not less than five days may be indicated. The training shall be arranged at site.

## **1.10 PAST EXPERIENCE**

The tenderer should furnish detailed data regarding his past experience in supply, erection and commissioning of air-conditioning plants of similar or higher capacity and type. Due weightage will be given for the past experience while evaluating tenders. The criteria for this will be decided by the zonal office.

## **1.11 AFTER SALE SERVICE**

The tenderer shall ensure adequate and prompt after sales service in the form of maintenance/servicing personnel and spares as and when required with a view to minimizing the break down period. Particular attention shall be given to ensure that all spares are easily available for a period of at least 10 years after the installation.

## **1.12 MISCELLANEOUS**

### **1.12.1 Completeness of tender**

In order to avoid correspondence and clarifications at a later date, tenderers are requested to indicate clearly all the technical details and information asked for in Section II & III of this specification.

**SECTION-II**

SCHEDULE OF REQUIREMENTS FOR SITC OF 4X33 TR, CHILLED WATER & WATER-COOLED CONDENSER AIR-CONDITIONING PLANTS FOR TRANSMITTER AT SPT, ALL INDIA RADIO, DODDABUALLALPUR, BANGALORE(KARNATKA).

SNo	Description of the equipment	Capacity of each Unit	Quantity	Reference to para of section-III for Technical specification	Remarks	
2.1.	SITC of chilled water & water cooled condenser air conditioning plants (Eqpt.) consisting of the following	As mentioned against each unit of the plant.	4 sets of plants as per details below	As mentioned against each unit of the plant.	Three plants with its associated Chilled water circuit & common water pump & common cooling tower will work at a time.	
2.1.1	Compressor Unit complete with motor and other accessories.	99,792 Kcal/Hr of refg.	4sets	Para 3.1.1 through 3.1.10 and para 3.2.1 through 3.2.8	The standard ambient conditions at which A/C Plants offered by the tenderer will give the rated capacity should be clearly quoted along with de-rating in tonnage with increase in ambient conditions.	
	<b>Ambient design conditions</b>					
	<b>Summer:</b> Dry Bulb: 40 degree C Wet Bulb: 25 degree C <b>Monsoon:</b> Dry Bulb: 29 degree C Wet Bulb: 22 degree C					
2.1.2	Water –cooled condenser complete with pressure gauges, temperature indicators, etc.	Heat rejection capacity <b>not &lt; 1,29,730 Kcal/Hr.</b>	4 sets	Para 3.3.1 to 3.3.13		
2.1.3	Air handling Unit each complete with:		2 sets	Para 3.7 3.7.6.3	One working + one standby	
	i)	Centrifugal blowers	22440 CMH			
			at static pressure of 40 mm WG			

	ii)	Cooling coil	Capacity 99,792 Kcal/Hr. SHF 0.85			
	iii)	Air Filter Bank	To match the blower			
	iv)	Expansion Valve	99,792 Kcal/hr.		Para 3.10.7	
2.1.4	Mechanical draft water re-cooling tower.		Heat rejection capacity not less than 3,89,190 K.Cal/hr.	2 no.	Para 3.6 to 3.6.13	One for two plants, other is standby
2.1.5	Water pump set complete with required accessories		Not less than 528 LPM at required head and Efficiency > 80%	4 nos.	Para 3.4.1 to 3.4.10 & 3.5.1 to 3.5.7	Three pump set will work at a time. The other shall be a standby
2.1.6	Make-up water tank		5,000- liters capacity as per IS- 10661/Sintex	2nos.	Para 3.8.1 to 3.8.2	
2.1.7	Refrigerant Piping		To suit each Plant	1 lot as per assessment	Para 3.10.1 to 3.10.6	Rate / Unit for different type and size of the pipes and valves to be used in circuit to be quoted as per the tentative quantities given in the diagram (Refer to para 1.3.3(b) of section – I <b>SEE NOTE -1</b>
2.1.8	Water pipes and plumbing accessories		To suit each plant	1 lot as per assessment )	Para 3.11.1 to 3.11.5 and Appendix-I	Rate/meter length of different size of pipes to be used in circuit to be quoted as per the tentative quantities given in the diagram (refer to Clause 1.3.3(b) of Section-I) <b>SEE NOTE -1</b>
2.1.9	Water Chiller Unit each complete with pressure gauges, temperature indicator, water meters and expansion valve etc.:		Not<99,792 Kcal/Hr. ( 33TR)	4 sets	Para 3.9.1 to 3.9.18	<b>The chiller shall be rated for a fouling factor of not&lt;0.0001M<sup>2</sup> Hr °C/ K cal.</b>
2.1.10	Chilled water pipes and plumbing accessories		To suit each plant and Transmitter's AHUs	1 lot as per assess- ment	Para 3.12.1 to 3.12.5 and Appendix-I	Rate/meter length of different size of pipes to be used in circuit to be quoted as per the tentative quantities given in the diagram (refer to Clause 1.3.3(b) of Section-I) <b>SEE NOTE -1</b>

2.1.11	Chilled water pump set complete with required accessories	Not less than 330 LPM at required head and Efficiency > 80%	4 nos.	Para 3.9.19 to 3.9.20 &	Two pump set will work at a time. The other shall be a standby
2.1.12	Expansion tank	200 litter	1 nos.	Para 3.11.14	Common for two sets of plants.
2.1.13	Electrical switch-gear and accessories	To suit each plant	1 lot as per assessment	Refer to Appendix-II	Requirement along With make and capacity/rating and number of panels/ sub-panels, ACBs/ MCCBs/FSUs/ Contactors etc.to be indicated by the tenderer(Refer to clause 1.3.2 (c) of section-I). <b>SEE NOTE -1</b>
2.1.14	Electrical Cables	To meet load requirements taking into consideration de-rating & overload conditions as per relevant IS	As per requirement	Refer to Appendix-I	Estimated requirement with cost along with Make and rating of Different power cables, Control wires is to be Indicated by the tenderer. Refer to clause 1.3.2 (c) of Section-I). <b>SEE NOTE-1</b>
2.1.15	Controls	To suit the design of the Plant	1 Lot	Para 3.13.1 to 3.13.5	
2.1.16	Remote Indication Panel	For status indication of Blowers, Pumps, Compressors, Cooling Tower etc.	1 No.	Para 3.11.6	The tenderer shall carry Out SITC of Remote Indication panel Including cabling from A/C plant room to Control Room.
2.1.17	On line water softening plant to prevent scale formation in condensor	As required	4 nos.	Para 3.3.12	The tenderer may study the water analysis report (Annexure-VI) to recommend and quote a suitable online scale preventor/water softening plant

2.2.	Spares	The spares required for open/semi-hermetically sealed compressor are to be quoted along with cost of each item.			
2.2.1	Fan Motor for cooling tower	Same as that of the motor in the circuit in the cooling tower.	1 No.		
2.2.2	Expansion Valve	Same as that in circuit	1 No.		
2.2.3	High Pressure cut-out switch	Same as that in circuit	1 No.		
2.2.4	Low Pressure cut-out switch	Same as that in circuit	1 No.		
2.2.5	Oil- Pressure cut-out switch	Same as that in circuit	1 No.		
2.2.6	Pressure Gauges for refrigerant & oil	Same as that in circuit	1 No. each of High Pr., Low Pr. & Oil Pr. Gauge.		
2.2.7	Pressure gauges for water pressure	Same as that in circuit	1 no. each of discharge and suction pressure gauges		
2.2.8	Dial type thermometer	Same as that in circuit	1 no. each for suction and discharge side		
2.2.9	Coil for Solenoid valve	Same as that in circuit	1 No. coil for each type of solenoid valve used in circuit.		
2.2.10	Empty Gas cylinder with regulating valve adopter & pressure gauge.		1 No.		
2.2.11	Lubricating Oil		As Required in one plant.		
2.2.12	Liquid line strainer	Same as that in circuit	1 No.		
2.2.13	Drier	Same as that in circuit	1 No.		
2.2.14	Nozzles	Same as that in circuit	1 No.		
2.2.15	Crank case heater	Same as that in circuit	1 No.		

2.3.	<b>Tools:</b> The tools will essentially consist of the following				The price /Charges Of each item of Tool shall be quoted Separately along With make. The Tools should be of Reputed make.
2.3.1	Flaring Tool	Imperial type with wide range	1 No.		
2.3.2	Tube cutter	Having a cutting range of all the size of tubes required to be used in the plant.	1 No.		
2.3.3	Pulley puller	Size 300 mm	1 No.		
		Size 150 mm	1 No.		
2.3.4	Valve Key	To suit the system	1 No.		
2.3.5	Ratchet Wrench	Size 12 (mm) <sup>2</sup>	1 No.		
2.3.6	Whirling Psychrometer		1 No.		
2.3.7	Anemometer		1 No.		
2.3.8	Thermometer	Accuracy 0.1°C	1 No.		
2.3.9	Fuse Puller		1 No.		
2.4.	Erection, commissioning & testing of the plant at site.		Lump sum	Para 1.4 & 1.6 of Section-I Section-IV	
2.5.	<b>Civil works</b>				
2.5.1	Foundation, staging etc for equipment etc for equipment & other misc. civil works	As per requirement & finalized drawings of the firm approved by zonal office	To be estimated by the tenderer.	Para 13.1 to 13.4 and 14 of section – III	Charges to be quoted separately for fixed & variable items of works.
2.5.2	Dismantling of old AC Plants		Lump sum		

#### NOTES

1. The items under paras 2.1.7, 2.1.8 , 2.1.9 & 2.1.10 of this section are to be quoted by the tenderer on the basis of quantities assessed in the diagram/details submitted with the tender (Refer to clause 1.3.2(c) and 1.3.3(c) of section-I). After scrutinizing the technical bids the indenter will intimate the tenderer the various quantities of each item under aforesaid paras on the basis of which the financial bids would be scrutinized/evaluated for arriving at the lowest satisfactory (L1) offer. However, the rate per unit length or unit basis shall also be given in the financial bids so that the payment could be made on the basis of quantity of each such actually used in the installation.
2. The various motor starters offered by the tenderer should ensure that the motor starting current is within the limits stipulated by the concerned Electricity Supply Authorities.
3. The wiring in Air Conditioning Plants Room for installation of Air Conditioning Equipment shall be carried out in cable trays running at a height of not less than 2300 mm from floor level. The tenderer shall provide necessary conduits and cable trays for running the wiring.
4. The tenderer has also to give a written undertaking that the spare parts required for air-conditioning plant shall be available off-the-shelf for a period of at least 10 years from the date of commissioning of plants at sites. Sufficient advance intimation shall be given to the indenter before phasing out any spare component/part so that indenter is able to stock the same for future use.

**SECTION -III**  
**TECHNICAL SPECIFICATIONS**  
**CHILLED WATER & WATER-COOLED CONDENSER AIR-CONDITIONING**  
**EQUIPMENT OF 4x33 TR CAPACITY FOR SPT,AIR, DODDABALLAPUR,**  
**BANGALORE (KARNATKA)**

SNO	PARTICULARS	AIR'S REQUIREMENT	TENDERER'S OFFER
3.1.	<b>Compressor</b>		
3.1.1	Type	Semi-hermetically / hermetically sealed using HCFC-22 /non-ODS as refrigerant.	
3.1.2	Capacity		
	(a) Under "ASHRAE" Conditions of 4.4° C suction temperatures and 40.5 ° C condensing temperature.	--- See section-II---	
	(b) Under site conditions.	--- See section-II---	
	(c) Working speed of the compressor	To be quoted by the tenderer	
3.1.3	Design (Mechanical)	(a) Semi-hermetically / hermetically sealed Scroll type Multi-compressor (not more than three compressor to form total tonnage of one unite)	
3.1.4	Working Noise	Silent and smooth-noise level not to exceed 85 dBA at a distance of 1 m from the machine	
3.1.5	Lubrication	Through self-contained pump and forced feed as per manufacturer's design.	
3.1.6	Bearing	Self-alignment type.	
3.1.7	Refrigerant		
	a) Type	HCFC/Non-ODS refrigerant	
	b) Quantity	To be indicated by the tenderer	
3.1.8	Cooling of compressor	As per manufacturer's design.	
3.1.9	Make of compressor	By standard and reputed manufacturer Carrier/ Copeland/ Voltas/ Blue Star.	
3.1.10	Other Essential Accessories of the compressor		
	(a) Suction and Discharge shut off Valve	Provision to be confirmed by the tenderer	
	(b) Low pressure cut-out	Type Danfoss MP-1 or similar	
	(c) High pressure cut-out	Type Danfoss MP-1 or similar	
	(d) Oil pressure protection	Type Danfoss MP-1 or similar	

(e) Pressure Gauges			
i)	Low pressure	Range from -2Kg/cm <sup>2</sup> to 12.5Kg/cm <sup>2</sup> (Fiebig /Emerald /Japsin/H. Guru make)	
ii)	High pressure	Range from -2Kg/cm <sup>2</sup> to 25 Kg/cm <sup>2</sup> (Fiebig /Emerald /Japsin/H. Guru make)	
iii)	Oil pressure	Range from 0 Kg/cm <sup>2</sup> to 14 Kg/cm <sup>2</sup> (Fiebig /Emerald /Japsin/H. Guru make)	
(f) High pressure to low pressure side relief (safety valve)		Preferably built-in feature of the compressor causing no loss of the refrigerant	
(g) Suction scale trap		Easily removable for cleaning	
(h) Crank case heater		Automatic. Will be ON when Compressor is off and vice versa	
(i) Multi stage Automatic capacity Control mechanism		Steps of capacity control including full load not less than 2. Capacity control should be through thermostat and solenoid valve etc. with separate thermostat for each step of capacity control.	
(j) Automatic unloading for starting		To unload the compressor by at least 75% of the full load for starting purpose.	
(k) Vibration isolator for compressor and motor			
i)	Type	Resistoflex pads/ribbed neoprene rubber	
ii)	Transmissibility factor at operating speed	Shall not be more than 10%.	
(l) Any other item		Applicable as per type of compressor	
<b>3.2.</b>	<b>COMPRESSOR MOTOR</b>		
3.2.1	Type, Power rating (H.P.) & Speed (RPM)	To be quoted by the tenderer. Design should be adequate to take care of continuous operation(18 hrs./day) derating/ overload & other factors as per the relevant IS.	
3.2.2	Power supply	3 Ph, 415 V,+/- 10%, 50+/- 3% Hz	
3.2.3	Starting Current	Not to exceed the limits stipulated by the local electric supply company. Provision of reduced inrush starting system to be confirmed by the tenderer	
3.2.4	Normal (full load) running current	To be specified by the tenderer	
3.2.5	Insulation	Class B or better	
3.2.6	Specifications	Shall conform to IS-325/96 and subsequent amendment thereof	
3.2.7	Make	By standard and reputed manufacturers normally Siemens/Crompton/ABB/NGEF/ Copeland.	

