

# **TENDER DOCUMENT**

## **FOR**

**SITC of MS Class-C Chilled Water Piping  
with insulation including valves etc. to  
connect Existing AHUs from KBAC Plant.**

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## **Section-C**

### **PART-A (TECHNICAL BID)**

#### **1. PROJECT INFORMATION**

IPR is having central Air-conditioning plant of 250 TR capacity (125 TR x 3 nos, 2W+1S) known as KBAC (Kitchen Basement Air-Conditioning) plant to serve comfort air conditioning to Library, Seminar Hall, Beta Lab., Aditya hall. Presently the KBAC plant is connected to Lab AHUs through underground chilled water piping laid along the corridors.

The proposed interconnection of chilled water piping shall laid in open at terrace of the building. The pipes shall be insulated with EPS insulation with one layer of cement / aluminium cladding for mechanical protection. Also it includes all related work likes testing, balancing, painting etc.

The system offered with better parameters as mentioned above and satisfying all functional aspects shall be preferred.

- **The Bidder shall have studied in detail the site conditions, scope of work, specifications, tender drawings, labour and other respective terms and conditions as applicable, each system complication to make piping layout specified in the tender.**
- **The Bidder shall have got clarified for any confusion regarding the tender terms and conditions, specifications, drawings and may be allowed to visit the site before submitting the offer.**
- **The Bidder shall timely complete the scope of work, through better planning, management, execution and coordination with all concern without compromising the quality of material and finished work, as the time is the most critical requirement of the work.**
- **Laying of chilled water pipes shall be executed at terrace of building of approx. height 7 mtrs.**
- **Small part of GI ducting & cable tray needs to be shifted to run the chilled water pipes. After laying pipes, proper finishing of GI ducting and cable tray shall be done.**
- **Installation of MS Chilled water expansion tank shall be installed at terrace of building at approx. height of 15 mtrs.**

#### **1.1. SCOPE OF WORK:**

**The scope of this section comprises the supply and laying of MS pipes, fittings, valves etc. and testing & balancing of all water piping required for the complete installation as shown on the Drawings. All piping inclusive of fittings and valves shall confirming to tender specifications, relevant BIS codes, in accordance with proposed schedule of quantities in annexure –II.**

The Bidder shall carry out work in every respect in conformity with the contract documents and with the directions of the Engineer in-charge.

- a) **Supply, installation and testing of items/ equipments/ materials as per SOQ in annexure –II with fittings and accessories.**
- b) **PCC blocks casting for laying pipes at regular interval as specified. Also anchoring of pipe supports to the Building RCC beam/ column.**
- c) **Insulation of new and existing chilled water pipe lines where ever required.**
- d) **Supply and fabrication of MS support works for chilled water pipes with painting.**
- e) **Cutting and removing of existing MS chilled water insulated pipes wherever required to install new chilled water pipes. Extra laid pipes also need to remove and kept at location marked by Engineer-in-charge.**
- f) **Necessary civil work like making slots/hole in the wall/RCC to run the pipe at desired location. Also proper sealing of remaining space in wall around the pipes.**
- g) **Small part of GI ducting & cable tray need to shift to run the chilled water pipes. After laying pipes, proper finishing of GI ducting and cable tray shall be done.**
- h) **Chilled water pipes shall be connected to KBAC plant and existing AHUs. Hence some modifications in pipes route also need to modify in AHU rooms, at terrace, in KBAC plant as**

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suit at site. Some existing installed valves need also to relocate. It includes shifting & storing of unused items to suitable place as directed by Engineer-in-Charge, IPR.

- i) Manpower, material-handling equipments, welding equipments, welding consumables, gas, tools & tackles needed to carry out installation, testing & commissioning are to be arranged by the contractor.
- j) Required metric thread studs / nuts / bolts / washers / anchor fasteners/ supports etc. need to be arranged by the contractor to install the pipes and equipments as per SOQ in annexure-II. The items supplied by the contractor should confirm relevant IS codes.
- k) All the insurance after delivery of materials at the site will be in the contractor's scope.
- l) The painting work for MS/GI pipes, fittings and supports are in the scope of the contractor. Colour shade shall be decided by the Engineer-in-Charge, IPR.
- m) The expenditures incurred for all the tests (including DPT/RT) shall be met by the contractor.

