DELHI METRO RAIL CORPORATION LTD.

(A Joint Venture of Govt. of India & Govt. of NCT, Delhi)

Comprehensive Annual Maintenance contract (CAMC) for Environment Control System (Mechanical & Electrical) for 06 underground stations (Udyog Bhawan, Race Course, Jor Bagh, INA, AIIMS, Green Park) at Line-2 of Delhi Metro Rail Corporation Ltd.

NO.DMRC/O&M/E&M/UG-II/M-3/CAMC-2015

NOTICE INVITING TENDER (NIT)

DELHI METRO RAIL CORPORATION LTD.

METRO BHAWAN, Fire Brigade Lane, Barakhamba Road

New Delhi-110001

SECTION 1

NOTICE INVITING TENDER

1.1 GENERAL

Delhi Metro Rail Corporation (DMRC) Ltd. invites **e-open tenders in TWO STAGE SYSTEM (Technical Bid and Financial Bid)** from the eligible tenderes as per tender clause 1.2. Of NIT for **"Comprehensive Annual Maintenance contract (CAMC) for Environment Control System (Mechanical & Electrical) for 06 underground stations (Udyog Bhawan, Race Course, Jor Bagh, INA, AIIMS, Green Park) at Line-2 of Delhi Metro Rail Corporation Ltd"**

1.1.1 Delhi Metro Rail Corporation (DMRC) Ltd. invites e-open tenders from eligible tenderers for the above-mentioned work as per following details:

Estimated cost of work	**Rs.1,23,84,558 /-(inclusive of all taxes)**
Tender Security amount	**Rs. 1,23,846/- (in form of bank guarantee with validity as per tender clause 11 of ITT or in form of draft)**
Cost of Tender form (Non Refundable)	**Rs. 5250/- (Rs.5000 plus 5% VAT)**
Contract period of the Work	**01 Year (From the day of issue of LOA)**
Underground stations at which works to be executed	**Udyog Bhawan, Race Course, Jor Bagh, INA, AIIMS, Green park underground metro stations.**
Tender documents on sale	**From 11.09.2015 to 12.10.2015 (upto1400 hrs) through e-tendering website www.tenderwizard.com/DMRC Tender document can only be obtained after registration of tenderer on the website www.tenderwizard.com/DMRC. For further information on this regard bidders are advised to contact 011-49424307, 011-49424365 or 011-23417910**
Last date of Seeking Clarification	**06.10.2015 up to 1500hrs**
Pre-Bid meeting	**09.10.2015 at 1500hrs**
Last date of issuing addendum	**12.10.2015**
Date & time of Submission of Tender	**12.10.2015 up to 1500 hrs**
Date & time of opening of	**12.10.2015 at 15.30 hrs**

Technical Bid	
Date & time of opening of Financial Bid	**Same will be intimated on www.tenderwizard.com/DMRC after technical evaluation**
Authority for purchase of tender documents, seeking clarifications and submission of completed tender documents	**DGM/E&M/UG-II** **Delhi Metro Rail Corporation,** **6th floor, C-Wing, Metro Bhawan,** **Fire Brigade Lane, Barakhamba Road,** **New Delhi –110 001**
The tender cost and tender security will be in the form of a Demand draft/ Banker's cheque drawn on a scheduled Commercial Bank based in India and should be in favour of "Delhi Metro Rail Corporation Ltd." payable at New Delhi. **The same should be submitted in original before opening of technical bid in the office of DGM/E&M/UG-II at the above mentioned address.** **NOTE: The bidders who fail to submit the tender cost & tender security (in original), etc. within stipulated scheduled time deemed to be rejected.**	

1.1.2 This is two bid open tender. Tenderer has to submit their e-offer in two different bids. One bid will be for technical bid and another will be for financial bid as per clause 8.3 of ITT.

1.2 ELIGIBILITY CRITERIA

1.2.1 **Work Experiences:**

The tenderers should have the experience in the similar nature of work not less than three years. The tenderers will be qualified only if they have completed work(s) in last five years in Govt., PSU/Semi-Govt./Govt. Autonomous body as mentioned below:-

a. Three similar works costing not less than the amount equal to 40% of the estimated cost. Or

b. Two similar works costing not less than the amount equal to 50% value of estimated cost Or

c. One similar work costing not less than the amount equal to 80% value of estimated cost

Similar nature of work:

Below mentioned work would be considered as similar nature of work for the purpose of evaluation of work experience mentioned in above clause i.e. clause 1.2.1(a), (b) & (c).

Supply, Installation, Testing and Commissioning or Comprehensive Annual Maintenance of Environment Control System (Mechanical systems & Electrical panels as detailed in Equipment List at Annexure-I). This SITC or CAMC work should include operation and maintenance of minimum 240 Tr. water cooled screw/centrifugal

chiller, without including this capacity of chiller experience will not be consider for tender evaluation.

Note: Work involving only operation of Environment Control System will not be considered as similar nature of work.

1.2.2 Completion Certificate of above mentioned work clearly describing the above mentioned similar work.

1.2.3 The tenderers shall submit details of works executed by them in the Performa prescribed in **FORM A of FOT of ITT** for the works to be considered for qualification of work experience criteria. **Documentary proof such as completion certificates from client clearly indicating the nature/scope of work, actual completion cost and actual date of completion for such work should be submitted. Tender offers submitted without this documentary proof may be liable to be rejected**. In case the work is executed for private client, copy of work order, bill of quantities, bill wise details of payment received certified by C.A., T.D.S certificates for all payments received and copy of final/last bill paid by client shall be submitted.

1.2.4 Value of successfully completed portion of any ongoing work will also be considered for qualification of work experience criteria.

1.2.5 The tenders for this contract will be considered only from those tenderers (proprietorship firms, partnerships firms, companies, corporations, consortia or joint ventures) who meet requisite eligibility criteria prescribed in the sub-clauses of Clause 1.2.1 of NIT. In the case of a JV or Consortium, all members of the Group shall be jointly and severally liable for the performance of whole contract..

A tenderer shall submit only one tender, either individually as a tenderer or as a partner of a JV/Consortium. A tenderer who submits or participates in more than one tender will cause all of the proposals in which the tenderer has participated either as sole tenderer or member of JV/consortium will be disqualified. No tenderer can be included as subcontractor while submitting a bid individually or as a partner of a JV/consortium in the same bidding process subsequently or at the tender stage. A tenderer, if acting in the capacity of subcontractor in any bid may however participate in more than one bid, but only in the capacity as subcontractor.

1.2.6 Tenderers shall not have a conflict of interest. Tenderers found to have a conflict of interest shall be disqualified. Tenderers shall be considered to have a conflict of interest with one or more parties in this bidding process, if:

(a) a tenderer has been engaged by the Employer to provide consulting services for the preparation related to procurement for implementation of the project;

(b) a tenderer's associate(s)/affiliate(s) (inclusive of parent firms) mentioned in subparagraph (a) above; or

(c) a tenderer lends, or temporarily seconds its personnel to firms or organizations which are engaged in consulting services for the preparation related to

procurement for implementation of the project, if the personnel would be involved in any capacity on the same project.

1.2.7 A firm, who has purchased the tender document in their name, can submit the tender either as individual firm or as partner of a joint venture/consortium. However, the lead partner in case of JV shall be one who has experience of similar works.

1.2.8 NON SUBSTANTIAL PARTNERS IN CASE OF JV/CONSORTIUM

a. Lead partner must have a minimum of 26% participation in the JV/Consortium.

b. Partners having less than 26% participation will be termed as non-substantial partner and will not be considered for evaluation which means that their financial soundness and work experience shall not be considered for evaluation of JV/Consortium.

c. In case of JV/Consortium, change in constitution or percentage participation shall not be permitted at any stage after their submission of application otherwise the applicant shall be treated as non-responsive.

1.3.1 **Financial Standings :**

a. Applicant should have average Annual Turnover of last three audited financial years not less than **80% of X.**

Where, X= estimated cost of work as per NIT

a. The tenderer shall submit the solvency certificate of 80% estimate value of contract from the Bank.

c. Applicant must not have been black listed or deregistered by any Govt or Public sector undertaking during last 5 years the contractor has to submit an undertaking on Rs. 10 stamp paper duly attested by Notary

d. Tenderers shall submit last three years (yr 2012-2013, 2013-2014, 2014-2015) audited financial statement duly attested by certified CA to work out net worth. **The net worth must be positive.**

e. Self attested copy of VAT/Service tax registration certificate, PAN no.

Documentary proof of satisfying eligibility conditions and charted accountant certificate for turnover to be furnished along with the application on printed letter heads. Testimonials of satisfactory completion should be obtained from an officer not below the rank of executive engineer

Notes :

- Financial data for last three audited financial years has to be submitted by the tenderer in **FORM T-V** along with audited balance sheets. The financial data in the prescribed format shall be certified by Chartered Accountant with his stamp and signature in original. In case audited balance sheet of the last financial year is not

made available by the bidder, he has to submit an affidavit certifying that 'the balance sheet has actually not been audited so far'. In such a case the financial data of previous '2' audited financial years will be taken into consideration for evaluation. If audited balance sheet of any year other than the last year is not submitted, the tender may be considered as non-responsive.

