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ARAB ENGINEERING BUR

2 WATER DISTRIBUTION

2.1 GENERAL

2.1.1 Scope

1 This Part specifies the requirements for the installation, testing and commissioning of services supplying water for use within buildings. It covers the system of pipes, fittings and connected appliances installed to supply any building with water for ablutionary, cleaning, sanitary and laundry purposes.

2 Related Sections and Parts are as follows:

This Section

Part 1 General

Part 4..... Cold Water Storage

Part 5..... Hot Water Storage

Part 6..... Commissioning of Systems

Section 1 General

Section 9 Mechanical and Electrical

2.1.2 References

1 The following standards are referred to in this Part:

BS 864Capillary and compression tube fittings of copper and copper alloy; (BS 864-2 Capillary and compression tube fittings of copper and copper alloy - Specification for capillary and compression fittings for copper tubes; EN 1254-1 Copper and copper alloys. Plumbing fittings - Capillary fittings for soldering or brazing to copper tubes; EN 1254-2 Copper and copper alloys. Plumbing fittings - Compression fittings for use with copper tubes; BS 864-3 Capillary and compression tube fittings of copper and copper alloy - Compression fittings for polyethylene pipes; BS 864-5 Capillary and compression tube fittings of copper and copper alloy - Specification for compression fittings for polyethylene pipes with outside diameters to BS 5556; EN 1254-3 Copper and copper alloys. Plumbing fittings - Compression fittings for use with plastics and multilayer pipes).

BS 1010.....Specification for draw-off taps and stopvalves for water services (screw-down pattern).

BS 1212.....Float operated valves (excluding floats); (BS 1212-1 Float operated valves - Specification for piston type float operated valves (copper alloy body) (excluding floats); BS 1212-2 Float operated valves - Specification for diaphragm type float operated valves (copper alloy body) (excluding floats); BS 1212-3 Float operated valves - Specification for diaphragm type float operated valves (plastics bodied) for cold water services only (excluding floats))

- BS 1394.....Stationary circulation pumps for heating and hot water service systems; (BS 1394-1 Stationary circulation pumps for heating and hot water service systems. - Specification for safety requirements; EN 60335-2-51 Household and similar electrical appliances. Safety - Particular requirements for stationary circulation pumps for heating and service water installations; BS 1394-2 Stationary circulation pumps for heating and hot water service systems - Specification for physical and performance requirements; EN 16297-1 Pumps. Rotodynamic pumps. Glandless circulators. - General requirements and procedures for testing and calculation of energy efficiency index (EEI); EN 16297-2 Pumps. Rotodynamic pumps. Glandless circulators - Calculation of energy efficiency index (EEI) for standalone circulators).
- BS 1968.....Specification for floats for ballvalves (copper).
- BS 1972.....Specification for polythene pipe (Type 32) for above ground use for cold water services; (EN 12201-1 Plastics piping systems for water supply, and for drainage and sewerage under pressure. Polyethylene (PE) – General; EN 12201-2 Plastics piping systems for water supply, and for drainage and sewerage under pressure. Polyethylene (PE) – Pipes; EN 12201-5 Plastics piping systems for water supply, and for drainage and sewerage under pressure. Polyethylene (PE) - Fitness for purpose of the system).
- BS 2456.....Specification for floats (plastics) for float operated valves for cold water services.
- BS 2494.....Specification for elastomeric seals for joints in pipework and pipelines.
- BS 2580.....Specification for underground plug cocks for cold water services.
- BS 2871.....Specification for copper and copper alloys; (BS 2871-1 Specification for copper and copper alloys. Tubes - Copper tubes for water, gas and sanitation; EN 1057 Copper and copper alloys. Seamless, round copper tubes for water and gas in sanitary and heating applications; BS 2871-2 Specification for copper and copper alloys. Tubes - Tubes for general purposes; EN 12449 Copper and copper alloys. Seamless, round tubes for general purposes; BS 2871-3 Specification for copper and copper alloys. Tubes - Tubes for heat exchangers; EN 12451 Copper and copper alloys. Seamless, round tubes for heat exchangers).
- BS 2879.....Specification for draining taps (screw-down pattern).

- BS 3505.....Specification for unplasticized polyvinyl chloride (PVC-U) pressure pipes for cold potable water; (ISO 1452-1 Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure — Unplasticized poly(vinyl chloride) (PVC-U) — Part 1: General; ISO 1452-2 Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure — Unplasticized poly(vinyl chloride) (PVC-U) — Part 2: Pipes; ISO 1452-3 Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure — Unplasticized poly(vinyl chloride) (PVC-U) — Part 3: Fittings; ISO 1452-4 Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure — Unplasticized poly(vinyl chloride) (PVC-U) — Part 4: Valves; ISO 1452-5 Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure — Unplasticized poly(vinyl chloride) (PVC-U) — Part 5: Fitness for purpose of the system).
- BS 3958.....Thermal insulating material.
- BS 4127.....Specification for light gauge stainless steel tubes, primarily for water applications; (EN 10312 Welded stainless steel tubes for the conveyance of aqueous liquids including water for human consumption. Technical delivery conditions).
- BS 4991.....Specification for propylene copolymer pressure pipe.
- BS 5114.....Specification for performance requirements for joints and compression fittings for use with polyethylene pipes.
- BS 5154.....Specification for copper alloy globe, globe stop and check, check and gate valves.
- BS 5163.....Specification for predominantly key-operated cast iron gate valves for waterworks purposes; (BS 5163-1 Valves for waterworks purposes - Predominantly key-operated cast iron gate valves. Code of practice; BS 5163-2 Valves for waterworks purposes - Stem caps for use on isolating valves and associated water control apparatus. Specification)
- BS 5412.....Specification for the performance of draw-off taps with metal bodies for water services; (EN 200 Sanitary tapware. Single taps and combination taps for water supply systems of type 1 and type 2. General technical specification).
- BS 5413.....Specification for the performance of draw-off taps with metal bodies for water services.
- BS 5422.....Method for specifying thermal insulating materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range -40°C to +700°C
- BS 5433.....Specification for underground stopvalves for water services.
- BS 6144.....Specification for expansion vessels using an internal diaphragm, for unvented hot water supply systems.

