

WP-WPM-P3/S1

General Specification of Internal Plumbing Material for Potable Water Networks

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1. Purpose

This Standard provides “Materials Standards & Specifications Section’s Engineers” the specification of materials used for Internal Plumbing Material for Potable Networks.

2. Scope

This Standard is applicable to all materials used for KM materials used for Internal Plumbing Material for Potable Networks, this work extends from water meter to water taps. This Standard shall be read in continuation of KAHRAMAA Water installation code.

3. Responsibilities & Authorities

Responsibilities and authority for ensuring that the steps in this guideline shall be carried out are specified at relevant steps in the guideline and include:

- Manager, Water Planning Department,
- Head, Materials Standards & Specifications Section,
- Materials Standard Engineers,
- Materials Specification Engineers.

If the responsible personnel listed above are absent, these responsibilities shall be designated to the relevant staff.

4. Abbreviations & Terminology

KM	: Qatar General Electricity and Water Corporation
WP	: Water Planning
MSS	: Materials Standards & Specifications Section

Term	Description
BS	British Standard- one of the international standards used in General Specifications for materials for waterworks
ISO	International Standards Organization - one of the international standards used in General Specifications for materials for waterworks.
WRC	Water Research Council- international body who certifies the non-toxicity of material if contact with potable water.
Manufacturer	A company whose business is manufacturing a certain product
Material	An item intended to be used in certain construction works or projects.
Specification	A detailed exact statement of particulars, especially a statement prescribing materials, dimensions and quality of work for something to be built, installed or manufactured.

Section - 1: General

1.1 Suitability of Materials

- 1.1.1 All materials in direct contact with potable water must have a health certificate issued by Worldwide Known Quality Body Certifier with potable water of +50 °C (See Appendix I) in accordance with requirement of BS6920:2000 "Suitability of Non-Metallic Products for use in direct contact with Water Intended for Human Consumption with regards to their effect on the quality of water".
- 1.1.2 All materials shall be suitable for using with minimum working water temperature at +50 °C and shall be minimum nominal pressure PN16.
- 1.1.3 All materials derived from polyethylene for pipes and fittings exposed to direct sunlight shall be with UV resistant.
- 1.1.4 All the relevant certificates of the materials/manufacturers must be in Original OR Notarized copy for Technical Evaluation and must be in Arabic or English language.

1.2 Storage of materials

- 1.2.1 All materials shall be stored according to environmental conditions.
- 1.2.2 All materials which are subject to deterioration by Ultraviolet Light such as Rubber gaskets, instruments, plastic pipe etc. must not be exposed to direct sunlight.

1.3 Manufacturer 's Certification

- 1.3.1 The Applicant must have a valid ISO 9001 Certificate issued by the granting certifier body holding BS EN ISO/IEC 17021:2011 certificates.
- 1.3.2 Provide the QA/QC plan.
- 1.3.3 All certificates must be in Original OR Notarized copy
- 1.3.4 All certificates must be in Arabic OR English language.

1.4 Standards

- 1.4.1 The supplier shall follow the latest KAHRAMAA General Specification of Internal Plumbing Material for Potable Water Networks.

1.5 Inspection and Testing

- 1.5.1 All materials shall be inspected and tested to ensure compliance with KAHRAMAA requirements and General Specification of Internal Plumbing Material for Potable Water Networks.
- 1.5.2 KAHRAMAA have the right to test any materials before they leave the manufacturer's premises or after delivery to the site.

- 1.5.3 KAHRAMAA have the right to reject any non-compliant materials after delivery to the site, notwithstanding any preliminary test approval of the materials at the manufacturer's premises.
- 1.5.4 The cost of all tests necessary to ensure compliance with the Project Documentation, shall be borne by the Contractor/ Manufacturer.
- 1.5.5 The number of samples to be tested must be not less than One Number of each size of the ordered materials at accredited laboratory.
- 1.5.6 Upon receipt of materials at the contractor's site store, materials to be inspected by Supervising Consultant of the subject project.
- 1.5.7 KAHRAMAA reserves the right to reject the supplied material during final inspection or at later date, if found not as per the General Specification and will have the right to put the Manufacturer under "ON HOLD "or "BLACK LISTED "until further action.
- 1.5.8 The non-repairable rejected materials, which were not complying with KM Specifications during inspection and marked by the Engineer (rejected), must be removed by the Contractor.
- 1.5.9 KAHRAMAA reserves the right to witness all types of testing locally, and the tests shall be carried out in accordance with applicable standards and codes.

