



DELHI METRO RAIL CORPORATION LTD.

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

" Supply, installation, testing ,commissioning of Air cooled chillers including the interconnection with existing FCUs and existing chilled water piping including complete integration with existing BMS system at Kashmiri Gate and Vishwavidyalya Metro stations. "

TENDER DOCUMENT

No. O&M/E&M/UG/2016/ACC/KG-VV

- * NOTICE INVITING TENDER
- * INSTRUCTION TO TENDERER
- * SPECIAL CONDITIONS OF CONTRACT
- * OTHRE TERMS AND CONDITIONS
- * BILL OF QUANTITY

SECTION 1
NOTICE INVITING TENDER

1.1 GENERAL

Delhi Metro Rail Corporation (DMRC) Ltd. Invites sealed e-open tenders in TWO PACKETS SYSTEM (Evaluation and Financial) from the eligible tenderers as per tender clause 1.2 of NIT for "Supply, installation, testing ,commissioning of Air cooled chillers including the interconnection with existing FCUs and existing chilled water piping including complete integration with existing BMS system at Kashmiri Gate & Vishwavidyalya Metro stations."

1.1.1 The details of the Tender are as per following:

Estimated cost of work	Rs. 2,12,34,660/- inclusive of all taxes
Tender Security amount	Rs 2,12,347/- (as per ITT clause 12.2)
Cost of Tender documents	INR 21000/- (inclusive of 5% DVAT) Non-Refundable
Completion period of the Work	Six months (from 10 th day of issue of letter of acceptance)
Tender documents on sale	From 10.11.16 TO 30.11.16 up to (1800 HRS) on e-tendering website https://eprocure.gov.in/eprocure/app
Last date of Seeking Clarification	From 10.11.16 TO 28.11.16 (upto 15:00 hrs) on e-tendering website https://eprocure.gov.in/eprocure/app
Last date of issuing addendum	Up to 01.12.16 , 15:00hrs
Date & time of Submission of Tender	From 10.11.16 TO 30.11.16 (upto 18:00 hrs) on e-tendering website https://eprocure.gov.in/eprocure/app
Date & time of opening of Technical Bid	on 01.12.16 , 15:00hrs on e-tendering website https://eprocure.gov.in/eprocure/app
Date & time of opening of Financial Bid	Shall be informed after evaluation of technical bid through website https://eprocure.gov.in/eprocure/app
Authority and place for purchase of tender documents, seeking clarifications and submission of completed tender documents	DGM/E&M/UG Delhi Metro Rail Corporation, 2nd floor, B-Wing, Metro Bhawan, Fire Brigade Lane, Barakhamba Road, New Delhi –110 001
<p>The tender cost and tender security will be in the form of demand draft/ banker's cheque / bank guarantee in favor of "Delhi Metro Rail Corporation Ltd" payable at New Delhi.) The same should be submitted in original up to 11:00hrs on date of opening of tender in the office of DGM/E&M/UG at above mentioned address.</p> <p>NOTE: Failure of submission of tender cost & tender security (in original) with in stipulated time as mentioned above, leads to rejection of offer submitted by the bidder.</p>	

1.2 Eligibility Criteria

1.2.1 Work Experience:

- a. Experience of having satisfactorily completed similar works carried out at Govt./Semi Govt organization/PSU during last five years ending last day of month previous to the one in which the Tenders are invited should be either of the following: -

Three similar works costing not less than the amount equal to 40% of the estimated cost put up to the tender.

or

Two similar works costing not less than the amount equal to 50% of the estimated cost put up to the tender

or

One similar work costing not less than the amount equal to 80% of the estimated cost put up to the tender

Similar nature of work means:

- Supply installation testing commissioning of Air cooled OR/AND
 - Supply Installation Testing Commissioning of Water cooled chillers
- along with / without associated works i.e. SITC of pumps/ FCUs/ Piping works/ electrical panels etc.

Note:

- 1) works related to SITC of window/ split ACs and / or SITC of VRV's shall not be considered as similar works
- 2) Following documents shall be considered for evaluating the criteria of work experience:
 - a) Self attested copies of work order, BOQ along with completion certificate (indicating the name of work, final amount, completion date etc) issued by the client preferably on their letter head for completed work from the officer not less than rank of Executive Engineer

1.2.2 Financial Standings:

- a. Applicant should have average Annual Turnover of year 2013-2014, 2014-2015, 2015-2016 audited financial years not less than 80% of Estimated cost of work.

Financial data for latest last three audited financial years has to be submitted by the tenderer along with audited balance sheets.

- b. Tenderer shall submit last three years (2013-2014, 2014-2015, 2015-2016) audited financial statement duly attested by certified CA to work out net worth. The net worth must be positive.
- c. Solvency certificate of 80% of estimate value of contract from the bank.

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

1.2.4 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 in format enclosed in annexure -D

1.2.5 Tenderer shall submit Technical data sheet as per annexure G

- 1.3 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 and considered rejected. 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 same should contain all Financial & other details as required for the consideration of tender.

1.4 Tender document consists of the following:

Volume –I

- i. Notice Inviting Tender
- ii. Scope of Work
- iii. Tender prices and schedule of payment
- iv. Instructions to Tenderers
- v. Technical Specifications
- vi. Special Conditions of Contract
- vii. Other terms and condition of Contract
- viii. General Conditions of Contract
- ix. Content of Bill of Quantities.

Volume –II

- a. Bill of Quantity

1.5 The tenderers may obtain further information in respect of these tender documents from the office of Deputy General Manager /E&M/UG office, 2nd Metro Bhawan Fire Brigade lane, Barakhamba Road New Delhi-110001

1.6 The contract shall be governed by the documents listed above along with latest edition of CPWD Specification, IRS Specifications & MORTH Specifications. These may be purchased separately from the market.

Please note carefully the requirements for submitting tenders and the date & time for submittal.

1.7 The bidders may obtain further information / clarification, if any, in respect of these tender documents from the office of DGM/E&M/UG, 2nd Metro Bhawan, Fire Brigade Lane, Barakhamba Road, New Delhi-110001

1.8 The intending bidders must be registered on e-tendering portal <https://eprocure.gov.in/eprocure/app>. 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.

1.9 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.

1.10 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.

1.11 Tenders shall be valid for a period of as per ITT clause 11.0 from the date of submission of Tenders.

1.12 Tenderer is cautioned that the tender containing any material deviation from the tender document which consists of NIT, Instructions to tenderers, General conditions of contract,

Special conditions of contract, Bill of quantities is liable to be summarily rejected as non-responsive.

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

1.14 Tenderers are advised to visit the site before offering their rates.

1.15 The bidders are advised to keep in touch with e-tendering portal <https://eprocure.gov.in/eprocure/app> for updates. Any corrigendum, addendum etc issued shall be part of this tender document and shall be made available on this e-tendering portal.

1.16 Late tenders (received after date and time of submission of bid) shall not be accepted under any circumstances.

(Vivek Shrivastava)

DGM/E&M/UG
Delhi Metro Rail Corporation Ltd
2nd floor, Metro Bhawan,
Fire Brigade lane,
Barakhambha Road
New Delhi-110001

SECTION 2

SCOPE OF WORK

The contractor will execute the work i.e. "Supply, installation, testing, commissioning of Air cooled chillers including the interconnection with existing FCUs and existing chilled water piping including complete integration with existing BMS system at Kashmiri Gate & Vishwavidyalya Metro stations."

Name of the stations where the Air Cooled chiller is to be installed as per the BOQ.

- I. Kashmiri Gate
- II. Vishwavidyalya

2.1 The specification, rating & suggested make of all the major parts of Air cooled Scroll chiller HVAC system is detailed in BOQ, the same shall be referred from there.

2.2 All the new installation provided shall be interconnected with the existing HVAC system as per the direction of engineer in-charge so that the overall efficiency of the system will not affected.

2.3 The FCU shall be connected as per the Room & station wise tonnage requirement and as per the direction of engineer in-charge.

2.4 Existing FCUs shall be re-used in consultation with engineer in-charge.

2.5 The contractor shall submit the technical specification, dimensions for the civil foundation, digging, and cutting etc. work required for the installation of the equipments.

2.6 Contractor shall paint all the pumping system, pumps, motors as base as per requirement.

2.7 Contractor shall provide the on site training to staff for operation & maintenance of system.

2.8 All the material removed from the system shall be handed over to DMRC.

3.0 Site preparation

3.1 All site preparatory work shall have been carried out prior to the commencement of the installation.

3.2 Such work shall include the following:

3.2.1 The preparation of all fixings and drilling of any holes required

3.2.2 Cutting and forming of holes for services through walls, floors, ceilings, partitions, roof, etc

3.2.3 Cutting and forming of chases, recesses, in floors, walls for the services

3.2.4 Formation of concrete bases, plinths, for plant and equipment, as per site requirement.

4.0 the contractor shall have to submit:-

4.1 List of important spares to be kept by DMRC after DLP for 2 year requirement.

4.2 List of consumables to be kept by DMRC after DLP for 2 year requirement.

4.3 List of important spares to be kept by DMRC after DLP for 10 year requirement.

4.4 Make, address of supplier & tentative cost of above listed items.

4.5 Three set of completion drawing.

4.6 Three set of O&M manuals with complete details & operation & maintenance procedure (in soft & hard copy).

4.7 Three sets of design manuals (in soft & hard copy).

5.0 Manpower deployment

5.1 The contractor shall deploy the manpower in consultation with Engineer in-charge and carry out the activities in hygienic manner.

5.2 The manpower can also be deployed during OFF days/holidays/night hours as per site requirements for which nothing shall be paid extra.

5.3 All the work associated with finishing complete in all respect shall be carried out by contractor for which nothing shall be paid extra.

6.0 Key dates

6.1 Contractor shall submit the detailed layout plan & design as per DMRC requirement within 15 days of issue of LOA.

6.2 Contractor shall also submit the schedule for completion of work with key dates for timely completion of work in consultation with DMRC Engineer – in - charge.

7.0 Preventive & corrective schedule During Defect liability period.

7.1 Preventive maintenance : Shall be carried out as per OEM recommendation / DMRC check list . A complete check list shall be prepared in consultation with DMRC Engineer – in – charge to carry out the preventive maintenance schedule

7.2 Corrective Maintenance: The Corrective/Breakdown Maintenance is to be carried out any time during 24 hrs x 365 days inclusive of all Sundays & Holidays.

For Corrective/breakdown condition:

Response Time (Max)	-	06 Hrs
A To attend the Minor repair		
Attending Time (Max.)	-	48 hours
B. To attend the Major repair		
Attending Time (Max.)	-	5 days

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

8.0 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.

SPECIFICATION

1. INTRODUCTION:

Specifications for Air Cooled Chillers

1.0 General

This section specifies the requirements for furnishing, installing and testing of Air Cooled Water chilling units with Scroll compressors and appurtenances as specified herein, including but not limited to:

- Chiller package
- Charge of refrigerant and oil
- Controls and control connections
- Chilled water connections
- Condenser water connections

Air cooled chiller packages shall be factory assembled and tested for rated efficiency. Unit shall be delivered to site fully assembled, and charged with refrigerant and oil by the manufacturer.

2.0 Quality Control

2.1 Materials and workmanship shall be in accordance with the latest edition of the following standards and codes to the extent specified herein. The publications listed below form a part of these specifications to the extent referenced. The publications are referred to in the text by basic designation only.

2.2 Chiller shall be pressure-tested, evacuated and fully charged with refrigerant and Oil and shall be factory operational run tested with water flowing through the vessel.

2.3 Within 14 days after successful completion of all factory tests the Contractor shall submit the following:

- i. Certified results for all factory tests conducted. All test data shall be bound in one report. The test report shall be indexed and cross-referenced in an easily understood manner.
- ii. Field test procedures.

2.4 Relevant Codes and Standards

2.4.1 BS 5422: Method for Specifying Thermal Insulating Materials on Pipes, Ductwork and Equipment (In Temperature Range 40 Degrees Celsius to +700 Degrees Celsius).

2.4.2 BS 5970: Thermal Insulation of Pipework and Equipment (In the Temperature Range – 100 Degrees Celsius to +870 Degrees Celsius).

2.4.3 NFPA Code 90A: Installation of Air Conditioning

2.4.4 NFPA Code 90B: Installation of Air-Conditioning System

2.4.5 All insulating materials shall comply with the requirement of BS 5422 & BS 5970.

2.4.6 All insulating materials shall be tested to comply with the following: BS 476: Part-4: Non Combustibility, Combustion rating when tested in accordance with NFPA Standard Nos. 90A and 90B, shall not exceed 25 for flame spread and 50 for smoke developed, Part 5: Product shall not ignite when tested by source A for 10s by face ignition, Part 6: Fire propagation I less than 12, i less than 6, Part 7 Class 1: surface spread of flame

2.4.7 ANSI/ASHRAE 15-1992, Safety code for mechanical refrigeration.

2.4.8 Material and workmanship shall be in accordance with the latest edition of the following standards and codes, and the materials shall be certified by the standard organization.

- 2.4.9 ASTM A167: Standard Specification for Stainless and Heat-Resisting Chromium – Nickel Steel Plate, Sheet and Strip
- 2.4.10 BS 21: Pipe Threads for Tubes and Fittings where Pressure-Tight Joints are made on the Threads (Metric Dimensions)
- 2.4.11 BS 759: Valves, Gauges and other Safety Fittings for Application to Boilers and to Piping Installations for and in Connection with Boiler
- 2.4.12 BS 1010: Draw off Taps and Stopvalves for Water Services (screwdown Pattern)
- 2.4.13 BS 1212: Float Operated Valves (Excluding Floats)
- 2.4.14 BS 1400: Copper Alloy Ingots and Copper alloy and High Conductivity Copper Castings.
- 2.4.15 BS 1452: Flake Graphite Cast Iron
- 2.4.16 BS 2456: Floats (Plastics) for Floated Operated Valves for Cold Water Services
- 2.4.17 BS 2879: Draining Traps (screw– Down Pattern)
- 2.4.18 BS 3456: Safety of Household and Similar Electrical Appliances
- 2.4.19 BS 4346: Joints and Fittings for Use with Unplasticized PVC Pressure Pipes
- 2.4.20 BS 4504: Circular Flanges for Pipes, Valves and Fittings (PN Designated)
- 2.4.21 BS 4514: Unplasticized PVC Soil and Ventilating Pipes, Fittings and Accessories
- 2.4.22 BS 4994: Design and Construction of Vessels and Tanks in Reinforced Plastics
- 2.4.23 BS 5150: Cast Iron Gate Valves
- 2.4.24 BS 5152: Cast Iron Globe and Globe Stop and Check Valves for General Purposes
- 2.4.25 BS 5154: Copper Alloy Globe, Globe Stop and Check, Check and Gate Valves
- 2.4.26 BS 5155: Butterfly Valves
- 2.4.27 BS 5163: Predominantly Key–Operated Cast Iron Gate Valves for Waterworks Purposes
- 2.4.28 BS 7350: Double Regulating Globe Valves and Flow Measurement Devices for Heating and Chilled Water Systems

3.0 Deleted

4.0 Technical and Installation requirements

4.1. Chiller

- 4.1.1 The water chilling machine shall be self contained type consisting of multiple Scroll compressors, squirrel cage induction motor, air cooled condensers, chiller, refrigerant piping, wiring and automatic controls all mounted on a steel base frame forming a compact assembly. The water chilling machine shall be complete with full charge of Zero ODP Environmental friendly refrigerant R134a/ R410A/ R407C and oil, vibration rubber isolation pads and accessories as per chilling unit manufacturer standards, factory assembled and tested for rated capacity.
- 4.1.2 The IKW/TR for part load conditions of 25% and 50% under operating conditions shall be indicated.
- 4.1.3 Structure shall be factory assembled and constructed out of formed & powder coated galvanized steel panels.
- 4.1.4 Any special requirements for the installation of the equipment will be advised to the Engineer. All components shall be sized to fit through all plant room access doorways.
- 4.1.5 The air cooled chiller package housing compressor, chiller and condensers shall be mounted on structural foundation. The Contractor shall supply all necessary foundation bolts, nuts, washers, leveling screws, mounting frame or base plate, vibration isolation pads etc. After

erection, the unit shall be properly leveled before grouting the foundation bolts and the levels should be shown to the Engineer's representative. All the equipment shall be thoroughly tested and checked for leaks.

