Section 2.2.2

HENRIETTA STOCKDALE NURSING COLLEGE

Specifications – HVAC - Water

BLOCK: FOR ALL BLOCKS

SPECIALTY: T80 – EMBEDDED RADIANT HEATING AND COOLING SYSTEM (TABS)

VERSION: 02
DATE: 2024-08-07

Table of Contents

SECTION T80 – EMBEDDED RADIANT HEATING AND COOLING SYSTEM (TABS)

PART1 - GENERAL

T80 -1.1 SECTION INCLUDES

A. Mains Pipe System

B. Distribution Pipe System

C. Concrete Embedded Pipe System

D. Controls

T80 -1.2 REFERENCES

A. Building Engineering Services Association: TR/20 – Part 6: Chilled Water

B. Building Engineering Services Association: TR/11: Guide To The Use Of Plastic Pipework.

C. En 15377-2:2008: Heating Systems in Buildings — Design of Embedded Water Based Surface Heating And Cooling Systems — Part 2: Design, Dimensioning and Installation.

D. SANS ISO 4427-1: Polyethylene (PE) pipes and fittings for water supply - Part 1: General.

E. SANS ISO 4427-2: Polyethylene (PE) pipes and fittings for water supply - Part 2: Pipes.

F. SANS ISO 4427-3: Plastics piping systems - Polyethylene (PE) pipes and fittings for water supply - Part 3: Fittings.

G. SANS ISO 4427-5: Polyethylene (PE) pipes and fittings for water supply - Part 5: Fitness for purpose of the system.

T80 -1.3 RELATED SECTIONS

A. T61 – Primary / Secondary Cooling Solutions

T80 -1.4 SCOPE

A. Supply, delivery and installation of main chilled water piping.

B. Supply, delivery and installation of TABS distribution piping.

C. Supply, delivery and installation of TABS embedded piping.

D. On site Rigging.

E. All related work and line components to connect to chilled and TABS pipes to the building and other HVAC services.

F. Connection to the electrical supply provided by others.

T80 -1.5 SUBMITTALS

A. Manufacturer's data sheets on each product to be used.

B. Preparation instructions and recommendations.

C. Storage and handling requirements and recommendations.

D. Typical installation methods.

T80 -1.6 DRAWINGS

A. 167-ME-MM-00-T-00 - SITE - TABS SUPPLY PIPES.

B. 167-ME-MM-01-T-00 - BLOCK A - GF TABS LAYOUT.

C. 167-ME-MM-02-T-00 - BLOCK A - 1st FLOOR - TABS LAYOUT.

D. 167_ME_MM_04_T_00 - BLOCK B - TABS LAYOUT.

E. 167-ME-MM-06-T-00 - BLOCK C - GF TABS LAYOUT.

F. 167_ME_MM_08_T_00 BLOCK D - TABS LAYOUT.

G. 167-ME-MM-010-T-00 BLOCK E - GF FLOOR TABS LAYOUT.

H. 167-ME-MM-011-T-00 BLOCK E - 1st FLOOR TABS LAYOUT.

I. 167-ME-MM-13-T-00 – BLOC F - GF TABS LAYOUT.

J. 167-ME-MM-15-T-00 - BLOCK G - TABS LAYOUT.

K. 167-ME-MM-17-T-00 BLOCK H GF TABS LAYOUT.

T80 -1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.

B. Installer Qualifications: Company specializing in performing work of this section with minimum five years documented experience with projects of similar scope and complexity.

C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

T80 -1.8 12-MONTH WARRANTY AND MAINTENANCE

A. All chilled water and TABS piping installations will be warranted for 12 months from date of commissioning, regardless of start-up date.

B. The user-client may require the HVAC contractor to enter into an extended planned maintenance contract and Service Level Agreement following lapse of compulsory 12-month maintenance after practical completion.

PART2 - PRODUCTS

T80 -2.1 PIPING

T80 -2.1.1 GENERAL

A. Fixing: Rates shall include for fixing, insulating, painting, pressure testing, commissioning and handing over of complete piping system inclusive of all brackets, materials, bolts, nuts, washers, anchors and appurtenances.

B. The drawings are generally diagrammatic and indicative of work to be done. The runs and arrangements of piping shall be as indicated, subject to modifications as required to suit conditions at the building, to avoid interference with work of other services and for proper convenient and accessible location of all parts of the piping system. All required offsets, fittings, valves, traps, drains, etc. may not be indicated but allowance must be made in tenders for all such necessary items to be furnished.

C. Piping shall be installed as straight and direct as possible, neatly spaced and in general forming right angles with, or parallel to walls or other piping.