**Important note:** Presently the KBAC Plant is connected to existing AHUs through underground Chilled Water pipes, which provide comfort air-conditioning to connected labs. Contractor has to consider this and prepare a work execution plan in consultation with IPR Engineer-in-Charge in such a way that minimum shut down require to execute the chilled water piping work. Hence contractor need to complete the piping, pressure testing and insulation work in all respect in segment wise to avoid the shutdown of other segments/ parts. Arrangement of required quantity and size of blind flanges on temporary basis in the scope of contractor to isolate the part of piping and execute the piping work without shut down of whole integrated system.

**1.2. FREE ISSUE MATERIALS / FACILITIES AND EXCLUSIONS:**

The contractor should deploy required man power till the final commissioning of the project.

- a) IPR shall provide free power and water for fabrication and testing purposes.
- b) IPR shall provide single electric power point at one place from where the vender should distribute it as per requirement.
- c) IPR will not provide covered site office cum stores for the execution of the job.
- d) IPR will supply material as per Annexure-1 as a free issue material for installation. These items are presently installed in existing lines. It needs to dismantle and re-installation after proper cleaning with required qty. of matching flanges, gaskets and fasteners etc.
- e) All the insurance after delivery of materials at the site will be in the contractor's scope.

**ANNEXURE - I****FREE ISSUE MATERIALS**

Sr. No.	Items description	Qty.	Rates (Rs.)	Cost (RS.)
1	150 NB, CI body, 150 #, Balancing Valves for return line.	01 Nos.	35000	35000
2	80 NB, CI Body, 150 #, Butterfly Valve for branch isolation.	04 Nos.	7500	30000
3	65 NB, CI Body, 150 #, Butterfly Valve for branch isolation.	06 Nos.	6500	39000
4	50 NB, CI Body, 150 #, Butterfly Valve for branch isolation.	02 Nos.	5500	11000
5	40 NB, CI Body, 150 #, Ball Valve for branch isolation.	02 Nos.	4500	9000
<b>Approx. total Cost (Rs.)</b>				<b>124000</b>

**1.3. COMPLETION PERIOD:**

The total completion period is **8 months from the date of approval of execution drawing**. The work in totality must be completed within the completion time period as per approved Bar chart / Project schedule. The entire project is to be completed at the earliest; hence the Bidder's labour may have to work on 24 hours basis/ round the clock if required, with necessary prior permission. Necessary penalty shall be applied as per the Penalty /LD clauses in case of delay on part of Bidder. Any deviations should be indicated separately and clearly in their offer by the bidder.

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The Bidder shall provide preliminary Bar chart along with the offer to justify the specified completion period.

### 1.4. DRAWINGS:

The Piping layout drawings enclosed with tenders is schematic only and indicates the extent of work covered in the contract. The drawings broadly suggest the concept and routes to be followed. Under no circumstances shall dimensions be scaled from these drawings. Any modifications / changes required to coordinate installation work as per site conditions, shall be made in consultation with and approval of Engineer-in-Charge.

After the award of the contract, the Bidder shall furnish three sets of detailed piping layout drawings, including overall system connected with foundation/ support details etc. with necessary sectional views as required for the approval of Engineer-in-Charge within **4 weeks** time from the date of PO/WO. **For the list of tender drawings refer tender Drawing Section.**

All drawings shall be submitted for approval in hard as well as soft copies in the size as desired by the Engineer-in-Charge. However preliminary soft copies prepared by IPR will be furnished to the successful bidder. Where drawings are approved, said approval does not mean that drawings supersede the contract requirements nor does it in any way relieve the Bidder of the responsibility or requirement to furnish material or perform work as required by the contract.

### 1.5. SUB-CONTRACTORS / SUPPLIERS:

List of sub-contractors, vendors and suppliers proposed for any part of work, system components, must be submitted to IPR for approval before placing the WO/ PO by the main contractor. The decision of the IPR Engineer-in-Charge to approve or reject sub-contractors, vendors and suppliers proposed for any part of work, system components shall be final. After getting approval of IPR Engineer-in-Charge, Copy of such orders shall be submitted for confirmation along with all specifications thereafter.

### 1.6. DEVIATIONS:

The Bidder shall attach separate sheets containing the techno-commercial deviations if any, in the following format.

Sr. no.	Tender condition	Deviation	Remark.
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IPR reserves the right to include additional terms and conditions in the Contract documents and it will be binding on the Contractor.

