

SECTION 15440

PLUMBING FIXTURES

PART 1: GENERAL

1.01 SCOPE OF SECTION

- A. This technical specification establishes the quality of workmanship of plumbing fixtures.

1.02 WORK INCLUDED

- A. Provision of all labour, materials and the performance of all operations in connection with the installation of plumbing fixtures as specified herein and shown on the drawings.
- B. Coordination: The Contractor shall be responsible for proper coordination of the work of all trades.
- C. Note for actual specification of type of appliances in toilet areas refer to Section 10800 toilet and bath accessories.

1.03 QUALITY ASSURANCE

- A. Installer: Firms regularly engaged in the installation of plumbing works of a similar quality and scope as this project for at least 5 years.

1.04 APPLICABLE CODES AND STANDARDS

- BS 5572 Sanitary pipe work
- BS 5627 Plastic connection for use with horizontal vitreous China W.C. pans in conjunction with BS 65, 416, 437, 1387, 2598, 2871, 3868, 4514, 4660, 5503 and 5504

1.05 OPERATION MAINTENANCE DATA

- A. Comply with Section 15010.

1.06 WARRANTY

- A. Provide 12 months warranty in accordance with contract conditions.

PART 2: PRODUCTS

2:1 PLUMBING FIXTURES

- A. All plumbing fixtures shall be local standard type

PART 3: EXECUTION

3.01 STORAGE

- A. All plumbing fixtures shall be stored in their original containers in a secure enclosed store. Vitreous china ware shall be stored out of direct sunlight. Fittings (Taps, Showers etc.) shall be stored in boxes or wrappings to prevent the ingress of dust to machined surfaces. All storage areas shall have adequate artificial lighting to allow for inspection of the equipment by the engineer.

3.02 FIXINGS

- A. All fixings (Screens, Bolts etc.) shall be as supplied and/or recommended by the fitting/fixture manufacturer. The fixings shall be entirely suitable for the medium they are fixing into and shall be chosen to prevent any electrolytic action between any of the installation elements. All fixings exposed to view shall be stainless steel or where only the heads are exposed shall have caps of the same colors as the item they are fixing.

3.03 INSTALLATION OF FIXTURES

- A. All preparation work (provision of holes, pipes etc.) shall be carried out in strict accordance with the fixture manufacturers requirements and shall be arranged such that pipe fittings, offsets & connections are kept to a minimum. All plumbing fixtures shall be securely fixed to the structure or their support system and shall be plumb & level. The fixtures & their plumbing connections shall be arranged to ensure the connections are not subject to any strain or load from the fixtures.

3.04 INSTALLATION OF FITTINGS

- A. All fittings shall be installed true & straight or where curved, shall follow the manufacturers recommendations to produce a smooth, fair & continuous radius. Any fittings exhibiting 'tool working' or surface finish damage shall be replaced. When positioning fixtures & fittings the contractor shall ensure that all items are central, or where in a range, consistent and symmetrical about Architectural finishes as indicated on the drawings.
- B. Where fittings are concealed the contractor shall ensure that they are accessible for maintenance without affecting the structure or finishes.

3.05 PROTECTION

- A. The Contractor shall take all measures necessary to protect fixtures and fittings during construction. Any damaged fixtures and fittings shall be replaced by new equivalent units. Repairing of damaged units shall not be accepted.
- B. All fixtures and fittings shall be finally cleaned and put into working order upon completion of construction. The Contractor shall be fully responsible for maintaining these items until the facility is finally handed over.

3.06 TOOLS

- A. The contractor shall supply any special wrenches or other devices necessary for servicing and maintaining the fixtures & fittings. The contractor shall supply 1 No. device for each 10 No. units installed.

End of Section

SECTION 15450

PLUMBING PIPING INSULATION

PART 1: GENERAL

1.01 SCOPE OF SECTION

- A. This technical specification establishes the type and quality of materials and the standard of workmanship to be used in the supply and application of thermal insulation to plumbing piping.

1.02 WORK INCLUDED

- A. The work includes the provision of all labor, materials and the performance of all operations in connection with the supply and application of thermal insulation as specified herein and where referred to on the Drawings.
- B. Coordination: The Contractor shall be responsible for the full coordination of the work of all trades.

1.03 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in the manufacture of thermal insulation materials whose products have been in satisfactory use for a similar application for not less than 10 years.
- B. Installer: Firms regularly engaged and qualified in the application of thermal insulation materials with at least 5 years successful installation experience on projects of a similar nature.