- 4.1.6 Chillers shall be shell and tube and Brazed type/any improved product as per manufacturer. The shell shall be of welded steel construction fitted with machined steel tube sheets on either ends. End water boxes shall be designed to provide adequate space for water movement such that there is no erosion of the tube ends. End box covers shall be removable, and allow easy access for cleaning the tubes.
- 4.1.7 The chillers shall either have internally finned copper tubes or tubes with other means for increasing heat transfer surface. The tube shall be supported in the shell by adequate, stiff supports to eliminate vibration and noise. The tube ends shall be mechanically bonded to the tube sheets to prevent leakage of refrigerant gas.
- 4.1.8 Tubes shall be as per OEM. The chiller shall be tested against leaks with a pressure as per OEM recommendation.
- 4.1.9 Chillers shall be complete with the following accessories:
 - a. Thermostatic expansion valves, pilot solenoid valves and filter drier. Or as per OEM recommendation
 - b. Necessary drain valves and vent.
 - c. Anti freeze thermostat. OR OEM recommendation.
 - d. Other standard accessories, necessary for the equipment supplied.
 - e. The chiller shall be insulated with factory-installed insulation.
- 4.2. Condenser
 - 4.2.1 Condensers shall be air cooled type of copper tube and copper fin construction/any improved product as per manufacturer. Copper tube dia shall be minimum 9.5mm.. Condenser shall be complete with provisions for refrigerant piping connections, shut off valves and any other standard accessory necessary with the equipment supplied. In case of twin compressor system two independent sets of condenser coils shall be incorporated. The condenser coils shall be arranged in staggered rows and shall be expanded into super slit aluminum fins to achieve superior efficiency. The fins shall have hydrophilic coating
 - 4.2.2 The condenser fans shall be propeller type, directly driven by a motor and positioned for vertical air discharge. The draw-through design provides uniform airflow over the entire condenser coil shall be, thus ensuring proper condensation throughout the coil. The condenser fan motors shall be of totally enclose squirrel case type with IP-54 type protection and shall be designed for outdoor operation in high ambient temperatures. They shall operate or 415 Volts (+/- 10%), 3 Phase, 50 Hz supply.
- 4.3. Compressor
 - 4.3.1 Chiller packages shall be provided with single/multiple compressors. The compressor shall be sealed having an integral cast iron frame. The compressor shall be internally lubricated with a highly refined, low foaming, mineral oil and should be provided with a crankcase heater..
- 4.4. Compressor Motor
 - 4.4.1 The compressor motor should be hermetic, refrigerant gas cooled with inherent all phase protection and shall be suitable for 415 V (+/-10%), 3 phase, 50 cycles AC supply.
 - 4.4.2 Motor shall be screen protected drip proof squirrel cage induction type, designed and guaranteed for continuous operation at name plate rating and motor to be suitable for the refrigerant being used. Temperature sensor shall be provided in motor winding to protect the motor for high temperature rise.
- 4.5. Starter for compressor motor
 - 4.5.1 The starter for the motor shall be automatic Star/-Delta type with tappings to limit starting current, within 2 times the full load current.

- 4.5.2 Unit mounted pre-wired & pretested with factory settings Starters shall include all necessary safety devices i.e. Overload relays, under voltage release and single phase preventing device
- 4.5.3 The motor starter shall be factory mounted and fully wired and factory tested during the run test of the unit
- 4.5.4 Starter shall have affixed to the inside of the door complete, as built, wiring scheme showing all accessory items.

4.6. Capacity Controls

The compressors shall have an automatic regulating capacity from 100% to 25%. In case of multiple compressors, sequencing of compressors shall be provided to allow the compressors to start at a time lag of 3-4 minutes.

4.7. Fans

- 4.7.1 The fans shall be dynamically and statically balanced, direct drive, corrosion resistant glass fiber reinforce composite blades molded into low noise, providing vertical air discharge from extended orifices for efficiency and low sound. Guards shall be made from heavy gauge, steel wire epoxy oven baked painting
- 4.7.2 The Fan Motors shall be of High efficiency, direct driven, 6 Pole 3 phase, insulation class "F". Totally Enclosed Fan Cooled (TEFC), rigid mounted, with double sealed, permanently lubricated, ball bearings.

4.8 FCU

- 4.8.1 This shall consist of aluminum impeller of forward curved type double skin, both statically and dynamically balanced, along with properly designed GI sheet casing.
- 4.8.2 Maximum noise level acceptable shall be 65dB at a distance of 3m from fan.
- 4.8.3 The two impeller shall be directly mounted on to a double shaft, single phase, multiple winding motor, capable of running at three speeds.
- 4.8.4 Motor shall be capable of providing at least 3 fan speeds ('LOW-MEDIUM- HIGH') and shall be of adequate capacity to prevent over-loading at any speed and duty of the fans. Each fan coil unit shall be equipped with a three-speed fan switch ('LOW-MEDIUM-HIGH') and ON/OFF switch for the fan control.
- 4.8.5 Motor shall be of the permanent split-capacitor type for direct-on-line starting, and factory wired to a terminal block inside a factory installed junction box. Motor shall be provided with UL listed thermal overload protection. Motor windings and electrical components shall be impregnated or protected to avoid trouble from condensation.
- 4.8.6 Connections unit or socket outlet shall be provided near each fan coil unit. Location of these electrical power points shall be coordinated so that the connection unit or socket outlet shall be positioned within 1 m from the fan coil unit
- 4.8.7 Electrical wiring connection including cables and wiring accessoires between the connection unit or socket outlet and the fan coil unit shall be provided.
- 4.8.8 Electrical cables or wiring installed outside the casing and inside the air stream shall be protected by metallic flexible conduit.

4.9 Control Panels

- 4.9.1 The chiller shall be provided with a factory installed and wired micro processor based rain tight control panel. The control panel shall be provided with necessary MCB/MCCB/isolator for termination of incoming power cable. A contactor shall be included in the control centre for each compressor and a pair of fan motors.

- 4.9.2 The control system shall automatically control the operation of the unit from the time the unit is started, through the operating period, until the unit is stopped. The internal components shall be arranged for easy access. The panel shall incorporate necessary interlocking between equipment as required. The motor control centre should include safety devices to protect the unit from mal functions. These controls should shut down the unit and signal the operator with their respective lights. The protective controls shall be as listed hereunder:
- i. High condenser pressure cutout.
 - ii. Low oil pressure cutout.
 - iii. High oil temperature cutout.
 - iv. High discharge temperature cutout.
 - v. Solid state motor over current cutout.
 - vi. Solid state low evaporator temperature control.
- 4.9.3 The chiller shall be to existing station BMS system compatible. The control panel shall incorporate hardware cards/control units for complete integration of chillers to building automation system.
- 4.9.4 The Software shall be stored in non-volatile memory, with programmed set-points retained in lithium battery backed real time clock (RTC) memory for minimum 5 years.
- 4.9.5 Liquid crystal display, descriptions in English, numeric data in English (or Metric) units. Sealed keypad with sections for Set points, Display/Print, Entry, Unit Options and clock, and On/Off Switch.
- 4.9.6 Programmable Set-points: Display language; chilled liquid temperature set point and range, remote reset temperature range, manual override for servicing, low and high ambient cutouts, number of compressors, low liquid temperature cutout, low suction pressure cutout, high discharge pressure cutout, anti-recycle timer (compressor start cycle time), and anti-coincident timer (delay compressor starts).
- 4.9.7 Display Data: Return and leaving liquid temperatures, low leaving liquid temperature cutout setting, low ambient temperature cutout setting, outdoor air temperature, English or metric data, suction pressure cutout setting, each system suction pressure discharge pressure (optional), liquid temperature reset via a Building Automation System (by others) via PWM input as standard or at a 4-20 milliamp or 0-10VDC input or contact closure with optional BAS interface, anti-coincident system start timer condition, compressor run status, no cooling load condition, day, date and time, daily start/stop times, holiday status, automatic or manual system lead/lag control, lead system definition, compressor starts/operating hours (each), status of hot gas valves, evaporator heater and fan operation, run permissive status, number of compressors running, liquid solenoid valve status, load and unload timer status, water pump status (optional).
- 4.9.8 System Safety: Shall cause individual compressor systems to perform auto shut down; for high discharge pressure, low suction pressure, high pressure switch, and motor protector. Compressor motor protector shall protect against damage due to high input current or thermal overload of windings.
- 4.9.9 Unit Safety: Shall be automatic reset and cause compressors to shut down if low ambient, low leaving chilled liquid temperature, under voltage, and flow switch operation. Contractor shall provide flow switch and wiring per chiller manufacturer requirements.
- 4.9.10 Alarm Contacts: Low ambient, low leaving chilled liquid temperature, low voltage, low battery, and (per compressor circuit): high discharge pressure, and low suction pressure.

4.9.11 Manufacturer shall provide any controls not listed above, necessary for automatic chiller operation. Mechanical Contractor shall provide field control wiring necessary to interface sensors to the chiller control system.

4.10 Power Panels

4.10.1 Rain tight, powder painted steel cabinets with hinged, latched, and gasket sealed outer doors. Provide main power connection (s), control power connections, compressor and fan motor start contactors, current overloads, and factory wiring. Power supply shall enter unit at a single location, be 3-phase of scheduled voltage, and connect to unit terminal blocks. Exposed compressor, control and fan motor power wiring shall be routed through liquid tight conduit.

4.10.2 The panel should be total type tested assembly as per IEC 61439 part I & II. IEC 61439/EN 61439 part I: specification for low voltage switchgear and control gear assemblies. Service life: All equipment, cables and wiring shall be designed, manufactured and installed so as to secure a service life as shown below:

Main switchboards	30 Years
Sub – main switchboards	30 Years
Cables	30 Years
Luminaries	20 Years
Tray, trunking and supports	30 Years
All other equipments	minimum 20 Years

4.10.3 Switchboards, equipment, and components shall be rated for operation in ambient temperatures of 50°C and humidity upto 75%.

4.11 Insulation

4.11.1 Semi-rigid fibre glass / wool or rockwool duct wrapped with a factory applied vapour barrier jacketing secured in position with adhesive and fixing pin/retaining washers. Vapour barrier shall be double sided aluminium foil reinforced by cross grid fibre glass filament. Areas of flat insulation with any dimension greater than 1200mm shall have galvanised fixings equal to the thickness of the insulation secured to the surface with self-sealing aluminium 'pop' rivets to provide firm fixing for finishes

- Minimum density: 48kg/m³ for glass wool and 64 kg/m³ for Rockwool
- Maximum K-factor: 0.035W/mK at 25°C mean temperature
- Temperature range: 0 to 120°C

4.11.2 Flexible elastomeric pipe insulation shall be of fire-retardant, flexible, close-cell, CFC free, in continuous lengths, with factory applied talc coating on inner surface. Flexible elastomeric insulation shall have a flame spread rating of 25 or less and a smoke developed rating of not over 150 for 12mm thickness, in accordance with ASTM E84 test method.

- Maximum K-factor : 0.04W/mK at 20°C mean temperature
- Density: 64kg/m³ for pipes, 80kg/m³ at supports
- Closed cell content: at least 90%
- Water vapour permeance: not exceeding 0.28 mgm/Nh
- Resistance to heat: at least 800 C.

4.11.3 Insulation inside false ceiling and service ducts shall not require any finish.

4.11.4 0.8mm thick aluminium hammerclad cladding firmly secured with 'pop' rivets evenly spaced at 100mm centres shall be applied to indoor insulation which is visually exposed to view inside station areas and within plant rooms. Cladding shall be provided with means of removal for repair and maintenance. The same cladding is to be provided on the chilled water pipes.

4.11.5 15mm cement plaster finish on chicken-wire mesh with additional finish of 0.8mm polyisobutylene sheeting with solvent weld joints shall be applied to outdoor type insulation which is exposed to ambient. The whole shall be then provided with a completely weatherproof external enclosure to the insulation. Corrosion proof bands and clips shall hold the sheeting tight against the insulation such that ballooning will not occur.

4.12 Globe Valves

4.12.1 The bodies shall be of an even thickness throughout, clean and free from scale and flaws. Valves up to and including 50 mm nominal bore shall have bronze bodies and valves of 65 mm bore and larger shall have cast iron bodies. No material used shall be susceptible to dezincification.

4.12.2 Globe valves are used for circuit regulation and shall have characterised plug discs. The discs shall be free to rotate, readily removable from the valve stem and renewable. Discs may be manufactured proprietary composition type materials if approved by the Engineer.

4.12.3 Valves may have packed stuffing boxes or be fitted with 'O' rings.

4.12.4 Valves up to and including 50 mm nominal bore shall have taper screw ends, valves of 65 mm nominal bore and larger shall have flanged connections.

4.12.5 Regulating valves shall be fitted with a lockable spindle to limit the proportion open once regulation is complete.

4.12.6 Bronze globe valves shall be rising stem pattern. Cast iron globe valves shall be outside screw rising stem type.

4.13 Gate Valves

4.13.1 Generally, gate valves shall be used on service pipelines where isolation of plant, equipment and system circuits is required and shall be fitted in the locations indicated on the Definitive Design Drawings.

4.13.2 The bodies shall be of an even thickness throughout, clean and free from scale and flaws. Valves up to and including 50 mm bore shall be bronze, 65 mm bore and larger shall be cast iron. No material used shall be susceptible to dezincification.

4.13.3 Valve wedges may be of cast iron, bronze, nickel alloy or stainless steel. Cast iron wedges shall have bronze trims and seating. Wedges shall be renewable and free to rotate on the valve spindle.

4.13.4 Valves may have packed stuffing boxes or alternatively may be fitted with 'O' rings.

4.13.5 Bronze gate valves shall have non-rising spindles. Cast iron body gate valves shall be outside screw rising stem type.

4.14 Balancing Valves

4.14.1 The balancing valves shall be capable of measuring, regulating and isolating the flow.

4.14.2 The balancing valves up to 40 mm dia shall be of gunmetal screw type and 50 mm dia. And above shall be C.I double-flanged type conforming to B.S. 1452 or equivalent specifications.

4.14.3 The balancing valves shall be made of stainless steel AISI 410. All other internals shall be non-corrosive material preferably of forged brass.

4.14.4 The port opening shall permit precise regulation of flow rate, by accurately measuring the pressure drop across the port.

4.14.5 The valve shall be complete with two ports for connections to a mercury manometer, to measure the pressure drop, as well as drain port.

4.14.6 The spindle shall have a shielded/concealed locking screw to avoid the tempering of the setting after balancing.

4.14.7 The valves must have easily accessible pressure drop measuring facility.

4.14.8 The balancing valve shall have indication of number of turns on hand wheel preferably digital type.

4.14.9 The balancing valve shall be used in lieu of butterfly / gate / globe / regulating / flow measurement valves and shall be suitable at 16 kg/sqm working pressure.

4.15 Flow Measurement Valves

- 4.15.1 Flow measurement valve sets shall comprise a screwed or flanged gate valve close-coupled to a flow measurement device.
- 4.15.2 Sets up to DN50 size shall be screwend valves and threaded nipple type carrier with integral orifice ring. Sets DN65 size and above shall be flanged and include an orifice plate and carrier with mating flange. Sets shall be used for measurement and isolation in conjunction with a double regulating valve.

4.16 Flow Measurement Variable Orifice Double Regulating Valve

- 4.16.1 Double regulating valves as described shall additionally be provided with 2 No. double seated pressure test valves for flow measurement in conjunction with a double regulating valve used in a balancing application.

4.17 Flow Measurement Fixed Orifice Double Regulating Valves (FODR Valves)

- 4.17.1 FODR valves up to DN50 shall be as for double regulating valves to BS 7350 or other equivalent standard directly coupled to a flow measurement device comprising male/female threaded nipple type carrier with integral orifice ring and 2 No. double seal pressure test valves.
- 4.17.2 FODR valves DN65 and above shall be cast-iron double regulating valves to BS 7350, or other equivalent standard with flanged connections.
- 4.17.3 The flow measurement device shall comprise a single piece stainless steel square edged orifice plate carrier with 2 No. double seal pressure test valves, integral orifice to fit between the valve outlet flange and mating flange.
- 4.17.4 Low flow rate commissioning sets shall comprise bronze double regulating globe valve with bronze stem, slotted parabolic disc and screw ends, close-coupled to a bronze carrier with integral fixed orifice and 2 No. double seal pressure test points.
- 4.17.5 Butterfly valve commissioning sets DN65 to DN300 shall comprise cast-iron wafer semi-lugged valves with stainless steel shaft, aluminium bronze disc, nitrile liner and gear operated double regulating properties close-coupled to fixed orifice nickel-plated cast-iron measuring station, with 2 No. double seal pressure test points.

4.18 Check Valves

- 4.18.1 Check valves shall be supplied and fitted in the locations indicated on the Definitive Design Drawings. Care shall be taken to ensure that the valves supplied are suitable for installation in the plane required as per data sheets. Check valves shall not be installed in vertical pipes with a downward fluid flow.
- 4.18.2 Check valves up to DN50 shall be bronze with renewable nitrile rubber faced disc and screw-in cap with ends screw taper thread.
- 4.18.3 Check valves DN65 to DN150 shall be cast iron with bronze seat and trim and nitrile rubber faced disc with flanged connection.
- 4.18.4 Check valves DN200 and above shall be with metal faced disc, bronze trim with flanged to connection to PN16.

4.19 Butterfly Valves

- 4.19.1 Valves of DN40 and larger shall be of cast iron body and arranged to be fixed between pairs of mating flanges (wafer body) with interconnecting long bolts except for 'end of line' service or equipment isolation. Valves for the latter applications shall be fully lugged type.
- 4.19.2 Valve stems shall be of stainless steel with either 'O' ring type seals or non-asbestos material packed glands.
- 4.19.3 All isolation valves shown on pipe schematic for all major branches and risers shall be lugged butterfly valves.
- 4.19.4 Valve discs shall be either stainless steel or aluminium bronze and shall be machined to give tight shut off against the valve seat. Valves may contain proprietary latex based

materials to ensure that a good seat is obtained. Where such materials are utilised they shall be well proven in use and fully bonded.

- 4.19.5 Valves shall be supplied with graduated indicator plates to show disc position.
- 4.19.6 Generally valves up to and including DN150 shall be lever operated and valves in excess of DN150 shall be provided with gear operation.

4.20 Ball Float Valves

- 4.20.1 Level controllers size 15mm shall be brass bodied float operated valves of the diaphragm type with discharge component to effectively prevent back-siphoning of water, all in accordance with BS 1212 Part 2. Copper floats shall be to BS 1968, and plastic floats to BS 2456 or equivalent.
- 4.20.2 Valves DN20 to DN30 shall be gunmetal bodies double seat balanced equilibrium type of full bore pattern with inlet screw end.
- 4.20.3 A stopcock shall be fitted on the inlet to all ball float valves.
- 4.20.4 Ball float valves of the delayed action type shall incorporate an equilibrium type ball valve with the float operating in an auxiliary chamber within the storage tank, cooling tower, etc. A second float below the base of the chamber shall operate a quick-operating valve, which shall provide open/shut control. Such ball valves shall be fitted where indicated on the Definitive Design Drawings.
- 4.20.5 Ball float valve installations shall be complete with water stilling pipes to minimize the effect of the water inflow on the operation of the floats and the level controllers.