Place:  
Date:

Signature and seal of Bidder

**Section-C****2. TECHNICAL SPECIFICATIONS OF COMPONENTS, WELDINGS AND INSULATIONS**

Following components are to be interconnected to satisfy the system requirements. Bidder has to provide a separate sheet confirming to the following specifications. Change in the specifications will not be accepted.

**For Chilled Water application:**

**2.1 Piping Specifications:**

- **Water Piping:** Chilled water pipes and all fittings shall be MS Class 'C' (Heavy Class) conforming to relevant BIS Codes.
- **All jointing** in the pipe system shall generally be by welding, unless otherwise mentioned, or directed at site. All welding shall be done by qualified welders and shall strictly conform to BIS Code of practice for manual metal arc welding of Mild Steel. First butt weld joints of each welder shall be tested for DP and Radiography test. DP and radiography testing of sample joints shall be arranged by contractor on their own cost at reputed test lab. After satisfactorily test report of sample testing, welder shall be allowed to carry further welding of the pipes. Rest of the welds joints shall have 100% visual inspection, 10 % DP test and hydrotest. Before welding of pipes, make proper 'V' notch at the joints by chamfering the end of pipe with surface grinder. All electrodes shall be selected to match the mechanical and chemical properties of the parent material. The welding rods shall be selected as per AWS-E-7018 or Equivalent BIS code, subject to Purchaser's approval.

Radiography charges shall be borne by contractor. Additional radiography required due to poor quality of contractor's welder, will be done at contractor's cost.

- **All pipes** and their supports shall be thoroughly cleaned and given one primary coat of bituminous paint / red oxide paint.
- **Fittings and accessories: All fitting likes elbows, Tees, reducer/ expander, coupling etc.** shall be of heavy class –C. Fittings used on welded piping shall be of the weldable type.
- **Piping Installation :**
  - Tender Drawings indicate schematically the size and location of pipes only. The Contractor, on award of the work, shall prepare detailed shop drawings, details of fittings, locations of isolating valves, drain and air vent with valves and all pipe supports. He must keep in view the specific openings in buildings and other structures through which pipes are designed to be passed.
  - Piping shall be properly supported on, or suspended from, stands, clamps, and hangers as specified and as required. The Contractor shall adequately design all the brackets, saddles, anchors, clamps and hangers and be responsible for their structural sufficiency. All pipes shall be supported with MS structural steel like C-channel, I-Beam, angle and M S Class 'C' pipes, supported from floor or column. Where pipe and clamps are of dissimilar materials, a gasket shall be provided in between. Spacing of pipe supports shall not exceed the following:

Pipe size	Spacing between supports
Up to 12 mm	1.5 Meter
15 to 25 mm	2.0 meter
30 to 150 mm	2.0 meter
Over 150 mm	2.5 meter

- Piping shall be properly supported on PCC blocks with proper support and clamps, or stands- clamps, as specified in SOQ. The Contractor shall adequately design all the brackets, saddles, clamps and hangers and be responsible for their structural sufficiency. All chilled water pipes shall be laid on square PUF/ Wooden pipe supports for proper thermal insulation.
- Vertical risers shall be parallel to walls and column lines and shall be straight and plumb. Risers passing from terrace floor, suitable flashing shall be provided to prevent water leakage. All piping work shall be carried out in a workmen like manner, causing minimum disturbance to the existing services, buildings, roads and structure. The entire piping work shall be organized, in coordination with other agency's work, so that laying of pipe supports, pipes and pressure testing for each area shall be carried out in one stretch.

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- Pipe lines shall have a suitable clean/ drain out of 20 NB size at the lower points and air vent of 15 NB size at the highest points.
- Auto air purge valves shall be provided at all high points in the piping system for venting. Auto air purge valves shall be of 15 mm/20 mm size with isolation ball valves of screw end. These pipes shall be pitched towards drain points.