3.2.8	Accessories for motor		
	a) Starter		Fully automatic star/delta or DOL type
	b) Protective devices		
	i)	Against compressor motor overload	May be part of the starter
	ii)	Against under voltage	May be part of the starter
	iii)	Single phasing preventor	Current sensing (series) type
iv)	Oil sump heater interlock	To be confirmed by the tenderer.	
<b>3.3.</b>	<b>CONDENSER UNIT</b>		
3.3.1	Heat Rejection Capacity	Shall not be less than <b>1,29,730</b> KCal/Hr for each 33 TR A/C plant	
3.3.2	Rating	For fluid refrigerant under full load conditions for 2.8 °C sub-cooling.	
3.3.3	Type	Shell & tube type, tubes arranged to have multi-pass(2/4 flow)	
3.3.4	Make	By reputed manufacturers Voltas/ Blue star/ Carrier	
3.3.5	Type of Cooling	Water-cooled	
3.3.6	Design material & construction	Steel shell, Seamless copper tubes with integral fins. Condenser tubes shall be individually replaceable.	
3.3.7	Quantity of water flow	Not less than 528 LPM for each 33 TR AC Plant.	
3.3.8	Fouling Factor	Not less than 0.0013 M <sup>2</sup> . °C/W (0.00075 h. ft <sup>2</sup> . °F/Btu)	
3.3.9	Head Loss (at the maximum water velocity through the condenser 2.5 meter/sec.)	To be stated by the tenderer	
3.3.10	Working pressure		
	i)	Water side	To be stated by the tenderer
	ii)	Refrigerant side	To be stated by the tenderer
3.3.11	Testing pressure		
	i)	Water side	1.5 times of working pressure on full load
	ii)	Refrigerant side	a. times of working pressure on full load
3.3.12	Water softening plant/online water scale preventor	To be quoted as a separate item, capacity to match condenser water requirement. Capable of handling the hardness of water as per site conditions (water analysis report is attached as Annexure-VI.)The tenderer may quote non-chemical type scale preventor (Scale guard/scale-ban or similar)together with its guaranteed life and workability level of hardness, as an option.	

3.3.13	Essential accessories			
	a)	Companion flanges for refrigerant & water connection	With suitable valves at inlet & outlet of refrigerant & water.	
	b)	Safety relief valve	Typically set at 21 Kg/cm <sup>2</sup>	
	c)	Water drain connection	To be confirmed by tenderer.	
	d)	Purge valve	To be confirmed by tenderer.	
	e)	Fusible plug for protection against high temp.	Sealed lead type	
	f)	Facilities for clearing the tubes & removal of scales.	Condenser should be of removable end covers type. Suitable connection should be provided for de-scaling the tubes by circulating chemical cleaning solution.	
	g)	Dial type thermometer	One each for water inlet and outlet side.	
<b>3.4.</b>	<b>PUMP SETS FOR CONDENSER UNIT</b>			
3.4.1	Type & Specifications		Shall conform to current IS specification. Electric motor driven, centrifugal & Mono-block type, continuous duty.	
3.4.2	Make & Model		It shall be from a standard manufacturer such as Voltas/ Kirloskar/Mather & Platt/ Beacon.	
3.4.3	Capacity (Even after usual deterioration in plumbing, spray nozzles, pump itself in addition to pressure drop in plumbing & condenser)		To be specified by the tenderer as given in section II.	
3.4.4	Delivery Head		Approximately 15 m.(water)	
3.4.5	Suction Lift		Approximately 4 m. (water)	
3.4.6	R.P.M.		To be specified by tenderer and at this speed should not generate excessive high pitch noise.	
3.4.7	Degree of protection design Working		IP 24 in accordance with IS-4691	
3.4.8	Noise		Noise level not to exceed 85 dBA at a distance of 1 m from the pump set.	
3.4.9	Essential accessories/ Fittings for Pump			
	a)	Suction & Discharge shut off valve	Valve should be of Butterfly type of standard make ( AUDCO/ ADVANCE/ CASTLE)	
	b)	Check valve Non-return (Discharge)	Provision to be confirmed by tenderer (Of standard make-ADVANCE/L&T/CASTLE)	
	c)	Water Pressure Gauges (150 mm Dia.)		
	i)	Suction side	Gauges should be of standard make such as Marshall/ Fiebrag/ EMERALD	

	ii)	Discharge	Gauges should be of standard make such as Marshall/ Fiebrag/ EMERALD	
	d)	Strainer in suction line	Y type strainer. Easily cleanable (of reputed make)	
	e)	Water Meter (Dial type) at combined output of pumps	Round integrating type of dial (Such as EMERALD/SAN)	
	f)	By -Pass arrangement for the water meter	To be provided by the tenderer.	
	g)	Gland drain	Typically 25 mm.	
3.4.10		Vibration isolation pads	Suitable vibration isolation pads for each pump sandwiched between foundation and pumps to be provided by the tenderer, along with concrete foundation if the existing foundation can not be re-utilized.	
<b>3.5.</b>	<b>PUMP MOTOR FOR CONDENSER UNIT</b>			
3.5.1		Type & Rating	Continuous duty. Rating 10% more than the BHP of the pump, to be specified by the tenderer	
3.5.2		H.P.	To be quoted by the tenderer	

3.5.3	Starting Current	To be specified by the tenderer	
3.5.4	Running Current	To be specified by the tenderer	
3.5.5	Insulation	Class E are better	
3.5.6	Make		
	a)	Pump-set	Standard and reputed manufacturers like Beacon/ Kirloskar/Mather & Platt/Voltas/ ABB/Crompton Greaves/ Siemens
	b)	Motor	Standard and reputed manufacturers like Beacon/ Kirloskar/Mather & Platt/Voltas/ ABB/Crompton Greaves/ Siemens
3.5.7	Essential accessories of Pump motor		
	a)	Starter	DOL type.
	b)	Protection against overload	May be built-in in the starter
	c)	Protection against under voltage	To be confirmed by tenderer
	d)	Single Phasing Preventor	Series type (current sensing)
	e)	Interlocking	Auxiliary contact in the starter for interlocking with the compressor circuit
<b>3.6.</b>	<b>Cooling Tower</b>		
3.6.1	Type	Induced draft cross flow fire-retardant FRP/HDG cooling tower with PVC film type fill.	
3.6.2	Total heat rejection capacity	Not less than 3,89,190K Cal/Hr at ambient conditions mentioned under Section-II.	
3.6.3	Water flow rate	To be specified by the tenderer and should be suitable for range of 4.2 °C and approach of 3.8 °C.	
3.6.4	Material & construction	Except where otherwise specified, all components of the cooling tower including the supporting grillage shall be fabricated of hot dipped galvanised(HDG) steel. Quantity of galvanisation in grammes per Sq.Mt. to be indicated by the tenderers. This shall include the mechanical equipment support structure, fan guards and all bolts, nuts, fasteners used in the construction of tower.	
3.6.5	Mechanical Equipment		
	a)	Fan	Fan shall be propeller-type incorporating heavy-duty blades of aluminium alloy or oriented-strand fibre-glass-reinforced epoxy. Blades shall be individually adjustable. Fan shall not generate sound level exceeding 80 dBA at a distance of two meter from fan discharge.

	b) Motor	Motor shall be TEFC, variable torque, and specially insulated for cooling tower duty. H.P. rating, speed, insulation class, degree of protection and electrical characteristics shall be indicated by the tenderer. Motor starter (D.O.L. type) with built- in overload, under voltage protection, protection against single phasing (current sensing type) and contacts for interlocking circuit shall be provided. Name plate horse power shall not be exceeded at design operation.	
	c) Assembly	<p>The complete mechanical equipment assembly shall be supported by a rigid, welded, hot dipped galvanised steel structural support.</p> <p>The mechanical equipment assembly shall be warranted against any failure caused by defects in materials and workmanship for not less than five (5) years following installation and commissioning. This warranty shall cover the fan, driveshaft and couplings, and mechanical equipment support(s). The electrical motor shall carry a manufacturer's warranty of at least one (1) year.</p>	
3.6.6	Fill, Louvers & Drift Eliminators	Fill shall be film-type, thermoformed of 15 mil (0.38 mm) thick PVC, with louvers formed as part of each fill sheet. Fill shall be suspended from hot-dip galvanized structural tubing supported from the tower structure, and shall be elevated at least 50.8 mm above the floor of the cold water basin to facilitate cleaning. Air inlet faces of the tower shall be free of water splash-out. Drift eliminators shall be PVC, triple-pass and shall limit drift losses to no more than 0.01% of the design flow rate.	

3.6.7	Hot Water Distribution system	<p>Open basins (one above each bank of fill) shall receive hot- water piped to each cell of the tower. These basins shall be installed and sealed at the factory, and shall be equipped with removable, galvanised steel/FRP covers.</p> <p>An internal system of piping shall deliver water equally to the distribution basins without the need for balancing valves. This internal piping system shall require no scheduled maintenance and shall be located such that it does not interfere with normal maintenance access. Removable interchangeable polypropylene nozzles installed in the floor of these basins shall provide full coverage of the fill by gravity flow.</p>									
3.6.8	Casing, Fan Deck & fan Cylinder	The casing, fan deck and fan cylinder shall be of heavy gauge galvanized steel. The top of the fan cylinder shall be equipped with a conical, non-sagging, removable fan guard, fabricated of welded 7.94mm and 7 gauge rods, and hot-dip galvanised after fabrication.									
3.6.9	Cold water Collection Basin	The cold water basin shall be heavy-gauge galvanised steel, and shall include the suction connections required to accommodate the outflow piping system. Suction connections shall be equipped with galvanised debris screens. A factory installed, float-operated, mechanical make-up valve shall be included. A suitable overflow pipe shall be provided. The basin shall include a depressed centre section for accumulating silt that can be flushed out for cleaning of the basin. The basin floor adjacent to the depressed section shall slope towards the depressed section to prevent build-up of silt under the fill area									
3.6.10	Accessories	<p>The cooling tower shall be provided with following minimum essential accessories.</p> <table border="1" data-bbox="699 1738 1366 1926"> <tr> <td data-bbox="699 1738 762 1816">a)</td> <td data-bbox="770 1738 1366 1816">Automatic float valve with a stop valve for continuous makeup water flow.</td> </tr> <tr> <td data-bbox="699 1816 762 1850">b)</td> <td data-bbox="770 1816 1366 1850">Butterfly valve at inlet and outlet.</td> </tr> <tr> <td data-bbox="699 1850 762 1895">c)</td> <td data-bbox="770 1850 1366 1895">Quick fill arrangement with stop valve.</td> </tr> <tr> <td data-bbox="699 1895 762 1926">d)</td> <td data-bbox="770 1895 1366 1926">Overflow connection</td> </tr> </table>	a)	Automatic float valve with a stop valve for continuous makeup water flow.	b)	Butterfly valve at inlet and outlet.	c)	Quick fill arrangement with stop valve.	d)	Overflow connection	
a)	Automatic float valve with a stop valve for continuous makeup water flow.										
b)	Butterfly valve at inlet and outlet.										
c)	Quick fill arrangement with stop valve.										
d)	Overflow connection										

		e)	Drain connection in the cold water basin with stop valve.	
		f)	Temperature meters for measurement of hot and cold water temp. Type of meters to be mentioned clearly by the tenderer.	
		g)	Water proof electrical isolation switch (externally lockable) at the basis of the CT for the fan motor.	
3.6.11	Supporting structure	The cooling tower shall be mounted over the roof of A/C plant room or at ground, as the case may be, on cement concrete foundation pillars. The tenderer may, however, specify a different arrangement for mounting of the cooling tower as per site condition and as required by the type and design of the C.T. offered and quote accordingly. The bottom of the cooling tower shall have adequate clearance for any maintenance, if required.		
3.6.12	Level Switch	Magnetic or an appropriate type level switch shall be provided for giving audible alarm and visual indication on control panel in A/C plant room in case of low level in the cooling tower basin.		
3.6.13	Access	A 400mm wide aluminium ladder with suitable side rails and rungs/steps shall be permanently attached to the end wall casing of the tower, rising from the base of the tower to the top of the hand rail/tower.		