4.21 Ball Valves

- 4.21.1 Ball valves up to DN50 shall be copper alloy bodies of DZR to BS 2872.CZ 132 or equivalent, have an inhibited brass body with chrome coated ball plug and valve stem, and PTFE seat and seals.
- 4.21.2 Valves shall be 1/4 turn lever handle operated.
- 4.21.3 Valves DN65 and above shall be cast iron.

4.22 Foot Valves

- 4.22.1 Foot valves with inlet bolted strainer shall be fitted on all pump suction dip pipes.
- 4.22.2 Valves shall be fitted with a leather flap and shall be screwed up to DN50 and flanged DN65 and above.

4.23 Three-way Escape Valves

- 4.23.1 Three-way escape (diverting) valves as per datasheet shall be provided.
- 4.23.2 Seat arrangement shall be that closure of one outlet port occurs when the alternate outlet port is opened. Clockwise hand wheel operation shall open the vent port.

4.24 Strainers

- 4.24.1 Strainers shall be 'Y' pattern, unless otherwise indicated, suitable for the working pressures and service of the piping system and of the same nominal bore as the pipeline in which they are to be installed.
- 4.24.2 Strainers shall be screw or flanged connected to suit the isolating valves adjacent to, and on the 'dead' side of which they shall be installed.
- 4.24.3 Strainers 15-300mm for use up to 120oC shall have upstream and downstream self-sealing test points incorporated and two blank tapped points.
- 4.24.4 Baskets/screens shall be readily accessible for removal with adequate clearances for inspection and clearing.
- 4.24.5 Baskets/screens shall be of specified sheet material with perforations recommended by the manufacturer for the service application.
- 4.24.6 Baskets/screens shall be cleaned with solvent after pipeline pre-operational cleaning and shall be again thoroughly cleaned before issue of a Completion Certificate.
- 4.24.7 Strainers for cold service up to 17 bar and size DN15 to DN40 shall be gunmetal body, screwed ends, with stainless steel screen, non-ferrous cap and non-asbestos cap gasket.

- 4.24.8 Strainers DN50 to DN200 shall be cast iron flanged body, with stainless steel strainer screen, cast iron cap, asbestos-free reinforced non-stick cap gasket. The cap shall be complete with 20mm drain valve fitted with hose union.
- 4.24.9 Strainers DN250 and above shall be cast steel flanged pot-type with scantlings as for DN200.

4.25 Thermoplastic Valves

- 4.25.1 Thermoplastic valves only shall be installed in ABS and uPVC pipework systems.
- 4.25.2 Solvent weld end valves shall be provided for sizes up to DN50. DN80 size valves shall be flanged.
- 4.25.3 Pipelines requiring regulation shall be fitted with 'B' grade diaphragm valves.
- 4.25.4 Pipelines requiring shut-off provision only shall be provided with ball valves with plain ends for solvent weld jointing in sizes DN15 to DN80 inclusive.
- 4.25.5 Foot valves and strainers in thermoplastic pipework systems shall be PVC ball foot valves and strainers for solvent welding.

4.26 Stopcocks

- 4.26.1 Stopcocks for fresh water systems shall conform to BS1010 Part 2 or equivalent standard and the materials for constructing the stopcock shall be non-dezincifiable type. They shall generally be able to withstand a working pressure of 16 bar.

4.27 Drain Valves

- 4.27.1 Drain valves shall be provided at the bottom of every riser and at all low points within the water systems to enable full draining down of the entire system.
- 4.27.2 Drain valves shall comply with BS 2879, be screwed end, solid wedge disc, inside screw, non-rising stem, screwed in bonnet lock shield type bronze gate valves with hose union connection.
- 4.27.3 Extended drain lines shall be of the same size as the drain valves.
- 4.27.4 Drain valves shall be of sizes indicated below:

Main Pipe Size (DN)	Drain Valve Size (DN)
Up to 25	15
32-100	20
100-300	32
300-600	50

4.28 Insulation and Protection at Pipe and Duct Supports

- 4.28.1 Insulated pipes shall be provided with high-density rockwool insulation of minimum 160kg/m³ density.
- 4.28.2 The collar shall not be less than 75mm width for pipe sizes up to 80mm diameter, 150mm width for pipe sizes up to 200mm diameter and 200mm for pipe sizes above 200mm diameter.
- 4.28.3 Brackets shall be of same width as the collar.
- 4.28.4 Insulation at pipe support shall be protected by galvanized sheet steel sleeve of 1.2mm in thickness and not less than 250 mm in length.
- 4.28.5 For insulated pipes above 300mm diameter, steel bridging pieces will be allowed to penetrate the insulation to support the pipe. All annular space between support saddle and pipe shall be filled with insulation and the supports shall be adequately insulated to prevent condensation (for chilled water pipes).

4.28.6 High density PUF supports i shall be added between pipes and hangers.

4.29 Pipeline fittings

4.29.1 Brass, bronze or cast iron valves shall generally be of 16 bar pressure rating (working pressure) type and UPVC valves of 10 bar. In addition, all valves at discharge side of transfer water pumps shall be of minimum 16 bar pressure rating.

4.29.2 Where valves are provided at the discharge side of 2 or more pumps, each valve shall be so selected to withstand effectively the anticipated system pressure under the worst case scenario.

4.29.3 screwed valves shall have taper threads to BS 21. Flanged valves shall have dimensions and bolting in accordance with BS 4504.

4.30 Refrigerant Circuit

The unit shall consist of copper refrigerant piping, independent refrigerant circuits for multi compressor unit. Each refrigerant circuit shall include: liquid line shutoff valve with charging port, filter-drier, solenoid valve, sight glass with moisture indicator, thermostatic expansion valves, and flexible, closed-cell foam insulated suction line.

5.0 Installation, Testing and commissioning

5.1 General

5.1.1 An approved Commissioning Specialist shall undertake the entire commissioning and performance testing of ECS installation. The Contractor shall at all times be responsible for the supervision of the Commissioning Specialist's work and shall ensure satisfactory completion of commissioning and recording results.

5.1.2 The Employer will be given the opportunity to witness all tests.

5.1.3 Any defects of Workmanship, materials, performance, maladjustment, non-compliance with this specification or other irregularities which become apparent during the tests or commissioning shall be rectified by the Contractor, at its own expense, until the whole Works is free from defects and in full working order to the complete satisfaction of the Engineer.

5.1.4 The Contractor shall provide all instruments, and sufficient evidence of the accuracy of the test instruments shall be provided. Test methods shall be demonstrated to the Engineer where required.

5.1.5 The Contractor shall submit to the Engineer a schedule detailing the equipment, which he proposes to use in the testing and commissioning of the services and the test methods to be employed.

5.1.6 Testing and commissioning of major items of proprietary plant or specialist equipment will be carried out by the suppliers personnel and witnessed by the Commissioning Specialist. The Engineer will be advised of such activities

5.1.7 Test results will be recorded on approved Commissioning certificates

5.1.8 All test and commissioning instruments will be provided by the Contractor or its Commissioning Specialist, and certified evidence of the accuracy of the test instruments will be provided. The Contractor will submit to the Engineer a schedule detailing the equipment which he or its Commissioning proposes to use in the testing and commissioning of the services and the test methods to be employed.

5.1.9 Instruments for testing will include as a minimum the following:

- Anemometer (range 1.5m/s to 13 m/s)
- Inclined tube anemometer
- Pitot tubes of various lengths to suit duct sizes
- Mercury in glass thermometers
- Weekly recording thermometers

- Weekly recording R.H. meters
- Specially mounted anemometers fixed in a conical sheet metal sheet box hood for measuring accurately air flow from diffusers
- Ammeter, Tachometer
- Vibration and Noise testing instruments
- Surface contact dial indicating pyrometer

5.2 Chiller

- 5.2.1 The refrigeration filling shall be as per manufacture's recommendation. The system shall be vacuumed to within 7.6mm Hg Absolute and maintained for four hours. At the end of this period the pumps shall be stopped and vacuum maintained for twenty four hours without exceeding a vacuum drop of 2.5mm Hg Absolute. The Contractor shall certify that the vacuum was maintained as specified above. All safety controls, low and high refrigerant pressure controls, starter, overload trips shall be suitably set and record of all the setting shall be furnished to the employer.
- 5.2.2 The plant will be continuously operated for a minimum period of 24 hours before tests are witnessed. The Contractor will confirm to the Employer, giving a minimum period of 24 hours notice, that the installation is ready for witness of performance testing.
- 5.2.3 The Contractor will be responsible for the supply, fixing, connection and safe operation of sufficient temporary artificial heat load equipment and any instrumentation necessary to demonstrate system performance and for subsequent disconnection and removal from site when the Employer is satisfied that tests are complete.
- 5.2.4 The Contractor will subject the entire plant to a total continuous run of the duration agreed with the Engineer to ensure that all apparatus, materials and systems are working properly. During the run tests will be carried out to ensure, that all controls, safety devices, operating services and all units are properly adjusted and operating correctly, that design temperatures in the piping system and throughout the air system are established and that the system provide the required internal conditions. The Contractor will assure himself that the design intent is achieved before demonstration to the Engineer. The performance will be evaluated during environmental conditions prevailing at that time.
- 5.2.5 The Contractor will provide a temporary installation of portable recorders where indicated and simultaneously record temperatures and humidities for summer and winter design conditions. The location of test instruments shall be approved by the Engineer. The corresponding external conditions will also be recorded whilst tests are in progress. The capacity of refrigeration plant, (including components thereof such as condensers, evaporators will also be demonstrated and recorded.
- 5.2.6 Individual room temperatures shall be measured by mercury-in-glass thermometers located 1.5m above floor level at points unaffected by the influence or draughts or direct radiation from hot or cold surfaces.
- 5.2.7 Measurements and records of performance test results will be entered on the Commissioning formats and handed to the Employer within a reasonable time after the tests are completed. Copies of the results will be retained on site by the Contractor and be available to other official representative as required.

5.3 FCU Installation

- 5.3.1 The FCU shall be installed as per good engineering practice and as per the standard referred.
- 5.3.2 Each FCU shall be provided with a thermostat positioned in an approved location. The thermostat shall have switches provide Low-Medium-High fan speeds and a rotating temperature set point selector.
- 5.3.3 The thermostat shall have an aesthetically made housing/cover.
- 5.3.4 The end of the flexible conduit shall be properly terminated in the junction box of the FCU and the pipe conduit/switch box at the other end.

- 5.4 The control panel shall have the following extended capabilities:
- 5.4.1 Remote indication of:
- Chiller operating status
 - Shutdown codes
 - Key operating parameters including but not limited to:
 - Entering and leaving chilled water temperatures
 - Entering and leaving condenser water temperatures
 - Oil feed and sump temperatures
 - Oil pump discharge and oil differential pressure
 - Motors amps and amps as a percent of rated load amps
 - Hours of operation and number of starts, time of last start and stop
 - Fault history for last 8 failures
 - Self-diagnostics
- 5.4.2 Programming capabilities of:
- Leaving chilled water temperature
- 5.4.3 Reset of chilled water temperature from:
- Return chilled water temperature (to maintain constant return chilled water temperature)
 - Reset of supply water temperature between +8°C to +12°C
 - Load on chiller
 - Power demand limit
 - Lead-lag operation and control
- 5.4.4 The control panel should include but not to be limited to the items listed below:
- Start/Stop switch (for both local/remote operation) and micro-processor module for capacity control system with overload limit control point adjustment, oil pump and purge unit controls, etc
 - Indicating lights
 - Suction, oil and discharge pressure indications
 - Necessary motor protection devices
 - Other time delays, relays, etc as required
- 5.4.5 As a minimum the following safeties shall be incorporated in the control panel:
- High and low discharge pressure
 - High discharge temperature
 - Chilled or condenser water pumps failure
 - High or low oil feed temperature
 - Low oil differential pressure
 - High motor temperature, low motor current
 - Starter fault
- 5.4.6 The display shall have a minimum of 160-characters liquid crystal having multi colour display and be backlit with a light emitting diode. Messages shall be in plain English. Coded two or three characters displays are not acceptable.
- 5.4.7 A time clock shall be incorporated to allow daily time starts and stops

- 5.4.8 The control system shall have automatic restart after a power failure and not require a battery backup for memory continuity.
- 5.4.9 The microprocessor shall be capable of communicating to other units or a PC using a twisted pair communication interface RS-232 or RS422/485 or with a 9600-baud modem. The protocol should be BAC-NET/MOD BUS compatible. In case of any translator being required for communication between the chiller panel & BMS the same would be provided by the contractor.
- 5.5 Pump
- 5.5.1 The pump shall be installed on a concrete foundation at a suitable height, as per site requirement .
- 5.5.2 Each pump shall be provided with certified performance curves showing power absorbed and corresponding flow rates by varying the speed. The tests shall be done at factory. Testing report shall be submitted to DMRC.
- 5.5.3 Split casing pumps, prior to testing shall be aligned with a dial indicator within 0.05mm.
- 5.5.4 Pump performance curves and power consumption with operating points clearly indicated shall be submitted and verified at the time of testing and commissioning of the installation.
- 5.5.5 Pump performance shall be computed from the pump curves provided by manufacturer. All pumps shall be tested at factory as per relevant codes.
- 5.6 SENSOR / TRANSMITTERS
Provide field mounted differential pressure sensor transmitter(s) as indicated on the plans. Unit shall transmit an isolated 4-20mA dc signal indicative of process variable to the pump logic controller via standard two wire 24 DC system. Unit shall have stainless steel wetted parts with two 0.25" male NPT process connections. It shall be protected against radio frequency interference and shall have a watertight, NEMA 4 electrical enclosure capable of withstanding 2000 PSI static pressure with a 0.5" NPT conduit connection. Accuracy shall be within 0.25% of full span.
- 5.7 Insulation
- 5.7.1 Insulation shall not be applied before the relevant plant or service has been satisfactorily inspected and tested.
- 5.7.2 All insulation shall be applied by skilled workmen.
- 5.7.3 Apply insulation on clean and dry surface with no foreign materials, such as oil, grease, rust, scale or any other dirt.
- 5.7.4 Apply clean and dry insulation only.
- 5.7.5 Install insulation in accordance with the manufacturer's recommendation as a minimum requirement.
- 5.7.6 Provide a complete moisture and vapour seal wherever insulation terminates against metal hangers, anchors, or other projections through insulation on cold surfaces.
- 5.7.7 Stagger all joints with respect to the adjacent butt joint. Seal with 50mm wide aluminium foil type for fibre glass insulation.
- 5.7.8 Apply insulation in a manner to give an acceptable look, smooth and lineable surface of uniform thickness. Steps and undulations in the surfaces will be rejected by the Engineer.
- 5.8 Insulation on Sheet Metal Ducts
- 5.8.1 Cut insulation slightly longer than perimeter of duct to insure full thickness at corners.
- 5.8.2 All insulation shall be applied with edges tightly banded.

- 5.8.3 Adhesive shall be applied so that insulation conforms to duct surfaces uniformly and firmly.
 - 5.8.4 Provide metal fixing pins and retaining clips in addition to adhesive for securing of insulation.
 - 5.8.5 The protruding ends of the pins shall be cut off flush and the vapour barrier facing shall be thoroughly sealed with a vapour barrier mastic or tape where the pins have pierced through. Pin spacing shall not exceed 300mm on centres.
- 5.9 Insulation of Pumps
- 5.9.1 Fit insulation snugly against equipment without voids.
 - 5.9.2 Bevel curved surface edges to provide a tight joint.
 - 5.9.3 Provide metal insulated cover with metal fasteners, supports, frames and membranes.
- 5.10 Piping
- 5.10.1 Install same thickness insulation as the adjoining pipe insulation on flanges, valves and other fittings to obtain the maximum strength and security. Seal joints, protruding metal parts and valve stems thoroughly.
 - 5.10.2 All valves, traps, flanges and strainers shall be insulated in conformity with the pipework in which they are incorporated except that 1.2mm thick galvanised steel or aluminium split boxes shall be provided to ensure easy removal of insulation.
 - 5.10.3 Insulate strainers in such a manner to permit removal of gasket without disturbing the insulation of the strainer body. Insulate valves up to and including bonnets.
- 5.11 Pipeline fittings
- 5.11.1 This Section specifies the manufacture and installation of globe valves, gate valves, check valves, butterfly valves, motorized valves, gauge cocks, automatic air valves, strainers, dirt pockets, stopcocks, pressure reducing valves, double regulation valves, safety and relief valves, thermostatic mixing valves, UPVC valves for flushing water, drain cocks, ball float valves, safety and pressure relief valves, escutcheons, thermometer, pressure gauges, flow measuring elements, vortex inhibitors, pipe sleeves, expansion loops, expansion joints, pipe anchors, pipe guides, gaskets for pipe separation, access pipes, traps, water – closet connectors and fresh air inlets.
 - 5.11.2 All valves, taps and cocks shall be of the types and working pressures suitable for the systems to which they are connected. Valves shall be rated to withstand the system hydraulic test pressure.
 - 5.11.3 All valves shall comply with British Standards in respect of tests and working pressures, dimensions and materials of construction.
 - 5.11.4 Wheel head valves shall be arranged for clockwise operation of the handle to close the valve.
 - 5.11.5 Connections shall be made between each valve and the adjoining pipe work or equipment with flanges for 65mm size pipe work and above. Flanges shall be selected to suit working pressure and temperature.
 - 5.11.6 Screwed connections shall be made between each valve and the adjoining pipe work or equipment for 50 mm size pipe work and below. A union shall be fitted on each side of all Screwed valves.
 - 5.11.7 All valves shall be suitably located in accessible positions for operation and maintenance purposes.
 - 5.11.8 All drain outlets and manual air vents shall have connection pipes leading to the nearest drain.
 - 5.11.9 Valve packing shall be suitable for the service intended. Valve packing consists of asbestos or asbestos based materials shall not be used.
 - 5.11.10 Valves of identical make, size, type and duty shall be fully interchangeable.
 - 5.11.11 Inverted mounting of valves shall not be permitted without prior Approval.
 - 5.11.12 All valves provided for manual operation shall have a hand wheel or other suitable device which shall be fixed to the valve. Hand wheels shall be rotated clock-wise to close the valves and shall be clearly marked with the words "OPEN" and "CLOSE" and arrows

pointing in the appropriate directions. The rims of hand wheels shall be machined to a smooth finish. All hand wheels which may be dangerously hot to touch when the system is in use shall be provided with Approved heat insulation on the rim and spokes.