**2.2 WELDING:**

- a) Only reputed brand electrodes like Advani / ESAB / D&H/ equivalent should be used for carrying out welding.
- b) The SS welding shall be TIG welding and arc-welding method may be followed for welding of MS/GI structures/ pipes.
- c) In case of defect being identified in any weld joint, the joint shall be grounded off to the base metal and shall be re-welded.
- d) The welding should be uniform and free from any welding defects

**2.3 Butterfly Valves (CI):**

Type	: Single piece body with flapper wafer type
Pressure rating class	: PN 10
Media	: Chilled Water
Operating temperature range	: 0° C to 80° C
MOC of Body	: CI / CS
MOC of disc and wetted parts	: ASTM A351 Gr. CF8/ CF8M as per SOQ in annexure-II
MOC of Seat	: EPDM/ Neoprene rubber replaceable
MOC of Operating handle/ lever/ wheel	: MS/SS/ Suitable
Seat leakage	: Tight shut off (Class VI)
General design & face to face dimensions	: API 6D/API 609 / ASME B 16.10
Valve testing	: API 598
Flange standard conformity	: Suitable for ASME B16.5, class 150 SORF flanges
Locking handle/ lever	: Locking facility should be available.

**Notes:** Bidder has to provide material test certificates, drawings etc. with all the details with the supplied materials.

**2.4 Ball Valves (Full bore CI/CS for 40 and 25 NB):**

Type	: Three piece full bore
Media	: Chilled Water
Pressure rating	: 150 Class
Operating temperature range	: 0 °C to 80 °C
MOC of Body	: CS/CI/ SS 304 as per SOQ in annexure-II
MOC of ball	: SS 304/ SS316 solid
Seat	: PTFE
MOC of handle	: MS/ SS/ equivalent with plastic cover
Seat leakage	: Tight shut off (Class VI)
Valve testing	: API 598
End connection	: Flange end

**2.5 Ball Valves (SS 304 for 20 nb and 15 nb):**

Type	: Single/ two piece/Three piece full bore
Media	: Chilled Water
Pressure rating	: 150 Class
Operating temperature range	: 0 °C to 80 °C
MOC of Body	: ASTM A351 SS 304/ SS 316 as per SOQ in annexure-II
Seat	: PTFE
MOC of handle	: MS/ SS/ equivalent with plastic cover
Seat leakage	: Tight shut off (Class VI)
Valve testing	: API 598
End connection	: BSP Thread/ Screwed end (female)

**2.6 AIR SEPARATOR:**

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Centrifugal Air Separator (Tangential in/out connection type) of 150 # pressure rating, working temperature range 0 to 80 °C for CHW return header, complete with tank insulated with 50 mm thick EPDM/ Nitrile insulation & 26 gauge aluminium cladding, flanged inlet & outlet connections at tangential, auto air vent at the top, clean-up/ drain point at bottom with nipple & ball valve for drain.

### **2.7 EXPANSION TANK:**

Design, fabrication, supply, installation and testing of MS chilled water expansion tank of 1000 ltrs. water storage capacity and 6 mm wall thickness with PUF/ TF quality EPS insulation entirely covered with black polyethylene sheet (Vapour Barrier), GI chicken wire-mesh for proper holding of vapour barrier and entirely covered with 22G Aluminium cladding with proper drain, vent, overflow, inlet / outlet water connections with openings for quick fill, float valve and air tight covers on top, Cold Galvanizing coating inside as per the specifications with necessary floating PCC / RCC / MS foundation. Submit drawing for the tank with all details for approval before fabrication. Size: 1 m x 1 m x 1 m

### **2.8 Pipe flanges:**

All flanges including flanges of valves are to be slip on serrated finished flanges (SORF) as per ASME B16.5, class 150 SORF /Matching flanges.

### **2.9 Thermal Insulation for Pipes:**

Thermal insulation of chilled water pipes within plants, at terrace and on existing pipes with 75/50 mm thick (as per SOQ) 16 kg/m<sup>3</sup> density, <0.04 W/m-K at 0°C thermal conductivity, pre-molded pipes section of TF quality expanded polystyrene (EPS, Thermocole) insulation entirely covered with black polyethylene sheet (Vapour Barrier), GI chicken wire-mesh for proper holding of vapour barrier, and entirely covered with sand cement of 20 mm thick (exposed pipes outside of building and KBAC plant)/ 26G Aluminium cladding (inside the building and AHUs rooms) installed with best workmanship. Sand cement cladding and aluminium cladding shall be done as per instruction of Engineer-in-Charge, IPR. Brush & clean pipe surface before applying insulation. MS pipes shall be provided with one coat of bituminous paint / two coats of zinc chromate/ red oxide primer. Stick insulation material using a thin film of manufacturer-recommended adhesive. Seal all joints air-tight. Provide minimum 50mm thick insulation up to 100mm dia. piping, and minimum 75mm thick insulation for 150mm and larger dia. All fittings/valves shall be insulated with the same thickness of insulation material. Sand cement covering shall be painted with two coats of primer for prepare base and two coats of enamel paints as per IPR approved shade.