1.04 APPLICABLE CODES AND STANDARDS

- A. The thermal insulation products and all associated materials shall comply with the latest relevant British Standards in all respects.
- B. The following are the most commonly used and relevant British Standards associated with thermal insulation products and associated material. However, the Contractor shall ensure that all applicable British Standards are complied with whether listed here or not.

BS 476 Part 4 : Non-combustibility Test for Materials.

BS 476 Part 7 : Method for Classification of the Surface Spread of Flame of Products

BS 476 Part 20 : Method for Determination of the Fire Resistance of Elements of Construction.

BS 1485 : Specification for Zinc Coated Hexagonal Steel Wire Netting.

BS 3958 Part 3	:	Metal Mesh Faced Man-made Mineral Fiber Mattresses.
BS 3958 Part 4	:	Bonded Preformed Man-made Mineral Fiber Pipe Sections.
BS 3958 Part 5	:	Specification for Bonded Man-made Mineral Fiber Slab.
BS 5422	:	Specification for the use of Thermal Insulation Materials.
BS 5970	:	Code of Practice for Thermal Insulation of Pipe work and Equipment.

PART 2: PRODUCTS

2.01 GENERAL

- A. For general applications the thermal insulation materials shall be made from materials which will not burn, but materials which are not entirely non-combustible may be accepted if they have self-extinguishing characteristics, the total mass of combustible materials is small and combustion does not produce dense smoke or toxic fumes. All material finishes shall conform to spread of flame classification class O. Such materials shall only be used with the prior permission of the Engineer.
- B. Insulation shall be waterproof, odourless, non-hyrosopic, shall not sustain vermin and shall not contribute to metal corrosion. Any finishes (or coverings) used shall not deteriorate with age or the effects of solar heat.
- C. Thermal insulation materials and their finishes shall be asbestos free and be suitable for continuous use throughout the range of operating temperatures and within the environment indicated.
- D. All insulating materials and associated products, sealant, tapes, adhesives, securing bands and protective cladding shall be as specified or equal and approved.

2.02 PLANT AND PIPEWORK INSULATION

- A. Thermal insulation shall be pre-formed rigid sections or slabs, the basic material consisting of one of the following:
 - * Rock wool mineral fiber (density 110-160 Kg/m³).
 - * Pre-formed glass fiber sections (density 80-110 Kg/m³).

The insulation shall be manufactured from long stranded mineral fibers, resin bonded to form sections having uniform density and high compressibility. The preformed rigid insulation outside surface shall be smooth, unbroken, uniform, concentric and firm.

- B. Pipe work insulation shall be high density rigid resin bonded preformed rock wool mineral fiber sections of the thickness specified. The insulation shall comprise of two half sections with a factory applied reinforced aluminium foil covering hinging the two half mating sections for ease of installation. The covering shall have a 50mm side overlap of reinforced aluminium foil to enable the outside surface to be completely sealed.
- C. Where thermal insulation of plant is required the insulation shall be preformed rigid sections or slab. The material shall consist of long fine fibers (free from shot and coarse fibers) bonded with a temperature resistant resin. The density shall be a minimum of 48 Kg/m³ and the surface shall have a factory applied reinforced aluminium foil finish.
- D. Thickness of insulation shall be determined in accordance with the following tables for the appropriate medium and the declared value of thermal conductivity of the insulation material at the relevant temperature.

When selecting the insulation thermal conductivity, the space available for the installation shall be thoroughly examined to ensure that the resultant thickness can be accommodated.

TABLE 1

THICKNESS OF INSULATION FOR HOT WATER SERVICES

DECLARED THERMAL CONDUCTIVITY (W/m ⁰ C)			
Size of Tube	Up to 0.040	0.041-0.055	0.056-0.070
mm	Minimum thickness of insulation(mm)		
15 to 32	25	25	25
40 to 50	25	32	32
65 to 80	32	32	32
100	32	32	38
125	32	38	44
150	38	44	44
Flat Surface	44	44	44

PART 3: EXECUTION

3.01 STORAGE

- A. All thermal insulation materials shall be stored in their original packaging in such a manner as to prevent the ingress of dust or moisture. The height of the packages shall be restricted to prevent any deformation of preformed rigid sections.
- B. Flat sheet and rolled metal materials used for protective claddings shall be stored away from the ground surface, adequately covered and protected in a manner to prevent damage to the materials.
- C. All storage areas shall have adequate lighting to allow for the inspection of all materials.