D. Piping shall be installed so that there is a clearance of at least 25 mm between the finished coverings of piping and adjoining structures. Piping shall be hung at or in the ceilings from the construction above and as close as possible to the soffits of slabs, beams etc. maintaining maximum head room at all times.

E. All piping shall be run so to avoid passing through ductwork, recessed light fixtures or interference with electric light outlets.

F. Sleeves shall be provided by the successful tenderer where piping passes through partitions, slabs, etc. Sleeves shall be flush with each side of the surface penetrated. Insulation shall be continuous through sleeves.

G. All piping shall be reamed after cutting. Connections with valves necessary for complete drainage of the piping system shall be provided at all low in the piping systems.

H. All piping shall be reamed after cutting. Connections with valves necessary for complete drainage of the piping system shall be provided at all low in the piping systems.

I. To facilitate maintenance, repair or replacement, unions (screwed or flanged as required) shall be furnished for all apparatus requiring disconnection for repairs. Shut off valves shall be installed where indicated and at the inlet and outlet of individual items of equipment to permit removal, without interfering with the rest of the system.

J. Piping shall be arranged for maximum accessibility for maintenance and repair and valves shall be located for easy access and operation.

K. Provision shall be made in the tender for testing of welds as directed by the Engineer. A number of joints may be required to be cut out for examination purposes. After removal of these joints, the piping shall be made good by the Contractor. Should any of the welds prove unsatisfactory, the Contractor will be called upon, at his own expense, to have all welds X-rayed and examined by an approved authority. On completion of the test, the Contractor shall submit test and inspection reports before the installation will be accepted.

T80 -2.1.2 MAIN PIPE (PLANT ROOM)

A. Type: All water piping on closed piping systems shall be medium class steel pipe in accordance with SANS 62 : 2003 - Part 1 and pipe fittings shall be medium class in accordance with Part II.

B. Schedule: 40

C. Water pipes sizes up to 40 mm shall be screwed, over 40 mm shall be flanged on every 12 m length of pipe.

D. Welded connections shall be of the best quality and shall comply with BS 2971-1961: Class 11 – “Metal Arc welding of steel pipelines or other pipe assemblies for carrying fluid”.

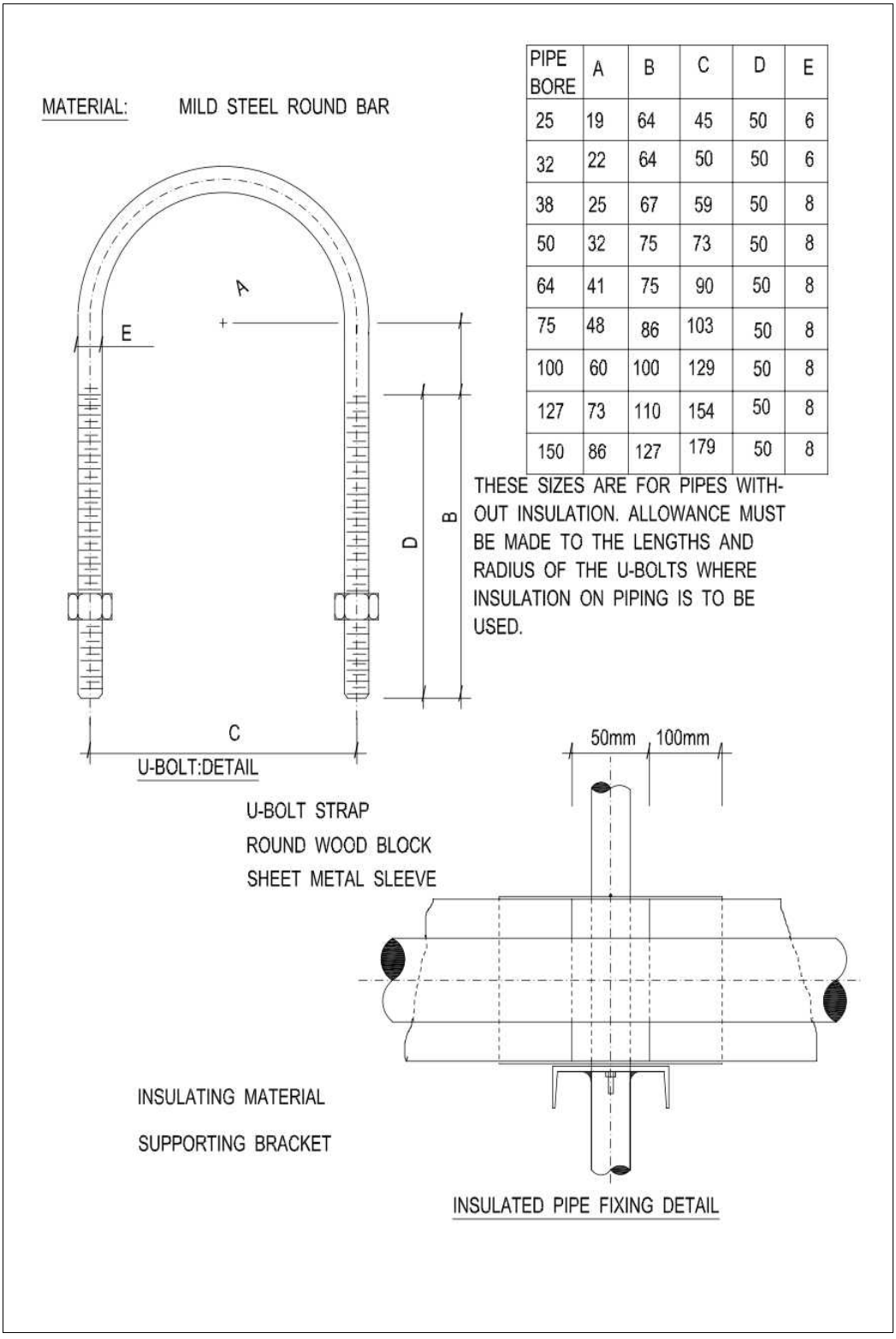
E. All flanges shall be in accordance with SANS 1123 : 2003 or BS 4504 Part 1 (one) and shall be plain faced and welded to the pipes. Flanged joints shall be made with thin metallic corrugated joint rings and jointing paste. Welding sockets shall be used for all welded pipe connections. All bolts on flanges must be accompanied by washers on both sides of the flange.