- Where a work is undertaken by a group, only that portion of the contract which is undertaken by the concerned applicant/member should be indicated and the remaining done by the other members of the group be excluded. This is to be substantiated with documentary evidence.

1.3.2 The tender submission of bidders, who do not qualify the minimum eligibility criteria stipulated in the clauses 1.2 above, shall not be considered for further evaluation. The mere fact that the bidder is qualified as mentioned in sub clause shall not imply that his bid shall automatically be accepted. The same shall be subject to the data as required for consideration of tender prescribed in the ITT

The mere fact that the tenderer is technically qualified as shall not imply that his bid shall automatically be accepted. The same should contain all Financial & other details as required for the consideration of tender.

1.3.3 The scope of work along with various other terms & conditions have been spelt out in the tender document consisting of the following:

a. Notice Inviting Tender - consisting of
   i. Notice Inviting Tender
   ii. Scope of Work
   iii. Tender prices
b. Instructions to Tenderers
c. General Conditions of Contract
d. Special Conditions of Contract
e. Bill of Quantities.

1.3.4 The tenderers may obtain further information in respect of these tender documents from the office of Deputy General Manager/E&M/UG-II office, 6th Floor, Metro Bhawan Fire Brigade lane, Barakhamba Road New Delhi-110001

1.3.5 The intending bidders must be registered on e-tendering portal **www.tenderwizard.com/DMRC**. Those who are not registered on the e-tendering portal shall be required to get registered beforehand. If needed they can be imparted training on 'online tendering process'. After registration the tenderer will get user id and password. On login tenderer can participate in tendering process and can witness various activities of the process.

1.3.6 The authorized signatory of intending bidder, as per Power of Attorney (POA), must have valid class-III digital signature. The tender document can only be downloaded or uploaded using Class-III digital signature of the authorized signatory.

1.3.7 Tender submissions will be made online after uploading the mandatory scanned documents towards cost of tender documents such as Demand Draft or Pay Order or Banker's Cheque from a Scheduled commercial bank based in India and towards Tender Security such as Bank Guarantee or Demand Draft or Pay Order or Banker's Cheque from a Scheduled commercial bank based in India and other documents as stated in the tender document.

1.3.8 Tenderer is cautioned that the tender containing any material deviation from the tender document which consists of NIT, Instructions to tenderes, General conditions of contract, Special conditions of contract, Bill of quantities is liable to be summarily rejected as non-responsive.

1.3.9 Tenders shall be valid for a period of 180 days from the date of submission of Tenders and shall be accompanied with a tender security of the requisite amount as per clause 8.0 of ITT.

1.4.0 DMRC reserves the right to accept or reject any or all proposals without assigning any reasons. No bidder shall have any cause of action or claim against the DMRC for rejection of his proposal.

1.4.1 Bidders shall note that the maximum file size that can be uploaded is 5 MB. All the uploaded files in tender submission should be named properly and arrange systematically.

1.4.2 The bidders are advised to keep in touch with e-tendering portal www.tenderwizard.com/DMRC for updates. Any corrigendum, addendum etc issued shall be part of this tender document and shall be made available on DMRC website **www.tenderwizard.com/DMRC**

(Vivek Shrivastava)
DGM/E&M/UG-II
Delhi Metro Rail Corporation Ltd
6th floor, Metro Bhawan,
Fire Brigade lane,
Barakhamba Road
New Delhi-110001

SECTION 2
SCOPE OF WORK

1.0 The contractor will execute the work i.e. **"Comprehensive Annual Maintenance contract (CAMC) for Environment Control System (Mechanical & Electrical) for 06 underground stations (Udyog Bhawan, Race Course, Jor Bagh, INA, AIIMS, Green Park) at Line-2 of Delhi Metro Rail Corporation Ltd".**

2.0 The works to be executed under this contract shall cover the System installed at the below mentioned stations of Line-2:

- Udyog Bhawan
- Race Course
- Jor Bagh
- INA
- AIIMS
- Green Park

The contract shall include the following services for the systems installed at the above stations:

Comprehensive Annual Maintenance contract (CAMC) for Environment Control System (Mechanical & Electrical) includes:

- **Part A: MECHANICAL SYSTEM** : This includes all Water cooled Chillers, Air Cooled Chillers, Air Handling Units, FCUs, Cooling Towers, ECS pumps, ECS fans, dampers ,Louvers, Grilles &Diffusers, Actuators, Valves, meters, gauges piping & ducting, insulation and other equipments related to operation of ECS
- **Part B: ELECTRICAL PANELS (ECS&TVS):** All Electrical Panels/DBs, Switch gears, cables and associated equipments related to operation of ECS & TVS.
- The detailed specifications & make of all the major parts of Part A, Part B is detailed in **Annexure-I.**
- The weight age of the CAMC for the Mechanical, Electrical Panels (ECS & TVS) are **70%, 30%** respectively.
- Only the pending defects as attached in **ECS Equipments status** list pertains to Environment Control System (Mechanical & Electrical) will be rectified by the DMRC for one time and beside the above mentioned defects in the attached list the other equipments shall be maintained by the contractor to execute the contract on as & where basis.
- The Contractor shall execute one time major overhaul of air cooled, water cooled chiller, Air Handling Units and Cooling Towers involving the yearly preventive maintenance activities as mentioned in the checklist (Annexure II) as per the instruction of Engineer In charge.

3.0 The term 'Comprehensive Annual Maintenance Contract' (CAMC) shall include cost on account of all repair and maintenance of all the ECS Equipments, replacement of spare

parts / mechanical parts thereof, oiling, chemical washing/ cleaning, greasing (general servicing), gas filling, replacement of filter and replacement/ repair of any or all the parts of machines including replacement of motors, replacement of faulty compressor, during the currency of the contract at the exclusive risk, responsibility and cost of the Contractor.

4.0 Site preparation

4.1 The Bidders shall visit the site & identify the defects & deficiencies and examine the site conditions for the execution of above named works and submit offer to execute and complete such works and remedy defects therein in conformity with the said Conditions of Contract, Specifications for the amount indicated in BOQ.

4.2 All site preparatory work shall have been carried out prior to the commencement of the work and all safety measures to be followed during the execution of work.

5.0 Schedule of Maintenance:-

The services to be provided by the contractor shall include, but not limited to, the following:

A. **Preventive Maintenance**:-

I. The scope of Preventive Maintenance shall include all the activities mentioned in the Check list attached as **Annexure-II.** The above Checklists have been designed as per the **recommendation of OEM**. However if contractor feels that any other activity is required to be additionally done for proper maintenance of the system as per the OEM recommendation, they shall carryout the same with approval from DMRC Engineer in charge.

II. The Daily operation and Logging will be done by the DMRC In charge the contractor shall review the logs on weekly basis and shall take the corrective action accordingly.

III. Contractor shall submit the Monthly Activity Schedule to carry out the preventive maintenance to the Employers representative before starting of the Maintenance Activities.

IV. The Contractor shall submit the service reports duly verified by the DMRC Representative to the DMRC Engineer in charge along the summary of Maintenance activities Carried out.

B. **Corrective/Breakdown Maintenance:**

I. The scope of **Corrective/Breakdown** Maintenance shall include all the Breakdown and failures occurring in the system at any time during **24 hrs x 365 days** inclusive of all Sundays & Holidays.

II. **Minor Maintenance**: - The Minor failures / defects which include repairing/replacement (if required) of defective items with spare parts/Components.

Response Time (Max.)	-	**03 hours**
Rectification Time (Max.)	-	**08 hours**

III. **Major Maintenance**: - Major failures / defects cover the attention of all type of major Failures/Breakdown, which includes Repair/Replacement of Assemblies, Sub-Assemblies, and Components etc.

Response Time (Max.)	-	**03 hours**
Rectification Time (Max.)	-	**Annexure-III**

The decision regarding minor/major maintenance shall be of DMRC, which will be binding on the contractor.

6.0 **ANNUAL MAINTENANCE PLAN**

6.1 The contractor shall submit the Annual Maintenance plan for the equipments mentioned under the Annexure-I. The annual maintenance activity shall be carried out after shut down of ECS system as per the instructions from DMRC and shall include the complete overhauling of the ECS system.

6.2 The contractor shall conduct the replacement for all the defective spares parts if any along with the Annual Maintenance activities as mentioned in the checklist. Upon completion of the maintenance activity, same shall be jointly inspected by the Contractor's site engineer and DMRC's Engineer In charge of the site. The system shall remain under trial run before the beginning of the ECS and parameters shall be logged during the initial testing of the system.

6.3 An annual maintenance report clearly indicating the work involved in the Annual Maintenance Plan and testing of the performance parameters of major equipments of the ECS shall be submitted to the Employer for further analysis of the system.

7.0 **ROOT CAUSE ANALYSIS :**

7.1 The contractor shall provide the root cause analysis for the major and repeated failures taking place in the system and shall submit a quarterly report giving proper analysis of the above faults.

7.2 Any correction/modification required in the system on the basis of the above analysis shall be done with prior approval from DMRC.