- BS 6281.....Devices without moving parts for the prevention of contamination of water by backflow; (BS 6281-1 Devices without moving parts for the prevention of contamination of water by backflow - Specification for type A air gaps; EN 13076 Devices to prevent pollution by backflow of potable water. Unrestricted air gap. Family A. Type A; EN 13077 Devices to prevent pollution by backflow of potable water. Air gap with non-circular overflow (unrestricted). Family A. Type B).
- BS 6282.....Devices with moving parts for the prevention of contamination of water by backflow; (BS 6282-3 Devices with moving parts for the prevention of contamination of water by backflow - Specification for in-line anti-vacuum valves of nominal size up to and including DN 42; EN 14451 Devices to prevent pollution by backflow of potable water. In-line anti-vacuum valves DN 10 to DN 50 inclusive. Family D, type A).
- BS 6283.....Safety and control devices for use in hot water systems; (BS 6283-1 Safety and control devices for use in hot water systems - Specification for expansion valves for pressures up to and including 10 bar; EN 1491 Building valves. Expansion valves. Tests and requirements; BS 6283-2 Safety and control devices for use in hot water systems - Specifications for temperature relief valves for pressures from 1 bar to 10 bar; BS 6283-3 Safety and control devices for use in hot water systems - Specification for combined temperature and pressure relief valves for pressures from 1 bar to 10 bar; EN 1490 Building valves. Combined temperature and pressure relief valves. Tests and requirements; BS 6283-4 Safety devices for use in hot water systems - Specification for drop-tight pressure reducing valves of nominal size up to and including DN 54 for supply pressures up to and including 12 bar).
- BS 6437.....Specification for polyethylene pipes (type 50) in metric diameters for general purposes; (EN 12201-1 Plastics piping systems for water supply, and for drainage and sewerage under pressure. Polyethylene (PE) – General; EN 12201-2 Plastics piping systems for water supply, and for drainage and sewerage under pressure. Polyethylene (PE) – Pipes; EN 12201-5 Plastics piping systems for water supply, and for drainage and sewerage under pressure. Polyethylene (PE) - Fitness for purpose of the system).
- BS 6572.....Specification for blue polyethylene pipes up to nominal size 63 for below ground use for potable water; (EN 12201-1 Plastics piping systems for water supply, and for drainage and sewerage under pressure. Polyethylene (PE) – General; EN 12201-2 Plastics piping systems for water supply, and for drainage and sewerage under pressure. Polyethylene (PE) – Pipes; EN 12201-5 Plastics piping systems for water supply, and for drainage and sewerage under pressure. Polyethylene (PE) - Fitness for purpose of the system).

- BS 6700.....Design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages Specification; (BS 8558 Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages. Complementary guidance to BS EN 806; EN 806-1 Specifications for installations inside buildings conveying water for human consumption – General; EN 806-2 Specifications for installations inside buildings conveying water for human consumption – Design; EN 806-3 Specifications for installations inside buildings conveying water for human consumption - Pipe sizing. Simplified method; EN 806-4 Specifications for installations inside buildings conveying water for human consumption – Installation; EN 806-5 Specifications for installations inside buildings conveying water for human consumption - Operation and maintenance).
- BS 6920.....Suitability of non-metallic materials and products for use in contact with water intended for human consumption with regard to their effect on the quality of the water
- BS 7671.....Requirements for Electrical Installations. IET Wiring Regulations.
- EN 12201Plastics piping systems for water supply, and for drainage and sewerage under pressure. Polyethylene (PE).
- ISO 1452Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure. Unplasticized poly(vinyl chloride) (PVC U).
- DIN 8077/8Propylene copolymer pressure pipe; (DIN 8077 Polypropylene (PP) pipes - PP-H, PP-B, PP-R, PP-RCT – Dimensions)
- DIN 8079Chlorinated polyvinyl chloride (PVC-C) pipes - Dimensions
- DIN 8080Chlorinated polyvinyl chloride (PVC-C) pipes - General quality requirements, testing
- ISO 4427Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE).
- Regulations of Internal Water Installations and Connection Works; Water Installations Code (issued by Qatar General Electricity & Water Corporation QGEWC "KAHRAMAA")

2.1.3 Quality Assurance

- 1 Items and equipment specified in this Part shall be provided by experienced and approved manufacturers and fabricators as designated in the Project Documentation or to the written approval of the Engineer.