5.11.13 Chain-operated hand wheels shall be provided including rustproof chain and chain guide for valves installed two meters or more above finished floor.

5.12 PAINTING

5.12.1 All pumping system, pumps, motors and bases shall be supplied with approved finish. Shop coat of paint that have become marred during shipment or erection shall be cleaned off with mineral spirits, wire brushed and spot primed over the affected areas, then coated with enamel paint to match the adjoining areas.

5.13 Sound level measurements

5.13.1 Reading will be taken to ensure that the required noise ratings are not exceed. Representative areas will be selected by agreement with the Engineer.

5.13.2 Wherever necessary, when measuring room sound levels, normal continuous background noise from sources other than the installation will be taken into account. Measurements relating to plant and equipment will generally be taken 1.5 m from the item.

5.13.3 Results of octave band analysis will be submitted on noise rating curve charts for each individual space.

5.14 Interlock and Padlocking Facilities

5.14.1 Mechanical key interlocks shall be provided and shall be so designed as to avoid mal-operation at the point of manual application. The scheme shall be such that attempts to remove a captive key shall not result in tripping or opening of the device.

5.14.2 Electrical interlocks on withdrawable equipment shall be so arranged that if the equipments are withdrawn, the complete operation of the withdrawn equipment shall be independent of the remote interlocking contacts. In addition, interlocks shall not be defeated leading to damages or unsafe operations of LVSBs due to the withdrawing of equipment.

5.14.3 Locking facilities shall be provided where appropriate for switches and isolators in order that they may be locked in the open position. Switchgear cubicle access doors shall be equipped with integral type locks, preferably incorporated in the handles of the equipment.

5.14.4 Where locking facilities are of the integral barrel type, the key for each lock shall be unique to the associated lock unless otherwise specified.

5.14.5 Two keys shall be provided for every lock supplied. The keys shall be fitted with rings with identification labels, and wooden cabinets with glazed front-opening doors shall be provided. The cabinets shall be adequate in size and equipped with hooks to house all keys when not in use, and shall be mounted in positions to be decided.

6.0 Make of equipments to be installed.

1. Refrigerant to be used R 134a, R-407c or 410a.
2. Air cooled Chiller: As specified in Technical data sheet.
3. Fan Coil Unit: As specified in Technical data sheet.
4. Water Pump: Kirloskar /ITT Bell & Gossett/ star rating (minimum three star and above)
5. Motor– ABB / Siemens/ Alstom / Crompton Greaves/Teco/KBL (minimum three star and above)
6. Starter : L&T/Siemens/Crompton/ Schneider
7. Panels: Neptune ELSTEEL Siemens/Schneider/Adlec/GE/ABB
8. MCCB: Siemens/ ABB/Siemens/Merlin Gerin/ Legrand/Hager
9. MCB: Legrand/ Hager
10. Ammeter/Voltmeter: AE/L&T/Crompton/Alstom/GEC/Laxmi
11. Switch Gear: Siemens/ Schneider
12. G.I. Sheet: SAIL/Jindal/TATA/Ispat
13. GI 'B' class pipe JINDAL /TATA /Sail
14. Pipe fittings including valves MAKE – Leader / Neta / Fouress for entire connection
15. Y Strainer: Emerald/ Sant/ Rapid cool/ DS
16. way valve & flow switch: Landis & Saefa/Honeywell/Johnson/Sauter/Anergy
17. Thermostat: Landis & Saefa/Honeywell/Johnson/Sauter/Anergy/Siemens/Danfoss
18. Expanded Polystyrene : Beardsell/ Owen Corning
19. Insulation Material (Glass wool): UP Twiga/ KIMMCO
20. Insulation Material (Rockwool): Lloyds
21. Automatic Expansion Tanks: CIMM/Taco/Elbi/Anergy
22. Automatic air vents: Anergy, Flamco/Taco
23. Thermometers /Pressure Gauges: Fiebig/WAREE/ H Guru/ taylor/Emerald
24. Ball Valves/ Gate Valves: Audco/ Kirloskar/Zoloto/ Kitz
25. Butterfly vale: Audco/ Advance / T&A/ Honeywell/ Danfoss/ Audco/ T&A/ Kitz
26. Balancing Valve: Advance/ Honeywell
27. Non Return Valve: Leader/Intervolve/ Advance/castle/ Sant/Honeywell
28. Check Valve: Kirloskar
29. Prefabricated ducts: Rolastar or equivalent facility
30. Precoated sheets: Shree/ISPAT
31. Cables used shall be of: polycab, Ducab, KEI, Finolex, cords, RASHI.
32. Wires used shall be of: polycab, KEI, Finolex, Havells,cords.
33. Paint: Nerolac/ Asian/Berger
34. Expansion Tank: CIMM/Taco/Albi/Anergy

SECTION 3

TENDER PRICES AND
SCHEDULE OF PAYMENT

3.1.1 Tender Prices

- 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, labour to & for transportation of material and labour charges etc.

3.1.2 TAXES AND DUTIES

- a. The firm shall quote rates for all items inclusive of all taxes and duties including octroi, Entry Tax, local area development tax and service tax as applicable.
- b. Works contract tax: - The rates offered by the firm shall also be inclusive of the work contract tax as applicable in the state. The Corporation i.e. DMRC shall deduct work contract tax from payments due to the firm as per rules of the state Government. The Accounts Officer of the concerned Division shall issue certificates for such deductions to the firm.
- c. The registration no. of M/s _____ for Service Tax is _____ (The firm is to intimate its Service Tax no. at the time of quoting of the tender)

3.1.3 VARIATION IN EXCISE DUTY:

- a. In case of statutory variation in excise duty in respect of engine alternator set only, within the stipulated date of completion of individual agreement, the same shall be paid or recovered as per the actual against the documentary proof. However, beyond this period department will take advantage of any duty reduction but will not pay extra on account of duty increase.
- b. Tendered rates are inclusive of taxes and levies payable under the respective statutes. However, pursuant to the Constitution (forty six Amendment Act, 1982, if any further tax or levy is imposed by statute after the date of receipt of tenders and the contractor(s) thereupon necessarily and properly pays taxes or levies, the contractor shall be reimbursed the amount paid provided such payment if any is not in the opinion of SE (whose decision shall be final and binding) attributable to delay in execution of work within the control of the contractor.
- c. (i) The contractor shall keep necessary books of accounts and other documents for the purpose of this condition as may be necessary and shall allow inspection of the same by a

duly authorised representative of Government and shall furnish such other information/documents as the Engineer-in-Charge may require.

(ii) The contractor(s) shall within a period of 30 days of imposition of any further tax or levy pursuant to the Constitution (Forty Six Amendment) Act 1982 give a written notice thereof to the Engineer-in-Chief that the same is given pursuant to this condition together with all necessary information relating thereto.

Note: - No additional condition whatsoever will be acceptable for turnover tax/sales tax on works contract. In case of additional conditions for the payment of such claims by the contractor, the tender will not be considered.

3.1.3 Schedule of Payment

- a. 60% of prorata of the approved price breakup of contract value on receipt of equipment at site and after satisfactory physical inspection.
- b. 30% of prorata of the approved price breakup of contract value after successful installation & commissioning of equipment.
- c. 10% of the approved contract value after successful completion of System acceptance test & Completion as per scope of work.

The payment shall be made subjected to submission of jointly signed report of DMRC Engineer in charge & your representative.

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

Supply, installation, testing ,commissioning of Air cooled chillers including the interconnection with existing FCUs and existing chilled water piping including complete integration with existing BMS system at Kashmiri Gate & Vishvidyalaya Metro stations.

INSTRUCTIONS TO TENDERERS

GENERAL

1.1 INTRODUCTION

e-Open tenders are invited for DMRC hereinafter called the 'Employer', for Works in accordance with this Tender Package. The tender papers consist of the following documents, along with their annexure, appendices, addenda and errata if any.

- Notice Inviting Tender (NIT)
- Technical specification
- Tender price and schedule of payment
- Instructions to Tenderers (ITT)
- Special Conditions of Contract (SCC)
- General Conditions of Contract (GCC)
- Bill of Quantities

Tender shall be prepared and uploaded in accordance with the instructions given herein.

1.2 Relevant address for correspondence relating to this tender is given below:

Deputy General Manager/E&M/UG,2nd Floor, Metro Bhawan, Fire Brigade Lane, Barakhambha Road New Delhi-11001

1.3 Some essential data/requirements pertaining to this Tender along with reference to Clause number of this volume where full details have been given are detailed below.

- a. Tender Security" to be furnished by the Tenderer: Amount as per NIT.
- b. Tenders will be opened on line at website <https://eprocure.gov.in/eprocure/app>.
- c. Date of opening of the Tender Package: As per NIT.
- d. Period for which the tender is to be kept valid: As per clause-11.0

2.0 POST QUALIFICATION REQUIREMENTS

- 2.1 This invitation to e-open eligible tenderers who has completed the similar nature of work refer clause 1.2 of NIT.
- 2.2 The Tenderer shall upload only one tender either himself or as a lead partner/ Lead Constituent in a joint venture/consortium for the work. The tenderer who upload more than one tender for the same work will be disqualified.
- 2.3 The tender, and, in the case of a successful tender, the Form of Agreement, shall be individually signed so as to be legally binding on all partners/constituents as the case may be.
- 2.4 Tenderer shall upload each page signed by the authorized signatory of the tenderer. Power of Attorney in favour of the signatory will be required to be furnished as detailed in Clause 13.0.

3.0 COST OF TENDERING

- 3.1 The Tenderer shall bear all costs associated with the preparation and submission of his tender and the Employer will in no case be responsible or liable for these costs.

4.0 SITE VISIT

- 4.1.1 The Tenderer is advised to visit and examine the Site of Works and its surroundings at his/their cost and obtain for himself on his own responsibility, all information that may be necessary for preparing the tender and entering into a Contract.
- 4.1.2 The agency shall be deemed to have inspected the Site and its surroundings before hand and taken into account all relevant factors pertaining to the Site in the preparation and submission of the Tender

TENDER DOCUMENTS

5.0 CONTENTS OF TENDER DOCUMENTS

- 5.1 The tenderer is expected to examine carefully all the contents of the tender documents as mentioned in Sub-clause 1.1 including instructions, conditions, forms, terms, and take them fully into account before submitting his offer. Failure to comply with the requirements as detailed in these documents shall be at the tenderer's own risk. Tenders which are not responsive to the requirements of the tender documents will be rejected.
- 5.2 The tenderer shall not make or cause to be made any alteration, erasure or obliteration to the text of the tender documents.

6.0 AMENDMENT TO TENDER DOCUMENTS

- 6.1 At any time prior to the deadline for the submission of tenders, the Employer may, for any reason, whether at his own initiative or in response to a clarification or query raised by a prospective tenderer, modify the tender documents by an amendment.
- 6.2 The said amendment in the form of an addendum will be uploaded on <https://eprocure.gov.in/eprocure/app> and same shall be binding upon them.

PREPARATION OF TENDERS

7.0 LANGUAGE OF TENDER

- 7.1 The tender prepared by the tenderer and all correspondence and documents relating to the tender exchanged between the tenderer and the Employer/Engineer shall be in the English language. In case any accompanying printed literature is in other languages, it shall be accompanied by an English translation. The English version shall prevail in matters of interpretation.

8.0 DOCUMENTS REQUIRED FOR EVALUATION OF TENDER

- 8.1.1 The Tenderer shall submit the tender cost and tender security in sealed envelopes addressed to Dy. General Manager / E&M/UG, DMRC duly superscripted with name of work, time and date for submission and time and date for opening. The envelope should also bear the name and address of the tenderer.
- 8.1.2 The Tenderer will submit Two envelopes namely Envelope-A & Envelope –B before opening of technical bid.

Envelope -A

Envelope-A shall contain demand draft for Tender Cost in original superscripted with Name of work & "Tender Cost". At lower portion Name and address of tenderer shall be mentioned.

Envelope-B

Envelope-B shall contain demand draft for Tender Security in original superscripted with Name of work & "Tender Security". At lower portion Name and address of tenderer shall be mentioned.

8.1.3 REQUISITE DOCUMENTS

Tender bid shall comprising of following forms and documents duly filled in or duly verified by the tenderer to be uploaded as per tender requirement.

- i. Work experiences as per clause no. 1.2.1 of NIT. Duly indicating the following information in completion certificate:
 - a. On company letter head or duly stamped by authorized signatory of firm issuing the completion certificate (client)
 - b. Name of work
 - c. Name and address of firm to whom the completion certificate issued
 - d. Actual cost of work and the final contract value
 - e. Completion date of work
- ii. Audited financial turn over and Documents to certify the positive net worth for financial eligibility as per clause no. 1.2.2 of NIT
- iii. Documents to certify the positive net worth as per clause no. 1.2.2 (b) of NIT. Tenderer shall submit last three years (yr 2013-2014, 2014-2015, 2015-2016) audited financial statement duly attested by certified CA.

The financial data submitted shall certified by the Chartered Accountant in original with his stamp, signature & membership number. The copies of audited balance sheets must be complete including all the related notes and income statements for the last three audited financial years.

In case audited balance sheet of last financial years is not made available by the bidder. The bidder must 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.

- iv. Solvency certificate of 80% of estimate value of contract from the bank as per clause no. 1.2.2 (c)
- v. Declaration for non black listing/ de-registered by any Govt/ PSU on Rs. 10 stamp paper duly attested by Notary in the format prescribed as per clause no. 1.2.4 of NIT, as per annexure D.
- vi. Form of Tender (FOT) - The Form of Tender along with all Appendixes shall be completed and duly signed by an authorized and empowered representative of the Tenderer. Signatures on the Form of Tender shall be witnessed and dated. Copies of relevant powers of attorney shall be attached.
- vii. Power of Attorney: Upload the power of attorney on stamp paper duly attested by notary & upload a copy of Board resolution, with a copy of declaration of Board members clearly indicating authority to further delegate the power.
In case of name change of firm tenderer shall upload the Memorandum or/and certificate of in-corporation.
- viii. Self Attested copies of the PAN. No. under income Tax Act, ESI & PF Registration No., Sale tax registration certificate and /or service tax registration certificate whichever applicable.
- ix. As per Delhi VAT Act, the party who is executing work in Delhi has to have registration with VAT authorities of Delhi. If a tenderer is outside Delhi intends to participate in

DMRC tender, he can be permitted provided he gives an undertaking to the fact that he will get himself registered with Delhi VAT authorities, in the event of issue of Letter of acceptance to the tenderer and shall submit registration number before claiming initial advance or first payment whichever is earlier. In the absence of registration detail with Delhi Sales Tax / Delhi VAT Department payment shall not be released.”

- x Proforma for Statement of Deviations
- xi Tenderer shall submit Technical data sheet as per annexure G
- xii Bill of Quantities (BOQ)
- xiii Experience record of similar works during the last three years and in progress on date may be furnished in the format prescribed (Form T-II).
- Xiv Details of Personnel may be furnished in the format prescribed (Form T-III).
- xv Details of Resources to be used for the work – Machinery & Equipments may be furnished in the format prescribed (Form T-IV).
- Xvi Total value of similar works executed for the last three financial years along may be given in the format prescribed (Form T-V).

Tenderer who fulfill the above technical requirement clause 8.1.3 (i) to 8.1.3 (xi) after duly verification of uploaded document shall be considered technically qualified. However, tenderer shall submit all the documents as per clause 8.1.3 (i) to 8.1.3 (xvi).

8.2 For Financial bid evaluation

- 8.2.1 The financial bid all the technical qualified tenderer shall be opened on scheduled time on line.

Note: - Financial bid of only those bidder who are found in technical suitability / eligibility and have submitted requisite security and fulfilled relevant terms and condition of tender documents shall be opened on line at <https://eprocure.gov.in/eprocure/app>.

- 8.3 The prices shall be entered in the Form of Tender and the BOQ enclosed in words as well figures. These prices should include all costs associated with the contract and taxes etc.
- 8.4 All documents uploaded for the purposes of tendering, and any amendments issued in accordance with Clause 6.0 shall be deemed as incorporated in the Tender.

9.0 TENDER PRICES

- 9.1 The tenderer is required to quote for all the items as per tender documents.
- 9.2 The Tenderer shall keep the contents of his tender and rates quoted by him confidential.

10.0 CURRENCIES OF THE TENDER

- 10.1 Tender prices shall be quoted in Indian Rupees only.

11.0 TENDER VALIDITY

- 11.1 The tender for the first year shall remain valid and open for acceptance for a period of 120 days from the Last date of submission of tender.
- 11.2 In exceptional circumstances, prior to expiry of the original tender validity period, the Employer/the Engineer may request the tenderers for a specified extension in the period of validity. The request and the response thereto shall be made online through website <https://eprocure.gov.in/eprocure/app>. or by writing or by telefax. A tenderer may refuse the request without forfeiting his tender security. A tenderer agreeing to the request, shall not be required or permitted to modify his tender but will be required to extend the validity of his tender security correspondingly.