<b>3.7.</b>	<b>Air Handling Unit (AHU)</b>	Horizontal Type	
3.7.1	Casing	<p>The AHU casing shall be made of double skinned panels fixed to 1.5 mm thick extruded aluminium alloy twin box section structural frame work with 24 gauge/ 0.63 mm pre-painted GSS sheet out side and 24 gauge/ 0.63mm G.I.sheet inside with 25mm thick PUF of 32 Kg/cu.m. density insulation in between the inner and outer sheets. The supply and return air duct connection and overall size is to suit site condition. (Makes: CARYAIRE EQUPTS/ SAVIER/ETA)</p> <p>The entire frame-work shall be mounted on channel base. The panels shall be sealed to the frame work by heavy duty gaskets held captive in the framed extrusions. All the panels shall be detachable or hinged. Hinges shall be made of die cast aluminium/engineering plastic with stainless steel pivots. Handles shall be provided with cam type adjustable seating arrangement to ensure perfect sealing and be operational from both inside and outside the unit. Units supplied shall be suitable for on-site assembly.</p>	
<b>3.7.2</b>	<b>Blower &amp; Fan section</b>		
3.7.2.1	Type & make of fan	Centrifugal-NICOTRA/COMEFRI KRUGER.	
3.7.2.2	Construction	Forward curved, DIOW multi-blade construction made out of heavy gauge steel sheets.	
3.7.2.3	Balancing	Static and dynamic (both).	
3.7.2.4	Direction of discharge	Vertical	
3.7.2.5	Nominal fan discharge (Speed not to exceed 1000 RPM)	22,440 CMH	
3.7.2.6	Static pressure at nominal discharge	40 mm WG	
3.7.2.7	Noise level	Not to exceed 80 dBA at a distance of one meter	
3.7.2.8	Fan Bearings	Ball bearings shall be pre-greased self-aligning type. Sealing should ensure containment of the lubricant and exclusion of contaminates.	
3.7.2.9	Fan Shaft	Tubular fan shaft made from a high grade stainless steel tubing.	

3.7.2.10	General	The fan section shall be complete with pulley, 'multi-'V' belt drive and adjustable motor mounting base. Belts shall be of the oil resistant type.	
<b>3.7.3</b>	<b>Fan Motor</b>		
3.7.3.1	Type and make	3 phase, induction, squirrel cage, totally enclosed, internally fan cooled type, continuous duty. ABB/NGEF/ Crompton/ Siemens make	
3.7.3.2	Power rating(H.P.)	Should be at least 20% more than the fan BHP. To be specified by the tenderer	
3.7.3.3	Speed(R.P.M)	To be specified by the tenderer	
3.7.3.4	Starting Current	To be specified by the tenderer	
3.7.3.5	Running Current	To be specified by the tenderer	
3.7.3.6	Insulation	Class F or better conforming to IS 325; with IP 55 protection	
3.7.3.7	Essential Accessories		
	a) Starter.	DOL/Star-Delta	
	b) Overload protection	To be confirmed by the tenderer	
	c) Under Voltage protection	To form a built-in feature of the starter	
	d) Contact for interlocking	To be confirmed by the tenderer	
	e) Protection against single phasing.	Current sensing type	
3.7.3.8	Mounting	Both fan and motor shall be mounted on deep section aluminium alloy or galvanised steel base frame. Isolation shall be provided from the unit casing suitably either by spring isolator or rubber anti-vibration mounts and flame retardant, flexible connection on the fan discharge	
<b>3.7.4</b>	<b>COIL SECTION</b>		
3.7.4.1	Capacity of cooling coil	99,792 K.Cal/hr.	
3.7.4.2	S.H.F.	0.85	
3.7.4.3	Velocity of air through cooling coil face	Cooling coils shall be arranged in the unit for Horizontal air flow selected for a face velocity not exceeding 152 meters/minute	

3.7.4.4	Construction Material used in bonding	Seamless 12.5 mm(1/2") outside dia round Copper tubes min.24 gauge thick with aluminium fins(not to exceed 5 fins/cm) mechanically/ hydraulically bonded and assembled in zinc coated steel frame. Face and surface areas shall be such as to ensure rated capacity without exceeding specified velocity of air through cooling coil face. The cooling coil shall be factory tested at 21 kg/ cm <sup>2</sup> air pressure under water.	
3.7.4.5	Provision for face & by-pass damper.	To be indicated by the tenderer	
3.7.4.6	Mounting	The cooling coil assembly shall be on aluminium rails and nylon rollers for easy withdrawal on either side.	
<b>3.7.5</b>	<b>FILTER SECTION</b>		
3.7.5.1	Type	50 mm thick dry synthetic washable type air filters	
3.7.5.2	Efficiency	Approximately 90% down to 10 microns	
3.7.5.3	Pressure drop when used in dry condition	To be specified by the tenderer	
3.7.5.4	Air velocity through the Filters	Not to exceed 152 meters/minute	
3.7.5.5	Frame	Filter frame work shall be constructed from aluminium alloy. Filter bank shall be easily accessible and designed for easy withdrawal and renewal of filter cells	
<b>3.7.6</b>	<b>Miscellaneous Accessories And Provisions</b>		
3.7.6.1	Vibration Isolators for the complete unit	To be used if necessary, as per manufacturer's recommendation	

3.7.6.2	Drip trays with draining arrangement	The condensate drain pan shall be made out of 18 gauge thick stainless steel with welded corner joints and drain connection. The drain pan should extend beyond the coil section with uniform slope from all sides leading to drain point providing complete condensate drainage. It should be fully insulated from bottom floor panels with suitable insulating material for eliminating panel seating	
3.7.6.3	Access Doors/panels	The unit shall have hinged, quick operating air-tight access door in the fan and filter sections. Access doors shall be double skin type.	
<b>3.8.</b>	<b>Make-up Water tank</b>		
3.8.1	Capacity	5000 Litres as per IS-10661/Sintex. The tank shall be complete with all piping, valves and connections from makeup water tank to cooling tower cold water basin. Complete details of the makeup water tank to be specified by the tenderer.	
3.8.2	Accessories	The MU Tank shall be provided with following minimum essential accessories.	
		a) Float based level indicator calibrated in litres	
		b) Integrated ladder	
		c) Lockable lid	
<b>3.9.</b>	<b>Chiller Unit :</b>		
3.9.1	Capacity	99,792 Kcal/Hr of refrigeration	
3.9.2	Make and Model	Shall be from a standard Manufacturer like Voltas/ Bluestar/ Carrier	
3.9.3	Type	DX type segmented baffles shall be provided in the shell.	
3.9.4	Type of tubes	To be specified by the tenderer.	
3.9.5	Material of the tubes/ Shell.	Seamless Copper tubes/ steel shell.	

3.9.6	Pressure drop on the water in side.	To be specified by the tenderer.	
3.9.7	No of passes	To be specified by the tenderer.	
3.9.8	Water flow rate	Typically 330 LPM	
3.9.9	Entering water temp.	To be specified by the tenderer.	
3.9.10	Leaving water temp.	To be specified by the tenderer.	
3.9.11	Saturated suction temp.	To be specified by the tenderer.	
3.9.12	Fouling factor	Not less than $0.0001\text{m}^2 - \text{Hr}$ °C/K Cal.( 0.0005FPS)	
3.9.13	Refrigerant side working pressure	To be specified by the tenderer.	
3.9.14	Water side working pressure	To be specified by the tenderer.	
3.9.15	Refrigerant side test pressure	To be specified by the tenderer.	
3.9.16	Water side test pressure.	The test pressure shall be at least 1.5 times of the working pressures.	
3.9.17	Heat Insulation	Expanded polystyrene/Multipurl insulation of thickness not less than 75 mm. finished with smooth cement plaster, allowing damaging the insulation.	

3.9.18	<b>Essential Accessories / Provision:</b>		
	a. Companion flanges for the refrigerant & water inlet & outlet connections.	Provision to be confirmed by the tenderer.	
	b. Water Drain connection	Provision to be confirmed by the tenderer. The drain opening shall be of adequate size to permit draining and cleaning of the shell.	
	c. Segmented baffles in the shell to promote turbulence.	To be confirmed by the tenderer.	
	a. Safety Thermostat	Anti freeze thermostat to be provided and the connection for its mounting to be provided.	
	b. Refrigerant controls	Each refrigerant circuit shall be independent and each circuit shall have its independent controls, such as thermostatic expansion valve and liquid line solenoid valve/pilot operated solenoid valve etc.	
<b>3.9.19</b>	<b>PUMP SETS FOR Chiller Unit</b>		
I	Type & Specifications	Shall conform to current IS specification. Electric motor driven, centrifugal & Mono-block type, continuous duty.	
II	Make & Model	It shall be from a standard manufacturer such as Voltas/ Kirloskar/Mather & Platt/ Beacon.	

III	Capacity (Even after usual deterioration in plumbing, spray nozzles, pump itself in addition to pressure drop in plumbing & condenser)	To be specified by the tenderer as given in section II.	
IV	Delivery Head	Not<30M of(water) for chiller	
V	Suction Lift	Approximately 4 m. (water)	
VI	R.P.M.	To be specified by tenderer and at this speed should not generate excessive high pitch noise.	
VII	Degree of protection design Working	IP 24 in accordance with IS-4691	
VIII	Noise	Noise level not to exceed 85 dBA at a distance of 1 m from the pump set.	
IX	Essential accessories/ Fittings for Pump		
	a)	Suction & Discharge shut off valve	Valve should be of Butterfly type of standard make ( AUDCO/ ADVANCE/ CASTLE)
	b)	Check valve Non-return (Discharge)	Provision to be confirmed by tenderer (Of standard make-ADVANCE/L&T/CASTLE)
	c)	Water Pressure Gauges (150 mm Dia.)	
	i)	Suction side	Gauges should be of standard make such as Marshall / Fiebrag/ EMERALD
		Discharge	Gauges should be of standard make such as Marshall / Fiebrag/ EMERALD
	d)	Strainer in suction line	Y type strainer. Easily cleanable (of reputed make)
	e)	Water Meter (Dial type) at combined output of pumps	Round integrating type of dial (Such as EMERALD/SAN)
	f)	By -Pass arrangement for the water meter	To be provided by the tenderer.
	g)	Gland drain	Typically 25 mm.
	h)	Heat insulation for chiller water recirculating pump	Adequate heat insulation shall be provided on the pump along with the pot strainer, control valves, fittings & chilled water piping etc. there shall not be any sweating at any position of the heat insulation

X	Vibration isolation pads	Suitable vibration isolation pads for each pump sandwiched between foundation and pumps to be provided by the tenderer, along with concrete foundation if the existing foundation can not be re-utilized.	
<b>3.9.20</b>	<b>PUMP MOTOR FOR Chiller Unit</b>		
I	Type & Rating	Continuous duty. Rating 10% more than the BHP of the pump, to be specified by the tenderer	
II	H.P.	To be quoted by the tenderer	
III	Starting Current	To be specified by the tenderer	
IV	Running Current	To be specified by the tenderer	
V	Insulation	Class E are better	
VI	Make		
	a) Pump-set	Standard and reputed manufacturers like Beacon/ Kirloskar/Mather & Platt/Voltas/ ABB/Crompton Greaves/ Siemens	
	b) Motor	Standard and reputed manufacturers like Beacon/ Kirloskar/Mather & Platt/Voltas/ ABB/Crompton Greaves/ Siemens	
VII	Essential accessories of Pump motor		
	a) Starter	DOL type.	
	b) Protection against overload	May be built-in in the starter	
	c) Protection against under voltage	To be confirmed by tenderer	
	d) Single Phasing Preventor	Series type (current sensing)	
	e) Interlocking	Auxiliary contact in the starter for interlocking with the compressor circuit	
3.10	<b>Refrigerant Circuit</b>		
3.10.1	Strainers		
	i) Liquid Line	Provision to be confirmed by the tenderer	
	ii) Suction	Provision to be confirmed by the tenderer	
3.10.2	Drier	Replaceable type silica-gel with isolating valves to be provided.	
3.10.3	Isolating valves (For isolation of various controls in ref. circuit)	Provision to be confirmed by the tenderer.	
3.10.4	Oil trap	Provision to be confirmed by the tenderer.	
3.10.5	Temperature wells for measuring suction and discharge temperature.	Provision to be confirmed by the tenderer.	
3.10.6	Solenoid Valves	Provision to be confirmed by the tenderer.	
3.10.7	Expansion Valve		
	a) Type	Direct Expansion	

	b)	Capacity	To match the refrigeration capacity of K.Cal/hr	
	c)	Make	Denfoss	
<b>3.11.</b>	<b>Water Piping &amp; Plumbing for condenser cooling water</b>			
3.11.1	Type & make		Galvanised mild steel (of TATA Steel/JINDAL HISSAR make)	
3.11.2	Class		Medium class conforming to IS-1239	
3.11.3	Size		The sizing of the pipe shall be liberal taking into consideration deterioration in time.	
3.11.4	Quality Selection		The piping & fittings shall be from fresh stock.	
3.11.5	Installation, testing & quality of work		As per details given in Appendix-I	
<b>3.12</b>	<b><u>CHILLED WATER PIPING PLUMBING &amp; ACCESSORIES</u></b>			
3.12.1	Type and Class		M.S. Black pipe conforming to IS – 1239-1958.	
3.12.2	Size		The size of the piping shall be decided by the tenderer. However, the sizing shall be liberal taking into consideration 20% deterioration in time.	
3.12.3	Quality selection		The piping and fittings shall be from fresh stock and shall be from standard manufacturer with ISI mark or approved by DGS&D.	
3.12.4	Insulation		The chilled water and condensate drain piping shall be insulated with premoulded rigid sections to thickness indicated under clause 14 – “ Insulation	
3.12.5	Air Vent / purge cocks		Air- Vents/ purge cocks shall be provided As required on the piping. Recommended vents sizes are: Up to 152 mm size of pipe.....12mm Vent Pipe. Over 152 mm size of pipe.....25mm Vent Pipe. <b>N.B</b> – Bends shall be installed after air vents / purge cocks so that purge water does not fall into chilled water lines.	