2.2 WATER SYSTEMS

2.2.1 General Requirements

- 1 Internal hot and cold water supply installations shall be constructed so that water delivered is not liable to become contaminated to the extent that it is hazardous to health or is unfit for its intended use.

- 2 Water systems shall comply with Regulations of Internal Water Installations and Connection Works issued by Qatar General Electricity & Water Corporation "KAHRAMAA" .

2.2.2 Cold Water Systems

- 1 Cold water systems shall be capable of providing cold water at the locations and in the quantities required and specified in the Project Documentation.
- 2 All cold water draw-off points shall be served via a cold water ground storage tank. The cold water ground storage tank will be served directly from the Qatar General Electricity & Water Corporation (QGEWC) "KAHRAMAA" supply mains.

2.2.3 Hot Water Systems

- 1 Hot water systems shall be capable of providing hot water at the locations, in the quantities and at the temperatures required and as specified in the Project Documentation.
- 2 To promote maximum economy of fuel and water the hot water distribution system should be designed so that hot water appears quickly at the taps when opened. To this end, dead legs should be as short as possible. The hot water pipe feeding a spray tap for hand washing should not exceed 1 metre in length. When draw-off points are situated at a distance from the hot water storage vessel, consideration should be given to the use of a separate water heater installed close to those draw-off points. When this is impracticable a secondary circuit with flow and return pipes to the storage vessel should be considered. Secondary circuits inevitable dissipate heat and should be avoided where possible

2.2.4 Pressurised Systems

- 1 Whether hot or cold water is involved, it shall be ensured that no part of the system bursts due to the hydraulic pressures to which it is subjected. The pressures in the system shall never exceed the safe working pressures of the component parts. The maximum working pressure in a sealed primary circuit shall not exceed 3 bar but it shall be capable of passing a test at 1.5 times the working pressure at the working temperature. The maximum working pressure in an unvented hot water storage vessel or secondary circuit shall not exceed 6 bar.
- 2 Where necessary the supply pressure shall be controlled by using an atmospheric break tank or pressure reducing valves. If the supply to a storage type water heater is through a pressure reducing valve of the type that permits backflow, the working pressure in the system shall be assumed to be the maximum pressure upstream of the valve. Where reliance is placed on pressure reducing valves to limit the maximum working pressure, these shall comply with BS 6283: Part 4.
- 3 Provision shall be made to accommodate expansion of water by one of the following alternative methods:
- (a) allow the expansion water to travel back along the cold feed pipe, provided that heated water cannot reach any communication pipe or branch feeding a cold water outlet
 - (b) where reverse flow along the cold feed is prevented by a stopvalve a with loose jumper, replace this valve by one with a fixed jumper
 - (c) where reverse flow along the cold feed is prevented, provide an expansion vessel in accordance with BS 6144 to accommodate expansion water. This vessel shall be sized in accordance with the volume of water heated and the water temperature rise so as to limit the pressure to the maximum working pressure for the system. The expansion vessel shall accommodate an expansion equal to 4% of the total volume of water heated. Any discharge from relief valves shall be readily visible and disposed of safely.

2.3 PUMPS

2.3.1 General Requirements

- 1 The installation of a pumped system should be undertaken by competent specialists experienced in such work.
- 2 Pumps shall be installed in accordance with the manufacturer's recommendations and in an accessible location such that they may be readily maintained.
- 3 All pumps and associated equipment shall be capable of continuous operation in ambient temperatures of up to 50° C.
- 4 Pumps shall be low speed and quiet in operation.
- 5 Pumps shall be firmly mounted. Measures to prevent vibration shall be taken where necessary.
- 6 No pump, required to increase pressure in or rate of flow from a supply pipe or any fitting or appliance connected to a supply pipe, shall be connected unless prior written approval from QGEWC "KAHRAMAA" is obtained.
- 7 Pumps located externally shall be provided with a suitable sun shade.

2.3.2 Lift Pumps

- 1 Centrifugal pumps with electric motors shall be used.
- 2 The pumps may be either the vertical type or horizontal type and shall be directly coupled to their electric motors.
- 3 Pump capacity shall be as stated in the Project Specification.
- 4 Where the pumping system has duty and standby pumps, the pumps shall be used alternately.

2.3.3 Circulation Pumps

- 1 Circulating pumps shall comply with the relevant provisions of BS 1394: Parts 1 and 2.
- 2 Circulating pumps shall be suitably suppressed to prevent radio and television interference.
- 3 Pump capacity shall be as stated in the Project Specification.

2.3.4 Pipework Connections

- 1 Flexible connections shall be used so as to prevent the transmission of pump and motor noise via pipework.
- 2 All pipework connections to and from the pump shall be adequately supported and anchored against thrust.
- 3 Inlet and outlet pipework connections to lift pumps shall be fitted with gate valves complying with the relevant provisions Clause 2.10 of this Part.
- 4 Inlet and outlet pipework connections to circulating pumps shall be fitted with servicing valves complying with the relevant provisions Clause 2.9 of this Part.