8.0 **MANPOWER DEPLOYMENT :**

8.1 The contractor shall deploy round the clock available specialized manpower having minimum experience requirement in the respective fields of specialization as mentioned below:

SL NO.	DESCRIPTION	EXPERIANCE	NOS. (minimum set not limited to)
1	VAC Engineer	5 yrs(min)	1
2	Electrical Engineer	5 yrs(min)	1
3	VAC Technician	3 yrs(min)	3
4	Electrician	3 yrs(min)	2
5	Semiskilled/Un Skilled	---------	As per Requirement

8.2 The employer can demand the enhancement of manpower as per site requirement. The same shall be incorporated by the contractor without any extra cost. The employees deputed by the contractor shall possess valid photo ID cards issued by DMRC for working in the station premises.

9.0 **TOOLS/TACKLES AND REPLACEMENT OF DEFECTIVE PARTS INCLUDING CONSUMABLES.**

9.1 The contractor shall bring special tools and test equipments which are essential for day to day use in both corrective and preventive maintenance during the period of the contract.

9.2 **The Contractor shall provide all the consumables for proper operation ECS system and the chemical require for the dosing in the condenser line and cooling tower as per site requirement**

9.3 The contract shall provide valid calibration certificates for all the measuring equipments involved in day to day operation and maintenance checks. The same shall stay valid during the period of the contract.

9.4 In the event of any item requires be routinely changing or calibrating regardless of whether it appears in the spares list or not shall be identified and replaced by the contractor.

9.5 The replacement of any defective material such as fills, eliminators, Nozzles in cooling tower, filters in AHU etc shall be done by the contractor as per instruction of the engineer in charge as per site requirement.

10.0 **TO MAINTAIN PROPER INVENTORY OF SPARES & CONSUMABLES AT SITE**

10.1 The contractor will keep adequate quantity of spares for immediate repairs and will replenish the same from time to time as per requirement. The contractor will supply, repair / replace all the spare parts during the currency of the contract as mentioned as per **Annexure-IV.**

10.2 The spare parts supplied by the contractor should be brand new /original one and from the reputed manufacturers / sources to ensure satisfactory performance. Used /repaired spare parts will not be accepted. Before using any spare, the same should be

shown and got approved by the employer's representative. The contractor will ensure that the repairs carried out do not require same repairs again within a reasonable time.

11.0 **TO MAINTAIN RECORD OF DEFECTS OCCURRED/ATTENDED WITH THE CONSUMPTION OF SPARES & CONSUMABLES.**

For every site visit, Engineer in-charge will prepare a service report, signed by Contractor's Service Engineer and DMRC engineer. First copy of it will be handed over to the DMRC engineer and second would be retained by Contractor's Service Engineer.

12.0 **OTHER ACTIVITIES TO BE CARRIED OUT TO UPKEEP THE SYSTEM IN HEALTHY CONDITION**

12.1 DMRC is an ISO-14001 & OHSAS 18001 certified Organization for Environment, Health & safety. The work is to be carried out as per International Norms/Standards and in such a manner that all premises always look Neat & Clean. Similarly, the waste disposal is also carried out in totally sealed manner without affecting the Environment.

12.2 If during the period if any equipment is required to be changed as a whole then the replacement will be done on mutually agreed terms.

12.3 For the hot works like welding, brazing, grinding and torch cutting and torch soldering to be carried out with prior hot work permit from DRMC under the supervision of DMRC staff and at most safety to be followed during the execution of any hot work. Preferably the hot work should be carried out during non revenue hours.

12.4 Repairing insulation removed for inspection & maintenance procedure.

12.5 Clean the equipment and surrounding area upon completion of work.

12.6 Report deficiencies and repairs required.

12.7 Contractor shall provide localized support for immediate problem resolution.

12.8 Completely filled the service inspection report after each visit with findings documented on equipment condition and performance, and recommendations on equipment enhancement to extend usable life.

12.9 Other activities required to be carried out as per manufacturer recommendation and to keep the system in healthy condition. If anything not included / missed and required for system proper operation if then it should be done by contractor free of cost.

ANNEXURE:-I

SUB: Equipment Details

Part A: MECHANICAL SYSTEM

S.No	Equipment	Station	Qty.	Capacity	Units	Make/type
1	Water Cooled Chiller	UDB	3	400	TR	York/Centrifugal
		RCC	3	370	TR	York/screw
		JB	3	400	TR	York/Centrifugal
		INA	3	400	TR	York/Centrifugal
		AIIMS	3	400	TR	York/Centrifugal
		GNPK	3	330	TR	York/screw
2	Air Cooled Chiller	UDB	2	40	TR	York/Scroll
		RCC	2	40	TR	York/Scroll
		JB	2	40	TR	York/Scroll
		INA	2	40	TR	York/Scroll
		AIIMS	2	40	TR	York/Scroll
		GNPK	2	40	TR	York/Scroll
3	CHWP-Pri	UDB	4	48	LPS	ITT Bell & Gossett
	CHWP-Sec (with VFD)		3	72	LPS	ITT Bell & Gossett
	CHWP-Pri	RCC	4	44	LPS	ITT Bell & Gossett
	CHWP-Sec (with VFD)		3	66	LPS	ITT Bell & Gossett
	CHWP-Pri	JB	4	44	LPS	ITT Bell & Gossett
	CHWP-Sec (with VFD)		3	67	LPS	ITT Bell & Gossett
	CHWP-Pri	INA	4	48	LPS	ITT Bell & Gossett
	CHWP-Sec (with VFD)		3	72	LPS	ITT Bell & Gossett
	CHWP-Pri	AIIMS	4	44	LPS	ITT Bell & Gossett
	CHWP-Sec (with VFD)		3	67	LPS	ITT Bell & Gossett
	CHWP-Pri	GNPK	4	40	LPS	ITT Bell & Gossett
	CHWP-Sec (with VFD)		3	60	LPS	ITT Bell & Gossett
4	CDWP	UDB	4	101	LPS	Crompton greaves/Kirloskar
		RCC	4	93	LPS	Crompton greaves/Kirloskar
		JB	4	93	LPS	Crompton greaves/Kirloskar
		INA	4	101	LPS	Crompton greaves/Kirloskar
		AIIMS	4	93	LPS	Crompton greaves/Kirloskar
		GNPK	4	83	LPS	Crompton greaves/Kirloskar
5	Air Cooled CHWP	UDB	2	7/13.5	LPS	Kirloskar
		RCC	2	7/13.5	LPS	Kirloskar
		JB	2	7/13.5	LPS	Kirloskar
		INA	2	7/13.5	LPS	Kirloskar
		AIIMS	2	7/13.5	LPS	Kirloskar
		GNPK	2	7/13.5	LPS	Kirloskar
6	Air Handling Units	UDB	4	126000	CMH	ETA
		RCC	4	126000	CMH	ETA
		JB	4	126000	CMH	ETA
		INA	4	126000	CMH	ETA
		AIIMS	4	126000	CMH	ETA
		GNPK	4	126000	CMH	ETA
7	Cooling Towers	UDB	3	1670	KW	Paharpur
		RCC	3	1527	KW	Paharpur

		JB	3	1527	KW	Paharpur
		INA	3	1570	KW	Paharpur
		AIIMS	3	1527	KW	Paharpur
		GNPK	3	1375	KW	Paharpur
8	Fan Coil Units	UDB	36	70	TR	ETA
		RCC	34	66	TR	ETA
		JB	36	71.5	TR	ETA
		INA	34	65	TR	ETA
		AIIMS	33	64.5	TR	ETA
		GNPK	38	73	TR	ETA
9	Ventilation Exhaust Fans	UDB	20	11/0.37/4	KW	Kruger
		RCC	18	15/0.37/4	KW	Kruger
		JB	18	15/0.37/4	KW	Kruger
		INA	18	15/0.37/4	KW	Kruger
		AIIMS	16	15/0.37/4	KW	Kruger
		GNPK	18	15/0.37/4	KW	Kruger
10	Ventilation Supply Fans	UDB	6	3/4	KW	Kruger
		RCC	4	11	KW	Kruger
		JB	4	11	KW	Kruger
		INA	4	11	KW	Kruger
		AIIMS	4	11	KW	Kruger
		GNPK	4	11	KW	Kruger
11	Fresh Air Fan	UDB	2	5.5	KW	Kruger
		RCC	2	7.5	KW	Kruger
		JB	2	7.5	KW	Kruger
		INA	2	7.5	KW	Kruger
		AIIMS	2	7.5	KW	Kruger
		GNPK	2	7.5	KW	Kruger
12	Smoke Exhaust Fan	UDB	0	0	KW	Kruger
		RCC	4	15	KW	Kruger
		JB	4	15	KW	Kruger
		INA	4	15	KW	Kruger
		AIIMS	4	15	KW	Kruger
		GNPK	4	15	KW	Kruger
13	Stair case Pressurization fans	UDB	2	4	KW	Kruger
		RCC	2	4	KW	Kruger
		JB	2	4	KW	Kruger
		INA	2	4	KW	Kruger
		AIIMS	2	4	KW	Kruger
		GNPK	2	4	KW	Kruger

ANNEXURE:-I

SUB: Equipment Details

Part B: Electrical Panels (ECS&TVS)