3.12.6	Piping Installation	<p><b>1)</b> The piping installation shall be carried out with approved working drawing and in consultation with the Installation Officer of A.I.R available at site. The approved drawing shall show the location of equipment, valves, drains and airvents.</p> <p><b>2)</b> The piping shall be adequately supported with suitable standard saddles, clamps, hangers etc. as required. Supports should also ensure freedom from vibration. The following spacing freedom recommended for pipe supports:-</p> <table border="0"> <thead> <tr> <th><b><u>PIPE DIA</u></b></th> <th><b><u>MAXIMUM SPAN</u></b></th> </tr> </thead> <tbody> <tr> <td>Up to 25 mm</td> <td>2Mts.</td> </tr> <tr> <td>31 to 150 mm</td> <td>2.5 Mts.</td> </tr> <tr> <td>150 and above</td> <td>3 Mts.</td> </tr> </tbody> </table> <p><b>N.B</b> : The insulated pipe shall be supported so as not to damage the insulation.</p> <p><b>3)</b> Wherever piping passes through walls, pipe sleeves 50 mm larger in India than the piping in question shall be provided and the angular spaces filled with suitable material.</p>	<b><u>PIPE DIA</u></b>	<b><u>MAXIMUM SPAN</u></b>	Up to 25 mm	2Mts.	31 to 150 mm	2.5 Mts.	150 and above	3 Mts.	
<b><u>PIPE DIA</u></b>	<b><u>MAXIMUM SPAN</u></b>										
Up to 25 mm	2Mts.										
31 to 150 mm	2.5 Mts.										
150 and above	3 Mts.										
3.12.7	Pressure Testing	<p>All piping shall be tested to hydrostatic test pressure of at least one and a half times the maximum operating pressure but not less than 7 Kg. / cm<sup>2</sup>. All leaks and defects in joints revealed during testing shall be rectified and re-tested in the same manner till there is no drop of pressure after 24 hours of pressure holding by the system.</p> <p><b>N.B. :</b> <b>1)</b> The pressure-hold-test as above shall be conducted in the presence of the Installation officer of All India Radio and to his satisfaction.</p> <p><b>2)</b> No insulation shall be applied to the piping until the completion of the pressure test to the satisfaction of the Installation Officer of All India Radio.</p> <p><b>3)</b> It shall be the responsibility of the contractor to provide all the materials tools, equipments, instruments, services and labour required to perform the test and to remove the water resulting from any leak. The contractor shall take adequate care and precaution so as not to cause any damage to the A.I.R. equipment during the pressure test.</p>									

3.12.8	Pressure Gauges	<p><b>1)</b> Pressure gauge shall be provided at the following locations:</p> <p><b>a)</b> Supply and return of chiller.  <b>b)</b> Discharge of pumps.  <b>c)</b> Supply and return of all coils.</p> <p><b>2)</b> The pressure gauges shall be " Bourdon" type with minimum of 100mm dia and a range such that the working pressure at the check point is indicated in the middle third of the gauge.</p> <p><b>3)</b> All gauges shall be provided with gauge cocks and duly calibrated before installation.</p> <p><b>N.B :</b> Care shall be taken to protect the pressure gauges during pressure testing.</p>	
3.12.9	Thermometers	<p><b>1)</b> Thermometers shall be provided at the following locations:</p> <p>a) Supply and return of chillers.  b) Supply and return of all coils.</p> <p><b>2)</b> Thermometers shall be installed in separable walls.</p> <p><b>3)</b> Thermometers shall be either 100mm dia or industrial type of appropriate range, duly calibrated before installation.</p>	
3.12.10	Controls	<p>Water flow/pressure switch, Gate valves, Globe valves and checks valves etc. shall be provided as shown in A.I.R drawing no. and as otherwise found necessary.</p>	
3.12.11	Quality selection of controls.	<p>The values used shall be of standard manufacture with ISI mark or from DGS&amp;D approved manufacturers.</p>	
3.12.12	Strainer	<p>Post strainer shall be provided on the suction side of each pump and 'Y' strainer at each chilled water cooling coil as per A.I.R drawing</p>	

3.12.13	Three way mixing pass value cum by-	Remote controlled, electrically operated Three way Mixing cum By pass value of standard manufacture shall be provided with each cooling coil as per AIR <b>drawing</b> . The control for these values shall be provided in the respective Electric Switch Board in the Compressor and Pump Room.	
3.12.14	<b><u>Expansion tank</u></b>	1 Nos.	
I	Capacity	To match the requirement of the system.	
II	Material	As per IS-10661/ Sintex	
III	Location	As per <b>drawing No.</b> The bottom of the tank shall be at least 1 meter above the highest chilled water point in the system	
IV	Insulation	The tank shall be insulated with 50mm thick expanded polysterene slabs (TF quality), Multipurl, tied in position with 25Gx 19mm wire netting and shall be finished with two layers of 6mm thick 1:3 cement plaster to give a smooth finish.	
V	Accessories	The tank shall be complete with lockable cover, float valve drain, overflow and make up connections with necessary gate values and vent piping.	
3.12.15	<b><u>INSULATIONS :</u></b>		
I		All chilled water pipes, condensate drain pipes and refrigerant suction line etc.. shall be insulated in the manner specified as per I.S : 7240 – 1974.	
II	Materials used	The insulating material shall be of Fire resistant type preferably Thermocols TF Quality/ Multipurl. The thickness of the insulation shall be a specified in the subsequent clauses. Asphalt used for setting the insulation shall be non absorbing, non hardening, odourless and low penetrating type. Samples of the materials used shall be submitted for approval.	

III	Insulation Thickness	<p><b>1)</b> The pipes shall be insulated with pre-formed insulation material specified in clause 11.2. above. The recommended thickness of the insulating pipe suction is as follows.</p>	
		Temp Range °C	Pipe dia in mm
		Recommended thickness of insulation in mm	
		-1.1 - +3.9	13 to75
		-1.1 - +3.9	100 to 300
		+4.4 - +12.8	All sizes
		+13.4 - +15.8	All sizes
<p><b>2)</b> The condensate /drain pipes shall be insulated</p> <p>With minimum 25mm thick insulation material specified under clause 11.2 and finished with smooth setting cement as specified in subsequent clause.</p> <p><b>3)</b> All valves, fittings and strainers shall generally be insulated to the same thickness as specified for the main run of the piping in which these components viz. valve etc. are installed. Valves, bonnets, yokes and spindles shall be insulated in such a manner as not to cause damage to the insulation when the valve etc. is used or serviced.</p> <p><b>4)</b> Chilled water recirculation pumps shall also be insulated to the same thickness as the pipe to which they are connected and applied as specified in the subsequent clauses.</p> <p><b>5)</b> The chillers operating between +4.4 °C to 10 °C shall be insulated to a minimum thickness of 75mm. The insulation shall be applied in suitable layers sealing and staggering the joints. The insulation shall be applied in such a manner as to allow the removal and replacement of and covers without damaging the insulation and finish.</p>			

IV	Application and finish	<p>The insulation shall be applied in single layer, set in hot asphalt. All joints shall be properly sealed and staggered. The insulation shall than be covered with 500gms, grade polythene overlapping the joints. The insulation surface shall be finished with smooth setting cement in minimum two 6mm thick layers over the length of wire mesh with 12mm holes and 20G wire. Pipes buried in the ground or exposed to weather shall be finished with two layers of minimum 10mm thick plaster.</p> <p><b>N.B:</b> No insulation shall be applied until the pipe is satisfactorily tested against any leaks.</p>	
V	<b>Insulation Supports</b>	<p>Insulations supports shall be carried out as per ISI specification (clause 5.10.4 of IS 7240 of1970).</p> <p><b>N.B:</b> All openings left in walls or slabs after fixing the pipes etc. in Position shall be sealed off to prevent transmission of noise or vibration by using suitable vibration and noise absorbing material. After the gaps are thus filled, they shall be finished by applying sand cement plastering.</p>	
<b>3.13</b>	<b>Controls</b>		
3.13.1	Thermostat for shutting off the plant.	<p>A separate thermostat to be provided in the return air circuit.</p> <p><b>Note</b></p> <ol style="list-style-type: none"> <li>1. The thermostats will be operative in the temperature range within <math>\pm 5.5</math> °C of the return air temperature.</li> <li>2. Each plant shall have separate set of thermostats.</li> <li>3. Thermostat shall be of adjustable type.</li> <li>4. Accuracy shall be with in <math>\pm 1</math> °C</li> <li>5. Thermostat shall be from reputed manufacturer.</li> </ol>	
3.13.2	Liquid line solenoid valve	Shall be installed between each condenser & corresponding expansion valve & shall be operated by the thermostat provided for.	
3.13.3	Oil failure switch	Shall be provided in the control circuit.	
3.13.4	Water Pressure switch	Shall be provided in the common water circuit of the condenser & shall be of reputed manufacturer.	

3.13.5	Interlocking & control circuit.	It shall be ensured that only one condenser fan, AHU and corresponding AC Plant is operative at a time.	
3.13.6	Remote status indication Panel	A Panel with status indications of the working of Blowers (AHU), compressors, condenser fan etc shall be wired & installed in control room. The panel shall have indication lamps i.e. Green Lamp for OFF & Red for ON conditions of the equipment. The control wiring of the panel between A/C Plant room & control room shall also be supplied & laid by the tenderer.	
<b>3.14.</b>	<b>Electrical Installation</b>	As per Appendix-II	
<b>3.15.</b>	<b>CIVIL WORKS</b>		
3.15.1	Foundation blocks & Vibration isolation	The tenderer shall provide the foundation blocks, suitable mounting arrangements (if required as per site condition) with vibration isolation for the compressors, condensers and AHUs for effective control of transmission of vibrations & structure borne noise. <b>NOTE</b> The holes if any made by the tenderer in the walls for passage of pipes, conduits, trenches, cables etc. shall be repaired & original finish shall be given by the tenderer.	
3.15.2	Staging & R.S. Joists	If required as per site conditions, the tenderer shall provide suitable stagings/ R.S.Joists for the cooling tower & make-up water tank(s). The design of the stagings /R.S.Joists should be liberal & of adequate size. The R. S. Joists should be given coats of primer & anti-rust paint.	
3.15.3	Conduits & Cable tray.	The tenderer shall provide the conduits & cable tray necessary for various electrical wiring ckt.	
3.15.4	Miscellaneous	Any other work not specifically mentioned above but necessary for satisfactory completion of entire job shall be the responsibility of the contractor.	
<b>3.16.</b>	<b>Surface Painting &amp; Finish</b>	All equipment & plumbing shall be painted after installation with an approved colour as given below.	
3.16.1	Compressor and Motor	Battle ship grey	
3.16.2	Condenser	Light blue	
3.16.3	Refrigerant discharge line	Red	
3.16.4	Refrigerant liquid line	Dark Blue	
3.16.5	Refrigerant Suction Line	Yellow	
3.16.6	Steel Supports	Battle ship grey	

3.16.7	Pumps	Battle ship grey	
3.16.8	Condenser Water lines	Light Blue(with Black arrows in the direction of flow)	
3.16.9	Electrical switch board and cable trays.	Battle ship grey	
<b>3.17.</b>	<b>Training Of Air Staff</b>	As per details at Section I Para 1.9	
<b>3.18.</b>	Spares	As per list in Section-II. Charges to be quoted separately by the tenderer.	
3.19.	Tools	As per list in Section-II. Charges to be quoted separately by the tenderer.	
3.20.	Past experience	As per details at Section I Para 1.10.	
3.21.	After sales service	Complete details of after sales service network available shall be given indicating the locations of service centers (including the one nearest to the place where the present intended A/C plants are to be installed) and staff pattern of these centers.	

**SECTION -IV****Inspection procedure and schedule of measurements**

1. The equipment will be inspected by the indenter or his authorised representative at tenderer's/ manufacturer's work before dispatch in accordance with various standards/procedures specified in Annexure-3 of this Section including modifications thereof that may be carried out by the indenter in consultation with the tenderer before issuing A/T. The tenderer shall intimate the indenter in advance about readiness of the equipment for inspection at a date mutually agreed upon by the indenter and tenderer.