1.6 Packing

- 1.6.1 The material shall be packed in compliances with KM and Manufacturer recommendation and procedure.

1.7 Technical clarification

- 1.7.1 In case there are disputes, KAHRAMAA shall have the right to ask the manufacturer all the technical documents that will supporter in clarifying this dispute.

1.8 Warranty

- 1.8.1 All materials must be subject to valid warranty period minimum 5 years.

Section - 2: Copper pipes

These clauses shall be read in continuation of Section 1 of this specification.

2.1 General

2.1.1 The copper tubes shall be manufactured and tested according to BS EN 1057

2.1.2 The copper tube grade shall be CU-DHP (Number CW024A).

2.1.3 The manufacturer shall submit a certification indicates that copper tube material has no influence on water intended for human consumption according to EN 15664.

2.2 Copper Tubes Properties

2.2.1 The copper tubes dimensions and material condition shall be as given in Table 1:

Table 1. Copper Tubes Dimensions and Materials

Nominal outside diameter (mm)	Nominal wall thickness (Table X) (mm)	Material condition
15	0.9	R250 (Half Hard) or R290 (Hard)
22	0.9	R250 (Half Hard) or R290 (Hard)
28	0.9	R250 (Half Hard) or R290 (Hard)
35	1.0	250 (Half Hard) or R290 (Hard)
42	1.2	R250 (Half Hard) or R290 (Hard)
54	1.2	R250 (Half Hard) or R290 (Hard)

Nominal outside diameter (mm)	Nominal wall thickness (Table Y) (mm)	Material condition
15	1.0	R220 (Annealed), R250 (Half Hard) or R290 (Hard)
22	1.2	R220 (Annealed), R250 (Half Hard) or R290 (Hard)
28	1.2	R220 (Annealed), R250 (Half Hard) or R290 (Hard)
35	1.0	R250 (Half Hard) or R290 (Hard)
42	1.5	R250 (Half Hard) or R290 (Hard)
54	2.0	R250 (Half Hard) or R290 (Hard)

2.2.2 The copper tubes shall be complying with the following mechanical properties as given in Table 2:

Table 2. Mechanical Properties of Copper Tubes

Material condition	Minimum Tensile Strength (MPa)	Minimum Elongation (%)	Hardness (Vickers)
R220 (Annealed)	220	40	40 to 70
R250 (Half Hard)	250	30	75 To 100
R290 (Hard)	290	3	Min. 100

2.3 Sheathing

2.3.1 The copper tubes should be externally covered over their entire length with continuous seamless plastic sheathing according to EN 13349, or by approved wrapping tape (no black color).

2.4 Testing materials

2.4.1 KAHRAMAA reserves the right to witness any kind of test at factory locally or internationally.

2.4.2 Hydrostatic test: copper tubes of sizes up to 54 mm shall be subjected to at least a water pressure of 35 bars for a minimum period of 10 seconds without evidence of leaking according to EN 1057.

2.4.3 Eddy Current test: Signals produced by reference standard tubes set the sorting limits for acceptance or rejection. Tubes containing defects which produce signals equal to or greater than the sorting limit shall be rejected. Test shall be as standard BSEN1971.

2.4.4 Pneumatic test: The tube under test shall be connected to a source of pressurized air. Air pressure at 4 bar (0,4 MPa) shall be maintained in the tube.

2.4.5 The tube shall be completely immersed in water for a minimum period of 10 s and inspected for the issue of bubbles from the tube. Should any bubbles be observed then the tube shall be rejected. If no bubbles are observed, then the tube shall be accepted.

2.5 Marking and form of delivery

2.5.1 Copper Tubes shall be permanently marked as per standard EN 1057/EN 13349 at repeated distances at least every meter along their length. The height of the characters shall be at least 4 mm. The Marking shall be legible and not water soluble and shall follow the following sequence:

- a- Number of this standard (EN 1057/EN 13349),
- b- Copper tube nominal cross-sectional dimensions: outside diameter × wall thickness (mm),
- c- Covering wall thickness (mm),
- d- Identification for material condition,
- e- Manufacturer's identification mark,
- f- Form and length,
- g- Date of production.
- h- Material Condition R220, R250, R290
- i- Model No.

2.5.2 The recommended form of delivery of tubes is given in Table 3.

Table 3. Form of delivery

Form of delivery	Nominal outside diameter (mm)		Nominal Length (m)	Material condition
	From	up to and including		
Coils	15	28	25 up to 50	R220 (Annealed)
Straight lengths	15	54	5 or 6	R250 (Half Hard) or R290 (Hard)

2.5.3 The manufacturer shall provide inspection test certificate in accordance with EN 10204 for the supplied copper tubes.