F. The length of bolts shall suit the flange thickness and only between 2 and 3 threads shall be visible behind the nut, with the nut fixed and torqued.

G. Fixing: Angle Brackets fixed to the wall or suspended from concrete slab with spring, chain or rod type pipe hangers.

H. Typical bracketing details:

1. Pipe U-bolt and insulation pipe fixing details:



2. Typical Pipe Support Details:

(a) Refer to Building Engineering Services Association: TR50 Guide to Good Practice: Supports and Fixings.

I. Spacing:

Nominal Pipe Size (mm)	Maximum Span (m)	Minimum Rod Diameter (mm)
25	2.2	10
40	2.8	10
50	3.2	10
80	3.7	14
90	4.0	14
100	4.3	16
125	4.9	16
150	5.2	20
200	5.8	22
250	6.7	22
300	7.0	22
>300	7	22

J. Insulation:

1. Supply: Yes
2. Return: No

K. Insulation materials and method:

1. Supports of insulated piping shall be lined with suitably hard insulation, such as wooden blocks, of same thickness as the general insulation material. Pipe insulation shall extend up to the wooden blocks, but the vapour seal shall extend over the blocks as per typical detail above.
2. All piping , pipe fittings etc. shall be thoroughly cleaned from rust, oil grease etc. before any insulation material is applied and shall be done as follows:

(a) The pipes are to be sandblasted to remove all scale.

(b) The pipes are to be cleaned inside and out from all grit.

(c) The pipes are to be cleaned inside and out from all grit.

(d) The pipes are painted with two coats ACP28 primer.

(e) The pipes are then painted with 2 coats of Dulux heavy duty enamel tractor paint.

3. After cleaning, the pipes, pipe fittings, etc. shall be covered with one layer of "Flintcote" or similar type paint before the insulation is applied.

4. No pipe insulation shall be applied unless the piping system has been pressure tested to the satisfaction of the Consulting Engineer or the appointed Mechanical Clarke of Works.

5. The insulation material used shall conform to the following specification:

(a) It shall be preformed to fit the relevant pipe size.

(b) It shall be manufactured from resin bonded glass fibre or mineral wool and shall have a density of not less than 60 kg/m^3.

(c) It shall be suitable to be applied to systems with a temperature range from –10°C to +300°C.

(d) It shall have a thermal conductivity coefficient of not more than 0,08 Watt/m°C.

(e) All pipe insulation sections shall be of the snap-on type and shall be covered with canvas.

(f) Insulation materials shall be completely incombustible regardless of the operating temperature. The insulation material shall carry a NBR1 classification class A (BS 476) for the Propagation of Flame Spread and the smoke contribution in fire shall be nil.