2. After completion of the entire installation as per specification in all respects, the tenderer shall demonstrate trouble free running of the AC installation for a period of 20 days subject to a minimum of 120 hours of running for each plant. During this period, AC plant shall be run continuously for 24 hours at least once.

3. After the trial run as in para 2 above, the tenderer shall offer the plant for the capacity tests. The first capacity test shall be conducted in the summer season or the monsoon season whichever occurs earlier. The second test (summer or monsoon) shall be conducted in the subsequent season in the first year of the plant. The final inspection and capacity tests shall be carried out as per details given in Annexure -4 of this Section.

4. In case the actual conditions in the season are not found to be close to design ambient conditions, the test shall be conducted on closest conditions and capacity of equipment shall be computed and compared with capacities indicated in technical data sheets furnished by the tenderer with his bid. Change in measured capacity of different components due to variation in ambient conditions shall be taken into account.

5. All instruments for testing shall be provided by the tenderer. Accuracy of the instruments shall be as follows:

a) Temperature: liquid in glass thermometer having the accuracy  $\pm 1$  °C as per IS 4825.

b) Wet bulb temperature: Whirling psychrometer conforming to IS 6017.

Scale error:

For  $< 0$  °C       $-0.3$  °C/ $+0.2$  °C.

For  $> 0$  °C       $-0.2$  °C/ $+0.1$  °C.

c) Pressure Gauge:  $\pm 1\%$  for maximum scale value from 10% to 90% and  $\pm 1.5\%$  maximum scale value on rest of the scale and conforming to IS3695.

d) Water flow meter:  $\pm 2\%$  conforming to IS 3695.

e) Electrical indicating instruments: Class I conforming to IS 1248.

In case the tenderer does not have testing instruments of the accuracy mentioned above, he/she should specify the accuracy of the instruments, available with him/her, at the tender stage.

**STATEMENT OF PARTICULARS FOR 4x33 TR WATER COOLED AC PLANTS**

(To be submitted with the technical bid)

**1. COMPRESSOR**

- a) Manufacturer's Name :
- b) Model :
- c) Type of Compressor - Open/Hermetic :
- d) Nominal Capacity of each machine TR:  
at design condition.
- e) Saturated Suction Temperature °C :
- f) Saturated Discharge Temperature °C :
- g) Max. RPM :
- h) Mode of start :
- i) Refrigerant used :
- j) Qty. of Refrigerant used :
- k) Power consumption KW/TR :  
Full load and part load  
at 66%and 33% as  
per compressor design)
- l) Type of capacity control :
- m) Range of capacity variation :
- n) Safety devices & controls :
- o) Monitoring Devices :
- p) Type of bearings :
- q) Quantity and grade of lubricating oil :

## 2. MOTOR(COMPRESSOR)

- a) Make of Motor :
- b) Type of Motor :
- c) Motor KW :
- d) Class of Insulation :
- e) R.P.M. :
- f) Type of starter :
- g) Electrical characteristics :
- h) Voltage/Frequency Fluctuations permissible :
- i) Method of Starting :
- j) Starter manufacturer :
- k) Full load current(AMP.) :
- l) Starting current(Amp.) :

Overload/under voltage/single phase protections provided. :

## 3. CONDENSER

- a) Manufacturer's Name :
- b) Model :
- c) Shell dia OD(MM) :
- d) Tube dia OD(MM) :
- e) No. of passes :
- f) No. of tubes :
- g) Length of tube(MM) :
- h) Material of Tubes :
- i) Material of shell :
- j) Number of Integral Fins :
- k) Overall length of condenser(MM) :

- l) Fouling Factor in MKS :
- m) Heat rejection capacity K cal/hr. :
- n) Shell thickness(MM) :
- o) Tube thickness(MM) :
- p) Water flow rate(LPM) :
- q) Water temperature in °C :
- r) Water temperature out °C :
- s) Pressure drop(mt. of water) :
- t) Surface area of tubes(refregerant side)  
in sq. metre
- u) Surface area of tubes (water side)  
in sq. metre.

#### 4. A.C. Plant (OVERALL)

- a) Operating Conditions :
- b) Actual Capacity of AC plant  
at above Operating Conditions :
- c) Overall dimension MM :
- d) Type of vibration isolator and its  
transmissibility factor :
- e) Operating Wt. Kg. :
- f) Service Clearance mm for condenser :

#### 5. COOLING TOWER :

- a) Make of cooling Tower :
- b) Type of cooling Tower :
- c) Model of cooling Tower :
- d) Material of casing, fill and basin :
- e) Overall dimension in mm :
- f) Dry weight KG :
- g) Operating weight :

- h) Water flow rate liter/minute :
- i) Drift Loss(%) :
- j) Evaporation Loss(%) :
- k) Approach of cooling tower :
- l) Range of cooling Tower :
- m) Capacity of cooling tower :
- n) fan diameter :
- o) Sound level generated by fan  
at 2 meters from fan discharge :

**6. FAN MOTOR**

- a) Type of Motor :
- b) Horse Power of motor :
- c) R.P.M. of Motor :
- d) Insulation Class :

**7. CONDENSER PUMP SETS** :

- a) Make :
- b) Type :
- c) Model :
- d) Discharge(LPM) :
- e) Head(mtrs.) :
- f) Efficiency :
- g) Brake Horse Power :
- h) Horse power of motor :
- i) Make/Type of motor :
- j) Make/Type of starter :
- k) Impeller Diameter(MM) :
- l) Material of Bearing/Seal :

m) Type of Bearing/Seal :

## 8. CHILLAR

General:

- a) Make and Model (Horizontal) :
- b) Type :
- c) Type of tubes :
- d) Material of tubes :
- e) Pressure drop on water in side :
- f) No. of passes :
- g) Water flow rate :
- h) Entering water temp. :
- i) Leaving water temp. :
- j) Saturated suction temp. :
- k) Fouling factor :
- l) Refrigerant side working pressure :
- m) Water side working pressure :
- n) Refrigerant side test pressure :
- o) Water side test pressure :
- p) Heat insulation :
- q) Range of Capacity(LITRE) :
- r) Capacity of CHILLAR
- s) Overall size LxBxH(mtrs.)
- t) Overall weight in Kg. :
- u) Service/side clearance required :

## 9. CHILLAR PUMP SETS :

- a) Make :
- b) Type :
- c) Model :
- d) Discharge(LPM) :
- e) Head(mtrs.) :
- f) Efficiency :
- g) Brake Horse Power :
- h) Horse power of motor :
- i) Make/Type of motor :
- j) Make/Type of starter :
- k) Impeller Diameter(MM) :
- l) Material of Bearing/Seal :
- m) Type of Bearing/Seal :

**10. CONTROLS(MAKES) :**

a) Flow Switch :

b) Pressure gauge :

c) Thermometers :

d) Solenoid Valve :

**11. ELECTRICAL ACCESSORIES**

Please indicate the make,type, rating/grade and other details of following :

a) Panels/switchboard :

b) ACB/MCCB/FSU :

c) HRC Fuses :

d) Rotary/selector Switches :

e) Starters :

f) Contactors :

g) Indicating Lights :

h) Push Buttons :

i) Control Cables :

j) Power Cables :

k) Ammeters :

l) Voltmeters :

m) Single Phase Preventors :

n) Current Transformer :

o) Bus-bar/Grade :

p) Overall dimensions of the panel :

## 12. PIPES

- a) Make :
- b) Class :
- c) Diameter and wall thickness mm :

## 13. VALVES

- a) Check Valve make :
- b) Butterfly Valve make :
- c) Y-Strainer Make :
- d) Pot - Strainer make :

## 14. PIPE INSULATION

- a) Manufacturer's name
- b) Material
- c) Density Kg./m<sup>3</sup>.
- d) Thermal conductivity K cal/hr.m °C

## 15. ON-LINE SCALE PREVENTOR/ WATER SOFTENING PLANT FOR CONDENSER WATER CIRCUIT

- a) Type :
- b) Make :
- c) Brief constructional details :
- d) Principle of operation :
- e) Type of connections and mounting :  
arrangement required.
- f) Whether AC Mains supply required :  
for units operation? If yes, details  
of power supply requirement

**CODES, REGULATIONS, NOISE AND VIBRATION CONTROL**

The codes, regulation as detailed below shall be followed in execution of the work:

- |     |  |   |
|-----|--|---|
| 1.  | Safety code for air-conditioning<br>(Revised) amendment. | IS 659:1964 (reaffirmed 1991)                       |
| 2.  | Safety code for mechanical refrigeration                 | IS 660:1963 (reaffirmed 1991)                       |
| 3.  | Testing of refrigeration compressors                     | IS 5111:1993  |
| 4.  | Air-cooled heat exchangers (Amendment I)                 | IS:10470:1983 (reaffirmed 1991)                     |
| 5.  | Hermetic compressors                                     | IS 10617:Part I, II & III<br>1983 (reaffirmed 1991) |
| 6.  | Thermostats for use in refrigeration etc.                | IS:11338:1965 (reaffirmed 1991)                     |
| 7.  | Steel for general structural purpose                     | IS:2062:1992  |
| 8.  | Piping work up to 150 mm Dia<br>above 150 mm dia         | IS 1239 Part I & II 1990/1992 & BS:3601<br>BS:3589  |
| 9.  | Hot Dip Zinc Coated Steel Tubes                          | IS 4736:1968  |
| 10. | Gate Valves for Water lines                              | IS 778:1980   |
| 11. | Copper Alloy Gate, Globe, Check valve<br>for water lines | IS 778:1980   |
| 12. | Butterfly Valve  | IS 13095:1991                                       |

13.	Steel Pipe flanges	IS:6392
14.	Gaskets	IS 638:1979 (reaffirmed 1993)
15.	Mild Steel Tubes & fittings	IS 1239 Part I & II
16.	Colour code for the identification of pipe lines	IS:2379:1963
17.	Specific requirements for the direct switching of the individual motors	IS 4064 (Part II) : 1978
18.	PVC Insulated (HD) Electric Cables for working voltage up to 1100 Volts and up to 11 KV grade respectively.	IS: 1554 (Part I & II)
19.	HRC Cartridge fuse links up to 650 Volts.	IS 2208:1976
20.	Starter	IS 8554 (Part I) :1979
21.	Inspection and testing of installation	IS 732 (Part III) 1979
22.	Three Phase induction motors	IS:325
23.	Code for practice for electrical wiring installations.	IS 732:1989
24.	Code for practice for earthing	IS 3043:1966
25.	Horizontal centrifugal pumps	IS : 1620
26.	Wrought aluminium & aluminium alloy sheet and strip for general engineering purposes.	IS : 737

27.	Burden tube pressure and vacuum gauges	IS:3624
28.	Glossary of terms used in refrigeration and air-conditioning	IS:3615
29.	Specification for single phase small AC & Universal motors	IS:996
31.	Circuit breaker A.C.	IS:2516:1980 (Part I & II)
32.	Contractors for A.C. Voltage upto 1100 V	IS:2959:1975
33.	Low Voltage switch gear and control gear Assemblies	IS 8623:1993 (Part I & II)
34.	Code of practice for selection of Starters for AC induction motors	IS 3914
35.	Specification for cables glands	IS 4821
36.	Coded for selection, installation & maintenance of switch gear and control gear	IS 10118:1982 Part I & IV
37.	Conduits for electrical installations	IS 9537:1981 Part I to IV
38.	Permissible limits of noise level for rotating electrical machines	IS 12065:1987
39.	Code of practice for installation and maintenance of motors	IS 3106:1966
40.	Electrically welded steel pipes for water, gas and sewage	IS:3589

- |     |  |                                |
|-----|--|--------------------------------|
| 41. | Method for testing panel type air filters<br>and AC purposes | IS 7613:1975 (reaffirmed 1991) |
| 42. | Unbonded glass wool for thermal insulation                   | IS 3690:1974                   |
| 43. | Expanded polystyrene for thermal                             | IS 4671:1984 (reaffirmed)      |
| 44. | Centrifugal fans (1 <sup>st</sup> Revision)                  | IS 894:1987 (reaffirmed 1991)  |

**SAFETY CODES** The following IS codes shall be followed:

- |    |   |         |
|----|---|---------|
| 1. | Safety code for scaffolds & ladders   | IS:3696 |
| 2. | Code of practice for fire precaution in<br>welding & cutting operations                                       | IS:3016 |
| 3. | Code for safety procedures and practices<br>in electrical works   | IS:5216 |
| 4. | Code of practice for safety and health<br>requirements in electrical & gas welding<br>and cutting operations. | IS:3696 |

## **SPACE**

All shop drawings shall be prepared by the Tenderer after examining. Architectural and other drawings, site conditions and shall be based and designed on the spaces shown on them.