## **3. MEASUREMENTS:**

Unless otherwise specified, measurement for piping for the project shall be on the basis of centre line measurements described herewith. Piping shall be measured in units of length corrected to centimeter along the centre line of installed pipes including all pipe fittings, flanges (with gaskets, nuts, and bolts for jointing), unions, bends, elbows, tees, concentric and / or eccentric reducers, inspection pieces, expansion loops etc. The above accessories shall be measured as part of piping length along the centre line of installed pipes, and no special multiples of pipe lengths for accessories shall be permitted. The quoted rates for centre line linear measurements of piping shall include all wastage allowances, pipe supports including hangers, MS/SS channel, wooden haunches, nuts, check nuts, vibration isolator suspension where specified or required, and any other item required to complete the piping installation as per the specifications. None of these items will be separately measured nor paid for. However, all valves (globe / check / butterfly / ball), thermometers, pressure gauges shall be separately counted and paid as per their individual unit rates, which shall also include their insulation as per specifications. Piping measurements shall be taken before application of the insulation. Fabrication of all types of pipe supports, provided as per the instruction of Engineer-in-Charge, will be paid on weight basis, excluding weight of fasteners. All temporary lines or equipment required for flushing, testing, draining or drying should be provided, installed and dismantled by the contractor within his quoted rates. Open end of the pipes shall be blanked within his quoted rates.

## **4. PAINTING - COLOUR CODE:**

All MS equipments/ piping shall be painted/ 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 two coats of enamel paint. Painting of insulated piping shall be painted with one or two coat of primer suitable for cement cladding and two coat of enamel paint approved shade. All painting colour code shall be approved before execution. No separate payment shall be made for painting work. Reputed make like Asian/Berger/ equivalent etc. are only to be used.

## **5. TECHNICAL DATA SHEETS**

*(List of technical information's to be furnished by the bidder to IPR)*

### **Notes:**



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- Separate technical data sheets shall be furnished for different type/ model/ configuration for different items.
- Take copies of the data sheet for different sizes/ category and furnish the information asked for.
- All the data sheets shall be endorsed with stamp and signature by the bidder.
- Bidder has to provide minimum technical details as enclosed herewith, however shall also provide remaining / additional details. All the Items shall be ordered only after Technical specification approval.
- Attach Technical leaflets, performance curves, etc. for all products / system parts offered.
- Please refer technical specifications asked for before filling the blank data sheets

➤ **BUTTERFLY VALVES (CI/ CS) FOR CHILLED WATER:**

• Type / Class	Wafer/ PN10	
• Make / Model	Approved make/ ----	
• MOC of all body parts: (Enclose details)		
– Body	CI/CS	
– Disc/ Stem	CF8/ CF8M	
– Seat	EPDM/ Neoprene Rubber	
– Bearing/ sleeve	--	
– Operating lever.	MS/ SS/ Suitable	
– Fasteners	--	
• Operating temp. range (°C).	0 °C to 80 °C	
• Flange standard conformity	Suitable for ASME B16.5, class 150 SORF flanges	
• Leakage class (Testing as per API 598)	VI	
• Locking handle/ Lever	Yes	
• Additional features if any:	--	

➤ **BALL VALVES (40 NB AND 25 NB):**

Type	Three piece full bore	
Media	Chilled Water	
Pressure rating	150 Class	
Operating temperature range	0 °C to 80 °C	
MOC of Body	CS/CI/ SS 304 as per SOQ in annexure-II	
MOC of Ball	SS 304/ SS316 solid body	
MOC of Seat	PTFE	
MOC of handle	MS/ SS/ equivalent with plastic cover	
Seat leakage	Tight shut off (Class VI)	
Valve testing	API 598	
End connection	Flange end	

➤ **BALL VALVES (20 NB AND 15 NB):**

Type	Single/ two/ three piece full bore	
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Media	Chilled Water	
Pressure rating	150 Class	
Operating temperature range	0 °C to 80 °C	
MOC of Body	ASTM A351 SS 304/ SS 316 as per SOQ in annexure-II	
MOC of Seat	PTFE	
MOC of handle	MS/ SS/ equivalent with plastic cover	
Seat leakage	Tight shut off (Class VI)	
Valve testing	API 598	
End connection	BSP Thread/ Screwed end (female)	