6. Pipe Insulation:

(a) All insulation sections shall be clamped onto piping, using special aluminium or galvanised steel bands. Bands shall be spaced at not more than 300 mm centres. The canvas shall be wrapped around the insulation section and the overlap ends shall be glued. Insulation ends shall also be covered with canvas to prevent deterioration.

(b) All insulation sections, on chilled water pipes only, must then be vapour proofed with two layers of "Decadex sealer", "Foster seal" or resin or approved type of vapour proofing.

(c) Concealed chilled water piping and pipe fittings shall be vapour sealed over the insulation as specified above without any further cladding.

(d) In addition to the above all pipe insulation exposed e.g. in plant rooms and below ceilings and in all insulation which will be subjected to outside weather conditions must be covered with galvanised sheet metal cladding of 0,7 mm thickness. The cladding must be secured with 15 mm wide, 0.4 mm thick GI bands at 300 mm centres, applied with strapping machine or pop-riveted.

(e) The cladding is to be installed only after the vapour barrier has been completed on the pipe work and fittings where applicable. Before the cladding is installed, the Contractor shall notify the Engineer so that inspections can be carried out.

(f) Pipe bends shall not be insulated as described above. These are to be covered with a layer of fibre-glass around which wire mesh is secured. This is then to be plastered to a smooth finish with asbestos plaster mixed with 20% building cement to act as a hardening agent. The vapour barrier is to extend around such bends and be continuous.

(g) All insulation sections shall be clamped onto piping, using special aluminium or galvanised steel bands. Bands shall be spaced at not more than 300 mm centres. The canvas shall be wrapped around the insulation section and the overlap ends shall be glued. Insulation ends shall also be covered with canvas to prevent deterioration.

(h) Insulation thickness shall be as follows:

Pipe Size (mm)	Insulation Thickness (mm)
12-80	25
>80	38

L. Marking and Colour Coding

1. All steelwork, piping, lagging, etc. supplied under this contract shall be painted as required under this clause.

2. All other exposed metal parts such as pumps, belt guards, all piping, pipe lagging, fittings, dampers, fans, coils, motors, pumps, packaged units, control panels, steelwork, exposed ducts and lagging, expansion tanks, make-up tanks, cooling tower, unit shelters, etc. shall be cleaned, primed, undercoated and finished in a high quality gloss paint of approved colour.
3. All external equipment exposed to the weather must be cleaned, primed and painted with two coats of epoxy paint.
4. All clad and unclad pipe insulation shall be painted in accordance with SANS 10140-3: Identification colour marking except on piping which is installed in shafts and concealed areas, which shall only be colour banded.
5. In enclosed horizontal or vertical ducts, surfaces, mezzanine spaces and basements where pipelines are already painted or galvanised or are lagged, painting may be restricted to 150 mm long lengths at a maximum spacing of 4 m, and at all branches, tees, valves, and at the entry from such ducts, spaces, etc.
6. Pump sets, valves, fittings, etc. shall be painted the same basic colour as the pipelines.
7. The length and width of the indicator shall be the same as the final pipe diameter, but not less than 100 mm. Where three bands are required per indicator, each band shall be one third of the final pipe diameter but not less than 35 mm. Where basic colour bands are used (as a background) the bands shall be centrally placed.
8. The direction of flow shall be indicated with a 25 x 100 mm long black arrow at intervals of approximately 4 m and at valves and junctions. Flow lines shall be marked with an F and return lines with an R at each arrow.

T80 -2.1.3 MAIN BULK CHILLED WATER RETICULATION (SITE RETICULATION)

A. Level: Below grade in service trenches. Trenching and backfilling by others.

B. Type: Pre-Insulated HDPE.

C. Pipe Composition: Inner HDPE, Outer PVC.

D. Class: HDPE SDR/13.6, PVC 4.

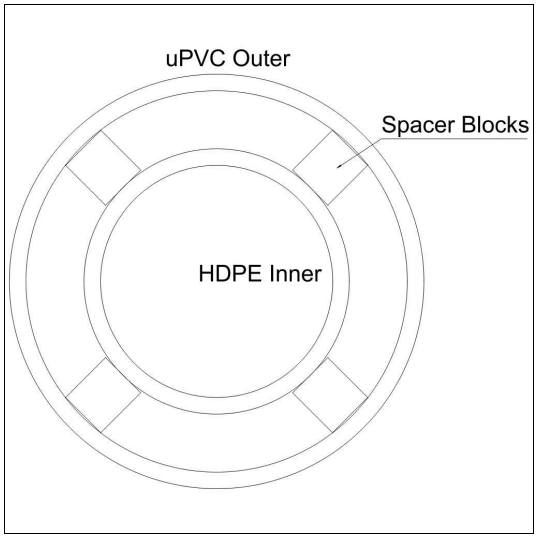
E. Sizing Table:

Inner OD (mm)	Inner Class	Outer OD (mm)	Outer Class	Outer ID(mm)	Insulation Thick (mm)
16	16	63	4	60	22
20	16	75	4	72	26
25	12	75	4	72	23.5
32	12	90	4	86.4	27.2
40	12	90	4	86.4	23.2
50	12	110	4	105.6	27.8
63	12	110	4	105.6	21.3
75	12	125	4	120	22.5
90	12	140	4	134.4	22.2
110	12	160	4	153.6	21.8
125	12	200	4	192.2	33.6
140	12	200	4	192.2	26.1
160	12	200	4	192.2	16.1
200	12	250	4	240.2	20.1
250	12	315	4	302.6	26.3

F. Insulation: 2-Component polyurethane, density 35-50kg/m^3, k<0.03 W/mK.

G. Joining Method: Butt Welding.

H. Spacer Blocks:



I. Laying: Trench to SANS 1200 (Trench and backfilling by others).

J. Couplings: Fused type.

T80 -2.1.4 DISTRIBUTION PIPING (MANIFOLDS)

A. Type: PPR

B. Standard: ISO/SANS 15874 Parts 2, 3 & 5.

C. Standard Dimension Ratio: 11

D. Class:

1. Exposed pipes: PN12,5
2. Underground: PN16

E. Pipe diameters: Nominal External

F. Insulation: None

G. Temperature Range: 0-90°C

H. Joining Method: Socket fusion heat welded thermoplastic fittings.

I. Fixing:

1. Pipes shall be firmly fixed to walls etc. with “Sikla” or “Hilti” type pipe clamps with provision made for thermal (lateral) expansion. Pipe clamps shall have rubber inserts designed for use with PPR pipes to avoid damage to the pipes.
2. Fixed pint fittings shall only be used at pipe branches or pipe bends all other supports shall be of the continuous horizontal type, e.g., cable trays.

3. Fixing in vertical service ducts can be via fixed installation points, e.g., pipes clamps specified above. However, the maximum fixing spacing for vertical installations shall be 3m.
4. When pipes are installed across trusses cable trays shall be used to ensure that the correct bracketing distances is maintained, unless otherwise specified.
5. Unless specifically otherwise stated, descriptions of pipes shall be deemed to include for fixing to walls, soffits, casting in, building in or suspending not exceeding 1m below suspension level.

J. Fixing Spacing: To suppliers specifications.

T80 -2.1.5 EMBEDDED PIPING

A. Type:
   1. A, B or C.
   2. Layer: Single.
   3. Oxygen Barrier: Yes.

B. Insulation: None

C. Temperature Range: 0-90°C

D. Joining Method: Compression Fittings

E. Pipe Size: 20mm OD

F. Fixing Concrete Slab: Pipes to be fixed on 10mm Rebar rod with cable ties. Rods to be raised with A-frame lattices of suitable height so that pipe network is on the neutral axis of the slab.

G. Fixing Surface Bed: Pipes to be fixed on 10mm Rebar rod with cable ties. Rods to be fixed to mesh placed on top of isolation board.

T80 -2.2 MAIN LINE COMPONENTS

T80 -2.2.1 VALVE CHAMBERS

A. Construction: By others

B. Fitting-out: By TABS specialist sub-contractor including valves, flanges, joints, distance pieces and spool pieces.

C. Connection to TABS mains: By TABS specialist sub-contractor.

T80 -2.2.2 ISOLATING VALVES (<= 65MM)

A. Type: Ball valve – full-way type with plastic coated steel handle.

B. Standard: SANS 1056-3:2016 (Ed. 2.05) - Ball valves Part 3: Light duty valves (not fire-safe).

C. Material: Brass

D. Test Pressure: 2000 kPa

T80 -2.2.3 ISOLATING VALVES (>= 65MM)

A. Type: Butterfly valve.

B. Standard: BS 5155 PN 16

C. Flanges: valves shall be designed to fit between flanges drilled to the BS10 Table D.

D. Materials:

1. Body: Cast Iron to grade 220 to BS 1452
2. Disc: spheroidal graphite iron to SANS 936/937 – 1969 grade SG42 with a nylon coating.
3. Liner: The liner shall be high nitrile rubber moulded to the valve body to form a resilient seal.
4. liner shall be lapped over into the body recess to provide a self-sealing joint with mating pipe flanges.
5. Ductile iron body, bronze disc, EPDM rubber seals. PN16.
6. Shaft: Grade 431 stainless steel to BS970.