2.3.5 Control

- 1 Pump control shall be as described in the Project Documentation.

2.4 WATER CONSERVATION:

2.4.1 General Requirements

- 1 Considerable amount of energy is consumed to deliver and treat the water we are using every day. By reducing the water use by efficient means will reduce the water consumption and the energy required in distribution network and treatment plants. In designing plumbing systems, utilize new techniques and options that can lead to maximum water efficiency and water savings.
- 2 The plumbing system for new and addition to existing buildings by all consultants, customers and developers shall comply with the requirements of Water Installations Code "KAHRAMAA".

2.4.2 Irrigation:

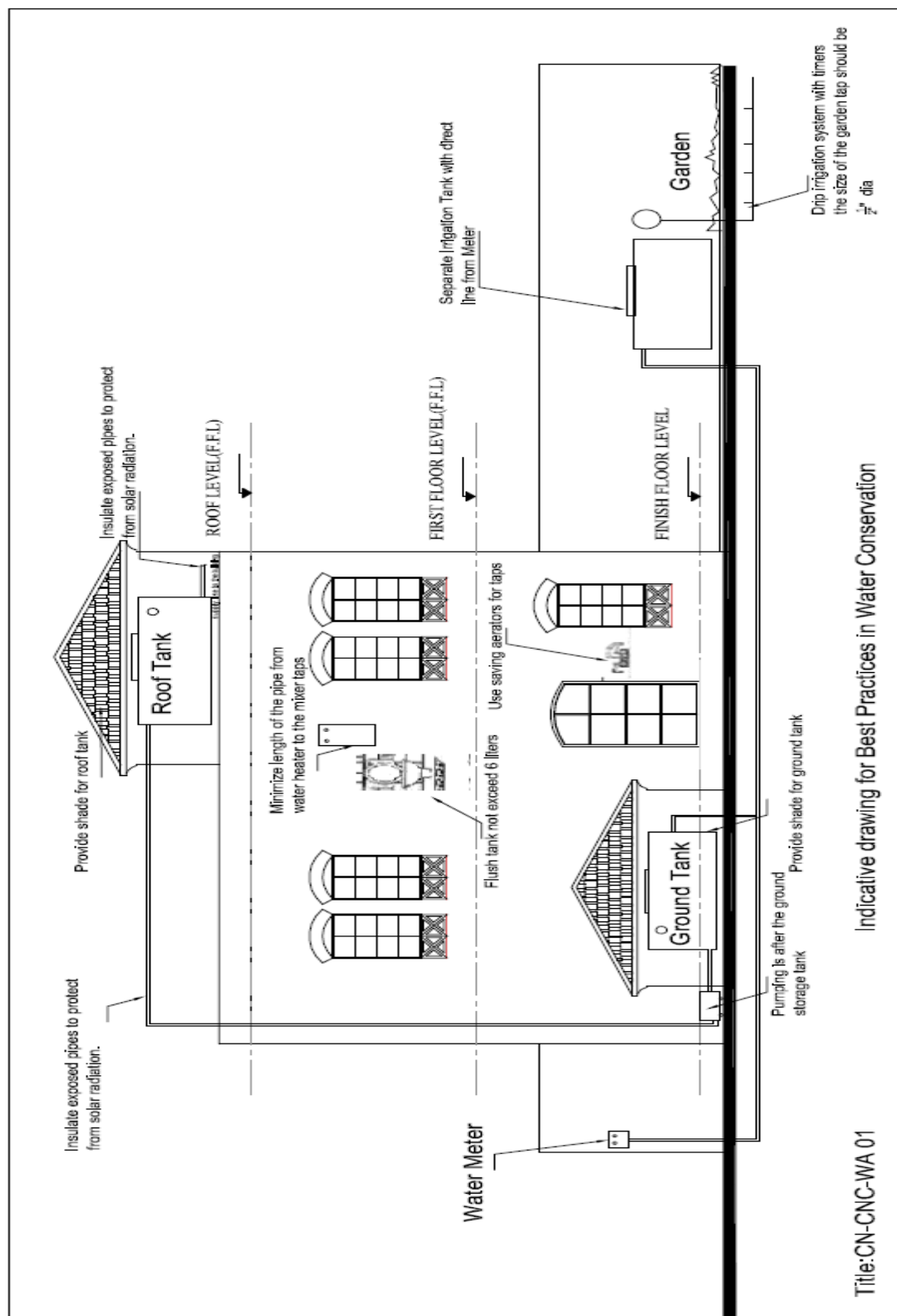
- 1 Type of Irrigation System:
 - (a) Consumers with irrigation water requirement exceeding 1 m³ per day and/or the irrigated area is greater than or equal to 100 m² shall comply with the following requirements:
 - (i) Flood irrigation is not allowed, Projects shall use irrigation systems such as drip irrigation or sprinkler systems or bubblers along with timers or weather based controllers
 - (ii) Separate irrigation tanks to be used.
- 2 Restricted potable Water Usage for Irrigation:
 - (a) Consumers shall not use potable water if the irrigation water requirements exceed 85 m³ per day and/or the irrigated area is greater than or equal to 7000 m²
 - (b) Consumers shall use Treated Water and/or Treated Grey water and/or condensate recovery or any other non potable water resources to meet the requirements. Treated water used for irrigation should meet applicable health and safety standards of the state of Qatar prescribed by competent authority.
- 3 Metering of water use for irrigation:
 - (a) Consumers with irrigation water demand of more than 25 m³ per day :
 - (i) Shall submit irrigation plan detailing species type and irrigation system
 - (ii) Provide a separate meter for Irrigation water consumption
 - (iii) Track the consumption on monthly basis
 - (iv) Submit water consumption data to KAHRAMAA when requested