2.6 Packing

2.6.1 The packing shall be as per Section 1, Clause 1.7 of this specification.

2.6.2 The coiled tubing is to be secured against uncoiling during transit, the straight lengths is to be fitted with end caps to prevent damage during transit.

Section - 3 Copper and copper alloys Fitting

3.1 General

These clauses shall be read in continuation of Section 1 of this specification.

3.1.1 The compression fittings shall be manufactured to EN 1254.

3.1.2 The compression fittings shall be manufacturing as:

- a. Type B: Requires forming of the tube at its end, and in which the joint is made by compressing the formed portion of the tube against the formed end of the fitting or a loose ring or sleeve within the fitting/tube.
- b. Type A: end that requires no preparation of the ends of the tube other than that they are cut square and deburred, or chamfered when specified, and in which the joint is made by the compression of a ring or sleeve onto the outside wall of the tube with or without additional sealing elements and with or without an internal tube support.

3.1.3 Copper and copper alloys Plumbing Fittings shall conform to the two (3) parts as standard EN1254:

- a. Part 1: Fittings with ends for capillary soldering or capillary brazing to copper tubes as EN 1254-1,
- b. Part 2: Fittings with compression ends for use with copper tubes as EN 1254-2,
- c. Part 6: Fittings with Push-Fit Ends shall be manufactured as per BSEN 1254-6.

3.1.4 All the above fittings shall be suitable for use with copper tube to BS EN 1057:2006 + A1:2010, Part 1, Table 'Y' and 'X'/ EN 1057 R-220-250/290, shall also be suitable for underground use with potable water and shall be wrapped by lubricated tape.

3.1.5 All nuts on these fittings shall be hexagonal or octagonal.

3.1.6 All Fittings must be new, clean.

3.1.7 All Gaskets to be supplied with fittings shall be suitable for use with potable water.

3.2 Materials

3.2.1 All fittings shall be as following tables:

Table 4. — Material of Gunmetal/DZR fittings

Designation			Standard
Material	Symbol	Number	
Gunmetal	CuSn5Zn5Pb5-C	CC491K	BSEN 1982
DZR Brass	CuZn36Pb2As	CW602N	BSEN 12164

Table 5. — Mechanical Properties of Gunmetal Fittings

Mechanical Properties	Unit	Value
Tensile Strength	N/mm ²	270
Proof/Yield Strength	N/mm ²	112
Elongation	%	36
Hardness	microns	70

Table 6. Physical Properties of Gunmetal Fittings

Physical Properties	Unit	Value
Density	g/cm ³	8.8

3.3 Marking

3.3.1 All fittings shall have engraved or casted the following:

- The manufacturer's name or Logo.
- Standard Number.
- The size of the fitting in mm.
- Type of material
- Model No.

3.4 Packing

3.4.1 The packing shall be as per Section 1 of this specification.

3.4.2 All compression fittings must be individually packed in transparent protective bags indicating its type , number of pieces by bag, and size.

3.4.3 All compression fittings must be packed in cartoon boxes.

Section - 4 Polypropylene pipes

4.1 General

These clauses shall be read in continuation of Section 1 of this specification.

- 4.1.1 Polypropylene Pipe and fittings shall be manufactured from natural virgin copolymer polypropylene material of a single or bi-modal process of manufacture with no added plasticizers, pigments or re-grind
- 4.1.2 PPR pipes must have a health certificate issued by Worldwide Known Quality Body Certifier in accordance with requirement of BS6920 "suitability of non-metallic product for use in direct contact with water intended for human consumption with regards to their effect on the quality of water.
- 4.1.3 Polypropylene Pipes & Fittings used for conveyance of potable water shall be manufactured in accordance with DIN 8077, ISO 4065, ISO 15874 or equivalent.
- 4.1.4 Polypropylene Pipes shall be PP-R type3, PN16.
- 4.1.5 Polypropylene Pipes shall not be black color and for if exposed to direct sunlight shall be UV resistant.
- 4.1.6 Polypropylene Pipes & fittings shall be Kite Marked certifying it complies with ISO 15874 or equivalent DIN, BS Standard.
- 4.1.7 Polypropylene Pipe shall be protected with GRP duct or PVC duct when laid aboveground along customer wall premises. The GRP or PVC shall be firmly fixed to the wall with brackets.
- 4.1.8 PPR material shall withstand 1 ppm of Chlorine (Cl₂) or chlorine dioxide (ClO₂) at a water temperature + 50 °C.
- 4.1.9 All pipes shall be suitable for working pressure PN 16.