E. Seals:

1. Primary: Integral with the body liner
2. Secondary: Integral with the body liner
3. Tertiary: Shaft mounted replaceable O-ring.

F. Operation: Manually operated and closed using a trigger lever which will incorporate a spring-loaded trigger enabling the disk to be set in a number of intermediate positions from fully opened to fully closed.

T80 -2.2.4 STOP COCKS

A. Type: Globe valve.

B. Material: Bronze. PN 20.

T80 -2.2.5 PRESSURE GAUGES

A. Size: 100mm Diameter.

B. Type: Dial.

C. Gauge Cock: Yes.

D. Damping: Glycerine

T80 -2.2.6 THERMOMETERS

A. Temperature Range: 0-40°C.

B. Material: Brass.

T80 -2.2.7 STRAINERS

A. Type: Pot or Y-Type

B. Material:

1. Sleeves: Cast Iron.
2. Covers: Bronze or stainless steel.

C. Class: PN16

D. Strainer : Stainless steel.

E. Connections:

1. <= 40 mm: Union.
2. > 40 mm: Flanged.

T80 -2.2.8 CHECK VALVES

A. Type: Swing or lift

B. Materials:

1. Body: Bronze. PN 25 for pipes <= 50mm.
2. Body: Cast iron. PN 16 for pipes >50mm.
3. Disc: Bronze or stainless steel.
4. Seats: Neoprene, gunmetal or stainless steel
5. Liner: The liner shall be high nitrile rubber moulded to the valve body to form a resilient seal.
6. Valves with metal to metal contact shall be provided with replaceable O-rings.

T80 -2.2.9 PRESSURE REDUCING VALVES

A. Body: Bronze.

B. Bell housing, maximum inlet pressure 21 bars, outlet pressure adjustable between 1,7 and 5,2 bars, threaded connections, flanged connections above 50 mm diameter pipe, stainless y-type steel strainer, union, tap and plug for pressure gauge, pressure gauge, bypass with globe valve.

T80 -2.2.10 DOUBLE REGULATING VALVE

A. Body: Bronze. PN 20 for pipes <= 50mm.

B. Body: Cast iron. PN 16 for pipes >50mm.

C. Threaded or capillary ends up to 50mm diameter, epoxy coating, flanged or grooved ends from 65mm diameter and above. Size shall be selected and calculated based on required pressure drop and submitted for Engineer's approval.

T80 -2.2.11 AUTOMATIC AIR BLEEDERS

A. Controller

1. Independent Control Channels: 2
2. Level Sensors per Channel: 2, One for LL and one for HL
3. Total Level Sensors: 4
4. Power Supply: 220VAC
5. Digital Outputs: 2x Relay, 220VAC
6. Enclosure: IP65
7. Protection: HHL Float Type Read Switch, hardwire inline to relay coil.

B. Solenoid

1. Type: Direct Acting, 1/2” NC
2. Body: Brass
3. Coil Voltage: 220VAC
4. Mechanical Endurance: 1.3 Million Cycles
5. Reaction Time: 10ms

C. Level Probes:

1. Type: Stainless Steel Button Head Bolts
2. Probe Functions: Common, LL, HL

D. Riser Piping

1. Type: PPR
2. Size: ø100mm
3. Riser Height above highest point in Plant Room: 1m
4. Shut off valves before Solenoid: Ball Type

T80 -2.2.12 BLADDER TANK

1. Temperature Range: -10°C – 100°C
2. Maximum Operating Pressure: 10 Bar
3. Static Set Pressure: 1.0 Bar
4. Static Set Water Temperature: 22°C
5. Expanded Final Pressure: 4.5 Bar
6. Expansion Volume: 150 Litres

T80 -2.2.13 MEASURING PORTS

A. Instrumentation for the measuring of water pressure and water temperature shall consist of a system of measuring ports with a matching portable thermometer and pressure gauge.

B. The measuring ports shall be of the self-sealing “Super Seal P/T Port” or any other approved type measuring port.

C. The positions of the measuring ports are not shown on the drawing but will include all vertical risers and horizontal branches from risers, all TABS manifold, suction and discharge points on pipes, and the main suction and discharge manifolds in the chiller yard.