S. NO.	PANEL/ DB NO	PANEL DESCRIPTION	INCOMER 1 (NORMAL)	INCOMER 2 (REPLACEMENT)	EQUIPMENTS CONNECTED
1	DB-130	Main Panel for ECS North	DB-100	DB-200	AHU
					TEF
					VENTILATION FANs
					Sub DBs
					FIDs for TEF,AHU,FANs
					ETVD
2	DB-131	Damper DB for ECS North	DB-130	N.A.	MODs
					MFDs
3	DB-132	DB for Fan Coil Units (BOH-N)	DB-130	N.A.	FAN COIL UNITs
4	DB-140	TVS Panel for North	DB-100	DB-200	Tunnel Ventilation Fans
					Air Compressor
					FIDs for TVF
					DRD
					Shaft Damper
					Nozzel Damper
					TVD
5	CAP-DB-130	Power Factor Correction Panel for DB-130	DB-130	N.A.	N.A.
6	ASS -DB-VENT (NORTH)	DB for A.S.S Ventilation Fans	DB-150	N.A.	Ventilation Fans for A.S.S
					Ventilation Fans for U.P.S Room
7	DB-230	Main Panel for ECS South	DB-200	DB-100	AHU
					TEF
					VENTILATION FANs
					Sub DBs
					FIDs for TEF,AHU,FANs
					ETVD
8	DB-231	Damper DB for ECS South	DB-230	N.A.	MODs
					MFDs
9	DB-232	DB for Fan Coil Units (BOH-S)	DB-230	N.A.	FAN COIL UNITs
10	DB-240	TVS Panel for South	DB-200	DB-100	Tunnel Ventilation Fans
					FIDs for TVF
					DRD
					Shaft Damper
					Nozzel Damper
					TVD
11	CAP-DB-230	Power Factor Correction Panel for DB-230	DB-230	N.A.	N.A.
12	ASS -DB-VENT (South)	DB for A.S.S Ventilation Fans-North	DB-250	N.A.	Ventilation Fans for A.S.S
					Ventilation Fans for U.P.S Room
13	DB-300	Main DB for A.S.S-III	Transformer 3	DB-100/DB-200	Water cooled Chiller
					Cooling Towers

					Primary CHW Pumps
					Secondary CHW Pumps
					Condenser Water Pumps
					Sub DBs
14	DB-330	Sub DB for Chiller Plant	DB-300	N.A.	Ventilation Fans
					MOVs for Main plant
15	CAP-DB-300	Power Factor Correction Panel for DB-230	DB-230	N.A.	N.A.
16	DB- Air Cooled	DB for Air Cooled Chiller	DB-300	DB-290	Air Cooled Chiller
					Chilled Water Pump for A/C Chiller
					MOVs for Air Cooled Chiller Circuit

ANNEXURE:-II

SUB: Checklist

Part A : MECHANICAL SYSTEM Maintenance Checklist

ITEM	CHECK POINTS	WEEKLY	MONTHLY	QUATERLY	HALF YEARLY	YEARLY
I. General						
1	Visual check for any leaks & damage.	X	X	X	X	X
2	Check for any visual damage.	X	X	X	X	X
3	Check the cleanliness of the system and clean if required	X	X	X	X	X
4	Check drain points for blockage.	X	X	X	X	X
5	Check for any damage to water handling components.	X	X	X	X	X
6	Check all gauges, meters for correct functions.		X	X	X	X
7	Check and clean Y-strainers.		X	X	X	X
8	General checking for loose brackets, supports etc.		X	X	X	X
9	Check isolating valves through full travel for operation.		X	X	X	X
10	Lubricate valve spindles for smooth operation.		X	X	X	X
11	Check the condition of insulation, repair if required.		X	X	X	X
13	Check condition of termination to damper motor/controls.		X	X	X	X
14	Clean and lubricate for loose suspended support etc.		X	X	X	X
15	Cleaning of all diffusers, dampers and grills.		X	X	X	X
16	Drain the chilled water line and charge with nitrogen.					X
17	Replace all faulty gauges, meters, sensors and valves.				X	X
II. Water Cooled Chillers						
1	Check 3 phase voltage, current balance.	X	X	X	X	X
2	Log the Chiller in running condition.	X	X	X	X	X
3	Check Oil and refrigerant level in running condition.	X	X	X	X	X
4	Check the heat sink temperature.	X	X	X	X	X
5	Check for any abnormal noise.	X	X	X	X	X
6	Check Evaporator and Condenser pressure and compare with standard values.	X	X	X	X	X
7	Check percentage loading of Chiller Plant as required.	X	X	X	X	X
8	Check Approach/STD temperature for condenser fouling.	X	X	X	X	X
9	Inspect the starters.	X	X	X	X	X
10	Check oil heater operation.		X	X	X	X
11	Check and record oil pump discharge pressure (for centrifugal pumps).		X	X	X	X
12	Measure and record oil filter pressure drop.		X	X	X	X
13	Measure and log the sub cooling.		X	X	X	X
14	Verify proper operation/setting/calibration of safety controls.			X	X	X
15	Check and tighten all electrical connections.			X	X	X
16	Clean all water strainers in both chilled and condenser water line.				X	X
17	Check all piping components for leakage or damage.				X	X
18	Clean and repaint any area that shows sign of corrosion.				X	X
19	Compressor oil analysis and replacement if required or replacement as per Engineer in charge instruction.					X
20	Replace oil filter & oil return filter/driers.					X

ITEM	CHECK POINTS	WEEKLY	MONTHLY	QUATERLY	HALF YEARLY	YEARLY
21	Clean or back flush heat exchanger of Solid State starter.				X	X
22	Replace coolant after cleaning heat exchanger.					X
23	Perform de-scaling of condenser & evaporator tubes.					X
24	Check all safety switches & alarms for proper operation. This shall include, but not limited to:-					X
24a	High pressure cut off.					X
24b	Low pressure cut off.					X
24c	Low oil pressure switch					X
24d	Oil pumps timers.					X
24e	Flow switches.					X
24f	Pump interlocks					X
24g	Systems monitor timers.					X
24h	System freeze stats.					X
24i	Vane closing switches					X
25	Check operation of all operating controls:-					X
25a	Temperature control stats.					X
25b	Motor load limit controls.					X
26	Megger motor winding.					X
27	Check to make sure that immersion heater is working.					X
28	Refrigerant Leak check.					X
29	Check earth connections.					X
30	Use a non destructive tube test to inspect the condenser and evaporator tubes, at the interval of 5 years.					
II . Air Cooled Chillers						
1	Check 3 phase voltage & current balance.	X	X	X	X	X
2	Check for any abnormal noise.	X	X	X	X	X
3	Inspect the starters.	X	X	X	X	X
4	Check the evaporator and condenser refrigerant pressures and temperatures.	X	X	X	X	X
5	Check the electronic expansion valve sight glasses.	X	X	X	X	X
6	Check system superheat, sub cooling and unit operating pressures.	X	X	X	X	X
7	Cleaning condenser coil.		X	X	X	X
8	Check oil level and oil heater operation.		X	X	X	X
9	Verify proper operation/setting/calibration of safety controls.			X	X	X
10	Check and tighten all electrical connections.			X	X	X
11	Clean all water strainers.			X	X	X
12	Check all piping components for leakage or damage.				X	X
13	Refrigerant Leak check.					X
14	Check oil filter /driers, replace if required.					X
15	Check all safety switches & alarms for proper operation. This shall include, but not limited to:-					X
16a	High pressure cut off.					X
16b	Low pressure cut off.					X
16c	Flow switches.					X
16d	Systems monitor timers.					X

ITEM	CHECK POINTS	WEEKLY	MONTHLY	QUATERLY	HALF YEARLY	YEARLY
17	Check the status & control operation of Temperature operating control.					X
18	Megger motor winding.					X
19	Compressor oil analysis.					X
20	Check earth connections.					X
III. ECS Pumps						
Chilled Water Pump (Primary)						
1	Check for 3-phase voltage and current balance.	X	X	X	X	X
2	Check the motor rotation with directional arrow on pump casing in case any abnormality in water flow is observed.	X	X	X	X	X
3	Check for any abnormal noise and vibration.	X	X	X	X	X
4	Check for bearing housing for high temperature with Infrared Thermometer/ Hand test.		X	X	X	X
5	Check shaft sealing.		X	X	X	X
6	Check for any leakage in motor and pump connections.		X	X	X	X
7	Check for leaks in isolation of valves, strainers, and flexible connections.		X	X	X	X
8	Check and clean pump and motor casings.			X	X	X
9	Tight and clean all electrical terminals, conduits, insulation and flexible connections.			X	X	X
10	Check seals and bearings for lubrication, for motor and pump, replace if required.				X	X
11	Check alignment for pump & motor				X	X
12	Check tightness of base frame bolts				X	X
13	Check coupling for wear				X	X
14	Check for EPB (Emergency Push Button)				X	X
15	Check and clean all contact surfaces of Circuit Breakers, enclosures switches and push buttons.					X
16	Check rotating element for wear					X
17	Check wear ring clearance if pump is dismantled.					X
18	Check earth connections.					X
Chilled Water Pump (Secondary with VFD)						
1	Check for 3-phase voltage and current.	X	X	X	X	X
2	Check the motor rotation with directional arrow on pump casing in case any abnormality in water flow is observed.	X	X	X	X	X
3	Check for any abnormal noise and vibration.	X	X	X	X	X
4	Check for any leakage in valves strainers and flexible connection.	X	X	X	X	X
5	Check the cable of Variable Frequency Drive for heating up.		X	X	X	X
6	Check for bearing housing for high temperature with Infrared Thermometer/ Hand test.		X	X	X	X
7	Check shaft sealing. A small leak is normal.		X	X	X	X
8	Check proper working of VFD and ensure its auto operation.					
9	Cleaning of pump, strainers and motors.				X	X
10	Check and tighten all electrical connection.				X	X
11	Check seals, bearings for lubrication, replace if required.				X	X