4.2 Testing

- 4.2.1 Hydrostatic Test Pressure for pipe and fitting shall be 1.5 times the working pressure.

4.3 Marking:

- 4.3.1 Pipes shall be marked as follows:

- a- Manufacturer's name
- b- Standard
- c- Nominal size of pipe in mm [nominal outside diameter x nominal wall thickness]
- d- Pressure rating in Bar
- e- Month & year of manufacture

Section - 5 CPVC pipes and fittings

5.1 General

These clauses shall be read in continuation of Section 1 of this specification.

- 5.1.1 The CPVC is a thermoplastic polymer material used for hot and cold potable water networks.
- 5.1.2 Certificate: CPVC pipe and fittings shall be manufactured according to the following international standard ISO 15877-2009 or equivalent.
- 5.1.3 CPVC must have a health certificate issued by Worldwide Known Quality Body Certifier in accordance with requirement of BS6920 "suitability of non-metallic product for use in direct contact with water intended for human consumption with regards to their effect on the quality of water.
- 5.1.4 CPVC pipe, fittings and solvent cement for joining shall be suitable for use with the range chemical characteristics of the water and complies with water quality requirement.
- 5.1.5 solvent cement for CPVC shall conform to the requirements of EN ISO 15877 or equivalent.
- 5.1.6 CPVC material shall withstand 1 ppm of Chlorine (Cl₂) or chlorine dioxide (ClO₂) at a water temperature + 50 °C.
- 5.1.7 All pipe shall be suitable for working pressure PN 16.

Table 7. Technical Specifications

outside diameter		Inside diameter (mm)	Wall thickness (mm)	Weight (kg/m)
mm	inch			
16	½	13.2	1.4	0.1
20	¾	17	1.5	0.151
25	1	21.2	1.9	0.234
32	1 ¼	27.2	2.4	0.379
40	1 ½	34	3	0.582
50	2	42.6	3.7	0.896
63	2 ½	53.6	4.7	1.43

5.2 Marking:

5.2.1 CPVC pipe shall be marked as follows:

- a- Manufacturer's name and logo.
- b- Standard.
- c- Pipe size in mm or inch.
- d- SDR.
- e- Pressure rating in Bar.
- f- Production date.
- g- CPVC indicator.

5.3 Material composition:

5.3.1 Material composition are given in table below:

Table 8. Material compositions

Specification	Value
Density	1.500 g/m ³
Coefficient of thermal expansion	0.7 (x10 ⁻⁴
Thermal Conductivity	0.14 W/MK
Operating temperature	95° C
Tensile strength (at 23 °C)	55 MPa
Operating Pressure	16 bar
Oxygen Permeation (cm ² /m .day atmosphere) at 70	<1
Water absorption	<= 0.040

Section - 6 Polyethylene HDPE pipes and fittings

6.1 General

These clauses shall be read in continuation of Section 1 of this specification.

- 6.1.1 All Polyethylene Pipes & Fittings used for conveyance of potable water shall be manufactured in accordance with DIN-8074, BS 6730, BS 6572, ISO 4427, BS EN 12201 or equivalent and shall be manufactured by ISO Certified Company.
- 6.1.2 Polyethylene Pipes & Fittings must have a health certificate issued by Worldwide Known Quality Body Certifier with potable water of +50 °C (See Appendix I) in accordance with requirement of BS6920:2000 "Suitability of Non-Metallic Products for use in direct contact with Water Intended for Human Consumption with regards to their effect on the quality of water".
- 6.1.3 Polyethylene Pipes & Fittings shall be PE100, minimum SDR 11, minimum PN16.
- 6.1.4 Polyethylene Pipes shall be multi-layer construction. (Black PE with outer layer blue PE), UV resistant
- 6.1.5 Hydrostatic test Pressure shall be 1.5 times the working pressure.
- 6.1.6 Polyethylene Pipes & fittings shall be certifying it complies with ISO 4427 or equivalent DIN, BS standard.
- 6.1.7 Manufacturers must provide test certificate in accordance with EN 10204-3.1 for batches of PE supplied.
- 6.1.8 Polyethylene Pipes & Fittings material shall withstand 1 ppm of Chlorine (Cl₂) or chlorine dioxide (ClO₂) at a water temperature + 50 °C.