3.02 FIXINGS

- A. All mechanical fixings (rivets, screws) shall be as recommended by the manufacturer of the material being fixed. All mechanical fixings, sealant, tapes and adhesives shall be entirely suitable for the medium that they are being applied to and the application shall be fully in accordance with the manufacturers recommendations.

3.03 PLANT AND PIPEWORK INSULATION

- A. Thermal insulation to pipe work shall be carried out by specialists and strictly in accordance with this Specification. No thermal insulation shall be applied to pipe work prior to witnessing of the pipe work pressure test and only then after a full inspection and approval by the Engineer.
- B. Thermal insulation shall be applied to the following:-
 - (i) All pipe work carrying hot fluids in circulation including flanges and bodies of valves on all sizes of pipe work.
 - (ii) External distributing mains and fittings above ground and in ducts, chases and trenches including all valve bodies and flanges.
 - (iii) Cold water cisterns, feed and expansion cisterns and vent pipe work in roof spaces and elsewhere, as indicated, to prevent the shedding of condensation.
 - (iv) Cold water pipe work (including valve bodies and flanges) run above ground external to buildings and run in ducts, chases, roof spaces and elsewhere as indicated, to prevent shedding of condensation.
 - (v) Buried pipe work shall have special forms of insulation as indicated.

Insulation shall fit closely on pipe work and other surfaces without gaps between.

- C. The following lines shall not be insulated:
 - 1. Pipe used solely for fire protection.
 - 2. Chromium-plated pipe to plumbing fixtures.

- D. All sections of the insulation shall be of the correct size and made for the type and grade of piping to which it is fitted and shall form a tight fit on the pipe work after application of adhesive and lapping. Bends shall be formed by cutting a series of gussets in the pre-formed sections to form a continuous finish with the pipe work. The valve bodies and flanges in plant rooms and those components within the entire pipe work system 65mm dia and above shall be insulated with the same insulation as the accompanying pipe work but contained within a removable aluminium box. Where a vapour seal is incorporated into the insulation, all joints shall be effectively sealed with approved sealing material and securely fixed.
- E. Load bearing inserts of hardwood or phenolic foam complete with a factory applied vapour seal shall be used at support positions on chilled water pipe work. The insert shall be of the same thickness as the insulating material and cut such that 50 mm protrudes either side of the support. The pre-formed insulation section shall be butt jointed to the insert and the joint fully sealed with 75 mm wide aluminium tape to maintain the vapour seal.

At flanges, expansion joints and anchor points, particular attention shall be paid to sealing the insulation against water vapour ingress.

- F. Each pre-formed rigid insulation section shall be butt jointed to the next, the joint being fully sealed with 75 mm wide aluminium tape. The preformed sections on domestic hot and cold water services shall be secured hard to the bracket where inserts are not used. The reinforced aluminium side overlap shall be sealed with a suitable adhesive or 75 mm wide aluminium tape. Outer coverings shall not come into contact with pipe work and attachments.
- G. Each section of pre-formed insulation shall be screwed to the pipe by one of the following means:
- * Circumferential tie wires each formed from three turns of wire not less than 1 mm thick, spaced not more than 450 mm apart.
 - * Circumferential bands of non-ferrous metal, plastic fiber or adhesive sheet.
 - * Rigid insulation applied to cylinders and flat surfaces shall be secured with non-ferrous metal or plastic fixings.
- H. The insulation on pipe work concealed from view within buildings will not require further protective cladding.
- I. Insulation on pipe work exposed to view and within plant rooms shall be clad fully in a pre-formed aluminium stucco finish cladding 0.8 mm thick held in place by means of rivets or self tapping screws. All joints shall be sealed with a non-setting sealing compound.
- J. Insulation on pipe work exposed to the outside atmosphere shall be clad with a covering of polyisobutylene sheet fixed with adhesive, lapped and solvent welded to form an impervious seal. At entries into buildings, the weatherproof insulation shall extend not less than 100 mm beyond the inner face of the wall and be sealed to the satisfaction of the Engineer.

- K. Thermal insulation on pipe work in concrete trenches shall be as that for insulation on pipe work exposed to the outside atmosphere.

3.04 PROTECTION

- A. The Contractor shall take all necessary measures to protect the works during construction. Any damaged sections of insulation shall be completely cut out and replaced with a new section. The vapour seal shall be repaired to ensure continuity.

All damaged sections shall be replaced at the Contractor's expense until the system is accepted and finally handed over.

End of Section

SECTION 15451

WATER HEATERS

PART 1: GENERAL

1.01 SCOPE OF SECTION

- A. This technical specification establishes the quality of materials and workmanship to be used in the supply and installation of water heaters.