ITEM	CHECK POINTS	WEEKLY	MONTHLY	QUATERLY	HALF YEARLY	YEARLY
12	Check alignment for pump & motor.				X	X
13	Check tightness of base frame bolts.				X	X
14	Check coupling for wear.				X	X
15	Check for EPB (Emergency Push Button).				X	X
16	Check rotating element for wear.					X
17	Check wear ring clearance if pump is dismantled.					X
18	Check earth connections.					X
Air Cooled Chiller Pump						
1	Check for 3-phase voltage and current.	X	X	X	X	X
2	Check the motor rotation with directional arrow on pump casing in case any abnormality in water flow is observed.	X	X	X	X	X
3	Check for any abnormal noise and vibration.	X	X	X	X	X
4	Check for bearing housing for high temperature with Infrared Thermometer/ Hand test		X	X	X	X
5	Check shaft sealing.		X	X	X	X
6	Check seals and bearings for lubrication, for motor and pump, replace if required.				X	X
7	Check tightness of base frame bolts				X	X
8	Check rotating element for wear					X
9	Check wear ring clearance if pump is dismantled.					X
10	Check earth connections.					X
Condenser Water Pump						
1	Check for 3-phase voltage and current.	X	X	X	X	X
2	Check the motor rotation with directional arrow on pump casing in case any abnormality in water flow is observed.	X	X	X	X	X
3	Check for any abnormal noise and vibration.	X	X	X	X	X
4	Check bearing housing for high temperature with Infrared Thermometer/Hand test.		X	X	X	X
5	Check shaft sealing.		X	X	X	X
6	Check for any leakage in motor and pump connections.		X	X	X	X
7	Check for leaks in isolation of valves, strainers, and flexible connections.		X	X	X	X
8	Check and clean pump and motor casings.			X	X	X
9	Tight and clean all electrical terminals, conduits, insulation and flexible connections.			X	X	X
10	Check seals and bearings for lubrication, for motor and pump, replace if required.				X	X
11	Check alignment for pump & motor				X	X
12	Check tightness of base frame bolts				X	X
13	Check coupling for wear				X	X
14	Check for EPB (Emergency Push Button)				X	X
15	Check and clean all contact surfaces of Circuit Breakers, enclosures switches and push buttons.				X	X
16	Check rotating element for wear					X
17	Check wear ring clearance if pump is dismantled.					X
18	Check earth connections.					X

ITEM	CHECK POINTS	WEEKLY	MONTHLY	QUATERLY	HALF YEARLY	YEARLY
IV.COOLING TOWER						
1	Check for 3-phase voltage and current balance.	X	X	X	X	X
2	Check for any abnormal noise and vibration.	X	X	X	X	X
3	Check water level and leakage in basin and float valve.	X	X	X	X	X
4	Check the air intake is free from blockage.	X	X	X	X	X
5	Inspect basin for clogging.	X	X	X	X	X
6	Drain cooling tower water				X	X
7	Check gear reducer, water basin & float valve for leakage.		X	X	X	X
8	Check static oil level in gear box and oil seal in gear reducer and check for water & sludge in the oil.		X	X	X	X
9	Check for unusual noise and vibration in fan, fan guard motor, driver shaft and gear reducer.		X	X	X	X
10	Cleaning of cooling tower from inside and outside.			X	X	X
11	Cleaning of sump and check for any leakage.			X	X	X
12	Clean suction screen.			X	X	X
13	Check operation of auto bleed off valve and its electrical connections. Applicable for Auto Bleed Off system. (Phase II)			X	X	X
14	Check operation of motorized butterfly valve. For Phase II systems.			X	X	X
15	Inspect Nozzles of Eliminator & Fills.				X	X
16	Check the working of control valve.				X	X
17	Inspect the motor for lubrication and motor winding for overheating.				X	X
18	Check fan blade tip clearance.				X	X
19	Check and adjust float valve for complete open & close operation.				X	X
20	Check for EPB (Emergency Push Button).				X	X
21	Check FRP & structure bolted connection.				X	X
22	Check and tighten loose bolts.				X	X
23	Clean fan & fan guard, motors, shaft, gear reducer, water basin, float valve, control valve etc.					X
24	Inspect the general condition of keys, keyways & set screws of fan & fan guard, motor, gear reducer, drive shafts, control valves, structural members, stairs ladders, etc. and clean.					X
25	Inspect the general condition of eliminators, fills, nozzles, water basin, float valves, and casings.					X
26	Check grease, clean & re-lubricate bearings of motor and Motorized Butterfly Valves.					X
27	Check rotating element for wear.					X
28	Check butterfly valves for smooth operation.					X
29	Check/ Change oil of gear reducer.					X
30	Rebalance fan & fan guard and drive shaft.					X
31	Repaint fan & fan guard, motor, shaft, gear reducer and if any.					X
32	Check and record insulation resistance.					X
33	Check earth connections.					X

ITEM	CHECK POINTS	WEEKLY	MONTHLY	QUATERLY	HALF YEARLY	YEARLY
V.AIR HANDLING UNITS						
1	Check for 3-phase voltage & current balance.	X	X	X	X	X
2	Check for any abnormal noise and vibration.	X	X	X	X	X
3	Check for air & water leak.	X	X	X	X	X
4	Inspect the condensate drain pan.	X	X	X	X	X
5	Check fan belts for correct tension & signs of wear & alignment of fan and motor.		X	X	X	X
6	Inspect coils for cleanliness and remove any built dust or dirt.		X	X	X	X
7	Check for damage especially to coil & filter.		X	X	X	X
8	Check access door and hinges for easy operation.		X	X	X	X
9	Check functioning of marine lights & limit switch interlock.		X	X	X	X
10	Cleaning of filters	X	X	X	X	X
11	Check for bearing of motor and blower.		X	X	X	X
12	Check flexible connections, connecting ducts and spool piece for air leakage.			X	X	X
13	Check for condition of inlet strainers and clean.			X	X	X
14	Check for UV emitter tubes for termination and cleanliness. Available for Phase II systems.			X	X	X
15	Check operation and status of NRD (Non Return Dampers).			X	X	X
16	Check tightness, operations & condition of all electrical connections.			X	X	X
17	Check looseness of any bolt in fan casing motor base and correct if necessary.			X	X	X
18	Top up grease for Fan shaft blower and motor bearings, if required.			X	X	X
19	Checks associated damper movement and apply grease.				X	X
20	Check for EPB (Emergency Push Button).				X	X
21	Clean the AHU internally, check for corrosion and tighten all the associated nut bolts of the motor.					X
22	Check / Clean coils internally and fins.					X
23	Observe the operation of all dampers and make any necessary adjustments in linkages and blade orientations for proper operations.					X
24	Check blower shaft, scroll, impeller & bearing.					X
25	Check alignment and security of driver pulleys.					X
26	Check anti vibration mounting.					X
27	Check insulation resistance (Megger) of motor.					X
28	Check earth connections.					X
VI. FAN COIL UNITS						
1	Check motor running current and compare with the full load ampere.	X	X	X	X	X
2	Check for any abnormal noise and vibration.	X	X	X	X	X
3	Check for water leakage.	X	X	X	X	X
4	Check drains pan/point for any blockage.	X	X	X	X	X
5	Clean air filters.	X	X	X	X	X
6	Check operation of 3 speed switch.	X	X	X	X	X
7	Check the operation of inlet / outlet isolation ball valves.		X	X	X	X
8	Check looseness of any bolt in fan casing motor base etc.		X	X	X	X
9	Check the fan belt tension (where fitted) and abnormal noise and rectify if required.		X	X	X	X