6.2 Polyethylene Pipes (Material)

- 6.2.1 Polyethylene shall be manufactured from virgin polyethylene resin of a single or bi-modal process of manufacture. Master batching and/or re-grind material is not permitted.
- 6.2.2 The polyethylene pipe shall be confirming the specification as given in table 9 :

Table 9. The specification of the polyethylene pipe

specification	Value
Min density measured according to ISO 1872	949 Kg/m ³
Melt flow rate measured according to ISO 1133	@ 2.16 Kg. load= 0.18g/10min. @ 5 Kg. load = 0.18/10min.
tensile strength at yield	18 Mpa
elongation at break	600 %
elongation	10 %
thermal conductivity	0.32 W/m° K
Vicat softening point at 1 kg. load	122°C
Flexural Modulus- ASTM d790	900 MPa
tensile strength ASTM d638	30 MPa
HDT @ 0.46 MPa – ASTM d648	90°C
HDT @ 1.82 MPa – ASTM d648	58°C

6.3 Length and Size:

6.3.1 the polyethylene pipes are normally supplied in coils as per the specification given in table 23 (or in bundles of straight lengths of 12 up to 500m as per the discretion of the Concerned engineer):

Table 10. the polyethylene pipe sizes (in mm) and coils (in meters).

nom. Ø	Min. Ø	Max. Ø	Min. Wall thickness	Max. Wall thickness	Max. Coil length
20	20	20.30	2.30	2.80	500
25	25	25.30	2.30	2.80	400
32	32	32.30	3.00	3.50	300
40	40	40.30	3.70	4.30	300
50	50	50.30	4.60	5.30	300
63	63	63.40	5.80	6.70	200

6.3.2 the ovality of the pipe in coils as manufactured shall be in accordance with EN BS 12201 standard or equivalent.

6.4 Fittings and Stop Valve:

6.4.1 All fitting for polyethylene pipes shall be compression (Gunmetal, Brass or DZR Brass) or welded fitting.

6.5 Marking

6.5.1 Pipes shall be marked as follows:

- a- Manufacturer's name / Logo
- b- Standard
- c- Nominal size of pipe in mm [nominal outside diameter x nominal wall thickness]
- d- SDR
- e- PE100
- f- Pressure rating in Bar
- g- Month & year of manufacture.

6.6 Handling & Storage

6.6.1 Pipes and Fittings shall be handled and stored carefully as per manufacturer's recommendation.

6.6.2 From manufacturer to laying stage, Pipes & Fittings shall be stored and transported in covered area to avoid direct sunlight.

6.6.3 all damaged Pipe & Fitting due to mishandling shall be rejected.

6.6.4 the height of stack of pipes shall be as per manufacturer's recommendation.

Section - 7 Stainless steel tube for connection

7.1 General

These clauses shall be read in continuation of Section 1 of this specification.

7.1.1 The Stainless-steel tube shall be manufactured and tested according to BS EN ISO 1127 and ASTM A312

7.1.2 The Stainless-steel tube shall be ANSI 304, ANSI 316, or greater.

7.2 Stainless steel tube

7.2.1 The Stainless steel tube dimensions shall be manufactured and tested according to BS EN ISO 1127.

7.2.2 KAHRAMAA reserves the right to witness the pressure test at factory. Stainless steel tubes shall be subjected to at least a water pressure of 24 bars for a minimum period of 30 seconds without evidence of leaking.

Section - 8: Polyethylene (PE-X) Pipes

8.1 General

These clauses shall be read in continuation of Section 1 of this specification.

8.1.1 PE-X pipes shall be manufactured in accordance with BS EN ISO 15875, DIN 16892 and DIN 16893.

8.1.2 PE-X Pipes must have a health certificate issued by Worldwide Known Quality Body Certifier with potable water of +50 °C (See Appendix I) in accordance with requirement of BS6920:2000 "Suitability of Non-Metallic Products for use in direct contact with Water Intended for Human Consumption with regards to their effect on the quality of water".

8.1.3 PE-X Pipes shall be HDPE (virgin material), PE100, SDR 11, PN12.5.

8.1.4 PE-X pipes shall be of types PEX-A or PEX-B

8.1.5 PE-X pipes shall be only suitable for indoor use since ultraviolet (sun-light) rays causes the PE-X pipes to breakdown quickly.