➤ **MS FLANGES:**

• Type	SORF	
• Class	150	
• MOC of flanges	MS as per SOQ	
• Design	ASME B16.5, SORF flanges	

➤ **MS PIPES FOR CHILLED WATER:**

• Make	As per approved	
• Class	'C'- Heavy	
• MOC	MS	

➤ **CENTRIFUGAL AIR SEPARATOR:**

Description	IPR Specification	To be filled by Vendor
• Type	Centrifugal type, tangential in/ out	
• Make	As per approved make	
• MOC	MS	
• End connection	Flanged end	
• Max. operating pressure (bar)	10 bar	
• Operating temperature range	0 °C to 80 °C	
• Insulation MOC	EPDM/ Nitrile sheet	
• Insulation thickness (mm)	50	
• Adhesive	As recommended by insu. manufacturer	
• MOC of cladding/ thickness	Aluminium sheet, 26 SWG	
• Auto air purge valve provided with isolation valve.	Yes	
• Clean-up / Drain point at bottom with isolation valves	Yes	

➤ **THERMAL INSULATION OF PIPES:**

Description	IPR Specification	To be filled by Vendor
• MOC of insulation	TF quality expanded polystyrene (EPS, Thermocole)	
• Density of insulation (kg/m3)	16 approx.	

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• Thermal conductivity	< 0.04 W/ m-K at 0 °C	
• Type	Pre-molded pipe section	
• Insulation thickness (mm)	75 or 50 as per SOQ.	
• Adhesive	As recommended by insu. manufacturer	
• MOC of cladding	Sand Cement/ Aluminium sheet as applicable	
• Thickness of Aluminium sheet	26 SWG	

**6. APPROVED MAKES**

The following makes are approved by IPR. Deviations in the approved make will not be allowed. So, the vendor has to consider this while submitting price bid. Also, refer technical specifications, accordingly select approved makes.

Description of item	Approved makes
Butterfly (manual)	L&T/ Intervalve / Weir-BDK / CRI/ Virgo/ Fisher control / AMRI/ Technova /Advance / Saunders / Crescent/ Deltech
Ball Valves	Accuflow/ Virgo/ BDK/ L&T-Audco/ Aptek/Lodha/ Ped-Lock/ Crescent
Air Separator	Emerald/ Anergy/ KD/ITT/Grundfoss/Armstrong/ Bell & Gossett (Xylem)/ PSVPL/ Bhalani/ Other equivalent make*
MS Chilled Water Pipes and fittings	Tata / Sail/ Jindal
GI Pipes and fittings	Tata / Sail/ Jindal / Surya/ ISMT
Expanded polystyrene (EPS)/ Nitrile Rubber Insulation	Llyods / Beardsell / Cooline/ Armaflex/ Armacell/ Superlon / Aeroflex / Arcoflex/ Navair/ Pyroguard

\* Subject to IPR approval

**7. STANDARDS/ CODES**

The following latest IS specifications / equivalent applicable codes are applicable for the proposed work.

IS : 3656	▪ Welds testing by DP
IS : 6392 – 1971/ ASME B16.5	▪ Steel pipe flanges.
IS : 628	▪ Rubber gasket, Teflon gasket for SS piping.
IS : 554 – 1975	▪ Dimensions for pipe threads for pressure tight joints
IS : 7240 – 1981 7413 - 1981	▪ Code for practice for application and finishing of thermal insulation material at temp. From - 80°C to 40°C. & 40°C to 700°C.
IS : 1367	▪ Bolts, nuts, and studs./ threaded fasteners.
ANSI - B36.19	▪ Stainless Steel pipes.
IS : 444/87	▪ Insulated rubber hose manufactured in woven textile / braided yarn reinforcement.

**8. TESTING & ACCEPTANCE:**

- VISUAL INSPECTION: 100% Visual Inspection of weld / flange joints shall be carried out.
- After the piping job is completed, the entire piping shall be flushed out with Soft water/Raw water.
- DP TEST: Dye Penetration test shall be carried out for 10 % of total joints. The procedure shall be as per pressure vessel code.
- Hydro pressure testing should be carried out at minimum 10 bar in the piping system.
- Leakage, if any observed during testing shall be rectified immediately.
- After the successful pressure test, insulation needs to be carried out.