ITEM	CHECK POINTS	WEEKLY	MONTHLY	QUATERLY	HALF YEARLY	YEARLY
10	Inspect cooling coils and remove any built up dust or dirt.			X	X	X
11	Check blower, motor unit etc, clean & lubricate.				X	X
12	Check and record the vibration value and compare with recommended values.				X	X
13	Check tightness of electrical connections, control wires & motor terminals.				X	X
14	Checks associated damper movement and apply grease.					X
15	Check /clean cooling coils and fins.					X
16	Clean Y- strainer and inlet strainers.					X
17	Check FCU 2 way valves for proper functioning.					X
18	Check insulation resistance (Megger) of motor.					X
19	Check earth connections.					X
20	Check the casing for any leak in the insulation.					X
VII. Ventilation fans						
1	Check for 3-phase voltage & current balance.	X	X	X	X	X
2	Check for any abnormal noise, vibrations and any damage.	X	X	X	X	X
3	Check looseness of any bolt in fan casing motor base etc.		X	X	X	X
4	Check for alignment of belt & pulley, fan & motor and correct if required.		X	X	X	X
5	Clean air filters.	X	X	X	X	X
6	Examine motor, fan & ancillary fittings (flexible connections and cone)		X	X	X	X
7	Check cleanliness of the fan and impeller blades, clean if required and check for any physical damage.			X	X	X
8	Check the operation of Non Return Damper where fitted.			X	X	X
9	Check associated damper movement and apply grease for the moving parts.			X	X	X
10	Add grease to the fan shaft bearing and blower bearing. (Greasing for z-bearings is not required.)			X	X	X
11	Lubricate fan shaft and blower bearing housing.				X	X
12	Check and record the vibration value and compare with recommended values.				X	X
13	Check tightness of electrical connections					X
14	Check tightness of fan to support fixing					X
15	Check movement of vibration isolators/mounting, replace if required					X
16	Grease motor bearings, if required ('Sealed for Life' bearings should not be serviced.)					X
17	Examine the clearance between the fan impeller blade tips & casing & security of impeller blades					X
18	Check the overlap and radial clearance between impeller shroud and inlet cone.					X
19	Check for EPB (Emergency Push Button)					X
20	Check insulation resistance (Megger) of motor.					X
21	Check earth connections.					X
VIII. Expansion Tank						
1	Check the pressure gauge. Not Applicable for gravity run systems.	X	X	X	X	X
2	Check Power supply.		X	X	X	X
3	General cleaning from outside.		X	X	X	X
4	Check for any water leakage in the tank.		X	X	X	X

ITEM	CHECK POINTS	WEEKLY	MONTHLY	QUATERLY	HALF YEARLY	YEARLY
5	Check pressure.					
6	Check Nitrogen charge.				X	X
7*	Check the operation of the inlet, outlet & drain valves and lubricate if required.				X	X
8	Repaint the tank and connecting pipelines, externally.					X
IX. Air Controlled Devices (Dampers & Actuators)						
1	Check the status & operation of the dampers.	X	X	X	X	X
2	Check the dampers for fail-safe operation.			X	X	X
3	Check the condition of terminations damper motor / control.					X
4	Check the operation of the dampers through the access door, wherever provided.					X
5	Clean the damper blades and other parts.		X	X	X	X
6	Clean & lubricate, if needed, dampers pivot, linkages, bearings and other movable parts.			X	X	X
7	Check for loose suspensions / support.					X
X. Ducting & Piping System						
	DUCT SYSTEM					
1	Check for any abnormal noise in the ECS plant room.	X	X	X	X	X
2	Check for air leakage in the ECS plant room.		X	X	X	X
3	Check condition of terminations to damper motors/controls.					X
4	Clean lubricate if needed, damper pivots & linkage.					X
5	General check for loose suspenders/supports etc.					X
6	Check the condition of insulation, repair if needed.					X
7	Check air leakage with smoke test.					X
	Piping SYSTEM					
1	Visual check for water leaks in pipe, fittings & valves in the ECS plant room.	X	X	X	X	X
2	Check valves position before operating the system in the ECS plant room.	X	X	X	X	X
3	Check drain points for blockage.	X	X	X	X	X
4	Check for any damage to water handling components.		X	X	X	X
5	Check pressure gauges & thermometers for correct functions.			X	X	X
6	Check & clean Y-strainers.			X	X	X
7	Conduct manual test for 2 way valves for full operating range.					X
8	Check isolating valves through full travel for operation.					X
9	Lubricate valve spindles for smooth operation if dismantled for corrective maintenance.					X
10	General check for loose brackets, supports etc.					X
11	Check the condition of insulation, repair if needed.					X

ANNEXURE:-II

SUB: Checklist

Part B : Electrical Panels (ECS&TVS) Maintenance Checklist

ITEM	CHECK POINTS	WEEKLY	MONTHLY	QUATERLY	HALF YEARLY	YEARLY
I. MAIN DISTRIBUTION BOARDS (Ensure that CAUTION notice is placed on panel before any maintenance work.)						
1	Check selector switch - Local/Remote.	X	X	X	X	X
2	Check the incoming voltage in 3 phases.	X	X	X	X	X
3	Check control supply.	X	X	X	X	X
4	Checks relay status.	X	X	X	X	X
5	Check for abnormal noise and vibration.	X	X	X	X	X
6	Check for foul or burning smell.	X	X	X	X	X
7	Keep service zones clean, well lit & ventilated.	X	X	X	X	X
8	Check indicating lamps, replace if damaged.		X	X	X	X
9	Check the Distribution Board case for physical and mechanical damage and check that door can be securely closed.		X	X	X	X
10	Check the in-built battery and power panel unit of the UPS system.		X	X	X	X
11	Inspect all wirings for wear and cuts.			X	X	X
12	Clean the louvers/filters and check operation of fan/thermostat.			X	X	X
13	Look for signs of discoloration due to overheating, arcing or insulation breakdown.			X	X	X
14	Cleaning of panels.				X	X
15	Check tightness of neutral link connections.				X	X
16	Check continuity of fuses.				X	X
17	Check measuring instruments / Energy meter.				X	X
18	Check & tighten nut, bolts of bus bar, solid links etc.				X	X
19	Check & tighten lug/thimbles terminations etc.				X	X
20	Check the contactor contacts for pitting, replace if needed.				X	X
21	Inspect all auxiliary and control circuits for desired functioning.					X
22	Check the control contactors.					X
23	Check the PLCs.					X
24	Check the contactors or micro-relay.					X
25	Check compartment doors for alignment and door driven mechanism.					X
26	Check that insulating barriers / Polycarbonate sheet are in place, particularly over incoming terminals.					X
27	Clean and check tightness of Bus bar risers/droppers.					X
28	Check for physical damage and signs of corrosion in Cables.					X
29	Check all gland plates.					X
30	Check all the insulators.					X
31	Check all the coupling points of panel sections, bus bar joints with fish plate.					X
32	Check the color coding of the bus bars.					X
33	Check all the earthing connections.					X
34	Check the panels for operation as per schematic diagram in Manual mode.					X
35	Check the panels for operation as per schematic diagram in Auto mode.					X

ITEM	CHECK POINTS	WEEKLY	MONTHLY	QUATERLY	HALF YEARLY	YEARLY
II. AIR CIRCUIT BREAKERS						
1	Check the status of T.U. Reset in ABB Emax category ACBs.	X	X	X	X	X
2	Check the warnings/alarms indication status.	X	X	X	X	X
3	Check the remote operation of the ACBs through SCADA through TPC.		X	X	X	X
4	Check the locking key.		X	X	X	X
5	Check opening/closing action of all ACBs.		X	X	X	X
6	Check the Auto/Manual charging of spring.		X	X	X	X
7	Check the status of mechanical interlocking of ACBs (amongst Incomers 1 & 2 and Bus Coupler)		X	X	X	X
8	Check the tightness of incoming/outgoing cables.		X	X	X	X
9	Check the reset mechanism, tripping of breaker through push button.			X	X	X
10	Check tripping of ACB through protection release.			X	X	X
11	Check ACB tripping through shunt release.			X	X	X
12	Check the Castle key operation.					X
13	Check the ACBs Rack out/Rack in operation					X
14	Check contacts for correct mechanical & electrical operation.					X
15	Check electrical connections for tightness and security.					X
16	Strip and clean interior.					X
17	Carry out servicing & lubrication of switchgears as required.					X
18	Check condition of arcing contact and gap between fixed and moving arcing contacts shall be checked.					X
19	Tripping of ACB manually through volt metric release.					X
20	Check and adjust freeness of DN and volt metric release trip rod.					X
21	Check presence and proper tightening of hardware.					X
22	Check presence of all cir clips					X
23	Check condition and alignment of jaw contact with cradle terminals.					X
24	Check condition of ACB wiring and replace if required					X
25	Check and adjusting gap between hylem sheet and side plate					X
26	Check proper closing of all poles together					X
27	Check working of anti pumping device in case of EDACB					X
28	Check alignment of SIC and it's operation					X
29	Check scrapping earth alignment					X
30	Check condition of arc chutes					X
31	Check U/V release pick up and drop off					X
32	Check motor operation in case of EDACB					X
33	Check closing coil operation in case of EDACB					X
34	Check continuity and proper changeover of aux contact block					X
35	Check IR between phase – phase (ACB closed condition)					X
36	Check IR between phase – earth (ACB closed condition)					X
37	Check IR between phase – earth (ACB in open condition)					X
38	Check of release by secondary injection for O/L, S/C, E/F					X
39	Check setting of release as per the load					X
40	Check the healthiness of CTs					X
ITEM	CHECK POINTS	WEEKLY	MONTHLY	QUATERLY	HALF YEARLY	YEARLY