8.2 Marking

8.2.1 Pipes shall be marked as follows:

- a- Manufacturer's name / Logo
- b- Standard
- c- Nominal size of pipe in mm [nominal outside diameter x nominal wall thickness]
- d- SDR
- e- PE100
- f- Pressure rating in Bar
- g- Month & year of manufacture.

8.3 Handling & Storage

8.3.1 Pipes and Fittings shall be handled and stored carefully as per manufacturer's recommendation.

8.3.2 From manufacturer to laying stage, Pipes & Fittings shall be stored and transported in covered area to avoid direct sunlight.

8.3.3 all damaged Pipe & Fitting due to mishandling shall be rejected.

8.3.4 the height of stack of pipes shall be as per manufacturer's recommendation.

Section - 9 : potable water Tank and accessories.

9.1 General

These clauses shall be read in continuation of Section 1 of this specification.

- 9.1.1 The installation and capacity (size) of the tank must comply with requirement design described in KM Water Installation Code (The distance tank-meter, distance tank wastewater, maximum height of the inlet, ...)
- 9.1.2 The water Tank and accessories should be made of a material that does not cause contamination or change of water quality (color, odor, taste...).
- 9.1.3 The tank shall be supported on a firm level base capable of withstanding the weight of the tank when filled with water to the rim.
- 9.1.4 The design should include measures to prevent dust.
- 9.1.5 The Water tank shall be suitable for use with water temperature up to +60°C. (+external temp + 80°C), at atmospheric pressure.
- 9.1.6 The water tank must have a health certificate issued by Worldwide Known Quality Body Certifier with potable water of +60°C in accordance with requirement of BS6920:2000
- 9.1.7 The roof tank should be under shade or shelter for conservation and protected for direct sun radiation.
- 9.1.8 Each tank shall be fitted with minimum 25 mm diameter outlet for connection to a washout pipe. The outlet shall be flush with the bottom of the tank. The floor of tank shall be laid at a slight fall towards the outlet. A washout pipe and a stop-tap shall be fitted to the outlet.
- 9.1.9 Distribution pipes for tanks shall be connected so that the lowest point of the outlet is not less than 50 mm above the bottom of the tank.

9.2 Materials

- 9.2.1 The Water tank shall be of the following types:
 - a- Fiberglass: The wall thickness of the tank should be more than 5 mm except for the manhole cover plate
 - b- Plastic (polyethylene, polypropylene, CPVC) multi-layer plastic, the raw material should be virgin plastic with UV stabilizer,
 - c- Stainless steel 316 or 316L.
 - d- Alloy Steel polyethylene external-internal coating.
 - e- Approved material by KAHRAMAA (special case).

9.3 Valve and Connection Tank:

- 9.3.1 Float Valve for controlling the flow of water into a Water Tank, the valve being operated by the vertical movement of a float riding on the surface of the water.
- 9.3.2 Float-controlled valves or equivalent flow control inlet devices should be securely and rigidly attached to the cistern or the tank and installed so that the valve closes when the level of the water is not less than 25mm and preferably not more than 50mm below the overflow level of the tank or roof cistern.
- 9.3.3 The internal pipelines in the network shall be hydraulically tested for 24 hours with a pressure of 1.5 times the internal pressure to ensure there is no leakage in the system.
- 9.3.4 All inlets to storage tanks and roof cisterns should be provided with a Servicing Valve to facilitate maintenance and a float-operated valve,
- 9.3.5 Tanks 2000mm and more in depth shall be equipped with a water level indicator arrangement. One common level indicator for a group of connected tanks is acceptable, subject to the Distribution Company's approval.
- 9.3.6 All tanks should have a rigid, close-fitting and securely-fixed cover which is not airtight, but which excludes light and insects from the cistern. It shall be made of a material or materials which does/do not shatter or fragment when broken and which will not contaminate the water quality.

9.4 GRP Sectional Panel Water Tank: (storage of water above-ground)

1. The GRP Sectional Water Storage Tanks shall be manufactured and design to the quality standard requirements of BS EN ISO 9001 and QCS Qatar and shall comply with BS EN 13280:2001 and BS 7491 part 3:1994.
2. Manufacturing Process shall be hot pressed SMC compression molding (SMC, Sheet Moulding Compound)
3. GRP Sectional Water Storage Tanks shall be suitable for use with water temperature up to 50°C in climate and soil conditions encountered in the State of Qatar.
4. All materials in direct contact with potable water must have a health certificate issued by Worldwide Known Quality Body Certifier (See Appendix IV) as per requirement of BS6920
5. The size of GRP panel should be produced by standard mould, having sizes 1*1m, 1*0.5m and 0.5*0.5m.
6. The thickness of the panels depends on the height of the tank.