12.0 TENDER SECURITY

- 12.1 The tenderer shall furnish, as tender security, an amount as mentioned in NIT.
- 12.2 The tender security will be in the form of a Bank Guarantee from a schedules bank in the performa at Annexure-B or in form of draft.
- 12.3 The "Original" of this tender security is to be submitted in the o/o DGM/E&M/UG as per date & time mentioned in NIT. If tender security is not submitted by the tenderer as mentioned above, then tender(s) shall be rejected considering it as non-responsive and their technical bid shall not be opened and if opened then it will not be evaluated.
- 12.4 The bank guarantee shall be irrevocable and operative for a period not less than 30 days beyond the validity of the tender.(120days + 30days from the last day of submission of tender)
- 12.5 The tender securities of unsuccessful tenderers shall be discharged/returned by the Employer as promptly as possible as but not later than 30 days after the expiration of the period of tender validity.
- 12.6 The tender security of the successful tenderer shall be returned upon the tenderer executing the Contract Agreement after furnishing the required performance guarantee for performance, as mentioned in this Tender Document.
- 12.7 The tender security shall be forfeited:
- i) If a Tenderer withdraws his tender during the period of tender validity, or
 - ii) If the Tenderer does not accept the correction of his tendered price in terms of Clause
 - iii) In the case of a successful tenderer, if he fails to:
 - a. Furnish the necessary performance guarantee for performance.
 - b. Enter into the Contract within the time limit specified in Clause 26.0
 - c. Commence the work as per Terms and Conditions of Tender after issuance of LOA.
- 12.8 No interest will be payable by the Employer on the tender security amount cited above.

13.0 FORMAT AND SIGNING OF TENDERS

- 13.1.1 If the tender is submitted / uploaded by a proprietary firm, all the documents uploaded on website <https://eprocure.gov.in/eprocure/app>, shall be signed by the proprietor above his full name and the full name of his firm with its current address.
- 13.1.2 If the tender is submitted/uploaded by a limited company or a limited corporation, all the documents uploaded on website <https://eprocure.gov.in/eprocure/app>, shall be signed by a duly authorized person holding the power of attorney for the firm. A certified copy of the power of attorney shall accompany the tender.
- 13.2 If the tender is submitted / uploaded by a partnership, consortium or a joint venture, all the documents uploaded on website <https://eprocure.gov.in/eprocure/app>, shall be signed by a person who is duly authorised by each member or participant thereof or by authorized signatory of each member. Copies of relevant powers of attorney shall be attached
- 13.3 The documents required to be submitted by the Tenderer will be as described under Clause 8.0 herein.
- 13.4 Entries to be filled in on line wherever applicable or else upload the document duly typed or written in indelible ink. In case of copies, legible photocopies are also acceptable and all the pages shall be signed by a person or persons authorized to sign on behalf of the

tenderer before uploading/ submission. Each page of such document should be signed in full at the bottom by the person submitting the Tender along with the date of signing. Each page of printed documents should be initialed at the bottom by the person submitting the tender along with the date of initialing. All the pages of the tender, where entries or amendments have been made, shall be initialed and dated by the person or persons signing the tender.

- 13.5 The complete tender shall be without alterations, overwriting, interlineations or erasures except those to accord with instructions issued by the Employer, or as necessary to correct errors made by the tenderer. All amendments/corrections shall be initialed by the person signing the tender.
- 13.6 All witnesses and sureties shall be persons of status and probity and their full names, occupations and addresses shall be written below their signatures.

14.0 SUBMISSION OF TENDERS

14.1 Uploading of Tender/ documents

- 14.2 The Tenderer shall follow the procedure as indicated below:
- 14.2.1 Each tender will be upload in one set which shall contain documents as detailed in Appendix - I.
- 14.2.2 The contents of Tender Package shall be as detailed under Clauses 8.0 hereon.
- 14.2.3 No application for the forged, documents uploaded will be entertained in the office and any such activity will lead to dis-qualification of the tenderer.

15.0 SUBMISSION OF TENDER COST and Security

- 15.1 Tender cost and Tender security draft/BG in original should be submitted at the following address
- Deputy General Manager/E&M/UG, 2nd Floor, Metro Bhawan, Fire Brigade Lane, Barakhambha Road New Delhi-110001 on date and time as mentioned in NIT.
- 15.2 Tender cost and Tender security shall be submitted in person to the Office of DMRC. The Engineer/Employer cannot take any cognizance and shall not be responsible for delay in transit.
- 15.3 Tender cost and Tender security sent telegraphically or through other means of transmission (telefax etc.) which cannot be delivered in a sealed envelope shall be treated as defective, invalid and shall stand rejected.
- 15.4 DMRC shall not be responsible for Tender cost and Tender security delivered to any other place/person in DMRC (like DAK section etc) other than the designated office and does not reach ithe designated office before dead line for submission.

16.0 LATE TENDER COST & SECURITY

- 16.1 Tenders have to be submitted online on e-tendering website [www.https://eprocure.gov.in/eprocure/app](https://eprocure.gov.in/eprocure/app) it shall be the responsibility of the bidder/ tenderer to ensure that his tender is submitted on e-tendering website of DMRC before the deadline of submission as per NIT. DMRC will not be responsible for non receipt of tender documents sue to any delay and/or loss etc,
- 16.2 Submission of tender shall be closed on e-tendering website of DMRC at the date & time of submission prescribed in NIT after which no tender shall be accepted.

- 16.3 It shall be the responsibility of the bidder/ tenderer to ensure that his tender is submitted online on e-tendering website [www.https://eprocure.gov.in/eprocure/app](https://eprocure.gov.in/eprocure/app) before the deadline of submission. DMRC will not be responsible for non receipt of tender documents due to any delay and / or loss etc.
- 16.4 The employer may, at his discretion, extend the deadline for submission of tenders by issuing an amendment, in which case all rights and obligations of the employer and the tenderer previously subject to the original deadline will thereafter be subject to the deadline as extended.
- 16.5 Any requisite document, Tender cost and tender security etc received in the designated office of DMRC after the deadline as per NIT will be returned to the tenderer and bid of tenderer shall summarily be considered as rejected.

TENDER OPENING AND EVALUATION

17.0 TENDER OPENING

- 17.1 The Employer or his authorized representative will open the Tender bids in the presence of tenderers or their Authorized representatives on date and time as mentioned in of NIT in the office of Dy. General Manager/E&M/UG, 2nd Floor, Metro Bhawan, Fire brigade Lane, Barakhamba Road, New Delhi 110001. If such nominated date for opening of Tender is subsequently declared as a Public Holiday by the Employer, the next official working day shall be deemed as the date of opening of Tender at the same time. The Tender of any Tenderer who has not complied with one or more of the foregoing instructions may not be considered.
- 17.2 The following procedure shall be adopted for opening of Tender (Two Bid)
- a. Notification (NIT) issued by DMRC for date of opening of technical bid. Date of opening of price bid shall be informed through website <https://eprocure.gov.in/eprocure/app> after opening of technical bid.
 - b. Corrigendum / Addendum issued by DMRC through website [www.https://eprocure.gov.in/eprocure/app](https://eprocure.gov.in/eprocure/app) as per NIT shall be part of tender.
 - c. Clarification if any, may be sought by the tenderer through website <https://eprocure.gov.in/eprocure/app> or through in writing letter to DMRC authorized person. In case of any clarification sought by the tenderer is not relevant, it may not be replied.
 - d. Before schedule of opening of technical bid Tenderer shall submit the tender cost and tender security, in original, with in stipulated time as per NIT. The tenderer fails to submit the same within stipulated scheduled time deemed to be rejected.
 - e. Envelopes containing 'Tender Security' and 'Cost of Tender Documents' will be opened first on date and time as mentioned in of NIT in the office of Dy. General Manager/E&M/UG, 2nd Floor, Metro Bhawan, Fire brigade Lane, Barakhamba Road, New Delhi 110001.. Tender (Technical & Financial Bids) of those tenderers who have not submitted valid 'Tender Security' and 'Cost of Tender Documents' shall be considered as non-responsive and liable to be rejected summarily.
 - f. On opening of the Technical bid, DMRC will first verify the details of tender cost and tender security filled online by tenderer with the original Demand Draft / Bank Guarantee submitted. If minimum amount of tender cost or tender security are not found as per NIT, the tender shall be summarily be considered as cancelled / rejected and no further evaluation or correspondence will be done in this regard.
 - g. The Technical bid of all tenderers who have submitted a valid tender cost and tender security shall be opened. Tenderers may visit the website <https://eprocure.gov.in/eprocure/app> to know the latest information regarding opening of

tender etc. Tenderers can also see the technical sheets (check-list) of other tenderers after completion of opening process by logging on the website.

- h. After ensuring that the documents submitted by the tenderer are found relevant and in order as per the tender, date and time of opening of price bid along with the name of eligible tenderers shall be informed through website <https://eprocure.gov.in/eprocure/app>.
 - i. In case documents of any tenderer is not in order or relevant or not meet the tender requirements, the tenderer may be informed and shall submit of documents as per tender requirement within time frame given by DMRC.
 - j. The tenderer shall submit the correct document. If correct/requisite document is not provided by any tenderer even in this case, deemed to be rejected for that particular tender and price bid of that tenderer shall not be opened. No further correspondence in this regard shall be made.
 - k. If required physical verification of all / any document in original may be done by DMRC. Tenderer shall bring the documents as and when asked by DMRC.
 - l. The tender submitted online will be taken as final bid.
 - m. The Financial Bid which tenderer(s) have uploaded online will be opened on a subsequent date after evaluation of technical bid. Financial bid of only those tenderers whose technical bid is found substantially responsive and technically compliant as per the tender requirement will be opened. The date & time of opening of financial bid shall be informed through website. Tenderer can visit to DMRC e-tendering website <https://eprocure.gov.in/eprocure/app> for further information.
 - n. The price bid of all eligible tenderers shall be opened online at schedule date and time of opening of price bid
- 17.3 Tenderers name, the presence or absence of the requisite tender security and such other details as the Employer or his authorized representative, at his discretion, may consider appropriate will be announced at the time of tender opening.

18 PROCESS TO BE CONFIDENTIAL

- 18.1 Except the public opening of tender, information relating to the examination, clarification, evaluation and comparison of tenders and recommendations concerning the award of Contract shall not be disclosed to tenderers or other persons not officially concerned with such process.
- 18.2 Any effort by a tenderer to influence the Employer/Engineer in the process of examination, clarification, evaluation and comparison of tenders and in decisions concerning award of contract, may result in the rejection of the tenderers tender.

19.0 CLARIFICATION OF TENDERS

- 19.1 Tenderer for any reason whatsoever, be in doubt about the meaning of anything contained in the Invitation to tender, Tender documents or the extent of detail in the Employer's requirement, technical specifications, and tender drawings etc, the tenderer shall seek clarification from DGM/E&M/UG. The DMRC may respond in writing/ through e-mail to any request for clarification received in writing/ through e-mail from the tenderers as per NIT clause.
- 19.2 Except for any such written clarification by DGM/E&M/UG, DMRC which is expressly stated to be by way of an addendum/ corrigendum to the documents referred to in ITT and/or for any other document issued by the Employer which is similarly described, no written or verbal communication, representation or explanation by any employee of the Employer or the engineer shall be taken to bind or fetter the Employer or the Engineer under the contract

- 19.3 To assist in the examination, evaluation and comparison of Tenders, the Engineer / Employer may ask tenderers individually for clarification of their tenders, including breakup of prices. The request for clarification and the response shall be in writing or by telefax but no change in the price or substance of the tender shall be sought, offered or permitted except as required to confirm correction of arithmetical errors discovered by the Engineer during the evaluation of tenders in accordance with Clause 22.0 herein.
- 19.4 All the correspondence from the DMRC pertaining to this tender till the award of work shall only be done to the designated officer in-charge.
- 20.0 DETERMINATION OF RESPONSIVENESS
- 20.1 Prior to the detailed evaluation of tenders, the Engineer will determine whether each tender is responsive to the requirements of the tender documents.
- 20.2 For the purpose of this Clause, a responsive tender is one, which conforms to all the terms, conditions and specifications of the tender documents without material deviation or reservation. "Deviation" may include exceptions, exclusions & qualifications. A material deviation or reservation is one which affects in any substantial way the scope, quality, performance or administration of the works to be undertaken by the tenderer under the Contract, or which limits in any substantial way, the Employer's rights or the tenderers obligations under the Contract as provided for in the Tender documents and / or is of an essential condition, the rectification of which would affect unfairly the competitive position of other tenderers presenting substantially responsive tenders at reasonable price.
- 20.2 If a tender is not substantially responsive to the requirements of the tender documents, it will be rejected by the Employer, and will not subsequently be permitted to be made responsive by the tenderer by correction or withdrawal of the non-conformity or infirmity. However minor clarifications if required may be asked from the Tenderer.
- 20.3 The decision of the Engineer/Employer as to which of the tenders are not substantially responsive or have impractical / methods or Programme for execution shall be final.
- 21.0 EVALUATION OF TENDER
- 21.0.1 General Evaluation: First of all it will be determined whether each tender is accompanied with the valid tender cost & tender security i.e. the required amount and in an acceptable form. Tenders not accompanied with the valid tender cost & tender security shall be rejected and may not be evaluated further.
- 21.0.2 Evaluation of minimum eligibility criteria – This evaluation will be done to check if the tenderer quality the minimum eligibility criteria of "work experience", "Financial standing" as laid down in Clause 1.2 of NIT. Tenderers, which do not qualify in any of the minimum eligibility criteria or bid capacity criteria, shall not be considered for further evaluation and shall be rejected.
- 21.0.3 The Employer will evaluate the technical suitability and acceptability of the proposals as per the employer's requirements. The evaluation shall be based on the documents submitted as per clause 8.0 of ITT. Tenderer(s) may be asked to make a presentation of their proposal to DMRC team for evaluation.
- 21.0.4 The Employer will carry out technical evaluation of submitted technical proposals/ mandatory documents as per eligibility criteria to determine that the tenderer has a full comprehension of the work of the contract. Where a tenderer's technical submittal has a major inadequacy his tender will be considered to be non-compliant and will be rejected.
- 21.0.5 Technically acceptable tenders will be eligible for consideration of their financial proposals.
- 21.0.6 If any tender is rejected, the Financial Bid of such tenderer shall be unopened

- 21.0.7 The Employer will carry out technical evaluation of submitted technical proposals to determine that the tenderer has a full comprehension of the work of the contract. Where a tenderer's technical submittal has a major inadequacy his tender will be considered to be non-compliant and will be rejected.
- 21.0.8 Tenderer who fails to submit the Tender cost and Tender security as per NIT in original, to the office of undersigned, summarily be rejected.
- 21.0.9 Technically acceptable tenders will be eligible for consideration of their financial proposals.
- 21.0.10 The evaluation of Financial proposals by the Employer / Engineer will take into account, in addition to the tender amounts, the following factors:
- a). Arithmetical errors corrected by the Employer/Engineer in accordance with Clause 22.0
 - b). Such other factors of administrative nature as the Employer/Engineer may consider to have a potentially significant impact on contract execution, price and payments, including the effect of items or unit rates that are unbalanced or unrealistically priced.
- 21.0.11 Offers, deviations and other factors, which are in excess of the requirements of the tender documents or otherwise will result in the accrual of unsolicited benefits to the Employer, shall not be taken into account in tender evaluation.
- 21.0.12 Price adjustment provisions applicable during the period of execution of the contract shall not be taken into account in tender evaluation.
- 21.0.13 Evaluation of financial offer will be based on quantities in Bill of quantities (BOQ) and rates quoted. Any alteration in BOQ will not be given any cognizance.

22.0 CORRECTION OF ERRORS

- 22.1 Tenders determined to be technically acceptable after technical evaluation will be checked by the Engineer/ Employer for any arithmetical errors in computation and summation during financial evaluation. Errors will be corrected by the Employer / Engineer as follows:
- a. Where there is a discrepancy between amounts in figures and in words, the amount in words will govern; and
 - b. Where there is a discrepancy between the unit price and the total amount derived from the multiplication of the unit price and the quantity, the unit price as quoted will normally govern unless in the opinion of the Employer / Engineer there is an obviously gross misplacement of the decimal point in the unit price, in which event, the total amount as quoted will govern.
- 22.2 If a Tenderer does not accept the correction of errors as outlined above, his tender will be rejected and the tender security forfeited.

AWARD OF CONTRACT

23.0 AWARD CRITERIA

- 23.0.1 DMRC is not bound to award the Contract to the tenderer and reserves its rights without incurring any liability to any tenderer. DMRC will not provide reasons for acceptance or rejection of any offer or part thereof.
- 23.0.2 The Employer will award, the Contract to the tenderer, whose tender has been determined to be substantially responsive, technically & financially suitable, complete and in accordance with the tender documents.

23.0.3 The Employer will award, the Contract to the tenderer, whose tender has been determined to be substantially responsive, technically & financially suitable, complete and in accordance with the tender documents.

24.0 EMPLOYER'S RIGHT TO ACCEPT ANY TENDER AND TO REJECT ANY OR ALL TENDERS

24.1 The Employer reserves the right to accept or reject any tender, and to annul the tender process and reject all tenders, at any time prior to award of Contract.

25.0 NOTIFICATION OF AWARD

25.1 Prior to the expiry of the period of tender validity prescribed by the Engineer/Employer, the Engineer/Employer will notify the successful tenderer www.https://eprocure.gov.in/eprocure/app, to be confirmed in writing by registered letter, that his tender has been accepted. This letter (hereinafter and in the Conditions of Contract called 'the Letter of Acceptance') shall name the sum which the Employer will pay to the Contractor in consideration of the execution, completion of the works by the Contractor as prescribed by the Contract (hereinafter and in the conditions of Contract called 'the Contract Price'). The "Letter of acceptance" will be sent in duplicate to the successful tenderer, who will return one copy to the Employer duly acknowledged and signed by the authorised signatory, within three days of receipt of the same by him. No correspondence will be entertained by the Employer from the unsuccessful Tenderers.