III. POWER FACTOR CORRECTION - AC CAPACITORS						
1	Check that the APFC (Automatic Power Factor Correction Relay) is set in Auto mode.	X	X	X	X	X
2	Check the exhaust fan	X	X	X	X	X
3	Check the power factor reading of the Energy meter in the MDB panel and the power factor reading in APFC relay panel.	X	X	X	X	X
4	Check the voltage and current reading through the capacitor using a true RMS multi-meter.		X	X	X	X
5	Check tightness & dust level of connections/terminals		X	X	X	X
6	Check the grounding connections.		X	X	X	X
7	Check for heating of capacitor cables & capacitor leaking.		X	X	X	X
8	Check short circuit protection fuses.		X	X	X	X
9	Check the discharge resistors/reactors.			X	X	X
10	Check the over pressure dis-connector.			X	X	X
11	Measure the value of Capacitances.					X
12	Check selector switch - Local/Remote.	X	X	X	X	X
13	Check the incoming voltage in 3 phases.	X	X	X	X	X
14	Check control supply.	X	X	X	X	X
15	Check for tripping or any fault messages in ACBs/MCCBs.	X	X	X	X	X
16	Check relay status.	X	X	X	X	X
17	Check for abnormal noise and vibration.	X	X	X	X	X
18	Check for foul or burning smell.	X	X	X	X	X
19	Keep service zones clean, well lit & ventilated.	X	X	X	X	X
20	Check the Distribution Board case for physical and mechanical damage and check that door can be securely closed.	X	X	X	X	X
21	Check indicating lamps, replace if damaged.	X	X	X	X	X
22	Clean the louvers/filters.	X	X	X	X	X
23	Check operation of fan/thermostat.		X	X	X	X
24	Check continuity of fuses.		X	X	X	X
25	Check measuring instruments / Energy meter.		X	X	X	X
26	Cleaning of panels.		X	X	X	X
27	Inspect all wirings for wear and cuts.		X	X	X	X
28	Check the Auto Transfer Switch. (ATS)			X	X	X
29	Check tightness of neutral link connections.			X	X	X
30	Check compartment doors for alignment and door driven mechanism.			X	X	X
31	Test all the MCCBs.				X	X
32	Look for signs of discoloration due to overheating, arcing or insulation breakdown.				X	X
33	Check & tighten nut, bolts of bus bar, solid links etc.				X	X
34	Check & tighten lug/thimbles terminations etc.				X	X
35	Check the contactor contacts for pitting, replace if needed.				X	X
36	Inspect all auxiliary and control circuits for desired functioning.					X
37	Check that insulating barriers / Polycarbonate sheet are in place, particularly over incoming terminals.					X
ITEM	**CHECK POINTS**	**WEEKLY**	**MONTHLY**	**QUATERLY**	**HALF YEARLY**	**YEARLY**
38	Clean and check tightness of Bus bar chambers.					X
39	Check for physical damage and signs of corrosion in Cables.					X
40	Check all gland plates.					X
41	Check the color coding of the Bus bars.					X

42	Check all the earthing connections.					X
43	Check the panels for operation as per schematic diagram in Manual mode.					X
44	Check the panels for operation as per schematic diagram in Auto mode.					X
IV. Other Distribution boards of ECS&TVS (with ATS)						
1	Check selector switch - Local/Remote.	X	X	X	X	X
2	Check the incoming voltage in 3 phases.	X	X	X	X	X
3	Check control supply.	X	X	X	X	X
4	Check for tripping or any fault messages in ACBs/MCCBs.	X	X	X	X	X
5	Check relay status.	X	X	X	X	X
6	Check for abnormal noise and vibration.	X	X	X	X	X
7	Check for foul or burning smell.	X	X	X	X	X
8	Keep service zones clean, well lit & ventilated.	X	X	X	X	X
9	Check the Distribution Board case for physical and mechanical damage and check that door can be securely closed.	X	X	X	X	X
10	Check indicating lamps, replace if damaged.	X	X	X	X	X
11	Clean the louvers/filters.		X	X	X	X
12	Check operation of fan/thermostat.		X	X	X	X
13	Check continuity of fuses.		X	X	X	X
14	Check measuring instruments / Energy meter.		X	X	X	X
15	Cleaning of panels.		X	X	X	X
16	Inspect all wirings for wear and cuts.		X	X	X	X
17	Check the Auto Transfer Switch. (ATS)			X	X	X
18	Check tightness of neutral link connections.			X	X	X
19	Check compartment doors for alignment and door driven mechanism.			X	X	X
20	Test all the MCCBs.				X	X
21	Look for signs of discoloration due to overheating, arcing or insulation breakdown.				X	X
22	Check & tighten nut, bolts of bus bar, solid links etc.				X	X
23	Check & tighten lug/thimbles terminations etc.				X	X
24	Check the contactor contacts for pitting, replace if needed.				X	X
25	Inspect all auxiliary and control circuits for desired functioning.					X
26	Check that insulating barriers / Polycarbonate sheet are in place, particularly over incoming terminals.					X
27	Clean and check tightness of Bus bar chambers.					X
28	Check for physical damage and signs of corrosion in Cables.					X
29	Check all gland plates.					X
30	Check the color coding of the Bus bars.					X
31	Check all the earthing connections.					X
32	Check the panels for operation as per schematic diagram in Manual mode.					X
33	Check the panels for operation as per schematic diagram in Auto mode.					X

ANNEXURE:-III

SUB: Expected Fault Rectification Time (Max.)

S No.	Fault details	EXPECTED TIME(Max) to Rectify the faults
	Part A: MECHANICAL SYSTEM	
Water Cooled Chiller		
1	Gas Leakage	05 Days
2	Oil Leakage	05 Days
3	Flow Switch Faulty	24 hrs
4	Display Faulty	03 Days
5	Motor Winding Burnt	15 days
6	Pressure &Temp Gauge faulty	24 hrs
7	Motorised Butterfly Valve Faulty	05 Days
8	High Heat Sink Temp	03 Days
9	Temp &Pressure Transducer Faulty	05 Days
10	Chiller not Working in Auto	24 hrs
11	Others	24 hrs
Air Cooled Chiller		
1	Gas Leakage	05 Days
2	Oil Leakage	05 Days
3	Flow Switch Faulty	24 hrs
4	Display Faulty	03 Days
5	Compressor Faulty	15 days
6	Pressure &Temp Gauge Faulty	24 hrs
7	Motorised Butterfly Valve Faulty	05 Days
8	Flexible Bellows Faulty	24 hrs
9	Leakage from Condenser Coil	05 Days
10	Compressor Oil Heater Faulty	24 hrs
11	Compressor lock out	24 hrs
12	Temp &Pressure Transducer	05 Days
13	Others	24 hrs
Air Handling Units		
1	Belt Broken	24 hrs
2	Motor Winding Burnt	07 Days
3	Base Plate Broken	03 Days
4	Spool Piece Open	24 hrs
5	Bearing and Bearing Housing Faulty	03 Days
6	Pulley Overheating	24 hrs
7	Motor and Blower Assembly Isolator Faulty	03 Days
8	Filter Damage	24 hrs
9	Y Strainer Broken	24 hrs
10	Door Limit Switch Faulty	24 hrs
11	Marine Light Faulty	24 hrs
12	Temp Control Valve not Working in Auto	03 Days
13	Others	24 hrs
Cooling Tower		
1	Oil Leakage	24 hrs

2	Motor Winding Burnt	07 Days
3	Excessive Vibration	24 hrs
4	Gear Assembly Coupling Faulty	10 days
5	Motorised Butterfly Valve Faulty	05 Days
6	Float Valve Faulty	24 hrs
7	Gate Valve Faulty	24 hrs
8	Basin Leakage	03 Days
9	Chemical unavailable	24 hrs
10	Dosing pump faulty	02 Days
11	Pipe/ antisyphon valve faulty	24 hrs
12	Uneven Distribution of Water	03 Days
13	Others	24 hrs
Pumps related to Chillers		
1	Motor Winding Burnt	07 Days
2	Bearing and Bearing housing Faulty	03 Days
3	Motor Terminal Box	02 Days
4	Pressure &Temp gauge faulty	24 hrs
5	NRV	05 Days
6	Y Strainer	05 Days
7	Leakage from gland	02 Days
8	Pump Coupling	03 Days
9	Excessive Vibration	24 hrs
10	PDS	24 hrs
11	Flexible bellows	10 dAYS
12	Others	24 hrs
Variable Frequency Drive		
1	Power supply card	02 Days
2	not working in auto	02 Days
Fan Coil Unit		
1	Motor Winding Burnt	07 Days
2	Bearing Faulty	02 Days
3	Y Strainer	24 hrs
4	Gate Valve	02 Days
5	Temp Control valve	02 Days
6	Flare nut	24 hrs
7	Thermo state	24 hrs
8	Micro PLC Faulty	02 Days
9	Others	24 hrs
Ventilation Fans		
1	Motor Winding Burnt	07 Days
2	Hub broken/crack	15 days
3	Canvas torn	05 Days
4	Vibration Isolator	03 Days
5	PDS	24 hrs
6	VSF Filter &frame housing damage	24 hrs
7	Others	24 hrs
Dampers		
1	Actuator faulty	02 Days
2	Dampers Blade Faulty	24 hrs
3	Limit switch faulty	24 hrs

4	Fusible link broken of FLFD	02 Days
5	Lever of manual damper	24 hrs
6	Status not coming in BMS	24 hrs
7	Others	24 hrs
Valves		
1	not operating	01 Days
Part B: ELECTRICAL PANELS (ECS&TVS)		
General		
1	Capacitors burnt	03 Days
2	Contactor	02 Days
3	Timer faulty	01 Days
4	MCB,MCCB,MPCB,ELCB	02 Days
5	ATS	02 Days
6	Connectors, thimble &Lugs	24 hrs
7	Exhaust fans	24 hrs
8	Panel light	24 hrs
9	Space Heater	24 hrs
10	relays/EOCR	24 hrs
11	Power factor controller	03 Days
12	Temp.& Humidity display Malfunctioning	02 Days
13	Starter circuit faulty	24 hrs
14	Others	24 hrs
ACB		
1	Spring charging mech faulty	24 hrs
2	micro logic relay	24 hrs
3	closing/tripping coil	24 hrs
4	Others	24 hrs