1.02 WORK INCLUDED

- A. The work includes the provision of all labour, materials and the performance of all operations in connection with the installation of the water heaters as specified herein and shown on the drawings.
- B. The work includes testing of the water heaters.
- C. Coordination: The Contractor shall be responsible for full coordination of the work of all trades.

1.03 APPLICABLE CODES AND STANDARDS

- A. The water heaters, and associated fittings and accessories shall comply fully with the latest relevant British Standards in all respects.
- B. The following are the most commonly used and relevant British Standards associated with water heaters. However the contractor shall ensure that all applicable British Standards are complied with, whether listed here or not.

BS 699	Copper direct cylinders for domestic purposes. In conjunction with BS 476, 864, 2779, 3456 and 5546.
BS 759	Valves, gauges and other safety fittings for application to boilers and to piping installations for and in connection with boilers. In conjunction with BS 779 and 855.
BS 1566	Copper indirect cylinders for domestic purposes. In conjunction with BS 476, 864, 2779, 2871, 3456 and 5546.
BS 3198	Copper hot water storage combination units for domestic purposes. In conjunction with BS 864, 1212, 1968, 2456, 2779, 2870 and 2871.
BS 5970	Code of practice for thermal insulation of equipment.
BS 6280	Vacuum (back siphonage) test for water-using appliances.

- BS 6281 Devices without moving parts for the prevention of contamination of water by backflow.
In conjunction with BS 864, 2779, 2872, 4504, 5412 and 5413.
- BS 6282 Devices with moving parts for the prevention of contamination of water by backflow.
In conjunction with BS 864, 2779, 2872, 4504, 5412 and 5413.
- BS 6283 Safety devices for use in hot water systems.
In conjunction with BS 864, 970, 2056, 2779, 2870, 2871, 2872, 2874, 3074, 3075, 3457, 4504, 5412 and 5413.
- BS 6759 Safety valves.

1.04 SUBMITTALS

- A. Drawings - refer to Section 15010
- B. Products - submit full manufacturers data for every item.

1.05 OPERATION MAINTENANCE DATA

- A. Comply with Section 15010.

1.06 WARRANTY

- A. Provide 12month warranty in accordance with contract conditions.

PART 2: PRODUCTS

2.01 WATER HEATERS

- A. The electrical water storage heaters shall be water heaters of capacities as shown on the drawings. Electric water heater shall be as manufactured by “ARI STON”.

- 1- Electric water heaters shall be of the storage type, cylindrical shape, white enamel, insulated and complete with the following:

<u>Capacity liters</u>	<u>Capacity watts</u>
50	750
75	1000
100	1500

- 2- One chrome plated recessed type gate valve, at the inlet.
- 3- Thermometer.
- 4- Thermostat.
- 5- Electrical connection.
- 6- Relief valve.
- 7- Metallic supports and accessories required for its installation, connection, support, fixing and its satisfactory operation.

PART 3: EXECUTION

3.01 PIPEWORK CONNECTIONS

- A. All pipework connections to each water heater shall have a union disconnection point between the heater and its stop valve.
- B. All drain points, vent and safety valve discharge pipes shall be extended to discharge over a tundish which shall be piped to the nearest floor drain. Tundish pipework shall be concealed.
- C. The Contractor shall ensure that all the pipe and electrical connections to each water heater are easily accessible for maintenance and that the heater can be removed and replaced with the minimum of disturbance to the system.

3.02 INSPECTION, TESTING AND STERILISATION

- A. All pipework shall be visibly examined and tested before being concealed or built into the structure.
 - 1) All pipework and water heaters are to be pressure tested to twice the working head whichever is the greater, without loss of pressure for 2 hours.

On satisfactory completion of A(1) all pipes shall be washed out and shall only then be built into the structures prior to final testing.
 - 2) The final tests will be as A(1) but shall also include that each draw-off tap and shower fitting meets the approved suppliers specification.
 - 3) On, satisfactory completion A(2), the system shall be flushed out and refilled with chlorinated water at a chlorine concentration of 50 mg/l free chlorine for 24 hours. The system is to be washed-out prior to acceptance until the free chlorine at the outlets is no greater than that present in the water mains.
 - 4) The above tests are to be witnessed by representatives of the Engineer and Contractor who will sign that the tests have been fully complied with.

End of Section

SECTION 15452

PUMPS

PART 1: GENERAL

1.01 SCOPE OF SECTION

- A. This technical specification establishes the quality of materials and workmanship to be used in the supply and installation of:

- i) Hot water pumps

1.02 WORK INCLUDED

- A. The work includes the provision of all labor materials and performance of all operations in connection with the installation of pumps as specified herein and shown on the drawings.
- B. The work includes testing of pumps.
- C. Coordination: The contractor shall be responsible for full coordination of the work with all other trades.

