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Introduction



GM-PP-R pipes and fittings are well known on international market especially in Arab countries for more than 10 years.

GM use most modern machine to produce PP-R pipes and fittings, also the all production procedures investigated with best laboratory equipments according to international standards.

Our technical support department embrace a well equipped team engineers, always ready to fulfill any kind of requirments and support our client with all propels, advices, also provide site demonstrations and training for handling, joining and installation.

GM has been certified with ISO 9001, 14000 and 18000 systems.

Best regards

GM Rawasy

ABOUT GM PP-R pipes and fittings

GM Is a high tech company engaged in producing high quality of PPR - product with advanced production technology Equipments from Germany for manufacturing pipes and fittings. European Raw Material is used which is certified by European authority to use for HOT and COLD WATER. This Is an ISO 9001:2000, ISO 14000 & ISO 18000 certified company and Equipped with High Tech Tool Room and LAB Facilities for reliable quality. GM PPR PIPES AND FITTINGS are in conformity with DIN Standard 80778078/ for pipes and DIN 19560 / 16962 for fittings.

More attention is paid to ensure that no leakage occurs any where in service. Each component is subjected to a multistage inspection, which ensures accuracy and durability of the fittings in all type of industrial, agricultural, domestic, and other piping installations. Our modern factory is equipped with up-to-date plant machinery and inspection equipment skilled craftsman, tough inspection throughout all stages of manufacturing ensures the high standard of accuracy

While in the production division of our operations, the number of elements produced automatically increases with every new piece of machine, the number of employees in customer service, quality control, research and other areas, where people can not be replaced by machines, is growing. This brings a great significance for the development of our company and services offered.

CUSTOMERS

Customer's satisfaction is a precondition for further existence of the company, therefore the main priorities and goals of GM PPR SYSTEM include satisfying needs and expectations of customers within the area of plastic piping systems. Satisfying customers' needs is understood providing supplies within the term agreed on and in the quality required. Negotiation with customers must be prompt and correct. Our goal is to continuously increase and improve the level of our customer.

GENERAL INFORMATION & ENVIRONMENT ASPECTS

PPR pipes are manufactured from Polypropylene Random Copolymer raw material. This raw material is called Type 3. The most important feature of PPR that distinguishes it from the others is that it could also be used in hot water systems besides being used in sanitary networks. They have been marketed as an alternative to galvanized pipes and in near future they will dominate the market 100 % because of the superiorities they possess. The product has also fittings for connections. They are used for connections and they can be used in any type of transitions. There are fittings with metal parts for connections with the threaded pieces on the line. Socket welding is used as the connection method. Since the product has high welding capacity it is possible to make proper welding after 12- hours of training. The production range is $\varnothing 20 - \varnothing 250$ mm. The product could be produced in different colors.

PPR plastic pipes have become the most reliable components in plumbing systems for hot and cold water use with service life of 50 years.

PPR plastic pipe is a crucial type of building material and is largely used in many fields. You can find it in Portable water supplies in hotels, offices, hospitals etc. but also in Pipe systems for rainwater utilization. Because of its chemical characteristics, these plastic pipes are widely used in agriculture and horticulture for transit of aggressive chemicals and fluids. Another very important feature of PPR plastic pipe is its high level of temperature resistance and taking that into the consideration, this plastic pipe is commonly used in heating systems in residential houses.

PPR plastic pipe is also very light weight which is a big advantage for installation and handling and its fusion welding guarantee perfect seal and therefore prevent leakage. Chemical components of PPR plastic pipe material prevent from any bacterial growth and makes these pipes highly hygienic and non-toxic.

PP-R SYSTEM ADVANTAGES

- Polypropylene plastic piping systems - hot and cold water distribution systems in buildings and heating systems.
- Meeting all health requirements.
- No corrosion and/or encrustation.
- Exceptionally long service life while preserving high utility value.
- Trouble - free operations with less noise.
- Less friction losses than with traditional materials.
- Less weight than with traditional materials.
- Quick, easy and clean installation works.
- Resistance in aggressive environments
- Available sizes from 20 up to 250 mm.
- PPR pipes and pipes with middle layer from aluminum foil (PPR-AL-PPR).
- Pipes length as a standard 4 meters.
- Pipes and fittings green color as a standard. (grey, blue, ivory colors could be available).
- Easy to weld
- Fast installation
- Installation without scrap
- At 20°C it stands up to PN25
- 50 years of service life is guaranteed Can be used at 95°C
- No corrosion
- Doesn't contaminate drinking water with corrosion
- No crack formation due to ice under 0°C
- Depending on its elastic structure can be installed easily in hard positions
- PPR Product Range
- Pipes : All GM PPR Pipes PN-10, PN-16, PN-20 and
- Fittings : All GM fitting and also combined threaded fittings.

Recommended for Usage

These products are used for interior hot and cold water distribution systems in buildings and floor & central heating systems, air ducts.

Pipe PN-10 application of this pipe is for cold water distribution and floor heating systems.
 Pipe PN-16 is used for higher pressure cold water distribution and DHW systems at lower pressures and also,
 Pipe PN-20 is for hot water distribution systems, central heating.