2.4.3 Water Conservation plumbing guidelines:

- 1 In addition to plumbing practices stipulated in other sections of this regulation the following practices are recommended:
 - (a) Water tanks exposed to direct sun shall be insulated or shaded to reduce the heat gain
 - (b) Water supply pipes exposed to direct sun shall be insulated
 - (c) Minimize the length of pipes from water heaters to tap/faucets and showers in order to reduce the heat loss from the pipes.

2.4.4 Non Conventional Energy for Plumbing applications:

- 1 Non conventional energy sources for plumbing applications like solar water heater are encouraged.
- 2 The best practices stipulated in this section are demonstrated in the drawing CN-CNC-WA 01



2.5 WATER DISTRIBUTION PIPEWORK

2.5.1 General Requirements

- 1 Every pipe, pipe joint and connected fitting shall be capable of withstanding, without damage or deterioration, sustained temperatures of up to 50°C for cold water installations and up to 80°C, with occasional short-term peaks of up to 100°C for heated water applications.
- 2 Pipes, pipe joints, pipe linings and connected fittings shall be made of materials that do not impart taste, colour, odour or toxicity to the water nor promote or foster microbial growth under the conditions where they are going to be installed.
- 3 If pipes, pipe joints or fittings are of dissimilar metals, measures shall be taken to prevent corrosion. Dissimilar metals shall be avoided in below ground installations.

2.5.2 Pipe Materials

- 1 Materials shall have a health certificate in contact with potable water up to 50 °C as per requirement of BS 6920 “ Suitability of Non Metallic Products for use in contact with Water Intended for Human Consumption with regards to their effect on the quality of Water ” issued by a international worldwide known quality body certifier.
- 2 All pipe materials shall be suitable for use with the range of chemical characteristics of the water and complies with W.H.O. guidelines as detailed in the Regulations of Internal Water Installations and Connection Works
- 3 All materials shall be suitable for using and storing in the environmental conditions detailed in the Regulations of Internal Water Installations and Connection Works and normal working water temperature at 50 °C.
- 4 Copper pipework shall comply with the relevant provisions of BS 2871: Part 1; underground pipes shall be to Table Y with a coating of seamless continuous PVC sheeting and above ground pipes shall be to Table X. Copper and copper alloy tube fittings should comply with the relevant provisions of BS 864: Part 1, Type B or BS 864: Part 2, Type A.
- 5 The use and installation of polyethylene pipework shall comply with the relevant provisions of EN 12201 or ISO 4427 . Copper alloy tube fittings for polyethylene pipes shall comply with the relevant provisions of BS 864: Part 3. Joints for polyethylene pipes shall comply with the relevant provisions of BS 5114 and BS 3505.
- 6 The use and installation of polypropylene pipework shall comply with the relevant provisions of BS 4991 or DIN 8077/8 .and shall be Series 1 or equivalent.
- 7 The use and installation of unplasticized PVC (PVC-U) pipework shall comply with the relevant provisions of BS 3505. Solvent welded joints and fittings for PVC-U pipes shall comply with the relevant provisions of ISO 1452. Mechanical joints and fittings for PVC-U pipes shall comply with the relevant provisions of ISO 1452 PVC-U pipework shall only be used for cold water applications.
- 8 The use and installation of chlorinated PVC (CPVC) pipework shall comply with the relevant provisions of DIN 8079 and DIN 8080.
- 9 Stainless steel pipework shall comply with the relevant provisions of BS 4127 grade SS 316L.

- 10 All materials internal coating or internal components shall be tested and approved by WRC, DVGW, KIWA, NSF61, SIRIM, or other world worldwide known quality body certifiers (Regulations of Internal Water Installations and Connection Works) in contact with potable water at 50 °C. as per the requirement of BS 6920 “ Suitability of Non Metallic Products for use in contact with Water Intended for Human Consumption with regards to their effect on the quality of Water ” or equivalent.

2.5.3 Pipework Jointing

- 1 Jointing of pipes shall be in accordance with the relevant provisions of BS 6700
- 2 All proprietary joints shall be made in accordance with the manufacturer’s instructions.
- 3 Care shall be taken to establish satisfactory jointing techniques for all water service pipework. All burrs shall be removed from the ends of the pipes and any jointing materials used shall be prevented from entering the water system
- 4 All piping and fittings shall be cleaned internally and be free from particles of sand, soil metal filings and chips etc.
- 5 Jointing systems using elastomeric sealing rings shall be Type W, complying with the relevant provisions of BS 2494, and shall be obtained from the pipe manufacturer.