1.03 REFERENCES

- A. ASME Section 8D - Pressure Vessel.
- B. U.L 1453 - Electric Boosters
- C. U.L 174 - Household electric storage tank water heaters.

1.04 SUBMITTALS

- A. Drawings - Refer to Section 15010.
- B. Submittals - Refer to Section 01340 - procedures for submittals.
- C. Product Data
1. Indicate pump type, capacity, power requirements.
 2. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include N.P.S.H curve when applicable.
 3. Provide electrical characteristics and connection requirements.

1.05 QUALITY ASSURANCE

- A. Manufacturers qualifications: Company specializing in manufacturing the products specified in this Section with minimum ten years experience.
- B. Provide pumps with manufacturers name plate, model number and rating/capacity identified.
- C. Ensure products & installation of specified products are in conformance with recommendation and requirements of the following organizations:
 - 1. American Society of Mechanical Engineers (A.S.M.E).
 - 2. National Sanitation Foundation (N.S.F)

PART 2: PRODUCTS

2.01 INSTALLATION

A. Pumps:

1. Submersible Pump

Supply and install where shown on the drawings, wet pit pumps of indicated capacities and heads. The pump should be heavy-duty automatic non-clog duplex type sewage pump. Pumps are to be of an overall length suitable for a sump 4 feet deep. Each pump shall be equipped with an enclosed, non-clog type, gray iron impeller, securely locked to a renewable stainless steel pump shaft, which in turn shall be locked to main shaft. Pump volute shall be close-grained gray iron and suspended from individual sub-plate by standard weight schedule 40 steel pipe column with machined flanges, assuring perfect alignment between pump volute and motor.

Pump rotating element shall be carried by grease packed deep-groove radial ball thrust bearing in dust proof housing machined in motor support base. Bottom column bearing at pump shall be renewable, water lubricated, bronze.

Each pump shall be direct connected through a flexible coupling to motor, mounted on combination motor support base and bearing housing. Motor shall have ample capacity to deliver the gpm and head specified and not overload at a 5 % reduction in head.

Main sump cover shall be gas tight suitable for a basin dimension of 7 feet x 4 feet and include manhole plate and vent flange connection control equipment shall consist of one enclosed, automatic heavy duty float switch and one mechanical alternator,

each mounted on independent rigid support bolted to the main sump cover and each actuated by a heavy copper float with brass float rod, and adjustable stops. Each pump shall operate alternately and if one pump cannot handle the inflow, alternator shall start the other pump automatically. Auxiliary float switch shall operate both pumps in the event of alternator failure. Provide a motor panel in single enclosure having circuit breaker type disconnect switches, magnetic motor starters with overload protection on all phases and hand-off automatic selector switches.

A compression type high water alarm shall be furnished with mounting bracket and alarm bell.

A gate valve and a check valve should be provided at pump discharge.

End of Section

SECTION 15530

FIRE FIGHTING SYSTEM

- 1- Portable Fire Extinguishers:
 - 1st. It shall be UL listed and FM approved.
 - 2nd. Supply & install wherever shown on the drawings portable fire extinguishers of the capacities and ratings indicated on the drawings.
 - 3rd. Each unit shall be complete with a frame for hanging, hose, discharge valve and pressure gauge.
 - 4th. Extinguisher Types:
 - 1- Carbon dioxide self-expelling type capacity as shown on drawings capacity for use in all flammable liquid services and electrical hazard spaces. Body shall be of red enamel galvanized steel body, flexible hose and horn discharge, squeeze lever, carrying handle, pressure gauge and mounting brackets. Extinguisher of this type is suitable for indoor use.
 - 5th. Extinguishers shall be of the approved type by civil defense.

End of Section

SECTION 15571

VENTILATION SYSTEM

1- Exhaust Fan:

Exhaust fan shall be of the centrifugal single inlet back word a curved blade type with two pieces housing where shell, shaft and inlet pan assembly installed in lower housing section. Fan shall be complete with:

- 1-1 Electric motor mounted on one chassis with the fan.
- 1-2 Reinforced heavy gauge fan casing.
- 1-3 Metallic fixing frames and supports.
- 1-4 Dust proofs, non-fused disconnect switch.
- 1-5 Pulleys, belt drive and belt guard.
- 1-6 Vibration isolators.

End of Section