ANNEXURE:-IV

SUB : Minimum INVENTORY OF SPARES Per year

S No.	Spare Part	Unit	Qty.
Part A : Mechanical System			
Chiller			
1	Transducer Cond. Oil & Discharge	No.	9
2	Transducer Evap	No.	6
3	Valve Relief	No.	3
4	Actuator Motor	No.	3
5	Sensor Temp. Evaporator	No.	3
6	Strainer Suction	No.	3
7	Ring Kit	No.	9
8	Ref. Sensor Level	No.	3
9	Heater Immersion	No.	3
10	Filter Oil Assay	No.	3
11	Valve Solenoid	No.	9
12	H.P Cut-out	No.	9
13	Sensor Temp. Discharge	No.	9
14	Valve Assy. Capacity Control	No.	3
15	Valve Solenoid	No.	3
16	Flow Switch	No.	9
17	Sensor Drop Leg	No.	3
18	Sensor Water Temp.	No.	12
19	SCR Assembly	No.	2
20	Kit Opt view	No.	2
21	Trigger Board	No.	2
22	Relay Board	No.	2
23	Power Supply Board	No.	2
24	Micro gateway	No.	2
25	Kit Display	No.	2
26	Key Pad	No.	2
27	Angle Valve	No.	9
28	Bram	No.	3
29	Eprom	No.	3
30	Transformer	No.	9
31	Coolant Pump	No.	2
32	MCB/Breaker	No.	2
33	Orifice Valve	No.	2
Primary Chilled Water Pump			
1	Wear Ring	Sets	2
2	Shaft Sleeve	Sets	2
3	Mechanical Seal	Sets	2
4	Keys	Sets	2
5	Pump Bearings	Sets	2
6	O Rings	Sets	2
7	Gaskets	Sets	2
8	Oil Seal	Sets	2
9	Coupling	Sets	2

10	Motor Bearing	Sets	2
Secondary Chilled Water Pump			
1	Water Ring	Sets	2
2	Shaft Sleeve	Sets	2
3	Mechanical Seal	Sets	2
4	Keys	Sets	2
5	Pump Bearings	Sets	2
6	O Rings	Sets	2
7	Gaskets	Sets	2
8	Oil Seals	Sets	2
9	Motor Bearing	Sets	2
Condenser Water Pump			
1	Water Ring	Sets	2
2	Shaft Sleeve	Sets	2
3	Mechanical Seal	Sets	2
4	Keys	Sets	2
5	Pump Bearings	Sets	2
6	O Rings	Sets	2
7	Gaskets	Sets	2
8	Oil Seal	Sets	2
9	Coupling	Sets	2
10	Motor Bearing	Sets	2
Cooling Tower			
1	Gear Box	Sets	2
2	Fan Assembly	Sets	2
3	Drive Shaft	Nos.	2
4	PP Nozzles	Lots	6
5	Motor Bearings	Sets	6
6	Float Valve Assembly	Nos.	18
Air Handling Units			
1	Fan Bearing	Sets	2
2	Motor Bearing	Sets	2
3	Door Limit Switch	Set	12
4	Door Handle	Set	12
Fan Coil Units			
1	Motor	Nos. for each Model	6
2	Room Thermostat	Nos.	6
Ventilation fans			
1	Motor Bearings	Sets for each Model	2
Part B : Electrical Panels (ECS&TVS)			
1	MCB,MCCB,MPCB,ELCB	Nos. for each Model	6
2	Spring charging mech of ACB	Nos	3
3	micro logic relay	Nos	3
4	Capacitors	Nos. for each Model	6
5	Contactor	Nos. for each Model	6
6	Timer faulty	Nos. for each Model	6
7	ATS	Nos	4

8	Exhaust fans	Nos	2
9	relays/EOCR	Nos	2
10	Power factor controller	Nos	2
11	Trip Coil	Set	6
12	Closing Coil	Set	6
13	Auxiliary Contactor	Nos.	6
14	Selector Switch	Nos.	6
Miscellaneous			
1	Auto Air Vents	Nos.	6
2	Gate Valve-25mm Dia	Nos.	12
3	Ball Valve for FCU	Set	6
4	Strainer Basket	Nos.	12
5	Water Pressure Gauge	Nos.	12
6	Ball Valve for Pressure Gauge	Nos.	12
7	Water Line Thermometers	Nos.	12
8	Damper Actuator	Nos.	20
9	Fusible Link for Fire Dampers	Nos.	36

ANNEXURE:-IV

SUB : Minimum INVENTORY OF Consumables Per year

S. No.	Spare Part	Unit	Qty.
	Chiller		
1	Filter Drier	No.	18
2	Oil Filter	No.	18
3	Compressor Oil (5 Gallon Pkg)	No.	18
4	Coolant (1 Gallon Pkg)	No.	36
5	Fuse 5A	No.	24
6	Fuse 2A	No.	18
7	Water Box Gasket (50 feet)	No.	18
8	Refrigerant (61 kg/Cylinder)	Cylinders	6
9	Condenser & Cooling Tower Descaling Chemicals	Per Year	As per requirement
	Cooling Tower		
1	Gear Oil	litre	108
	Air Handling Units		
1	Marine Lamp Bulb	Nos.	24
2	V-Belts	Sets	72
3	Filters	Set	12
4	Flexible Canvass Connection	Nos.	6
5	Chemical for Coil Cleaning	Per Year	As per requirement
6	UV tubes	Per Year	As per requirement
	Fan Coil Units		
1	Filter	Nos. for each Model	3
	Ventilation fans		
1	Flexible Canvass Connection	Nos. for each Model	2
	Miscellaneous		
1	Grease	Kgs	12
2	Indicating Bulbs	Nos.	120
3	Lubricating Oil	Per Year	As per requirement

ECS Equipments status							
S.No.	**Station/ Equipment**	**UDB**	**RCC**	**JB**	**INA**	**AIIMS**	**GNPK**
1	Water Cooled Chillers	WCCH-02 in fault due to Mother board faulty, High phase heat sink Problem.	All are OK	All are OK	All are OK but High phase heat sink Temperature.	WCCH_03 in fault due to low Refrigerant, Logic board faulty, VSOP Card faulty, heat Exchanger faulty.	All are OK
2	Air Cooled Chillers	ACCH-02 in fault due to compressor faulty and evaporator tubes punctured.	All are OK		ACCH-01 in fault due to Display faulty and Contactor burnt.	All are OK	ACCH-02 in fault due to Mother board faulty
3	Cooling Tower	All are OK	All are OK	All are OK	All are OK	All are OK	All are OK
4	AHU	All are OK	All are OK	All are OK	All are OK	All are OK	All are OK
5	Chiller Pumps	All are OK	All are OK	All are OK	All are OK	All are OK	All are OK
6	FAF/VEF/VSF	01 no. Exhaust fan in TVF-S faulty.	NIL	404, 405 no-VEF IN ASS-300 and 02 nos. Exhaust fan in TVF-S faulty.	304 no-VEF and 01 no. Exhaust fan in TEF-S faulty.	303 no-VEF and 01 no. Exhaust fan in ASS-3 faulty.	01 no-VEF and 01 no. Exhaust fan faulty.
7	Actuator	21 nos. Actuator faulty	30 nos. Actuator faulty	24 nos. Actuator faulty	25 nos. Actuator faulty	20 nos. Actuator faulty	20 nos. Actuator faulty
8	ATS	Supply interconnecti on in reverse order	Supply interconnection in reverse order	Supply interconnection in reverse order.ATS-240 not working	Supply interconnection in reverse order	Supply interconnection in reverse order	Supply interconnection in reverse order.ATS 140 UA controller faulty, ACCH panel ATS faulty.
8	Valves	MBV-01 no. Faulty, Expansion tank leaking	Auto bleed of valve controller faulty.	MBV-02 nos. faulty	MBV-04 nos. faulty. Auto bleeds of valve broken.	MBV-04 nos. faulty	MBV-02 nos. faulty
9	Temp & Humd display	All display faulty	All display faulty	All display faulty	All display faulty	All display faulty	All display faulty

SECTION 3
TENDER PRICES AND
SCHEDULE OF PAYMENT

3.1 Tender Prices

3.1.1 a. Unless explicitly stated otherwise in the Tender Documents, the contractor shall be responsible for the whole works, based on the Bill of Quantities and payment shall be as per accepted rates based on the activities carried out as in the Schedule of work.

b. The rate quoted by the tenderer shall be inclusive of all duties, taxes, fees, octroi and other levies, materials, labor etc. service tax shall be shown separately in BOQ by the contractor.

3.1.2 **Schedule of Payment**

Payment shall be made by running bills as per accepted rates on the quarterly basis after submission of bill along with the service reports duly verified from the DMRC in charge.

Payment shall be subjected to deduction of all T.D.S as per applicable law.