## NOISE AND VIBRATION CONTROL

The tenderer must take all necessary precautions to have a minimum noise generation and its transmission as deemed necessary. Minimum vibration as permitted by IS relevant code shall be ensured. A few points for guidance are given below:

- a) Double fire retardant flexible connection shall be made from air discharge to the duct.
- b) Vibration isolation pads of suitable thickness and loading for elimination of vibration shall be provided under all pumps, air handlers etc. as per recommendations of the manufacturer.
- c) Vibration isolation springs of DUNLOP make only of suitable size to suit weight of pump & compressor for elimination of vibrations shall be provided as per recommendations of the manufacturer.
- d) Flexible conduits of suitable diameter and length are to be provided for making flexible electrical connection to the motors. All conduit connections where conduits are 60mm and large shall be made of at least 1.2 times the minimum length and installed in U shape, grossly slack to provide maximum vibration isolation.
- e) All mono-block pumps shall be bolted and grouted to the base which in turn shall be supported on suitable vibration isolation rubber pads duly sandwiched with 24 gauge GI sheets. Concrete inertia blocks shall be formed of suitable thickness and of adequate size. The floor supported piping shall be mounted on rubber pads with 7.5 mm ribbed neoprene pads between the base plate and the support.
- f) All suspended ceiling shall be isolated on hangers. The vibration hangers shall have stable steel spring. A neoprene neck shall be provided where the hanger rod is connected to the supporting element to prevent metal to metal contact. The steel spring element shall have static deflection equal to half the static deflection of the isolated equipment and shall be used to support all equipment from the vibration equipment or from the floor or ceiling of the equipment room.
- g) All other mechanical equipment such as expansion tanks etc. shall have double deflection neoprene in compression for overload of 9 mm. The top and bottom surface shall be ribbed and bolt holes shall be supplied in the base.
- h) In case of conduits, pipes, tubes, the annular space between construction and penetrating element shall be filled with fibrous material and both sides sealed with hardening resident sealant.
- i) All floor mounted vibration isolated equipment shall be supported on steel frames or concrete block.
- j) The air conditioning tenderer shall take all other precautions or provide on his own if not specified above for reducing noise level to within limits or minimise vibrations in all mechanical equipment without any additional cost.
- k) The pumps shall be supported on suitable MS base epoxy painted frame that shall be isolated from its concrete foundation (of suitable size and strength). Vibration isolation springs of suitable size and duty and of Dunlop make shall be provided for elimination of vibrations.

**INSPECTION PROCEDURE FOR INITIAL INSPECTION OF CENTRAL  
AC PLANTS AT MANUFACTURER/TENDERER WORKS.**

**I. AIR CONDITIONING PLANT COMPRISING COMPRESSOR & CONDENSER CHILLER.**

1. Physical verification of the unit for its make, model, type, capacity etc. shall be carried out of the equipment offered at Manufacturer's/tenderer works with reference to A/T.
2. Manufacturer's test certificate shall be scrutinized to check compliance with the requirement as specified in the order.

**II. A.H.U. AND COOLING COIL**

**(A) AIR HANDLING UNIT**

1. Salient features such as model, size, physical dimensions and other details of various sections, fan motor detail, fan dimension etc. shall be verified against the contract requirements.
2. Manufacturer's test certificate for the motor and air-handling unit shall be furnished and scrutinized as per contract requirements.
3. Test certificate for static and dynamic balancing of the fan/blower shall be furnished for verification.

**(B) Cooling Coil.**

1. Manufacturer's internal test certificate on salient features like type, material, no. and gauge of fins and tubes and no. of rows shall be furnished and verified with reference to contract requirements.
2. Hydraulic pressure to the extent of 21 Kg/ cm<sup>2</sup> shall be applied and this pressure should be maintained for 15 minutes and no drop should be observed indicating any leaks. Alternatively pneumatic submerged pressure test shall be carried out for 15 minutes with compressed air or dry nitrogen at a pressure of 21 kg/ cm<sup>2</sup> to ensure that there is no leakage.

**III. PUMPS**

1. Salient features such as model and make shall be checked as per contract requirements.
2. Manufacturer's test certificate will be furnished and verified against contract requirements.

### **III. COOLING TOWERS**

1. Salient features such as dimensions, materials used, constructional details, number and size of nozzles, type, make and size of fan and fan motor etc. shall be verified against the requirements. Inspection of cooling tower in knocked down condition shall be carried out at manufacturer's/ tenderer's works.
2. Manufacturer test certificate certifying the capacity of cooling tower and static balancing of fan should be furnished.

### **IV. SWITCH GEAR, CONTROL GEAR AND MEASURING INSTRUMENTS**

1. It shall be verified that control panel is of CPRI approved make.
2. Manufacturer's test certificate for air circuit breaker shall be verified as per contract requirement.
3. Availability of measuring instruments of required accuracy for conducting different tests shall be verified.

### **V. Electric motor**

1. It shall be verified that the electric motors are of approved make.

### **VI. PIPES AND VALVES**

1. It shall be checked that the pipes and valves are as per makes specified in the contract. For items for which makes are not given in the contract, they should be of ISI mark/duly approved by the indentor.
2. Dimensions including thickness shall be checked for pipes against the requirements of contract.

### **NOTES**

- 1) All the components where initial inspection at manufacturer's works is not stipulated shall be of approved make.
- ii) Accuracy of testing instruments shall be as mentioned in the inspection procedure laid down in this Section.

**ANNEXURE-IV****INITIAL TEST AT SITE AFTER INSTALLATION WITH TEST READINGS**

Tenderer's representative shall witness all type of routine tests. Performance tests of equipment/control installed shall be carried out at site.

On completion of installation, the tenderer shall conduct initial test. Any defects found shall be rectified immediately. The test readings during initial test run shall be recorded in the Test Readings Proforma enclosed with this Annexure.

The initial test that has to be carried out by the tenderer shall be (but not limited to) as follows: -

- a) Pressure tests for all condenser water and refrigerant circuit as given in this specification/ as recommended by the manufacturer before charging the system.
- b) To check satisfactory functioning of all electrical motors, switch-gear, pumps, controls, pressure testing of all condenser and water and refrigerant system, air handler etc.
- c) To check alignment of motors.
- d) To operate, check and run compressor, cooling towers, pump sets, air handlers and adjust water flows in all lines,

**NOTES:**

All necessary test instruments such as thermometers, pyrometer, pressure gauges, anemometer, dust-count meter, water flow-meter, Sound level(decibel) meter, personnel, and required quantity of gas, oil and lubricants etc. shall be arranged by the tenderer at his own expense. However, water and power for testing and commissioning of the system shall be provided free of cost by the indenter.

In addition to the initial test as explained in Section I and above, the tenderer shall also give two continuous running tests of the system during peak summer and monsoon each of 24 hour duration or for 3 days each of 10 hour duration when the ambient conditions are close to the design conditions. The capacity test shall be conducted in presence of representative of the indenter and inside and outside conditions shall be recorded on hourly basis.

**CAPACITY OF PLANT**

Before capacity tests are conducted, the following aspects shall be checked:

- a) The tests shall be conducted during the peak season only. In case the outside design conditions are not available, then tests shall be conducted at design conditions closest to outside design conditions.
- b) All internal loads such as light load, occupancy or equipment load shall be close to design loads. Otherwise, artificial load shall be generated to satisfy internal design loads.
- c) Hourly readings of temperature, relative humidity, electric current, power consumption etc. shall be recorded. The capacity of the system components shall be computed as given in the TEST READING-PROFORMA given below.
- d) Test readings shall be furnished in duplicate prior to handing over the plants.

## **1. OUTSIDE DESIGN CONDITIONS**

- a) Season :
- b) Dry bulb temp. °C. :
- c) Wet bulb temp. °C. :

## **2. INSIDE DESIGN CONDITIONS**

- a) Dry bulb temp. °c. :
- b) Wet bulb temp. °C. :
- c) Relative Humidity % :

## **3. COMPRESSOR**

- a) Suction Temp. °C. :
- b) Suction Pressure Kg./cm<sup>2</sup> :
- c) Discharge temp. °C. :
- d) Discharge pressure Kg/ cm<sup>2</sup>
- e) Oil Pressure Kg./ cm<sup>2</sup>. :
- f) Capacity of compressor motor(HP):
- g) Starting current(Amps)
- h) Readings of voltmeter, Ammeter and power factor meter.

Power computation at various loads of 100% 75%, 50%, 25%

- Motor current - Amps :
- Voltage - Volts :
- Starting current -Amps. :

## **4. CONDENSER WATER CIRCUIT**

- a) Water flow rate LPM :
- b) Entering water temp. °C. :
- c) Leaving water temp. °C. :
- d) Pressure drop through Condenser Kg/cm<sup>2</sup> :
- e) Refrigerant condensing temp. °C. :
- f) Refrigerant Pressure Kg/ cm<sup>2</sup> :

Flow of water through condenser may be obtained by means of a flow meter or by pressure drop in the condenser. The water flow can be read against the recorded pressure drop from the manufacturer's rating curves

### **5. COOLING TOWERS**

- a) Wet bulb approach :
- b) Water flow rate LPM :
- c) Leaving water temp. °C. :
- d) Entering water temp. °C. :

### **6. CONDENSER WATER CIRCULATION PUMP SETS**

- a) Flow rate LPM :
- b) Suction pressure Kg./cm<sup>2</sup>. :
- c) Discharge Pressure Kg/ cm<sup>2</sup>. :
- d) Rated HP of motor :
- e) Rated voltage/current/ volts/ ampere :
- f) Actual voltage/current/ volts/ ampere :
- g) Starting current Amps. :

Record all data for pump, as for compressor motor.

### **7. CHILLER WATER CIRCUIT**

- a) Water flow rate LPM :
- b) Entering water temp. °C :
- c) Leaving water temp. °C :
- d) Pressure drop through chiller Kg/cm<sup>2</sup>

Flow of water through chiller may be obtained by means of a flow meter or by pressure drop in the chiller. The water flow can be read against the recorded pressure drop from the manufacturer's rating curves.

### **8. CHILLER WATER CIRCULATION PUMP SETS**

- a) Flow rate LPM :
- b) Suction pressure Kg./cm<sup>2</sup>. :
- c) Discharge Pressure Kg/ cm<sup>2</sup>. :

- d) Rated HP of motor :
- e) Rated voltage/current/ volts/ ampere :
- f) Actual voltage/current/ volts/ ampere :
- g) Starting current Amps. :

Record all data for pump, as for compressor motor.

**Notes:**

**1. TESTING VARIOUS LOADING CONDITIONS**

The performance tests shall be conducted at various loads of 100%, 75%, 50% and 25% of the capacity of each plant.

**2. COMPUTATION OF CAPACITY OF VARIOUS EQUIPMENT.**

**a) Compressor**

$$\text{B.H.P./Ton} = \frac{\text{Power input in kW}}{0.746 \times \text{Compressor Cap. in ton.}}$$

The capacity of compressor shall be taken from manufacturer's rating chart to be supplied by the tenderer.

**b) Condenser**

Refrigerating Capacity  $H_c = [(T_2 - T_1)W - 860P]$  Kcal/hr.

$$= \frac{[(T_2 - T_1)W - 860P]}{3024} \text{ TR}$$

$H_c$  = Net cooling effect produced in Kcal/hr.

$T_2$  = Outlet water temp.

$T_1$  = Inlet water temp.

$W$  = Quantity of water passed/hr in kg.

$p$  = Power input in kW.

**c) Cooling Tower**

$$\begin{aligned} \text{Cooling Tower Efficiency} &= \frac{\text{Range} \times 100}{\text{Range} + \text{Approch}} \\ &= \frac{(T_h - T_c) \times 100}{(T_h - T_c) + (T_c - T_{wb})} \\ &= \frac{(T_h - T_c) \times 100}{(T_h - T_{wb})} \end{aligned}$$

Where-

Th - Hot water temp.( Water inlet)

Tc - Cold water temp.( Water Outlet)

Twb- Ambient wet bulb temp.

**d) Cooling coils of Air Handlers**

$$\text{Capacity of cooling coil} = \frac{\text{Cfm} \times 60 (\text{he-hl})}{\text{Avg. sp. volume } V \times 12000}$$

Whereas he = Enthalpy of entering air in btu/lb\*

hl = Enthalpy of leaving air in btu/lb.\*

V = (Ve + Vl)/2

Ve = Specific volume of air entering in Cft/lb of air

Vl = Specific volume of leaving air Cft/lb of air.

\* Wet bulb temperature of air before and after the cooling coil of the AHU should be measured to know he and hl values.

3. All functional tests of motors, other electrical equipment, electrical cables shall be conducted as per Indian Electrical Rules and ISI specifications.
4. The interlocking of compressor motor with condenser and cooling tower fan shall be checked.
5. HP/LP cut-out, oil failure switch, flow switch, etc. shall be thoroughly checked and tested at various settings.
6. The in built capacity control arrangement of each compressor shall be checked at various steps of loading.