9.5 Markings

9.5.1 The name-plate shall be securely attached to the tank exterior, by stainless steel grade 316 bolts and nuts or a similar in a clearly visible and accessible location.

The name-plate shall be made of a material not affected by weather conditions:

- a- The following data shall be engraved on the plate,
- b- Material,
- c- Range of temperature,
- d- Name of manufacturer or brand (trade) name,
- e- Serial number,
- f- Tank size or capacity/volume (in cubic meters) or imperial gallons,
- g- Year of manufacture.

Appendix I:

I. TYPICAL DRINKING WATER QUALITY



إدارة الصحة والسلامة والبيئة
Health, Safety & Environment Dept.

KAHRAMAA DRINKING WATER QUALITY REQUIREMENTS- 2012

Kahramaa-HSEd

Approved by: HSEd Manager
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Kahramaa-HSEd

DWQR-2012



Kahramaa Water Quality Requirements & GCC Standards

The Kahramaa Water Quality Requirement is applicable for water at entry point of water into distribution system and until the customer connection point. The Potable Water is regulated to meet **Kahramaa Requirements** on its characteristics, constituents and ionic ratio as listed in the following table. If any parameter is not listed in the below table, then the latest edition of the WHO guidelines for drinking water quality shall be used as a reference for that parameter value. The **GSO 149/2009 Standard for Un-bottled Drinking Water** is adopted as Qatari Standard and is the minimum quality requirement that can be accepted where no alternative water supply is applicable.

Parameter	GSO 149/2009 Standard For Un-Bottled Drinking Water	Kahramaa Requirement for Water in Distribution System
pH	6.5-8	6.5-8.5
Taste	-	Acceptable
Odor	-	Acceptable
Temperature	-	Acceptable
Color (TCU)	-	15
Turbidity (NTU)	-	4.0
Conductivity (us/cm)	-	150-500
TDS (mg/l)	100-1000	110-250
Total Hardness (mg/l as CaCO ₃)*	-	<150
Alkalinity (mg/l as CaCO ₃) *	-	70-120
Lead (mg/l)	0.01	0.01
Mercury (mg/l)	0.001 (total)	0.001
Iron (mg/l)	-	0.3
Copper (mg/l)	1	1.0
Manganese (mg/l)	0.4	0.05
Zink (mg/l)	-	3.0
Phosphate (mg/l)	-	0.01
Aluminum (mg/l)	-	0.2
Sodium (mg/l)	-	180
Chloride (mg/l)	-	<80
Nickel (mg/l)	0.07	0.07
Cadmium (mg/l)	0.003	0.003
Barium (mg/l)	0.7	0.7
Molybdenum (mg/l)	0.07	0.07
Cyanide (mg/l)	0.07	0.07
Chromium (mg/l)	0.03	0.05
Antimony (mg/l)	-	0.02
Arsenic (mg/l)	0.01	0.01
Selenium (mg/l)	0.01	0.01
Boron (mg/l)	0.5	0.5

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Organic compounds

The following is a list of organic pollutants with their maximum permitted level as indicated in the GSO Standard No. 149/2009 for Un-Bottled Drinking Water.