D. The length of the measuring port shall be determined by the thickness of the pipe insulation. The pressure gauge shall be a 90mm circular type calibrated in kPa from 0 to 600kPa and shall be equipped with a feeler bulb that can penetrate through the measuring point into the water

E. The thermometer shall be an electronic digital thermometer of the major MT600 type calibrated in °C with a measuring range of –10°C to +100°C. The thermometer shall be equipped with a probe that can penetrate into the water.

F. The pressure gauge and thermometer shall be handed over to the Engineer at date of hand over.

G. The price in the bill must include for the supply and installation of the measuring port, as well as for the supply and installation of a suitable socket in the pipe in which the measuring port can be accommodated.

H. A separate price must be provided for the measuring instruments.

T80 -2.2.14 FLOW SWITCHES

A. Flow switches shall be of the Johnson Penn Series F61 or other equal approved type which shall be mounted in a socket welded onto the pipe.

B. The flow switch shall be suitable to operate in water between the temperature of 2 – 50°C and up to a pressure of 1000 kPa.

C. The part of the flow switch which is in contact with the water shall be manufactured from bronze or stainless steel.

D. The switch must switch a 220 volt signal and must be adjustable. The electrical equipment must be housed in a watertight compartment.

T80 -2.2.15 RUBBER FLEXIBLE PIPE CONNECTIONS

A. Type: RFE

B. Test Pressure: 1000 kPa

C. Size: same diameter as the adjoining pipe

D. Each connector shall consist of 2 flanges with a butyl reinforced pipe clamped between the flanges.

T80 -2.3 DISTRIBUTION LINE COMPONENTS

T80 -2.3.1 ISOLATING VALVES (<= 50MM)

A. Type: PPR Ball valve.

B. Material: PPR

T80 -2.3.2 ISOLATING VALVES (> 50MM)

A. Type: PPR Ball Valve.

B. Material: PPR

T80 -2.3.3 SOLENOID VALVES

A. Body:Plastic

B. Voltage: 24VAC

C. Size: 50mm

D. Integrated Flow Control Valve: Yes

E. Application: Irrigation

T80 -2.4 EMBEDDED LINE COMPONENTS

T80 -2.4.1 ISOLATING VALVES (<= 50MM)

A. Type: Ball valve.

B. Material: PVC with PVC nipples.

T80 -2.5 WATER TREATMENT

A. Type: Filming amine corrosion inhibitor NCH 47 H

B. Key Performance Indicators:

1. TDS: 500-3000 ppm
2. PH: 9,2-11
3. NCH 47 H: 40-60 ppm

C. Water Filtration Unit:

1. Type: Side-stream stainless steel
2. Filtration Rate: 30 m^3/h
3. Filter: Washable bag type 50 micron
4. Appurtenances required: 2 x ø100 mm glycerine filled pressure gauges
5. Connections: 75 mm flanged

D. Corrosion Monitoring:

1. Type: Rack
2. Coupons: Stainless steel, copper and mild steel

PART3 - EXECUTION

T80 -3.1 MAIN LINE

T80 -3.1.1 GENERAL

A. Joint Trades: Yes, TABS specialised sub-contractor to allow for joint trades during construction of main bulk chilled water reticulation, TABS distribution and embedded piping and main mechanical plant room.

T80 -3.1.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the project conditions.

T80 -3.1.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and the requirements of authorities having jurisdiction.

B. Use manufacturer's guidelines for minimum clearances to combustibles, walls, and finishes.

C. Anchor all components firmly in position.

D. Upon completion of installation, visually inspect all exposed surfaces. Touch up scratches and abrasions with touch up paint recommended by the manufacturer; make imperfections invisible to the unaided eye from a distance of 2 meters.

E. Test for proper operation and adjust until satisfactory results are obtained.

T80 -3.1.4 INSULATION METHODOLOGY:

A. Outer sleeve shall be cut shorter than the inner pipe, to allow the electrofusion couplings to be fitted as normal.

B. Plastic en cap will be cut to fit snugly over the inner pipe and with an outer diameter large enough to allow for welding the end cap to the outer sleeve.

C. Inner pipe will be spaced with wooden blocks from the outer sleeve in at least four intervals along the length of the pipe.

D. Pipes will be insulated in 6m lengths and mounted at an angle of at least 30° to ensure that the liquid easily reach the bottom.

E. Mounting frame shall be such that the pipes can be strapped to a stiff member that will ensure the pipe is neatly straight after the cast.

F. Polyurethane injector capable to continuously mix the 2 components in the exact ratio as determined by the supplier, will be used to inject the liquid.