25.2 The Letter of Acceptance will constitute a part of the contract.

25.3 Upon "Letter of acceptance" being signed and returned by the successful tenderer, the employer will promptly notify the unsuccessful tenderers and discharge / return their tender securities.

26.0 SIGNING OF AGREEMENT

26.1 The Employer shall prepare the Agreement in the Proforma (Form E) included in this Document, duly incorporating all the terms of agreement between the two parties. Within 45 Days from the date of issue of the letter of acceptance, the successful tenderer will be required to execute the Contract Agreement.

27.0 PERFORMANCE SECURITY

27.1 Within 30 days of receipt of the letter of Acceptance the successful Tenderer shall furnish performance security in accordance with Clause 4.2 of the GCC shall be in the form of a bank guarantee (as per Form-D) from branch in India of a schedules foreign bank or from a scheduled commercial bank in India acceptable to the employer for an amount of 10% of contract value in types & proportions of currencies in which the contract Price is payable. The approved from provided in the "Instructions to Tenderers" documents, or any other form approved by the Employer shall be used for Bank Guarantee. The Bank Guarantee shall be valid up to Defect Liability Period.

27.2 The required Performance Security for the sum mentioned above may be submitted in any one of the following forms:

Irrevocable Bank Guarantee in the prescribed format, given as FORM-D of Instruction to Tenderers (ITT), issued by a Scheduled Commercial Bank based in India or from a branch in India of Scheduled Foreign Bank (as per Annexure-E) The Bank Guarantee must be issued on the Structured Financial Messaging System (SFMS) Platform. A separate invoice of the BG will invariably be sent by the issuing bank to the Employer's bank through SFMS. The details of Employer's Bank are as under:

ICICI BANK LTD.
9A, Phelps Building,
Connaught Place, New Delhi – 110001
IFSC Code – ICIC0000007

The Bank Guarantee issued on the SFMS platform shall only be acceptable to the Employer.

The Performance Guarantee should be valid for a period of 6 (six) months beyond the Defect Liability Period.

- 6.1 The Tenderer has to furnish other Guarantees, Undertakings and Warranties in accordance with the provisions of the General Conditions of Contract and Special Conditions of Contract.
- 6.2 Failure of successful Tenderer to furnish the required Performance Security shall be a ground for annulment of the award and forfeiture of the Tender Security.

- 28.0 Cancellation of Letter of Acceptance (LOA) and Form of Tender.

- 28.1 In case Successful tenderer fails to commence the work (for whatsoever reasons) as per Terms and Conditions of Tender after issuance of LOA then the LOA shall be cancelled and the tender security shall be forfeited.

- 29.0 Defect Liability Period
- 29.1 Defect Liability Period shall be of 02(two) years from the date of issue of Completion Certificate, for all the items supplied, works carried out & the defects left by contractor in execution of work.
- 29.2 During the DLP, contractor shall be responsible to carry out all the comprehensive preventive, corrective & breakdown maintenance of the installed system including spare parts & consumables.

APPENDIX I

CHECK LIST OF DOCUMENTS TO BE SUBMITTED WITH THE TENDER
COMPILED FROM THE PROVISIONS IN THIS VOLUME

Sl. No.	Document	Reference to Clause No. of "Instructions to Tenderers"
	TENDER PACKAGE COMPRISING OF:	
1.	Tender Cost and Tender Security	3.0 & 12.0
2.	Power of attorney for individuals signing on behalf of Company/Firm Or Power of attorney in favour of the leading member of Joint Venture / Consortium.	2.4 & 13.0 2.4 & 13.0
3.	Documents Required for evaluation of Tender	8.0
4.	Work Experiences	8.1.3 (i)
5.	Audited Financial Document	8.1.3 (ii)
6.	Documents to certify the positive net worth	8.1.3 (iii)
7.	Solvency certificate	8.1.3 (iv)
8.	Declaration for Non-Black Listing / De-registered by any Govt / PSU	8.1.3 (v)
9.	Form of tender	8.1.3 (vi)
10.	Power of Attorney	8.1.3 (vii)
11.	Self attested copies of the following documents: i. Pan No. as per Income Tax Act. j. Sales Tax Registration Certificate / VAT Registration Certificate k. Service Tax Registration Certificate l. PF Registration No./ Exemption undertaking m. ESI Registration No. / Exemption undertaking	8.1.3 (viii & ix)
12.	Statement of deviations from Tender Documents (Form C)	8.1.3 (x)
13.	Technical data sheet	8.1.3 (xi)
14.	Experience record of similar works (Form T-II)	8.1.3 (xii)
15.	Detail of Personnel (Form T-III)	8.1.3 (xiii)
16.	Detail of Resources (Form T-IV)	8.1.3 (xiv)
17.	Financial Data for similar work (Form T-V)	8.1.3 (xv)

INDEX ON

PROFORMA OF FORMS

1.	PROFORMA OF FORMS – GENERAL (Items (iii & IV) applicable only for successful tenderers)	FORM
	i. Form of Tender with Appendix	A
	ii. Performa for Statement of Deviations	C
	iii. Form of Performance Security (Guarantee) by Bank	D
	iv. Form of Agreement	E
2.	PROFORMA OF FORMS – POST QUALIFICATION PARTICULARS	FORM
	i. General Information	T-I
	ii. Experience Record	T-II
	iii. Resources Proposed for the Work-Personnel	T-III
	iv. Resources Proposed for the work- Machinery & Equipment	T-IV
	v. Financial Data	T-V

FORM OF TENDER

- Note:
- i. The Appendix forms part of the Tender
 - ii. Tenderers are required to fill up all the blank spaces in this Form of Tender and Appendix.

Name of Work: As in the NIT clause No. 1.1

To,
Dy. GM/ E&M/UG,
DMRC,
2nd, Floor, Fire Brigade Lane,
Barakhamba Road New Delhi-110001

1. Having visited the site and examined the General Conditions of Contract as well as Special Conditions of Contract, Specifications, Instructions to Tenderers, for the execution of above named works, we the undersigned, offer to execute and complete such works and remedy defects therein in conformity with the said Conditions of Contract, Specifications, and Addenda for the amount indicated in BOQ.
2. We acknowledge that the Appendix forms an integral part of the Tender.
3. We undertake, if our Tender is accepted, to commence the works within 10 days of issue of the LOA to commence and to complete the whole of the Works comprised in the Contract within 6 months calculated from the 10th day of issue of LOA, as indicated in the Appendix.
4. If our Tender is accepted, we will furnish at our option a Bank Guarantee for Performance as security for the due performance of the Contract. The amount and form of such guarantee or bond will be in accordance with Clause 15.0 of the General Conditions of the Contract and as indicated in the Appendix.
5. We have independently considered the amount shown Clause 8.5 of the General Conditions of Contract as liquidated damages and agree that they represent a fair estimate of the damages likely to be suffered by you in the event of the work not being completed in time.
6. We agree to abide by this Tender for a minimum period of 120 days from the date fixed for receiving the same and it shall remain binding upon us and may be accepted at any time before the expiry of that period or any extended period mutually agreed to.
7. Unless and until a formal Agreement is prepared and executed, this Tender, together with your written acceptance thereof, shall constitute a binding contract between us.
8. We declare that the submission of this Tender confirms that no agent, middleman or any intermediary has been, or will be engaged to provide any services, or any other item of work related to the award and performance of this Contract. We further confirm and declare that no agency commission or any payment, which may be construed as an agency commission has been, or will be, paid and that the tender price does not include any such amount.
9. We acknowledge the right of the Employer, if he finds to the contrary, to declare our Tender to be non-compliant and if the Contract has been awarded to declare the Contract null and void.
10. We understand that you are not bound to accept the lowest or any tender you may receive.
11. If our Tender is accepted we understand that we are to be held solely responsible for the due performance of the Contract.

Dated this.....day of..... 2016

Signature

Name..... in the capacity of

duly authorised to sign Tenders for and on behalf of.....

Address

Witness – Signature

Name

Address

Occupation

APPENDIX TO THE FORM OF TENDER

Condition of contract clause

- i. Amount of bank guarantee as performance security 27.0 of ITT
- ii. Contract period from the date of issue of LOA 1.1.1 of NIT

Signature of authorized signatory

On behalf of tenderer

Date

Name

Place

Address

PROFORMA FOR STATEMENT OF DEVIATIONS

1. The following are particulars of deviations from the requirements of the tender specifications

Sr. No.	Clause	Deviations	Remark (Including justification)	Price adjustment for withdrawal of each deviation/s.

2. The following are particulars of deviations from the requirements of the "Instructions to Tenderers," "General Conditions of Contract" and "Special Conditions of Contract".

Sr. No.	Clause	Deviations	Remark (Including justification)	Price adjustment for withdrawal of each deviation/s.

Signature of Tenderer

Note

- Where there is no deviation, the statement should be returned duly signed with an endorsement indicating 'No Deviations'.
- The tenderer shall indicate price adjustment against each deviation, which he shall like to add to the tender price for withdrawing unconditionally his deviations if the same are unacceptable to the Employer.

FORM OF PERFORMANCE SECURITY (GUARANTEE) BY BANK

1. This deed of Guarantee made this day of _____ 2016 between Bank of _____ (hereinafter called the "Bank") of the one part, and Delhi Metro Rail Corporation Limited (hereinafter called "the Employer") of the other part.
2. Whereas Delhi Metro Rail Corporation Limited has awarded the Contract for -----
----- of
Delhi MRTS Project (hereinafter called "the contract") to M/s _____ (Name of the Contractor)
(hereinafter called "the Contractor").
3. AND WHEREAS the Contractor is bound by the said Contract to submit to the Employer a Performance Security for a total amount of Rs. _____ (Amount in figures and words).
4. Now we the Undersigned _____ (Name of the Bank) being fully authorised to sign and to incur obligations for and on behalf of and in the name of _____ (Full name of Bank), hereby declare that the said Bank will guarantee the Employer the full amount of Rs. _____ (Amount in figures and Words) as stated above.
5. After the Contractor has signed the aforementioned Contract with the Employer, the Bank is engaged to pay the Employer, any amount up to and inclusive of the aforementioned full amount upon written order from the Employer to indemnify the Employer for any liability of damage resulting from any defects or shortcomings of the Contractor or the debts he may have incurred to any parties involved in the Works under the Contract mentioned above, whether these defects or shortcomings or debts are actual or estimated or expected. The Bank will deliver the money required by the Employer immediately on demand without delay without reference to the Contractor and without the necessity of a previous notice or of judicial or administrative procedures and without it being necessary to prove to the Bank the liability or damages resulting from any defects or shortcomings or debts of the Contractor. The Bank shall pay to the Employer any money so demanded notwithstanding any dispute/disputes raised by the Contractor in any suit or proceedings pending before any Court, Tribunal or Arbitrator/s relating thereto and the liability under this guarantee shall be absolute and unequivocal.
6. This Guarantee is valid for a period of 36 Months from the date of signing. (The initial period for which this Guarantee will be valid must be for at least 24 months longer than the anticipated expiry date of Contract period.
7. At any time during the period in which this Guarantee is still valid, if the Employer agrees to grant a time extension to the Contractor or if the Contractor fails to complete the Works within the time of completion as stated in the Contract, or fails to discharge himself of the liability or damages or debts as stated under Para 5, above, it is understood that the Bank will extend this Guarantee under the same conditions for the required time on demand by the Employer and at the cost of the Contractor.
8. The Guarantee hereinbefore contained shall not be affected by any change in the Constitution of the Bank or of the Contractor.

- 9. The neglect or forbearance of the Employer in enforcement of payment of any moneys, the payment whereof is intended to be hereby secured or the giving of time by the Employer for the payment hereof shall in no way relieve the bank of their liability under this deed.
- 10. The expressions "the Employer", "the Bank" and "the Contractor" hereinbefore used shall include their respective successors and assigns.

In witness whereof I/We of the bank have signed and sealed this guarantee on the _____ day of _____ (Month) 2016 being herewith duly authorised.

For and on behalf of

the _____ Bank.

Signature of authorised Bank official

Name :
 Designation :
 I.D. No. :
 Stamp/Seal of the Bank :

Signed, sealed and delivered
for and on behalf of the Bank
by the above named _____

In the presence of :

Witness 1.

Signature
 Name
 Address

Witness 2.

Signature
 Name
 Address

FORM OF AGREEMENT

This Agreement is made on the _____ day of _____ 2016 Between Delhi Metro Rail Corporation Limited 2nd Floor, Metro Bhawan, Fire Brigade Lane, Barakhambha Road New Delhi-110001 hereinafter called "the Employer" of the one part and _____ (Name and _____ Address _____ of _____ Contractor) _____ hereinafter called "the Contractor" of the other part.

Whereas the Employer is desirous that (***) certain Goods and Services should be provided and certain Works should be executed, Contract for -----of Metro Corridor of Delhi MRTS Project hereinafter called "the Works" and has accepted a Tender by the Contractor for the execution and completion of such works (***) as well as guarantee of such works) and the remedying of defects therein.

NOW THIS AGREEMENT WITNESSETH as follows:

1. In this Agreement words and expression shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.
2. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz:
 - (a) Letter of acceptance
 - (b) General Conditions of Contract
 - (c) Special Conditions of Contract
 - (d) Notice Inviting Tender
 - (e) Specifications & Drawings
 - (f) Bill of Quantities
 - (g) Form of Tender with Appendix
 - (h) Addendums, if any
 - (i) Other conditions agreed to and documented as listed below:
 - (i) Statement of deviations (if applicable)
 - (ii) Any other item as applicable
3. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the works by **_____ and remedy any defects therein in conformity in all respects with the provisions of the Contract.
4. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the works and the remedying of defects therein, the Contract Price of **Rs_____ being the sum stated in the letter of acceptance subject to such additions thereto or deductions there from as may be made under the provisions of the Contract at the times and in the manner prescribed by the Contract.

5. OBLIGATION OF THE CONTRACTOR

The contractor shall ensure full compliance with tax laws of India with regard to this contract and shall be solely responsible for the same. The contractor shall submit copies of acknowledgements evidencing filing of returns every year and shall keep the Employer fully indemnified against liability of tax, interest, penalty etc. of the contractor in respect thereof, which may arise.

6. JURISDICTION OF COURT

The Courts at Delhi/New Delhi shall have the exclusive jurisdiction to try all disputes arising out of this agreement between the parties.

IN WITNESS WHEREOF the parties hereto have caused their respective Common Seals to be hereunto affixed / (or have hereunto set their respective hands and seals) the day and year first above written.

For and on behalf of the Contractor

For and on behalf of the Employer

Signature of the authorised official

Signature of the authorised official

Name of the official

Name of the official

Stamp/Seal of the Contractor

Stamp/Seal of the Employer

SIGNED, SEALED AND DELIVERED

By the said

By the said

_____ Name

_____ Name

on behalf of the Contractor in the presence of:

on behalf of the Employer in the presence of:

Witness _____

Witness _____

Name _____

Name _____

Address _____

Address _____

Note :

- + To be made out by the Employer at the time of finalization of the Form of Agreement.
- ** Blanks to be filled by the Employer at the time of finalization of the Form of Agreement.
- *** to be deleted if not applicable

GENERAL INFORMATION

Notes :

- (i) Attach an attested photocopy of Certificate of Registration and ownership as well as of Constitution and legal status.

1. Names of participating member

(a)

2. Address, telephone, telefax, cable numbers

Registered Office

Office for correspondence

(a)

(b)

(c)

3. Contact persons address, telephone etc.

(a)

(b)

(c)

EXPERIENCERECORD

1. Details of experience of similar work".

Sl. No.	Period	Details of work handled	Total Cost of work in Rs.	Remarks
(1)	(2)	(3)	(4)	(5)

Notes :

- i) Details submitted in any other Performa will not be considered.
- ii) The details of work including the cost of the work should be supported by attested copy of each client's certificate.
- iii) Additional pages may be attached if required.
- iv) All the pages must be signed by the authorize signatory of the tenderer.

DETAILS OF PERSONNEL

S. No.	Designation	No. of Personnel Available
A	B	C
1	Engineer	
2	Supervisors	
3	Technician	

Resources for the works - Machinery & Equipment

Sl.No.	Description Of Machines/Equipments	Nos. available	Location

FINANCIAL DATA

Total value work for Similar work done During the period 2013-14 to 2015-16

S.No.	Description	Year 2013-2014	Year 2014-2015	Year 2015 - 2016
(1)	(2)	(3)	(4)	(5)
1.	Total value of work done			

FINANCIAL DATA
(Refer Clause 8.1.1)

List of all Ongoing Contracts

Name of the applicant (constituent member in case of Group)	Total number of works in hand	Number of contracts of each type		Number for which applicant went in for		Number of contracts in which date of completion given in the original has already burst	Total value of works done in Rupee equivalent as on 31/03/2016		
				Arbitration	litigation		Year 2013-2014	Year 2014-2015	Year 2015 - 2016

Applicant should provide information on their current commitments or all contracts that have been awarded or for which a letter of intent or acceptance has been received or for contracts approaching completion but for which a completion certificate is yet to be issued.