2.6 PIPE FIXINGS

2.6.1 General Requirements

- 1 Copper and stainless steel piping shall be secured by clips or brackets made from copper or copper-alloy.
- 2 Steel piping shall be secured by clips or brackets made from steel, copper alloy or suitable plastic. Copper clips or brackets shall not be used for fixing steel piping.
- 3 PVC-U, polyethylene, polypropylene and CPVC piping shall be secured by clips or brackets made from suitable metal or plastic. Allowance shall be made for free lateral movement within the clips and brackets.
- 4 Piping that is insulated shall be secured on clips or brackets that allow sufficient space behind the back of the pipe and the batten or wall to which the pipe is fixed for the insulation to be properly installed.

2.6.2 Spacing of Pipe Fixings

- 1 The spacings for fixings for internally located piping shall be in accordance with Table 2.1, 2.2, 2.3 and 2.4 as applicable. The figures given are based on an ambient temperature of 20°C. For other temperature ranges the pipe manufacturer should be consulted.

Table 2.1
Maximum Spacing of Fixings for Internal Piping

Type of Piping	Nominal size of pipe (mm)	Spacing on horizontal run (metres)	Spacing on vertical run (metres)
Copper (light gauge) and stainless steel complying with BS 2871: Part 1 or BS 4127: Part 2	15	1.200	1.800
	22	1.800	2.400
	28	1.800	2.400
	35	2.400	3.000
	42	2.400	3.000
	54	2.700	3.000
	76	3.000	3.600
	108	3.000	3.600
	133	3.000	3.600
	159	3.600	4.200

Table 2.2
Maximum Spacing of Fixings for Internal Piping

Type of Piping	Nominal size of pipe (mm)	Spacing on horizontal run (metres)	Spacing on vertical run (metres)
Copper (heavy gauge) complying with BS 2871: Part 2	15	1.800	2.400
	22	2.400	3.000
	28	2.400	3.000
	35	2.700	3.000
	42	3.000	3.600
	54	3.000	3.600
	76	3.600	4.500
	108	3.900	4.500
	133	3.900	4.500
	159	4.500	5.400

Table 2.3
Maximum Spacing of Fixings for Internal Piping

Type of Piping	Nominal size of pipe (inches)	Spacing on horizontal run (metres)	Spacing on vertical run (metres)
PVC-U complying with BS 3505 and CPVC complying with DIN 8079 and 8080	$\frac{3}{8}$	0.530	1.060
	$\frac{1}{2}$	0.610	1.220
	$\frac{3}{4}$	0.685	1.370
	1	0.760	1.520
	$1\frac{1}{4}$	0.840	1.680
	$1\frac{1}{2}$	0.915	1.830
	2	1.065	2.130
	3	1.370	2.740
	4	1.525	3.050
	6	1.830	3.660

Tables 2.4
Maximum Spacing of Fixings for Internal Piping

Type of Piping	Nominal size of pipe (mm)	Spacing on horizontal run (metres)	Spacing on vertical run (metres)
Polyethylene and polypropylene complying with BS 1972 or BS 4991 or DIN 8077/8	20mm	0.300	0.500
	25mm	0.400	0.800
	32mm	0.400	0.800
	40mm	0.450	0.900
	50mm	0.550	0.900
	63mm	0.550	1.100
	75mm	0.600	1.100
	90mm	0.700	1.200
	110mm	0.700	1.400

2.7 TAPS, VALVES AND PROTECTION DEVICES

2.7.1 Draw-off Taps

- 1 Metal bodied draw-off taps shall conform to the relevant provisions of BS 5412: Parts 1-5.
- 2 Plastic bodied draw-off taps shall confirm to the relevant provisions of BS 5413: Parts 1-5.

- 3 Taps not fixed directly to an appliance shall be screwed into a suitable pipe fitting.
- 4 The fitting, or the pipe immediately adjacent to the tap, shall be firmly secured to a suitable support so as to prevent strain on the pipe and its joints when the tap is operated.

2.7.2 Drain Taps

- 1 Draining taps shall comply with the relevant provisions of BS 2879.
- 2 Draining tap shall be of the screwdown type with a removable key and shall be fixed over a drain or have provision for discharging the water to the nearest convenient point for disposal.

2.7.3 Ball Float Valves

- 1 Except for interconnected tanks arranged to store water at the same level, every pipe supplying water to a storage tank shall be fitted with a float operated valve or some other equally effective device to control the inflow of water and maintain it at the required level. The inlet control device shall be suitable for the particular application, taking into account the supply pressure and the temperature of the water in the cistern.
- 2 When a float operated valve is used it shall either:
 - (a) comply with BS 1212: Part 2 or 3 and be used with a float complying with BS 1968 or BS 2456 of the correct size corresponding to the length of the lever arm and the water supply pressure; or
 - (b) where any other float operated valve or other level control device is used, it shall comply with the performance requirements of BS 1212 where applicable to the circumstances of its use and shall be clearly marked with the water pressure, temperature and other characteristics for which it is intended to be used.
- 3 Every float operated valve shall be securely fixed to the cistern it supplies and where necessary braced to prevent the thrust of the float causing the valve to move and so alter the water level at which it shuts off. This water level shall be at least 25 mm below the lowest point of the warning pipe connection or, if no warning pipe is fitted at least 50 mm below the lowest point of the lowest over flow pipe connection
- 4 Every pipe taking water from a cistern of capacity exceeding 18 litres shall be fitted with a servicing valve close to the storage cistern, tank or cylinder.
- 5 Every ball float valve shall be so placed that it is readily accessibly for examination, maintenance and operation.