**9. SITE CLEARANCE:**

The scope of work includes site clearance (after completion of job), hence all area shall be cleared of debris and excess material left during the fabrication / commissioning related work.

**10. GUARANTEE:**

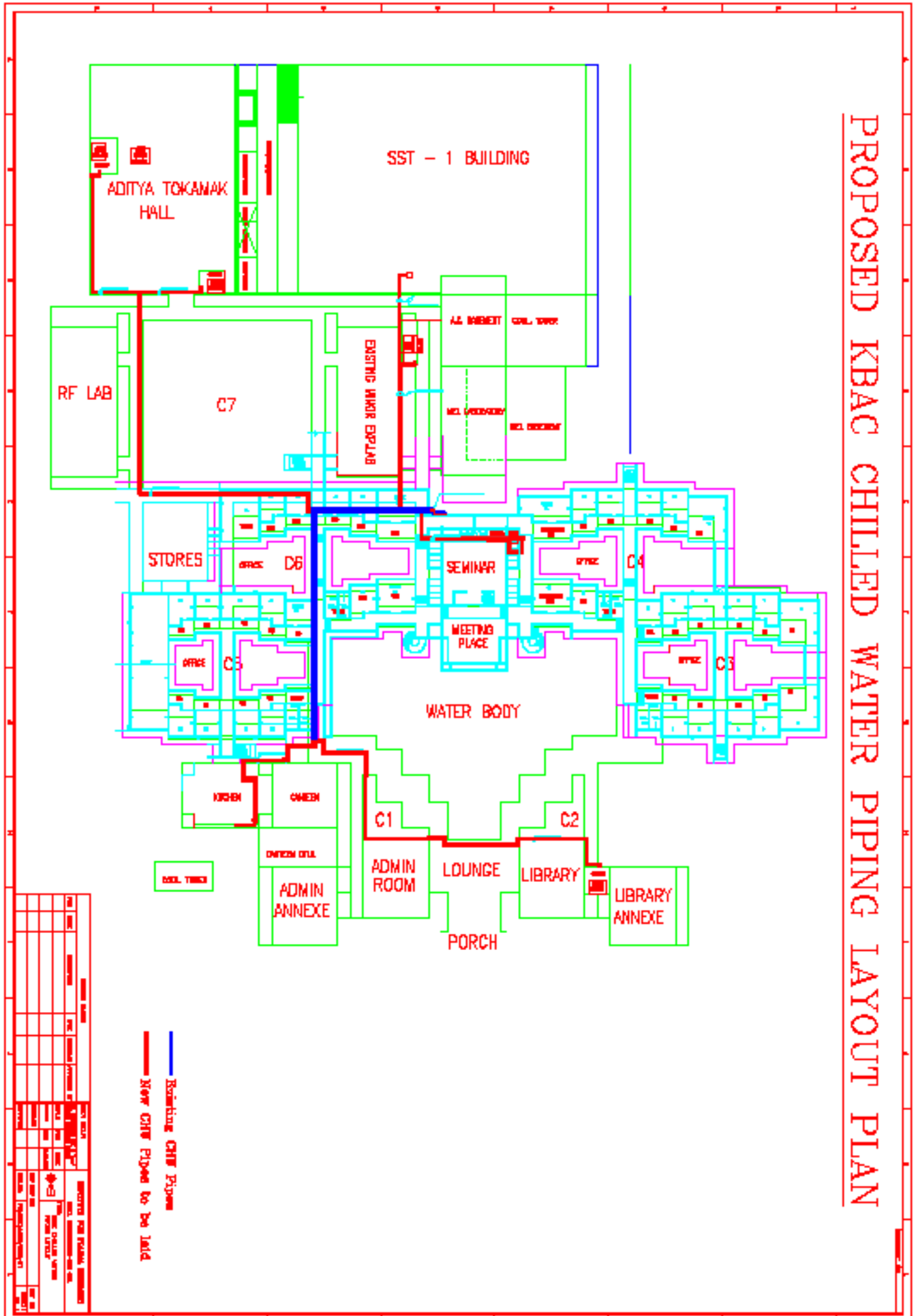
The overall job guarantee shall be of one year form date of acceptance against any fault. Any repair / services shall be provided at no extra cost to the owner during this period.