Special Conditions of Contract

1. Advance Payment: - No Advance of any type shall be paid.
2. Price Variation Clause: - The Price Variation Clause is not applicable in this contract. The rate quoted shall be inclusive of all taxes and duties.
3. Taxes: The contractor shall quote the rate inclusive of all the applicable taxes for the item/items mentioned in the Bill of Quantities (BOQ). However the firm shall have to show all the taxes separately applicable at the time of payment in the bill submitted for the payment.
4. Termination of Contract: - If the contractor fails to perform satisfactorily, the contract can be terminated at any time without assigning any reason by giving 15 days notice to the Contractor.
5. Penalty: i. DLP penalty: A penalty will be imposed @Rs.200/- per day for minor repair works & Rs. 2000/- per day for major repair works, in case of non-rectification of fault stipulated time as per tender clause Section-2, 7.0 or poor work quality.
ii. if fault not rectified in stipulated time, the work shall be carried out by DMRC on the risk & cost of contractor
6. Safety of Personnel: - The Contractor will take full responsibility for the Safety of his Staff, Materials etc.
7. Quantity / Contract period variation Clause: - The Quantity of manpower/ contract period mentioned may vary +/-25% of BOQ
8. Extension of time: If the contractor shall desire an extension of time for completion of work on the grounds of his having been unavoidably hindered in its execution or on any other ground, he shall apply in writing to the Engineer – in –charge within 30 days of the hindrance on the account on which he desires such extension as aforesaid, and the Engineer – in – charge shall, if in his opinion reasonable grounds to be shown therefore, authorize such provisional extension of time, if any, as in his opinion be necessary or proper.
9. Compensation for delay: Against delay in completion of work: If the contractor fails to maintain the required progress or complete the work and clear the site on or before the contract or extended date of completion, he has to pay the compensation for delay which is limited to 0.5% per week of work order value for the first 10 weeks and 0.7 % per week for next 10 weeks and thereafter subject to a maximum of 10% of the work order value for the location where the work is delayed and the firm is found responsible for the same. Flow chart of the procurement process / contract shall be supplied by the contractor and approved by Executive Engineer concerned.
10. Any Damage/Breakage to the DMRC property during the execution of work will be at the risk & cost of the Contractor & in this regard The DMRC' decision will be final regarding amount of damage/breakage etc. The amount will be deduced from contractor's bill.
11. Materials identified as such by the Engineer and advised to the contractor, shall not be dispatched from the site without written authority from the Engineer.
12. The Contractor if awards either partly or fully of any work covered under contract to a Sub-contractor/OEM/Third party, he shall submit the documentary proof from the contractor concerned, that such award will not in any way affect the performance of the equipment/Plant, prior to the start of such work. Also, the sub-contractor firm name, address and availability of trained manpower shall be furnished for the approval.
13. The DMRC shall have the right to make minor alterations/additions/substitutions in the specifications in the scope of work or issue instructions that may be deemed necessary during the period of the contract and contractor shall carry out the work in accordance with the instructions which may be given to him by Authorized DMRC' representative.
14. The contractor shall on request of Engineer-in-charge forthwith remove from the works any person employed thereon by him who in the opinion of Engineer-in-charge may

misconduct himself or suspicious from security point of view and such persons shall not again be employed on the work without permission of the Engineer-in-charge.

15. The DMRC' General Conditions of Contract are applicable & can be seen by the contractor at the office of Dy.GM/E&M/UG on any working day.
16. Electrical power connection, water as required shall be provided by DMRC free of cost. However, contractor shall use its own resources to take necessary connections from point informed by Engineer in-charge.
17. Price variation on account of any statutory changes in VAT and Service tax shall be payable/recoverable during currency of contract and any variation in all other existing taxes, duties, levies etc, will not be considered.
18. Any additional new taxes (if imposed in future and applicable for this type of contract) shall be dealt accordingly as per the provisions of new tax.

Terms and Conditions

1. Only authorized staff of Contractor having proper Photo Identity Card issued by the Contractor and with Permission granted by DMRC, shall be permitted to work "Supply, installation, testing ,commissioning of Air cooled chillers including the interconnection with existing FCUs and existing chilled water piping including complete integration with existing BMS system at Kashmiri Gate & Vishvidyalaya Metro stations."
2. The contractor will have to submit the list of the Authorized staff along with a set of the Photo Identity Cards to whom permission will be required to be issued by DMRC
3. The Contractor during the Execution of work shall follow the Indian Electricity Rules, Indian Electricity Act & all other Statutory Rules, Regulations & Acts as available on date & during the period of contract.
4. The Contractor shall be responsible to fulfill all statutory liabilities, if any towards his staff such as payment of minimum wages, PF, ESI and any other dues etc including all amendments issued by the Govt. from time to time. Being a Principal Employer, DMRC may ask to submit documents in original.
5. The work is to be carried out under the guidance of DMRC only.
6. No T&Ps shall be issued to the contractor. All T&Ps, Instruments, Machines, etc. will be brought by the Contractor only. The cost of all these items shall be borne by the contractor.
7. Labour- No labour shall be provided by DMRC.
8. Transport: No separate charges will be paid for transport.
9. As per site conditions the contractor may have to carry out the work during night hours. No extra payment shall be made on this account.
10. Successful Contractor shall be submit the following insurance cover under the following requirements:
 - a) Contractor's all risk & third party.
 - b) Liability under the workmen's compensation act 1923, minimum wages act 1948 and contract labour (regulation and abolition) act, 1970.
 - c) Accident to staff, engineers, supervisors and other who are not governed by workmen's compensation Act.
 - d) Damage to material, machinery and works due to fire, theft etc.

ANNEXURE 'A'

CERTIFICATE BY CONTRACTOR

1. In compliance to the provisions of the Minimum wages act 1948 and rules made there under in respect of any employees engaged by me/us, I/We hereby declare that the labour engaged by me/us have been fully paid for. In the event of any outstanding due to be payable to any labour/labours engaged by me/us, Cooperation is entitled to recover the same from any money due to accruing to me /us in consideration of payment to such labour/labour.

2. Certified that EPF, Payment of wages act, 1948, workmen compensation Act, 1923 Contractor Labour Act, 1938, Factories Act, 1948 have been fully complied with by me/us. Photocopies of challans for EPF/ESI deposited are enclosed herewith

Annexure-B

FORM OF BANK GUARANTEE FOR TENDER SECURITY

Know all Men by these presents that we
 (name of bank and address) of India, having our registered office at
(hereinafter called the Bank) are bound unto DELHI METRO
 RAIL CORPORATION (hereinafter called the Employer) in sum of/- for which
 payment well and truly to be made to the said Employer, the bank binds himself, his successors
 and assigns by these presents.

WHEREAS (name of Tenderer) (hereinafter called "the Tenderer") has
 submitted his tender datedfor contract /Joint Ventures/Consortium, in Govt./Semi Govt.
 organization (refer clause 1.2.2 of NIT) for "....." (hereinafter offer as
 aforesaid).

WHEREAS the Tenderer is required to furnish a Bank Guarantee for the sum of
 ' (Amount in figures and words) as Tender security against the Tenderer's
 offer as aforesaid.

AND WHEREAS(name of bank) (from scheduled commercial bank based in
 India or State bank of India) have, at the request of the Tenderer, agreed to give this guarantee
 as hereinafter contained.

We further agree as follows:

- i.) That the employer may without affecting this guarantee grant time or other indulgence
 to or negotiate further with the Tenderer in regard to the conditions contained in the
 said tender and thereby modify these conditions or add thereto any further conditions
 as may be mutually agreed upon between the Employer and the tenderer.
- ii.) That the guarantee herein before contained shall not be affected by any change in
 constitution of out bank or in the constitution of the tenderer.
- iii.) That this guarantee commences from the date hereof and shall remain in force till
 - a. The tenderer, in case his tender is accepted by the Employer, executes a formal
 agreement after furnishing the Performance security on an scheduled commercial
 bank based in India.
 - b. 30 days after the date of validity or the extended date of validity of the tender, as
 the case maybe;

which ever is earlier.

- iv.) That the expression "the Tenderer" and the "the Bank" herein used shall, unless such as
 interpretation is repugnant to the subject or context, include their respective
 successors and assigns.

THE CONDITIONS of this obligation are:

- i) If the Tenderer withdraws his tender during the period of tender validity specified in the
 form of Tender, or
- ii) If the Tenderer refuses to accept the corrections of error in his tender; or
- iii) If the tenderer fails to withdraw conditions, qualifications, deviations etc. proposed by
 him at the cost of withdrwal given in his tender; or
- iv) If the tenderer having seen notified of the acceptance of his Tender by the Employer
 during the period of tender validity.
 - a. Fails or refuses to furnish the Performance Security and/or

- b. Fails or refuses to enter into a Contract within the time limit specified in tender clause...12.7 of the "Instructions to tenderers"

We undertake to pay to the Employer the above amount upon receipt of his first written demand, without the Employer having to substantiate his demand provided that in his demand the Employer will note that the amount claimed by him is due to him owing to the occurrence of any one or more of the conditions (i), (ii), (iii), (iv) a and (iv) b mentioned above, specifying the occurred condition or conditions.

Signature of Witness

Signature of Authorized official of the bank

Name of Witness.....

Name of Official.....

Address of witness

Designation.....

.....

Stamp/Seal of Bank.....

.....

Annexure – C

i. Contract /LOA / Agreement No.:ii. Beneficiary Name:iii. Beneficiary Address:

Line-1:	
Line-2:	
District / City :	State /UT :
PIN CIDE :	Tele / Fax :
Mobile Alert :	
1.	
2.	
3.	
4.	

iv. Bank Details:

Bank Name :									
Branch Address :									
Beneficiary A/c No. :									
Beneficiary A/c Type (Saving / Current) :									
Beneficiary A/c Name :									
9-Digit Branch MICR Code :									
IFSC Code of the Branch									

Stamp & Signature of Authorized Signatory

NOTE: Duly verified by Bank

Note: along with one cancelled cheque

VENDOR MASTER DATA CREATION / CHANGE REQUEST FORM	
Account Group (In case of New Vendor Creation Only)	
Purchasing Organization (In case of New Vendor Creation Only)	
VENDOR NUMBER (In case of Change Only)	
NAME #	
Title	
Name	
SEARCH TERM %	
Search Term	
STREET ADDRESS #	
Street / House No.	
Postal Code / City	
Country	
COMMUNICATION #	
Telephone No.	
Mobile No.	
Fax No.	
E-Mail	
TAX INFORMATION #	
VAT Registration No.	
PAN Number	
BANK DETAIL #	
Bank Name	
Branch Address	
Country	
Beneficiary A/c Type (Saving / Current)	
Beneficiary A/c Name	
Beneficiary A/c Number	
Branch MICR Code (Optional)	
Branch IFSC Code	
Bank Key	
ALTERNATIVE PAYEE IN DOCUMENT %	
Permitted Payee, if any	
ACCOUNTING INFORMATION %	
Reconciliation Account	
Sort Key	
Cash Management Group	
PAYMENT DATA %	
Payment Terms	
Chk Cashing Time	
AUTOMATIC PAYMENT TRANSACTIONS %	
Payment Method	
House Bank	
WITHHOLDING TAX INFORMATION %	
Withholding Tax Type (Separated by comma in case of more than one)	
W/Tax Code	
Liable (Y / N)	
Rec. Type	
W / Tax ID	

Annexure-D

(On stamp paper of Rs. 10/-)

I, S/o....., proprietor/authorized signatory of M/s....., (Name and address of the firm) do hereby undertaking that M/s.....(Name and address of the firm) not involved in any litigation/arbitration or no case pending in any court against them and has not been also blacklisted or de-registered by any Government or public sector during the last 5 year.

Place.....

Date.....

Deponent

VERIFICATION

I the above named deponent do hereby solemnly affirm and declare that the content of my above undertaking are true to the best of my knowledge and nothing has been concealed therein.

Verified on.....

DEPONENT

ANNEXURE-E

The following are the Scheduled Banks in India (Public Sector)

1. State Bank of India
2. State Bank of Bikaner and Jaipur
3. State Bank of Hyderabad
4. State Bank of Indore
5. State Bank of Mysore
6. State Bank of Patiala
7. State Bank of Saurashtra
8. State Bank of Travancore
9. Andhara Bank
10. Allahabad Bank
11. Bank of Baroda
12. Bank of India
13. Bank of Maharashtra
14. Canara Bank
15. Central Bank of India
16. Corporation Bank
17. Dena Bank
18. Indian Overseas Bank
19. Indian Bank
20. Oriental Bank of Commerce
21. Punjab National Bank
22. Punjab and Sind Bank
23. Syndicate Bank
24. Union Bank of India
25. United Bank of India
26. UCO Bank
27. Vijaya Bank

The following are the Scheduled Banks in India (Pvt. Sector)

1. Vysya Bank Ltd.
2. Axis Bank Ltd.
3. Indusind Bank Ltd.
4. ICICI Banking Corporation Bank Ltd.
5. Global trust Bank Ltd.
6. HDFC Bank Ltd.
7. Centurion Bank Ltd.
8. Bank of Punjab Ltd.
9. IDBI Bank Ltd.

The following are the Scheduled Foreign Banks in India

1. American Express Bank Ltd.
2. ANZ Gridlays Bank Plc.
3. Bank of America NT & SA
4. Bank of Tokyo Ltd.
5. BanqucNationale de Paris
6. Barclays Bank Plc
7. Citi Bank N.C.
8. Deutsche Bank A.G
9. HSBC
10. Standard Chartered Bank
11. The Chase Manhattan Bank Ltd.

(Annexure to be submit with each invoice)
((To be printed on Company / Firm Letter Head))

To.
Dy HOD of Executive deptt
DMRC Ltd
Metro Bhawan
Delhi

Sub: Declaration regarding service tax/ DVAT charged on Invoice No. dt.... For contract no.....
Ref: Contractor name : M/s
Contract No.....
PAN No., DVAT/HVAT/UPVAT no., service tax no.

Dear Sir,

I (Name of Prop/partner/Director or any authorized person) certified on half of M/s (Name of company) that M/s complied all the applicable laws under the registration number as mentioned above, further the amount of service tax (service tax of my Portion, in case of reverse charge)_ and State VAT Laws (such as DVAT, UPVAT & HVAT) charged on Tax invoice(s) as mentioned above is paid or will be paid on or before the due date to the Govt. Treasury and the challan/ return duly reconciled will be provided to you on half yearly basis.

Thanking You

(Authoerized Signatory)

For M/s

Verified by Engineer In-charge

Signature

Annexure-G

Technical Data Sheet

S No	Equipm ent	Specification as per DMRC requirement		Complied/ Non Complied	Remarks
1	Air cooled chiller	Capacity	Not less than 34 TR at outside design condition of 95°F DB and 75°F WB		
2		Leaving chilled water temperature	8 °C		
3		Entering chilled water temperature	15 °C		
4		Chilled water flow rate	82 USGPM (2.5USGPM / TR)		
5		Chiller fouling factor	0.000089 m ² °C/W		
6		Outside design conditions	95°F DB and 75°F WB		
7		IKW	Not more than 1.25 KW/TR at Full Load and at 95 Degree F DB		
8		High ambient Test	Chiller shall be designed for working at high ambient temperature equal or above 52 °c		
9		Type of Compressor	Scroll type (Single OR Double)		
10		Refrigerant	R134a / R 410 a/R 407		
11		Modulation capacity	Compressors shall be with Step Less Capacity modulation with each step variation less than 1% of total capacity		
12		db level	Not more than 80db from 3 mtr distance.		
13		Starter	Star-Delta starter		
14		Chiller tubes	Shell and Tube or brazed plate type		
15		Air Cooled condenser tubes	fins with hydrophobic coating to give 3-5 times higher corrosion control resistance. Or as per OEM recommendation		
16		Microprocessor Panel	Panel shall be BMS compatible with existing BMS communication protocol installed at stations (firm shall verify during the site visit at station)		
17		In built Starter	Machine Panel Board in built Starter station BMS compatible		
18		Make	TRANE/CARRIER/ BLUESTAR/YORK/VOLTAS/DAIKIN/ HITACHI/Dunham Bush/ETA		

19	Chilled Water Pumps	Type of Pump	End section centrifugal pump for Chilled Water Circulation, directly coupled to IEC standard electric motor for low noise and vibration		
20		Delivering capacity	82 USGPM of water against a head of 42/55 m.		
21		Pump rating	Energy Efficient Squirrel Cage Induction Motor, TEFC, synchronous speed 1500 RPM, suitable for operation in 400 volts, 3 phase 50 Hz. AC		
22		Protection class enclosure,	IP 55		
23		insulation class	Class - 'F' conforming to IS - 325.		
24		Make	Kirloskar /ITT Bell & Gossett/ star rating (minimum three star and above)		
25	FCUs	type fan coil unit	sheet metal horizontal ceiling suspended / vertical high wall mounted with isolators		
26		Type of blower	Double skin forward curved centrifugal blowers (as per specification) statically and dynamically balanced		
27		Power supply	Single phase drive motor suitable for 220V (+/-10%) power supply with 3 way motorized valve		
28		Motor	Split Capacitor type UL listed having thermal overload protection		
29		chilled water cooling coil structure	of at least 3 rows deep with copper tube [27g (nominal)]		
30		Filter fabrication	cleanable synthetic woven filter with anodized aluminum frame		
31		Provision of thermostat and speed control	snap acting type room thermostat with ON/OFF and 3-speed control		
32		Make	Blue Star, ETA, York, Zeco, Edgetech, System Air, Waves		
33	Expansion tank	Expansion tank fabrication	Open Type		
34		insulation	HDPE material having MS cap of 14SWG		
35		Make	CIMM/Taco/Albi/Anergy		
36	Chiller water piping	Out side pipe insulation	Insulated with fire rated glass wool (minimum density 48Kg/Cu mtr, 50mm thick)		
37		In side pipe insulation	Pipes pre-insulated with 36 kg per cum thickness 50mm with 22G loack seam jackets		
38		Make	TATA/SAIL/JINDAL		

39	Electrical Panel	Mounting Arrangement	floor mounted, self supporting MV Panel Boards		
40		Fabrication of panel	factory fabricated from 2 mm thick CRCA sheet cubical design for indoor mounting Powder coated through nine tank process		
41		operational requirement	440 V 3 phase, 50 Hz, A.C. with ACBs/MCCBs/MCBs and other accessories		
42		provision of compartmentation	compartmentalized cubical construction,		
43		Protection class	IP 54		
44		Provision of BMS compatibility	The Panel should be BMS compatible type		
45		Make	Neptune/ Elsteel/ Siemens/ Schneider/ Adlec/ Tricolite		
46	Cable	Cable specification	FRLSZH fire rated CU cables as per BS 6724		
47		Make	polycab, Ducab, KEI, Finolex, cords, RASHI		

Content of Bill of Quantity

"Supply, installation, testing ,commissioning of Air cooled chillers including the interconnection with existing FCUs and existing chilled water piping including complete integration with existing BMS system at Kashmiri Gate & Vishvidyalya Metro stations."