Organic Pollutants	Maximum level	Pesticides and Insecticides	Maximum level
Carbon tetrachloride (µg/l)	4	Alachlor (µg/l)	20
Diethylhexyl phthalate (µg/l)	8	Aldicarb (µg/l)	10
Dichlorobenzene, 1, 2 (µg/l)	1000	Aldrin and Dieldrin (µg/l)	0.03
Dichlorobenzene 1,4 (µg/l)	300	Atrazine (µg/l)	2
Dichloroethane 1,2 (µg/l)	30	Carbofuran (µg/l)	7
Dichloroethene 1,1 (µg/l)	30	Chlordane (µg/l)	0.2
Dichloroethene 1,2 (µg/l)	50	Chlorotoluron (µg/l)	30
Dichloromethane (µg/l)	20	Cyanazine (µg/l)	0.6
Hexa chloro butadiene (µg/l)	0.6	2,4 dichlorophenoxy acetic acid (µg/l)	30
Nitrilotriacetic acid (µg/l)	200	2,4 D-B (µg/l)	90
EDTA (µg/l)	600	1,2 Di bromo,3 chloropropane (µg/l)	1
Pentachlorophenol (µg/l)	9	1,2 Dibromoethane (µg/l)	0.4
Styrene (µg/l)	20	1,2 Dichloropropane ((µg/l) µg/l)	40
Tetrachloroethane (µg/l)	40	1,3 Dichloropropane	20
Trichloroethane (µg/l)	20	Dichloroprop (µg/l)	100
Cyanogens chloride (µg/l)	70	Dimethoate (µg/l)	6
Dibromoacetonitrile (µg/l)	70	Endrin (µg/l)	0.6
Trichlorophenol, 2, 4, 6 (µg/l)	200	Finoprop (µg/l)	9
Acrylamide (µg/l)	0.5	Isoproturone (µg/l)	9
Epichlorhydrine (µg/l)	0.4	Lindane (µg/l)	2
Benzoalapharyrine (µg/l)	0.7	MCPA (µg/l)	2
Phenyl chloride (µg/l)	0.3	Micoprop (µg/l)	10
Dichloroacetonitrile (µg/l)	20	Methoxychlor (µg/l)	20
Dioxin 1,4 (µg/l)	50	Metolachlor (µg/l)	10
Pesticides for Health		Molinate (µg/l)	6
Permethrine (µg/l)	300	Pentadimethalin (µg/l)	20
Peroxyfen (µg/l)	300	Simazine (µg/l)	2
Chloropyrifos (µg/l)	30	2,4,5 T (µg/l)	9
DDT (µg/l)	1	Terbutylazine (µg/l)	7
Toxins		Trifluraline (µg/l)	20
Microstatin L-R (µg/l)	1		

* The water leaving the treatment plants should have Langelier Index 0 to+ 0.3 and CCP number that does not cause corrosion or scaling problems in distribution system.

** Residual chlorine is applicable only if disinfection method used is based on chlorine gas or hypochlorite solution and Residual chlorine dioxide is applicable only if disinfection method used is based on chlorine dioxide. Also Mono-chloramine is applicable where used only. Both residuals chlorine and chlorine dioxides are applicable only if there is possible mixing of both in the distribution system due to mixing of water coming from different desalination plants using different disinfectants.

*** Parameters values indicated are for screening limits. If limits are exceeded then WHO guidelines to be consulted. The radiological parameters required by the GSO standard are as indicated in WHO Guidelines, Kahramaa adopt these levels by default.



Parameter	GSO 149/2009 Standard For Un-Bottled Drinking Water	Kahramaa Requirement for Water In Distribution System
Fluoride (mg/l)	1.5 Fluoride at a minimum: $0.34/x$ $X=0.038+(0.0062*(T*9/5+32))$	1.5
Ammonia (mg/l)	-	0.5
Sulphate (mg/l)	-	50
Foaming agents	-	0.5
Nitrate (mg/l) as NO ₃	50	10
Nitrite (mg/l) as NO ₂	3 long term (0.2) short term	0.1
Chlorine residual (mg/l)**	5 (for effective disinfection, chlorine residual to be >0.5 mg/l after 30 minutes of contact time at pH <8)	0.2-1.0
Chlorine Dioxide (mg/l) **	-	0.8
Monochloramine (mg/l)	3	3
Chloroform (mg/l)	0.3	0.2
Chlorate (µg/l)	700	700
Chlorite (µg/l)	700	700
Bromoform (µg/l)	100	100
Bromodichloromethane (µg /l)	60	60
Dibromochloromethane (µg/l)	100	100
Dichloromethane (µg/l)	20	20
Total THM (µg/l)	1	The sum of the ratio of the concentration of the THM's to the adopted guideline value <1
Haloacetic Acid (mg/l)	DCA: 0.05 MCA: 0.02 TCA: 0.2	DCA: 0.05 MCA: 0.02 TCA: 0.25
Bromate (mg/l)	0.01	0.01
PAH (mg/l)	-	0.0007
Tolouene (mg/l)	0.7	0.7
Benzene (mg/l)	0.01	0.01
Ethylbenzene (µg/l)	300	300
Tributillin (mg/l)	-	0.001
Xylene (mg/l)	0.5	0.5
Alpha particles (Bq/l)***	WHO guidelines values	0.5
Beta particles (Bq/l)***	WHO guidelines values	1.0
Uranium (mg/l)	0.015	0.015
Total Coli (MPN/100 ml) or (CFU/100ml)	nil	Nil in 98%tested samples for large supplies
Fecal Coli or E. coli (MPN/100 ml) or (CFU/100ml)	nil	Nil in 98% tested samples for large supplies

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