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**11. LIST OF DRAWINGS:**

- (I) Proposed KBAC Chilled Water Piping Layout Plan (Dwg. No.: IPR/HVAC/KBAC/2018/01)
- (II) Section view of pipes with supports for BETA Lab. (Dwg. No.: IPR/HVAC/KBAC/2018/02)

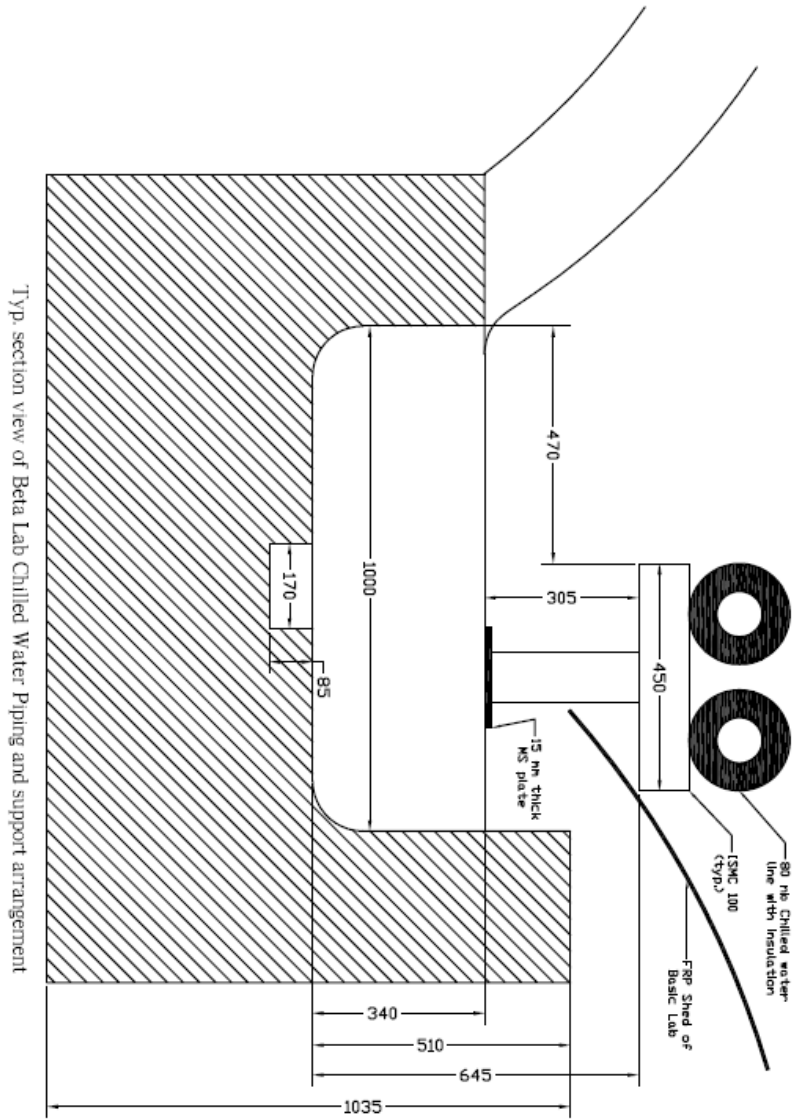
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PROPOSED KBAC CHILLED WATER PIPING LAYOUT PLAN

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**SECTION VIEW OF PIPES WITH SUPPORTS FOR BETA LAB.**



ALL DIMENSIONS ARE IN "mm" (UNLESS OTHERWISE STATED)		<b>INSTITUTE FOR PLASMA RESEARCH</b>	
SCALE: N.T.S.		BHAT, GANDHINAGAR-382 428.	
DATE	N.T.S.	TITLE:	
DATE	S.K.S. (mm/year)	Section view of Pipes with supports for BETA Lab.	
CHECKED		REF. Dwg NO:	REV
APPROVED		Dwg. NO:	01 OF 01
		IPR/HWAC/KAC/2018/02	

## Work execution Plan

Work description	Duration
➤ Installation and testing of interconnecting pipes with insulation.	12 weeks
➤ Branching work in existing headers at terrace level (at 4 places).	2 weeks
➤ Connection with Library and Seminar Hall AHUs.	3 weeks
➤ Interconnection of Beta Lab. & Aditya Hall AHUs.	4 weeks
➤ Main Piping header in KBAC Plant.	3 weeks

**The above schedule does not include procurement, supply and commissioning.**