Sl. No.	Item Description	Quantity	Units
1	2	4	5
1	Chiller		
1.01	Supply, Installation, Testing and Commissioning of Terrace mounted type air Cooled, microprocessor controlled, Scroll Type water Chilling package having a capacity not less than 34 TR at outside design condition of 95 deg F DB and 75 deg F WB with complete unit assebmilled on a structural steel base with chilled Water Inlet/ Outlet Temp of 15 Deg C/ 8 Deg C & Fouling Factor of 0.000089 m ² °C/W, water flow rate of 82 us gpm with complete control through BMS of station complete as required.	6.000	Nos
1.02	Having multiple Hermetic Scroll Compressors with Automatic Capacity Control, safety control switches, complete with Refrigerant Cooled Motor suitable to work on 415+/- 10% Volts, 50 Hz, AC Supply complete with OEM supplied Star Delta Starter etc, as reqd. Matching air cooled condenser with integrally finned copper tubes. The condenser fans are propeller type of heavy dut, direct driven, slow speed 3 phase, 415 v, positioned for vertical discharge, all weather proof internally protected against overload & other safety devices, controls as per specifications attached .The fan shall provide proper air flow on the entire condenser coil area. The fan guard should also be provided.		
1.03	The chiller shall be of Shell and Tube type/ brazed type or any improved type as per manufacturer		
1.04	Refrigerant piping, fittings, valves and accessories to connect compressor, condenser, chiller and expansion valve complete with safety valve , angle valve ,Liquid Line indication & liquid line control etc.		
1.05	Fins shall be 10-12/inch with hydrophobic coating to give 3-5 times higher corrosion resistance		
1.06	Initial /First charge of Refrigerant Gas & Compressor Oil		
1.07	Frame work for mounting the above condenser, chiller, Compressor & Motor with Base Plate complete with Anti-Vibration pads.with GI powder coating & RCC foundation etc. as required.		
1.08	Each machine will be witness tested at manufacturer works at 100% loading		
1.09	The units shall be capable to operate at higher ambient of 52 Deg C		
1.1	Max IKW/TR at full load at rated parameters for the chiller shall not be more than 1.25		
1.11	The unit shall have microprocessor based control panel with Modbus communication capability and compitable with station BMS.		
1.12	Providing package mounted microprocessor based control (PLC) for the group operation of the water chilling packages covering the complete range of functions viz. safety controls, operating contorls, safety interlocks with necessary indications and alram facility as required.		
1.13	Package mounted Electical contol panel having suitable size of incoming MCCB complete with suitable starters for compressor motors along with No volt coil, overload releases & single phase prevention devices other safeties & controls Electrical wiring and interconnecting control wiring for motors, starters & protective devices.		

2	Chilled Water Pumps		
2.01	Providing & Fixing of end suction centrifugal chilled water pump set capable of delivering 82 USGPM of water against a head of <u>42/55Mtr.</u> Each pump shall comprise of cast Iron casing, bronze impeller, SS-10 shaft sleeve and EN-8 Shaft and MS fabricated base plate, vibration isolators, foundations, insulation and all other necessary civil works complete as per site requirement.	6.000	Nos
2.02	The pump shall be duly insulated with the fire rated glass wool (minimum density 48kg / cu mtr , 50 mm thick) wrapped in vapour barrier jacketing secured in position with adhesive and fixing pins/ retaining washers & 22 G Aluminium sheet cladding conforming to IP 55 protection and F class insulation		
3	FCU		
3.1	Supplying, installation, testing and commissioning of sheet metal horizontal ceiling suspended / vertical high wall mounted double skin with isolaters exposed type fan coil unit of following minimum capacity complete with forward curved centrifugal blowers (as per specification) statically and dynamically balanced, single phase drive motor suitable for 220V (+/-10%) power supply, chilled water cooling coil of at least 3 rows deep with copper tube [27g (nominal)] and Alu. fins, cleanable synthetic woven filter with anodized aluminium frame, controls along with 3 way motorised valve and snap acting type room thermostat with ON/OFF and 3-speed control to be installed at suitable location as instructed by the Engineer-In-Charge ,inlet and outlet valves ball valve sets(with and without strainers)double movable louvers for horizontal and vertical movement for supply air and fixed louvers for return air etc complete as required flexible control wiring in MS conduit from the thermostat to the fan coil unit terminal including extending the power supply from the existing power-plug in the room for main supply to fan coil unit(10 meter) earthing i/c Alu. Anodised supply air grill, Ball value set etc .as reqd.		
3.2	1 TR	1.000	Nos
3.3	1.5 TR	1.000	Nos
3.4	2 TR	20.000	Nos
3.5	2.5 TR	14.000	Nos
3.6	3 TR	20.000	Nos
4	Indoor Application		
4.01	Supplying, Laying, Fixing of following nominal sizes of pipes pre insulated with 36 kg per cum fire rated glass wool of thickness 50mm with 22G lock seam Aluminum jackets. Chilled Water Plumbing (with necessary clamps, vibration isolators and fittings but excluding valve, strainers, gauges.etc) duly insulated		
4.02	The pipes shall be preinsulated leaving 150mm on either side for the connections which will be welded in the open areas/ joined with vitaulic coupling.		
4.03	The joints will be insulated with fire rated glass wool (minimum density 48kg / cu mtrs , 50 mm thick) wrapped in vapour barrier jacketing secured in position with adhesive and fixing pins/ retaining washers & 22 G Aluminium sheet cladding		
4.04	100 mm dia MS C Class	425.000	RMT
4.05	80 mm dia MS C Class	740.000	RMT
4.06	50 mm dia MS C Class	550.000	RMT
4.07	40 mm dia MS C Class	110.000	RMT
4.08	32 mm dia MS C Class	340.000	RMT
4.09	25mm dia MS Pipes	425.000	RMT

4.1	20mm dia MS Pipes	40.000	RMT
5	Providing & fixing of following valves, strainers, gauges duly insulated with fire rated glass wool (minimum density 48kg / cu mtrs , 50 mm thick) wrapped in vapour barrier jacketing secured in position with adhesive and fixing pins/ retaininh washer & 22G Aluminium Sheet cladding		
5.01	Butterfly Valves (PN 16 rated) of cast iron body with SGI epoxy coating disc		
5.02	80 mm dia	36.000	Nos
5.03	Supply, Installation, Testing & Commissioing of 80mm Motorised Butterfly valve	14.000	Nos
5.04	Supply, Installation, Testing & Commissioing of 100mm Manual Butterfly valve	4.000	Nos
5.05	Balancing Valves of cast iron with flange and pressure test cocks in SS-410 Stem, SS-410 Disc and EPDM sealing disc		
5.06	80 mm dia	6.000	Nos
5.07	NRV- Dual Plate check valves of cast iron to confirming to IS 210 Gr FG 260 Body, CA-15 (SS-410) plates, wafer type		
5.08	80 mm dia	6.000	Nos
5.09	Y Strainer- MS/ CI Y strainer with Stainless steel Bucket having 03 perforation with flanged ends		
5.1	80 mm dia	6.000	Nos
6	Chilled Water Piping Exposed Application		
6.01	Supplying, Laying, Fixing of following nominal sizes of pipes (with necessary clamps, vibration isolators and fittings but excluding valves, strainers, gauges, etc)		
6.02	The pipes & joints will be insulated with fire rated glass wool (minimum density 48kg / cu mtr , 50 mm thick) wrapped in vapour barrier jacketing secured in position with adhesive and finished with 15 mm thick sand cement plaster		
6.03	100 mm dia MS C Class	95.000	RMT
6.04	80 mm dia MS C Class	105.000	RMT
7	Providing & fixing of following valves, strainers, gauges duly insulated with fire rated glass wool (minimum density 48kg / cu mtr , 50 mm thick) wrapped in vapour barrier jacketing secured in position with adhesive and finished with 15 mm thick sand cement plaster.		
7.01	Butterfly Valves (PN 16 rated) of cast iron body with SGI epoxy coating disc		
7.02	80 mm dia	12.000	Nos
7.03	Balancing Valves of cast iron with flange and pressure test cocks in SS-410 Stem, SS-410 Disc and EPDM sealing disc		
7.04	80 mm dia	7.000	Nos
8	Providing & fixing of following valves, strainers, gauges duly insulated with fire rated glass wool (minimum density 48kg / cu mtr , 50 mm thick) wrapped in vapour barrier jacketing secured in position with adhesive and fixing pins/ retaining washers & 22		
8.01	Motorized Butterfly valve with On/off Actuator. Actuator Housing shall be IP-54 with close off pressure of 1200 KPA		
8.02	100 mm dia	4.000	Nos
9	Providing and fixing in position pressure gauges -100 mm dia dial type with syphon and gauge cock, glycerin filled	28.000	Nos
10	Providing and fixing in position temperature gauges -100 mm dial type	16.000	Nos
11	Providing & fixing of Auto air vent-10 mm dia	20.000	Nos

12	Rubber Expansion joints with retainer rings and control units (Single Arch) with hydro test pressure of 15 kg/sqcm of 80 mm dia	24.000	Nos
13	Supplying, installing, testing and commissioning of OPEN TYPE EXPANSION TANK OF HDPE material having MS cap of 14 SWG, with minimum 500 ltr capacity complete with makeup connection, quick fill, outlet connection, drain with valve, over flow connection, air vent, brass float wall along with necessary structural arrangement	2.000	Nos
14	SITC of Victaulic mechanical couplings for joining Mild Steel Pipe		
14.01	Pipes shall be roll grooved for the installation of valves		
14.02	Manufactured in two segments of cast ductile iron, conforming to ASTM A-536, Grade 65-45-12. Gaskets shall be pressure-responsive synthetic rubber, grade to suit the intended service, conforming to ASTM D-2000. (Gaskets used for potable water applications		
14.03	Gasket: Synthetic rubber, wide width, conforming to steel pipe outside diameter and coupling housing, manufactured of elastomers as designated in ASTM D-2000.		
14.04	Victaulic Grooved End Fittings: Fittings shall be cast of ductile iron conforming to ASTM A-536, Grade 65-45-12, forged steel conforming to ASTM A-234, Grade WPB 0.375" wall (9,53 mm wall), or fabricated from Std. Wt. Carbon Steel pipe conforming to ASTM		
14.05	1.All grooved components shall conform to local code approval and/or as listed by ANSI-B-31.1, B-31.3, B-31.9, ASME, UL/ULC, FM, IAPMO or BOCA.		
14.06	Grooved end product manufacturer to be ISO-9001 certified		
14.07	Victaulic Grooved End Fittings: Fittings shall be cast of ductile iron conforming to ASTM A-536, Grade 65-45-12, forged steel conforming to ASTM A-234, Grade WPB 0.375" wall (9,53 mm wall), or fabricated from Std. Wt. Carbon Steel pipe conforming to ASTM		
14.08	All grooved components (including couplings, fittings, valves and accessories) to be supplied by one manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.		
14.09	Rigid Type: Coupling housings with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with ANSI B31.1, B31.9, and NFPA 13. Victaulic Style 07 (Zero-Flex®).		
14.1	for 100/80 mm dia	24.000	Nos
14.11	Flexible Type: Use in locations where vibration attenuation and stress relief are required. Flexible couplings may be used in lieu of flexible connectors at equipment connections. Three Couplings shall be placed in close proximity to the vibration source.		
14.12	for 100/80 mm dia	10.000	Nos
15	Main Electrical Panel		
15.01	SITC Main Electrical Panel	2.000	Nos
15.02	IP-54 Panel Enclosure Compartmentalized Floor mounted Single Front type fabricated from 2/1.6mm thick CRCA sheet Feeder for motorised operated valve also required(11 nos.)		
15.03	500 A Bus Bar Cu. 1 No.		
15.04	Incomer		
15.05	400 A MCCB TP 50KA Microprocessor Based O/C,S/C,E/F Release With Motorized Mechanism Release. + Shunt Release - 2 No. (Both the ncomer shall be Electrically and Mechanically Interlocked having proper interlocking so that only one remain ON at a time.)		
15.06	Push Buttons On/off Flush Head Non Illuminated Type For MCCB. - 4 No		
15.07	0-500 A Digital Ameter of Class 1 .0 accuracy panel mounted 1 no		

15.08	RYB Indicating Lamps,22.5 mm Dia LED Type- 2 No.		
15.09	Digital Multi function Meter L&T Vega Model Class B or equivalent - 2 nos.		
15.1	500/5 A Current Transformer Class-1.0,15 VA- 3 No.		
15.11	6 A MCB SP 10KA- 8 No.		
15.12	CT Shorting Terminal- 8 No.		
15.13	Out-Going Feeders		
15.14	125 A MCCB TP 25KA Microprocessor Based O/C,S/C,E/F Release With Motorized Mechanism Release. + Aux. Contact + Shunt Release- 4 no.		
15.15	0-125 A Digital Ammeter (in built ASS)Acc. Class 1.0 96Sq. mm.- 4 no.		
15.16	150/ 5A Current Transformer Class-1.0,5 VA- 12 No.		
15.17	CT Shorting Terminal- 16 No.		
15.18	Aux. Contactor with 2NO+2NC- 8 No.		
15.19	ON/OFF Indicating Lamps 22.5 mm Dia LED Type- 8 no.		
15.2	Push Buttons On/off Flush Head Non Illuminated Type For MCCB- 8 no.		
15.21	6 A MCB SP 10KA- 4 No.		
15.22	MOTORISED OPERATED VALVE - DOL Starter - 500 W - 10 Set		
15.23	MPCB, 3-Pole (1 - 1.6 A), with Aux. Contact (1 NO + 1 NC) and Fault trip contact (1 NO)- 9 Nos. (Main) + 1 No. (Spare) and following material for all MPCB's - 10 Nos.		
15.24	Power Contactor 9A, 3P, 230 V AC with Aux.Contact - 10 Nos.		
15.25	Aux. Relay 2C/O - 10 Nos.		
15.26	LED indication lamp for ON. OFF. TRIP - 30 Nos.		
15.27	Push Button Open / Close - 206 Nos.		
15.28	LED indication lamp for the following		
15.29	ON. OFF, TRIP - 30 Nos.		
15.3	Auto / Local / Remote / S/S with key - 10 Nos.		
15.31	Miniature Circuit Breaker, 6A, SP - 10 Nos.		
15.32	Motorized butterfly valve panel		
15.33	MCCB 63A :01 no.		
15.34	Digital Ammeter- 01 no		
15.35	CTs 03 nos		
15.36	Digital Voltmeter -01 no		
15.37	Indicating light - 03 nos		
15.38	Indicating Light RYB - 01 set		
15.39	MCB 2A, SP, 10kA -06 nos		
15.4	Busbar 100A, TPN & E- 1 set		
15.41	Outgoing feeder for 500w butterfly valve (7 working + 1 standby)		

15.42	MCB 16A, DP, 10kA- 08 nos		
15.43	Power Contactor 16A, DP - 08 nos		
15.44	Push Button illuminated (Open/Close) 16 nos		
15.45	Selector Swithc (Auto/Local/remote 08 nos		
16	Power & Control Cabling		
16.01	Supply & Installation of complete cable work using FRLSZH fire rated cables as per BS 6724 of following sizes for electric supply of including interconnections from starters to motors on suitable cable trays/ support as required including connections on both		
16.02	3.5 C x 50 Sq. mm Cu armoured cable for chiller	400.000	RMT
16.03	3C x 6 Sq. mm Cu armoured cable	420.000	RMT
16.04	3C x 4 Sq. mm Cu armoured cable	445.000	RMT
16.05	3C x 2.5 Sq. mm Cu armoured cable	675.000	RMT
16.06	4C x 240 Sqmm FRLSZH cable	380.000	RMT
17	SITC of 5X32 Sq mm 5 GI strip as Earth conductor for extension of body earth connection on surface or in recess complete as required.	550.000	RMT
18	Supply & installation 3 x 2.5 sqmm FRSLZH copper conductor wire in flexible/ MS conduit on surface or in recess for provision of power supply to FCUs complete as required.	75.000	RMT
19	Providing and fixing of 20 mm GI conduit on surface or in recess as per site requiremetn complete with all accessories as reqrueid.	110.000	RMT
20	Providing and fixing cable termination with Brass termination gland complete as required.		
20.01	3c x 4sqmm	10.000	Nos
20.02	4c x 240sqmm	4.000	Nos
21	Supplying and installing following size of perforated pre-painted GI. cable trays Tee's with perforation not more than 17.5%, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required.		
21.01	40 mm X 150 mm X 1.6 mm	330.000	Nos
22	Providing and fixing GI wire on surface or in recess for loop earthing complete as required		
22.01	8 SWG	100.000	Nos
23	Cabling Glanding & Termination	2.000	LOT
24	Dismantling of existing equipments and shifting to the storage area to the DMRC store within 20Km		
24.1	Split Airconditioners 1/1.5/2 /2.5 TR	60.000	Nos

The rates should be quoted by the Contractors in the separate BOQ sheet uploaded on website <https://eprocure.gov.in/eprocure/app>