**ANNEXURE-V**  
**LIST OF APPROVED MAKES OF DIFERENT EQUIPMENT**

1. Compressors : CARRIER/ACCEL/VOLTAS/BLUE STAR/COPELAND
2. Water Pumps : BEACON/KIRLOSKAR/MATHER&PLATT/VOLTAS
3. Air Handler Unit Casing : SAIVER/CARYAIRE EQUIPMENTS/ETA
4. AHU fan(Centrifugal) : NICOTRA/COMEFRI/KRUGER
5. Cooling Coil : VOLTAS/BLUE STAR/CARRIER AIRCON/COIL Co./AIRFLOW
6. Induction Motors : ABB/CROMPTON GREAVES/SIEMENS/NGEF
- 7 Pot/Y-Strainer : EMERALD/SANT
8. Water Pipes
  - A) Piping upto 150 mm : TATA STEEL/JINDAL HISSAR
  - b) Piping above 150 mm : HSL/JINDAL HISSAR
9. a) Water Duty butterfly valve : AUDCO/ADVANCE/CASTLE  
 b) Water Duty Check Valve (Dual Check Type) : ADVANCE/LARSEN & TOUBRO/CASTLE
10. Pressure Gauges : FIEBIG/EMERALD/JAPSIN/H.GURU
11. Industrial Type Thermometer : EMERALD/D.S. ENGINEERS/JAPSIN
12. Glass Wool : U.P. TWIGA/KIMCO/OWENS CORNING
13. Expanded Polystyrene : METTUR BEARDELL/THERMOLLOYD/STYRENE PACKING
14. Fibre Glass Rigid Board : U.P. TWIGA/KIMCO/OWENS CORNING
15. Fire Damper : CARYAIRE/CONAIR/SERVEX/O.P. ENGINEERING
16. Paints : ICI/ASIAN/JENSON & NICHOLSON/GOODLASS NEROLAC/SHALIMAR
17. Air-Circuit Breakers/MCCB : L&T/SIEMENS/GE/CROMPTON/MDF/KOPP
18. MCB : INDOKOPP/L&T/GE/CROMPTON
19. Power Cable : ICC/CCI/GLOSTER/GRANDLAY/UNIVERSAL/INCAB
20. Control Cable : GLOSTER/GRANDLAY/NATIONAL/HENLEY BATRA/INCAB/UNIVERSAL

21. Volt Meter/Ammeter	: A.E/IMP
22. Switches	: L&T/SIEMENS/GE
23. H.R.C. Fuse and Fittings	: L&T/SIEMENS/GE
24. Current Transformer	: A.E/KAPPA/PRECISE
25. Contactors and Over Load Relays	: L&T/SIEMENS/GE/LAKSHMI
26. Indicating Lights/Push Buttons.	: SIEMENS/L&T/VAISHNO/BINAY
27. Selector/Toggle Switch	: KAYCEE/L&T
28. Change Over Switch	: ELECON/L&T
29. Time Delay Device	: SIEMENS/L&T/BCH
30. Single Phase Device	: L&T/MINILEC/LAKSHMI
31. Electrical Panel, Sub-Panels, etc.	: ASPL/MILESTONE/TRICOLITE/ CPRI Approved firms
32. Water softening plant/ On-line scale preventor BAN / OR Similar.	: COLLOID-A-TRON/SCALE GUARD/SCALE-

**APPENDIX-I**

The scope shall comprise the supply, installation of pipe, fittings, valves etc. and testing and balancing the complete system. Refer to drawings submitted with the tender and specifications to determine number and requirements of items of equipment requiring piping, such as bends, drain, relief etc. wherever equipment is provided with connections for such piping.

**Pipes:**

All piping work shall conform to specifications and details given below:

Pipes upto 150NB shall be MS ERW (Electric Rod Welded) medium (black steel bevelled end) and as per IS 1239/79 Part- I with amendment of Jan., 1987.

Above 150 NB to 250 NB the pipes shall be MS ERW as per BS 3589.

Pipe sizes shall be selected with water velocity not exceeding 2.5 metre/second or as per the requirement of individual liquid flow to ensure smooth, noiseless balanced circulation of fluid. The maximum friction in pipe shall not exceed 6 Metre Per 100 metre.

All piping and their steel supports shall be thoroughly cleaned with steel brush for removing dirt, rust and grease with chemical solution, if required, and coated with zinc chromate primer and given two coats of cold setting adhesive compound before installation.

**Fittings:**

The dimensions of the fittings shall conform to BE 1239-part II (as per latest amendment). All bends up to and including 150 mm diameter shall be ready made of heavy duty wrought steel of appropriate class. All fittings such as branches, reducers etc. in all sizes shall be fabricated from pipe of same diameter and thickness and its length shall be at least twice the diameter of the pipe. Bends in sizes of 200 mm diameter or higher may be fabricated from pipes of same diameter and thickness with a minimum of 4 sections and having minimum centre line radius of 1.5 times diameter of pipe. The dead ends are to be formed with flanged joints and 6-mm thick blank between flanged pair for 150 mm and over in case a future extension is to be made here. Otherwise blank end disc 6 mm thick is to be welded with additional cross stiffeners from 50 mm x 50mm MS heavy angles. For sizes above 350 mm and all ends larger than 400 mm dia shall have dished ends and tested

**Flanges:**

All flanges shall be of mild steel as per IS 6392/71(as per latest amendment) or the relevant BS and shall be slip-on type welded to the pipes. Flange thickness shall be suitable for class-I pressure. Flanges may be tacks welded into position, but all final welding shall be done with joints dismantled. 3mm thick gaskets shall be used with all flange joints. The gaskets shall be fibre-reinforced rubbers as approved by indentor or his representative at site. Flanged pairs shall be used on all such equipment, which may require to be isolated and removed for service, e.g. pumps, refrigeration machines, Air Handling Unit etc.,.

Special adhesive compound shall be used between flanges of air & gas lines. All threaded valves shall be provided with nipples and flanged pair on both sides to permit flanged connection for removal of valves from main line for repair/replacement.

**Valves:**

All gate valves and check valves up to and including 65 mm shall be of gun metal screwed type, conforming to class 2 of IS: 778. All gate and check valves of 80 mm diameter and above shall be of cast iron flanged type having black rubber seat and conforming to class 2 of IS: 780(for sizes up to 300 mm) and of IS: 2906(for sizes 350 mm and above). All such valves shall be with ISI marking and certification.

All gauges cocks shall be of gun metal plug type, complete with syphon (brass chrome plated). All drain valves shall be of gunmetal with a hose union connection at one end. Auto air purge valves shall be provided at higher points in the piping system for venting.

All balancing valves up including 40-mm diameter shall be gunmetal screwed type construction. The valves of 50-mm diameter and above shall be in cast iron flanged end construction. The valve shall have stainless steel disc with special erosion/corrosion proof sealing. The valves shall be capable of delivering metered quantity of water and subsequently function as isolating valve. All valves shall have built-in pressure drop measuring facility to ascertain water flow rate. The valve shall have temper proof adjustable and lockable arrangement for required water quantity after commissioning. The valves shall be complete with pressure test cock etc. The valves shall meet minimum requirement of relevant BS specification. The test cocks should be long enough to protrude out of valve insulation. All valves shall be supplied with test certificates and the manufacturer must have test facilities at his/her works.

#### **Strainers:**

The strainers shall be Pot type/'Y' type cast iron or fabricated steel body, tested to a pressure of 10 kg/sq.cm. The strainers shall have a perforated bronze/SS screen with 3-mm perforations, 0.63 mm thick and with a permanent magnet to catch iron fillings. The Pot strainers shall be provided with flanged connections and Y- strainers shall be provided with flanged ends. The strainers shall be designed to facilitate easy removal of filter screen for cleaning without disconnection of the pipeline.

#### **Jointing:**

All pipelines shall be of welded type except GI piping, which shall have screwed joints. Square cut plain ends will be welded for pipes up to and including 100 mm dia. All pipes 125-mm dia or larger shall be beveled by 35 degrees before welding.

#### **Miscellaneous:**

All piping is to be provided to make the equipment connected complete and ready for regular and safe operation. Connect the equipment as per recommendation of manufacturer, duly approved by the indenter.

All condensate drainage to be pitched in the direction of flow to ensure proper drainage. Pitching shall be preferably 20mm per metre length but not less than 10 mm per metre in any case. Provide valves and capped connection for all low points in piping system where necessary or required for drainage system. Provide isolating valves and drain valve in all riser to permit repairs without interfering with rest of the system. Take precautions to close ends of pipes to prevent debris entering the piping system. Independent supports are to be provided for piping so that equipment is not stressed by piping weight. Cut the pipes accurately according to measurements established at site so as to place them in position without forcing. Pipe support shall be adjustable for height and given primer coat with rust preventive paint and finish coated with paint as approved by the Indenter or his representative at site.

Unions, if used, shall be flanged type. Locate unions between shut off valves and equipment as required. Provide shut off valves where indicated and for individual equipment/units at inlet and outlet to permit unit removal for repairs without interfering with the remaining system. By-pass line and stop valves shall be provided for all automatic control valves as specified. All valves to be located for easy access and operation.

Spacing of pipe supports shall not be more than as specified below:

Nominal pipe size	Spacing in metres
In mm	
15	1.25
20 & 25	2.00
32, 40, 50 & 65	2.50
80, 100 & 125	2.50

Extra supports shall be provided at the bends and at heavy fittings like valves to avoid undue stresses on the pipes. Pipe hangers shall be fixed on walls and ceiling by means of approved

metallic dash fasteners using vibration isolators wherever required for minimising transmission of vibration to the structure.

### **Hangers & supports:**

Hangers and supports shall be provided and installed for all piping and tubing, wherever indicated, required or otherwise specified. Wherever necessary additional hangers and support shall be provided to prevent vibration or excessive deflection of piping or tubing. All hangers and supports shall be of steel. Hangers shall be supported from structural steel or concrete inserts (dash fasteners/expansion bolts) as per site conditions. No hanger shall be secured to underside of lightweight roof decking. Drilling or punching of holes in steel joist members shall not be permitted.

All pipes in plant room shall be supported by pipes and channels from floor or as directed by the indentor or his representative at site. A layer of felt shall be provided between the pipes and respective hanger/support.

Where pipes are to be buried underground these should be coated with one coat of bituminous paint as per specification. The top of the pipe shall not be less than 75 CMS from the ground level. Wherever this is not practical, permission of indentor or his representative at site shall be taken for lower depth. The pipes shall be surrounded on all sides by sand cushion of not less than 15 CMS. After the pipes have been laid with top sand cushion, the trench shall be refilled with excavated soil and extra soil shall be removed from the site by the tenderer.

### **Sleeves:**

Where pipes pass through walls, provide steel pipe sleeve 50 mm larger thick sheet than outside diameter of pipe. Where pipes are insulated, sleeve shall be large enough to have ample clearance for insulation.

Where pipes pass through wall or floor slab the space between pipe and sleeve shall be packed with glass wool. The center of pipe shall be in center of pipe sleeve and the sleeve shall be flush with the finished surface. Floor sleeve shall project 50 mm above finished floor level.

### **Arrangement and Alignment of Piping**

All piping shall be arranged and aligned in accordance with the drawings as specified. Unless otherwise specified, the piping shall be installed in a uniform way parallel to or perpendicular to walls or ceiling and all changes in direction shall be made with fittings. The horizontal piping shall be run at right angles and shall not be diagonally across rooms or other piping. Wherever possible all piping shall be arranged to provide maximum headroom.

All piping shall be installed as directly as possible between connecting points in so far as the work of other trades permits. Where interference occurs with another trade, whose work is more difficult to route, the tenderer shall re-route his piping as required at the direction of indentor or his representative at site. All piping shall be carefully installed to provide for proper alignment, slope and expansion. The stresses in the pipelines shall be guided and pipes shall be supported in such a manner that pipe lines shall not creep, sag or buckle. Anchors and supports shall be provided wherever necessary to prevent any misalignment of piping. Small tubing, gauges, controls or other equipment installed on any apparatus, shall not be coiled nor be excessive in length, but shall be installed neatly, carefully bent at all changes of direction, secured in place and properly fastened to equipment at suitable intervals to prevent sagging.

The piping shall be grouped wherever possible and shall be installed uniformly in straight parallel lines in either vertical or horizontal positions. All tubing/capillaries shall be provided with PVC sleeve to save it against frictional cuts or damage due to vibration.

### **Expansion or Contraction:**

The tenderer shall provide for expansion and contraction in all long runs of piping installed by use of swing connections and expansion loops.

## Testing:

Entire piping shall be tested before connection to equipment. In no case piping, equipment or appliances be subjected to pressures exceeding their test rating. The tests shall be completed before applying insulation. Testing of the segments of pipe work will be permitted provided blank-offs or flanges first close all open ends. After tests have been completed, the system shall be drained and flushed and cleaned of all dust and debris. All strainers, valves and fittings shall also be cleaned of all dirt, fillings and debris.

Entire piping shall be tested to hydraulic test pressure of at least one and a half times the maximum operating pressure but not less than 10 Kg/sq.cm. For a period of not less than 12 hours. All leaks and defects in the joints revealed during testing shall be rectified to the satisfaction of indenter or his representative at site and test repeated till no leak or defects are found without any extra cost. All piping system shall be tested in the presence of indenter or his representative. The dates for carrying out the test shall be intimated in advance to indenter and all equipment, labour and the tenderer shall provide material required during the test.

The condensate pipe shall be tested and proven tight under hydraulic pressure 20 kg/cm<sup>2</sup>, unless otherwise stated, for a period of 4 hours without drop in pressure.

The test after rectification shall be repeated till the entire system is found satisfactory. The test can be carried out for a portion of piping to avoid hindrance in the work of insulation.

The tenderer shall ensure proper noiseless circulation through all piping systems. If, due to air lock, proper circulation is not achieved, the tenderer shall bear all expenses for carrying out rectification work including finishing of floors, walls and ceiling damaged in the process of rectification. The tenderer shall provide all labour and materials for removal of water and its disposal at proper location.