2.7.4 Servicing Valves

- 1 Servicing valves shall be located in accessible positions so as to enable the flow of water to individual or groups of appliances to be controlled and to limit the inconvenience caused by interruption of supply during repairs.
- 2 A servicing valve shall either comply with the requirements for stopvalves as specified in Clause 2.13 of this Part or shall be capable of withstanding a static pressure 1.5 times the maximum pressure it will be subjected to in use, be leaktight when closed against the latter pressure and, when installed on any pipe pressurised from the mains or on any pipe under a static pressure exceeding 1 bar, shall be operable only by means of a key, screwdriver or coin inserted into a slot on the valve. Screwdown servicing valves shall not be of loose jumper design. Copper alloy gate valves complying with the relevant provisions of BS 5154 may be used as servicing valves.
- 3 A servicing valve shall be fitted upstream of, and as close as practicable to, every float operated valve connected to a supply pipe.

- 4 Pipes taking water from a storage tank of capacity exceeding 18 litres shall be fitted with a servicing valve. The valve shall be fitted as close to the storage tank as practicable. Pipes taking water from storage tanks with a capacity that does not exceed 18 litres shall not be fitted with servicing valves.

2.7.5 Stopvalves

- 1 The use and installation of stopvalves shall comply with the relevant provisions of BS 6700.
- 2 Stopvalves fitted to service pipes shall comply with the relevant provisions of the British Standards referenced in Table 2.5.

Table 2.5
Stopvalves Fitted to Service Pipes

Nominal Size of Pipe	Standard	
	Above Ground	Below Ground
50 mm or smaller	BS 1010: Part 2	BS 2580
	BS 2580	BS 5433
	BS 5433	
50 mm or larger	BS 5163	BS 5163

- 3 Stopvalve components of fittings incorporating stopvalves shall comply with the requirements for stopvalves.
- 4 Stop valves shall be so placed that they may be readily inspected, operated and maintained.
- 5 When a stopvalve is installed on an underground pipe it shall be enclosed in a pipe guard or chamber under a surface box of the correct grade for the traffic loading relevant to the location.

2.7.6 Backflow Protection Devices

- 1 Every pipe through which water is supplied to a point of use or draw-off where backflow or backsiphonage is likely to occur shall be fitted with a backflow protection device.
- 2 Pipe interrupters for backflow protection shall comply with the relevant provisions of BS 6281: Part 3.
- 3 Vacuum breakers for backflow protection shall comply with the relevant provisions of BS 6282: Part 2 and 3.
- 4 Check valves for backflow protection shall comply with the relevant provisions of BS 6282: Part 1. Any additional installation instruction issued by the manufacturer or supplier of the check valve shall also be complied with.
- 5 Combined check valve and vacuum breaker for backflow protection shall comply with the relevant provisions of BS 6282: Part 4.
- 6 Double check valve assembly for backflow protection shall comply with the relevant provisions of BS 6282: Part 1, with a draining tap complying with the relevant provisions of BS 2879 connected between them.

2.8 PIPE INSTALLATIONS

2.8.1 General Requirements

- 1 Pipe runs within buildings should not be laid exactly horizontal but to a slight fall to reduce the risk of air locks forming.

2.8.2 Pipework Expansion

- 1 In installations with limited straight runs and many bends and offsets, thermal movement is accommodated automatically. In installations that do not have limited straight runs and many bends and offsets, allowance for expansion and contraction of the pipes shall be made by forming expansion loops, by introducing changes of direction to avoid long straight runs or by fitting proprietary expansion joints. This is particularly important where temperature changes are considerable and where the pipe material has a relatively large coefficient of expansion.
- 2 The maximum length of a straight run for each different pipe material to be used shall be detailed in the Project Specification or shown on the Project Drawings.

2.8.3 Pipe Sleeves

- 1 Where a pipe enters a building it shall be accommodated in a sleeve that has previously been solidly built-in and the space between the pipe and the sleeve shall be filled with non-hardening, non-cracking, water-resistant material for a minimum length, of 150 mm at both ends to prevent the passage of water, gas or insects.