G. Mixing the polyurethane by hand will not be accepted as the control of density will be compromised.

H. Injection quantities shall be limited so that each pipe is completed in 3 stages at a minimum.

I. Allow for an expansion ratio of 10:1.

J. Joints where insulation had to be shortened for the butt weld machine to function, will be insulated with a slip sleeve that will cover the joint and filled with polyurethane.

T80 -3.1.5 PROTECTION

A. Protect installed products until completion of project.

B. Ensure that all open pipe ends are plugged in working areas, until connections are made.

C. Touch-up, repair or replace damaged products before completion.

T80 -3.1.6 DELIVERY, STORAGE AND HANDLING

A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.

B. Protect from damage due to weather, excessive temperature, and construction operations.

T80 -3.1 DISTRIBUTION LINE

T80 -3.1.1 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the project conditions.

T80 -3.1.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and the requirements of authorities having jurisdiction.

B. Use manufacturer's guidelines for minimum clearances to combustibles, walls, and finishes.

C. Anchor all components firmly in position.

D. Ensure that entire pipe system is under pressure at all times, as soon as a portion of the installation is finished.

T80 -3.1.3 PROTECTION

A. Protect installed products until completion of project.

B. Ensure that all open pipe ends are plugged in working areas, until connections are made.

T80 -3.1.4 DELIVERY, STORAGE AND HANDLING

A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.

B. Protect from damage due to weather, excessive temperature, and construction operations.

T80 -3.1 EMBEDDED LINE

T80 -3.1.1 PREPARATION

A. Lay bottom rebar. Do NOT proceed with top rebar until pipe coils are fixed.

B. Ensure that the pressure pump system is operational and prepared to put all the coils under pressure for the duration of the casting process

T80 -3.1.2 INSTALLATION

A. Fix A-frame lattices to bottom rebar with cable ties, every 400mm. Space lattices 1m apart, perpendicular to the coil direction and ensure it spans the entire width of the coil with an overhang of 200mm minimum at each side.

B. Fix 10mm rebar rods perpendicular to the A-frame lattices, at the indicated pitch of the coils. Rods shall span the entire length of the coil.

C. Fix the pipe to the rebar rod with cable ties every 400mm. Ensure that all cut ends are removed from the deck.

D. A minimum bending radius of 250mm is required at each turn.

E. Ensure that no-go areas around columns and slab edges are adhered to as per drawings. Pipes can simply be routed around these areas and pitched narrower for sections.

F. Where pipes cross over construction joints, a 300mm long HDPE sleeve shall be put over the crossings.

G. Where pipes need to penetrate through shutter boards, a 32mm hole shall be drilled, and a 250mm long 32mm HDPE sleeve slipped over the pipe end. The sleeve shall be plugged on the concrete side to ensure that concrete does not leak through during the pour.

H. Where pipe end exit to ground manifolds, care shall be taken that pipes are not closer than 100mm from each other, in order not to create a honeycomb.

I. Inspect the coils to ensure that the pipe is not pinched anywhere.

J. Fix the top rebar only after the pipe coil are inspected and cleared of defects.

K. Make up a temporary manifold an ensure all pipe coils are connected.

L. Start the pressure pump system and bleed the air out of the system.

M. Keep the system under pressure for the duration of the casting process, as well as during construction.

T80 -3.1.3 TEMPORARY PRESSURE PUMP SYSTEM

A. A temporary pressure pump system that can be easily moved on site, shall be used to put the pipe system under pressure from casting, and for the duration of the project.

B. This is to ensure that should any damage occur on the embedded pipes, the leak can be found instantly and repaired before finishing is done.

C. The system shall consist of a pressure pump that can deliver 0.5 L/s at 6 Bar pressure.

D. A plastic buffer tank shall be used that will be connected to the suction side of the pump.

E. The pump shall feed into the coils or distribution piping via temporary manifolds that will be made from 20mm Pex piping. Plasson type Tees can be used for connecting the temporary manifold.

F. The return pipe shall feed back into the buffer tank and choked with a ball valve to ensure that air is bled form the system.

T80 -3.1.4 PROTECTION

A. Protect installed products until completion of project.

B. Ensure that all open pipe ends are plugged in working areas, until connections are made.

C. All drilling in slabs must be done with stopper sleeves over the drill bits to ensure that drill bits cannot penetrate deeper than 75mm into any surface with embedded pipes.

T80 -3.1.5 DELIVERY, STORAGE AND HANDLING

A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.

B. Protect from damage due to weather, excessive temperature, and construction operations.

C. Rates for delivery of equipment are to be inclusive of hoisting and placing equipment on grade or elevated levels. Contractors are advised to study tender drawings at tender stage to determine costs and include in their tendered rates.