## Drain piping:

The drain piping shall be medium class galvanized sheet as per IS 1239/1979, The fittings shall be of 'B' Brand or Equal forged with screwed connections. The gate valves shall be of GunMetal as described earlier. Pipe crosses shall be provided at bends to permit easy cleaning of drain lines. The drain line shall be provided to the nearest drain trap and pitched towards the trap. Drain lines shall be provided at all the lowest points in the System as well as at equipment where leakage of water is likely to occur or to remove condensate and water from pump glands.

## Thermal Insulation Specifications

The thermal insulation material shall be PUF of density 32 kg/m<sup>3</sup> and thermal conductivity not more than 0.032Kcal/hr.mt.°C. The insulation shall be either of 25 mm, 50 mm or 75 mm thick as necessary. To minimize wastage, two layers of 25 mm thick mattresses can be used to form a 50 mm thick pad and a 50 mm and a 25 mm combination may be used to form a 75 mm thick pad and so on. The chicken wire mesh used shall be made of GI wire. Tar felt used should be ISI marked. GI binding wire shall be of 22 gauge.

Thickness of insulation material to be used:

- |  |       |
|--|-------|
| i. On pipes up to and including 80 mm NB                 | 50 mm |
| ii On other pipes  | 75 mm |
| iii On all pipes running in trenches outside or exposed. | 75 mm |

Vapour barrier to be used

Polythene faced fire retardant on all insulation except PUF/hessian of 10 oz grade.

Exterior surface finish

- i. All surfaces in the plant room:

30 gauge Al foil stuck with Al tape

ii. All surfaces in trench or exposed to weather Tar felt sealed with bitumen applied over a plaster of asbestos cement.

Sequence of application:  
On pipes.

Clean surface, apply a coat of Black Japan paint, insulation held with chicken wire mesh, apply polythene faced hessian, apply surface finish.

Balancing valves and 'Y' stainers need not be insulated to facilitate ease of measurement and maintenance

Measurements:

Pipe insulation shall be measured along with center line of the pipe in linear measurement including all the valves, flanges and fittings,. Following additional measurement of the same size of pipe shall be allowed for the valves and fittings.

All GM valves @ 1.5 Rmt of the same size pipe length

All CI Flanged valve @ 2,3 Rmt of the same size pipe length

All flanges @ 0.8 Rmt of the same size pipe length.

**ELECTRICAL INSTALLATION:**

The scope of this section comprises fabrication, supply, erection, testing, commissioning of electrical panel, wiring and earthing of all air-conditioning equipment, components and accessories. Work shall be carried out in accordance with CPWD General specifications for electrical works(internal), 1994, Local Bye-laws, Indian Electricity Act 1910 as amended up to date and Rules issued thereunder, Regulation of the Punjab Fire Service and relevant BIS code of practice as may be applicable.

**Wiring:**

All power wiring shall be carried out with 1100 Volts grade PVC insulated, PVC sheathed armoured, aluminium conductor cables. Cables shall be sized by applying proper de-rating factor. All control wiring shall be carried out using 650 Volts PVC insulated copper conductor wires in raceways or in conduit or multi-core armoured cables on surface of walls, in ducts, pipes or in the ground as per standard practice/specifications. Minimum size of control wiring shall be 1.5 Sq.mm PVC insulated copper conductor wires. Minimum size of conductor for power wiring shall be 4 Sq.mm 1100 Volts grade cable.

**Electrical Panel:**

This shall be enclosed sheet steel cubicle, indoor type, front operated, floor mounting type. The panel shall be totally enclosed dust and vermin proof. Gaskets between adjacent units and beneath all covers shall be provided to render the joints dust proof. The panel shall be arranged in multi-tier formation. All CRCA steel sheets used in construction of panel shall be 2 mm thick and shall be folded and braced as necessary to provide a rigid support for all components. Joints of any kind in the sheet metal shall be seam welded, all welded slag grounded off and welding pits wiped smooth with plumber metal.

The design shall include all provisions of safety of operating and maintenance personnel. All panels and covers shall be properly fitted with frame and holes in the panel correctly positioned. Fixing screws shall enter into holes tapped into an adequate thickness of metal or provided with tack nuts. Self-threading screws shall not be provided in construction of Electrical Panels. Base channel of 75mm x 75mm x 5mm thick shall be provided at the bottom. Minimum clear space of 200 mm between the floor of Electrical Panel and bottom most unit(HRC fuse Switch Unit, MCCB or Bus Bar) shall be provided. Knockout holes of appropriate size and number shall be provided in the Electrical panel in conformity with location of incoming and outgoing conduits/cables.

All equipment such as meters and indicating lamps etc, shall be located adjacent to the unit with which these are associated and care shall be taken to achieve a neat arrangement. One indicator panel will be located in the plant room and provision shall be available for wiring a remote indicator panel to be fixed up in a different location of the building.

Facility shall be provided for entry of cables from both above and below Electrical Panel. Connector strips for termination of cables shall be arranged in tiers to facilitate making connection to the upper and lower units. Clamps shall be provided to support the weight of Cables.

All power wiring inside the panel shall be with copper conductor bars/strips colour coded and control wiring ferruled for easy identification. Circuit diagram showing the arrangement of circuits shall be pasted on the inside of panel door and covered with transparent plastic sheets and all labeling shall be provided in engraved anodized aluminium/bakelite strips on front face of the panel board. All materials used in Electrical panels shall be of make specified under head "Approved makes". The design and manufacture of these items would ensure withstanding of rupturing capacity of 31 MVA. All bolts, washers, nuts and screws shall be adequately galvanized. Each circuit breaker, contactor and relay shall be housed in separate compartment and shall have steel sheets on top and bottom of compartment. Sheet steel barriers shall be provided between the tiers in vertical section.

Adequate space shall be provided for accommodating instruments indicating lamps, control contactors and control fuses etc. These shall be accessible for testing and maintenance without any danger of accidental contact with live parts of the circuit breaker and bus bar.

The Bus bar shall be of high conductivity aluminium and of rectangular cross section so that a current density of 130 Amp/cm<sup>2</sup>. is not exceeded at nominal current rating. The cross section of the neutral bus bar shall be the same as that of phase bus bar of capacities up to 200 A, for higher capacity, the neutral bus bar must not be less than half the cross-section of that of the phase bus bars and bus bars shall be extendible on either side. The bus bars and interconnections shall be insulated with PVC sleeves/tapes and shall be colour coded. All bus bars shall be supported on unbreakable, non-hygroscopic insulated supports at regular intervals, to withstand the forces arising in case of short circuit in the system. All bus bars shall be provided in a separate chamber and properly ventilated. All bus bar connections in the panel shall be done by drilling holes and connecting by cadmium plated/hot dipped galvanized bolts, nuts and washers. Clearance for bus bars SHALL BE NOT LESS THAN 32 mm FOR PHASE TO PHASE AND 26 mm FOR PHASE TO EARTH.

All bus bar connections in smaller sub-panels shall be done by drilling holes and connecting by forged brass bolts and nuts. All tap-off connections between the bus bars and breaker and contactors shall be through strips of proper size to carry rated current and shall be insulated with PVC sleeves & between breakers and contactors through copper conductor with tinned copper thimbles.

The interconnecting control wiring shall be carried out in a horizontal raceway for connecting vertical sections. The raceway shall be provided with screwed covers. All incoming and outgoing cables entering from bottom or top of Electrical Panel shall be taken through adequately sized cable compartment for easy and convenient termination. All cables in this compartment shall be adequately supported. Before fabrication, the tenderer shall submit detailed dimensional drawing for approval. Suitable bakelite cover shall be provided to shield the exposed Bus bars. The section panels for the incomer and bus bars shall be separated and shall not be mixed with outgoing feeders.

The magnetic coil of contactor of each equipment starter shall be terminated in outgoing terminals. Switches shall be panel mounted double break type and suitable for load break duty, quick make and break action, manufactured in accordance with relevant BIS code Switch contact shall be silver plated and shall be braced up with HRC fuses of appropriate rating. All switchgear shall be suitable for a system short circuit capacity of 31 MVA at 415 Volts.

Each motor shall be provided with a starter of suitable rating. Starters shall be fully automatic. Starter contactors shall have 3 main and 2 numbers NO/NC auxiliary contacts and shall be of air break type suitable for making and breaking contact at minimum power factor of 0.35 The contactor shall be suitable for starting current of connected motor as 6 times the full

load current in case of DOL starters and 3 times the full load current in case of star-delta starters. The insulation for contactor coils shall be of class 'E'. The operating coils of contactors shall be suitable for 240/415 Volts AC supply. The contactors shall drop out when the voltage drops below 90% of the rated voltage. The housing of the contactors shall be heat resistant and having high impact strength. Each starter shall have thermal overload protection on all three phases.

Contactors shall be provided with a three element, positive acting, ambient temperature compensated time lagged, hand reset type thermal overload with adjustable setting. Hand reset button shall be flushed with the front door for resetting with starter compartment door closed.

Current Transformers shall be of accuracy class I and suitable VA burden for operation of connected meters. These shall be resin bonded and epoxy coated.

Single-phase preventers shall be provided as per schedule of quantities and shall be according to BIS standards. Single phase preventers shall act when supply voltage drops down to 90% rated voltage or on failure of one or more phases.

All meters and indicating lamps shall be in accordance with BS 37 & BS 39. The meters shall be flush mounted and draw out type. The indicating lamp shall be of low wattage type. Main panel shall be provided with 0-500 Volts Voltmeter with three-way & off selector switch, CT operated ammeter of suitable range with 3 nos. CTs of suitable range with 3-way and off selector switch, and phase indicating lamps. Each phase indicating lamp shall be with suitable Amps fuse.

Toggle switches where called for shall be in conformity with relevant IS codes and shall be of 5 Amps rating.

Push Button switches shall be provided for manual starting and stopping of motors/equipment as called for (Green and Red colour push buttons for starting and stopping operations, respectively). "Start" and "Stop" indicating flaps shall be provided for push buttons. Push buttons shall be of 6 Amps current rating and suitable for panel mounting with access from front without opening the door. All switches, contactors, push buttons and indicating lamps shall be distinctly marked with small description of the device installed.

All sheet work shall be degreased, thoroughly cleaned through seven tank process and then painted with high corrosion resistant primer. All panels shall then be baked in an oven. The finishing treatment shall be by application of synthetic enamel paint of BIS approved make and of Battle ship grey shade.

**Cable:**

MV cables shall be PVC insulated PVC sheathed aluminium/copper conductor and armoured conforming to IS 1554 Part-I/1998 with latest amendments/revisions thereof. Cables shall be suitable for laying in trenches, ducts and on cable trays as required. Control cables shall be multi-core PVC insulated PVC sheathed copper conductor.

Cable shall be laid generally in accordance with standard practice/CPWD specifications. Cable shall be laid on 2mm perforated MS sheet cable trays, and cable drops/risers shall be fixed to ladder type cable trays fabricated out of steel angle. Access to all cables shall be provided to allow cable withdrawal/replacement in future. Where more than one cable is running, proper spacing shall be provided to minimise the loss in current carrying capacity. Cables shall be suitably fixed with galvanized saddles when run on walls/trays. When buried, these shall be laid in 350mm thick layer of sand and protected with bricks. Special care shall be taken to ensure that cables are not damaged at bends. The radius of bend when installed shall not be less than 12 times of diameter of cable.

### **Cable Tray**

Cadmium plated 'u' shaped channel 40 mm x 20 mm made out of 1.6 mm thick sheet for main members. Intermediate members shall be of 30 mm x 20 mm size with gap between intermediate members not exceeding 300 mm center to center.

### **Earthing:**

All 3 phase motors and equipment shall be earthed with 2 nos. distinct and independent GI wires of 8 SWG(The cost of these wires shall be included by the tenderer in the item of electrical panel boards).

All switches shall be earthed with 2 numbers distinct and independent copper wire/tapes as follows:

- a) Up to 60 Amps      2 Nos. 3 mm dia copper wires
- b) 63 Amps to 100 Amps      2 Nos. 4 mm dia copper wires
- c) 125 Amps to 200 Amps      2 Nos. 6mm dia copper wires
- d) Above 200 Amps rating      2 Nos. 3mmx25mm copper strip

Sweated lugs of adequate capacity shall be used for all termination of wires. Lugs shall be bolted to equipment body after metal portion is cleaned of paint etc.

The switch board shall be provided with at least the following minimum facilities/indicators/instruments etc.

1. Voltmeter with selector switch for measuring the voltage of all the three phases.
2. Separate ammeter of suitable range and size with each electrical motor.
3. Neon lamp type phase indicator in each phase.
4. Indicators at various control circuit points to indicate the positive function of each electrical equipment/accessory.
5. Name plates to indicate the equipment or circuits controlled by the switches shall be fixed on the switchboard panel.

### **NOTES;**

1. The general requirements of these indicating instruments shall be as per IS: 1248 and they shall be of reputed make.
- 2, The instruments shall be of flush mounting type.
3. Compressed scale ammeters may be used with circuits using DOL starters.

The main power supply connection terminated in a cable box will be provided by the indenter in the plant room. Complete electrical installation for the control of various units from this point onwards is to be carried out by the tenderer.

a) **Tentative** details showing cable sizes and length, equipment capacities, switchgear rating and number, rating and number of control components.

b) A schedule giving time period from start to finish of the complete work.