2.8.4 Concealed Pipework

- 1 Concealed pipework shall be housed in properly constructed builders work ducts or wall chases and have access for maintenance and inspection.
- 2 Ducts and chases should be constructed as the building structure is erected and should be finished smooth to receive pipe fixings.
- 3 No pipe or joint in or under a building shall be embedded in any wall or solid floor or in any material below a solid floor at ground level except for the following:
 - (a) the enclosing of any pipe and associated pipe joints in a purpose made duct or chase in a solid floor in such a way that the pipe and pipe joints can be exposed for purposes of examination, repair or replacement without endangering the structural integrity of the building
 - (b) the enclosing of any pipe and associated pipe joints in a purpose made chase in a solid wall (but not within the cavity of a hollow wall) in such a way that the pipe and pipe joints can either be capped off and isolated or be exposed for purposes of examination, repair or replacement without endangering the structural integrity of the building
 - (c) the enclosing of any pipe and associated pipe joints in any internal wall that is not a solid wall
 - (d) the enclosing of any pipe within a purpose made pipe sleeve or duct in or under any solid floor in such a way that the pipe may be removed and replaced; for pipes laid in such a way, there shall be an inspection access point at each joint.
- 4 No pipe or pipe joint shall be located under floorboards or a suspended floor, at ground floor level unless every pipe and pipe joint is accessible for examination.
- 5 Where access panels are formed in floor panels of structural chipboard or plywood, the structural stability of the building shall not be affected.
- 6 All pipe laid in ducts shall be adequately supported by clipping as specified in Table 2.1.

2.8.5 Maximum allowable flow rates for plumbing fixtures

- 1 Water closets:

- (a) The flush rates of single flush water closets either flush tank, flushometer tank or flushometer valve operated shall not exceed 4.9 L/flush (or 1.28 gpf). In case of dual flush toilets, the flush rates shall not exceed 6 L/flush (or 1.6 gpf) for full flush and 4.2 L/flush (or 1.1 gpf) for reduced flush.
- (b) Control valve shall be installed on the inlet line to the flush tank/flush valve in order to shutoff them in case of leakage.
- (c) Water closets shall conform to the applicable requirements of section 420, International Plumbing code 2006. The conformity shall be verified by laboratories accredited by International Institutions.

2 Urinals:

- (a) The flush rates for all type of urinals not exceed 1.9 L/flush (or 0.5 gpf). The urinal system shall be flushed only after usage.
- (b) Urinals shall conform to the applicable requirements of section 419, International Plumbing code 2006. The conformity shall be verified by laboratories accredited by International Institution.

3 Faucets:

- (a) The flow rates of faucets shall not exceed the flow rates stipulated in the below Table
- (b) Maximum allowable flow rates for faucets

#	(d) Plumbing Fixtures/Fixture	(e) Maximum allowable flow
1	Lavatory Faucet- Residential Occupancy (Residential, Hotel Guest room only, Hospital –patient rooms only)	5.7 L/min (or 1.5 gpm) at an operating pressure of 04 bar (60 PSI)
2	Lavatory Faucet- Non Residential Occupancy	3.8 L/min (or 1 gpm) at an operating pressure of 04 bar (60 PSI)
3	Kitchen Sinks	8.3 L/min (or 2.2 gpm) at an operating pressure of 04 bar (60 PSI)

(o)

- (p) Exclusion: bath tub taps or nay other taps where a pre-qualified amount of water need to be filled are excluded from requirements of above Table.
- (q) Lavatories and Sinks shall conform to the applicable requirements of section 416 and section 418, International Plumbing code 2006. The conformity shall be verified by laboratories accredited by International Institutions.

4 Shower:

- (a) The flow rate of shower head or hand held showers shall not exceed 9.5 L/min (or 2.5 gpm) at an operating pressure of 5.5 bar (80 psi).
- (b) Showers shall conform to the applicable requirements of section 417, International Plumbing Code 2006. The conformity shall be verified by laboratories accredited by International Institutions.

2.9 INSULATION OF WATER PIPES

2.9.1 General

- 1 Thermal insulating materials shall comply with BS 5422 and BS 3958 where applicable.

- 2 Thermal insulating materials shall be applied in accordance with the manufacturer's recommendations. They shall be kept dry before, during and after application, except for water which may be required for the purpose of mixing. Gaps shall not be left at the joints of the insulating materials.
- 3 Where necessary, the insulating material shall be resistant to, or protected by a suitable covering against, mechanical damage, rain, moist atmosphere, groundwater and vermin.
- 4 Examples of suitable materials of insulating purposes are:
 - (a) polyurethane foam
 - (b) foamed or expanded plastics
 - (c) corkboard
 - (d) amoliated vermiculite.

2.9.2 Application

- 1 While insulating material shall be continuous over pipes and fittings, it shall be finished in such a manner as to allow access to valves for operation.
- 2 Where cold water pipes pass through areas of relatively high dew point, e.g. habitable areas, they shall be insulated to prevent condensation forming on them.
- 3 Pipes in hot water supply systems that exceed the maximum lengths given in Table 2.6 shall be thermally insulated in accordance with BS 5422.

Table 2.6
Maximum Permissible Lengths of Uninsulated Hot Water Pipes

Outside diameter of pipes (mm)	Maximum length (m)
12	20
Over 12 up to and including 22	12
Over 22 up to and including 28	8
Over 28	3

2.10 MISCELLANEOUS

2.10.1 Electrical Work Related to Plumbing Works

- 1 Electrical works related to plumbing works shall be done in accordance with the relevant provisions of BS 7671 and the requirements of QGEWC "KAHRAMAA".

2.10.2 Water Meter Cabinet

- 1 Water meter cabinets shall comply with the Rules and Regulations Guide for Plumbing Works prepared by QGEWC "KAHRAMAA".
- 2 Water meter cabinets shall be located in an easily accessible place as approved by QGEWC "KAHRAMAA".

END OF PART