RAW MATERIAL

Polypropylene Random Copolymer:

GM pipes and fittings are produced from Polypropylene Random Copolymer Type 3 as raw material having low melt flow rate, high molecular weight and good flexibility.

This raw material is recommended for the production of pressure pipes including potable water transfer lines for hot and cold water, floor heating and also for chemical industry applications.

Long term pressure resistance and easy processing and installation technique give cold and hot water systems made of PP-R pipes an advantage as alternative to the traditional systems.

Polypropylene Copolymer type 3 corresponds to German DIN standards:

DIN 8077 Dec. 1997 PP Pipe Dimensions

DIN 8078 April 1996 PP Pipes General Quality Requirements and Testing.

Standards Applied in Production:

DIN 1988 Drinking water lines in premises.

DIN 8078 PP Pipes general quality requirements and testing.

DIN 16928 Pipe connections and components layout.

DIN 16962 Pipe joints and components for pressure pipes of polypropylene.

DIN 4109 Sound insulation in building construction.

DIN 18381 Lines within buildings.

DVGW W308 Regulations and requirements for fittings, pipes & drinking water installations.

LABORATORY OPERATIONS & TEST DEVICES

1-MFI (Melt Flow Index) Test apparatus:

This device is used in simulating the materials flow behavior before being processed in the extruder. This device gives us information regarding the flow rate of the material in the unit temperature and time. This helps us to have information on the possible behavior of the material in the extruder. The quality Standard for this test is ISO 1133.

2- Density kit device :

Using this kit to weigh of the material which was passed from MFI device is determined according to the standard ISO 1183 separately in the air and immersed in the water whose density is known. After having these weight figures, the materials density is determined by using the specific density formula built in with this device.

3- Izod-Charpy Test Device :

With this device, the amount of the energy absorption and the possible applicable force on the unit area are determined by using free falling method using materials having different weights. By doing this test, we obtain information regarding materials behavior at the different loads with sudden impacts. The standards applied for this test are ISO 179 and ISO 180.

4- Tensile Test Device :

Using this device, we obtain information's about the maximum load strength, elasticity module (the maximum force strength per unit area), maximum tension, elongation in percentage, deformation, elongation at break point, tension at break point etc. of the product. By means of these tests we can make forecasts on the possible behavior of the material in the working conditions. In these tests ISO R 527 standard is applied.



5- CNC milling machine :

This device is used for the preparation of the sample which will be tested in the tensile test.

The sample is prepared in accordance with Standard No. ISO 527.

6- Shore (Hardness Device):

This device is used for the determination of the material's hardness. When we apply load on the sample, if the material is too soft then it will be pressed like paper while if it is too hard then it will be broken. For this reason the hardness value of the product must be within the range of the values mentioned in the Standard No. DIN 53505.

7- Microtom Device :

This is a device used to cut thin pieces which can be monitored under microscope for the purpose of inspecting the infrastructure of the material.

8- Microscope Image System :

This is a system used for monitoring the fibro structure of the material. The aim of this test is to secure for the material to have a homogeneous infrastructure. If the fibros image is not in the linear form then it means that there is a mistake either in the production stage or in the quality of the raw material itself.

9- Furnace-Deep Freezer:

These devices are used for shock cooling or heating. In certain intervals of time impact test is applied on the material which is hold in the furnace or deep freezer and its behavior is monitored at different test temperatures.

10- Pressure Test:

For the pipes produced according to the Standard TS 5439, to monitor the strength of the pipes to the pressure, a pressure test is applied under 100h (at 20 °C), and 165 and 1000h (at 80 °C). The standards used for this test are ISO 4427 (for PE 100), ISO 4437 (for PE 80) and TSE 10827.

11- Precise Balance :

To weigh any sample with high accuracy up to 0.001 mg

PP-R Pipes Applications

PP-R pipes are also called the three polypropylene pipes, polypropylene random copolymer by extrusion using a pipe, a pipe fitting injection. Europe's development and application of the early 90s the new plastic pipe products. PP-R is the late 80s, the gas-phase copolymerization process makes about 5% PE in the molecular chain of PP random homogeneous polymer (random copolymer) as a new generation of pipe materials. It has good impact resistance and long-term creep properties.

PP-R pipes mainly used

- 1- PP-R pipes are used to build hot and cold water systems.
- 2- PP-R pipes are a part of building heating system, including floor, wall and radiant heating systems.
- 3- In the central (concentration) air conditioning systems, PP-R pipes always also play an important part.
- 4- PP-R pipes are used to transfer or discharge of chemical media, such as industrial piping system.

PPR pipes have good heat resistance. PP-R pipes vicat softening point of 131.5 °C. Maximum working temperature of PPR is 95 °C. while at water supply and drainage, PPR pipes meet the require of construction specifications of hot water system. PPR cold water pipes are generally used as water pipes, and PPR hot water pipes usually used to connect tubes, but it can also be used as the cold pipes.

PPR pipes are non-toxic. The elements of PPR pipes are only carbon and hydrogen, and there is no harmful toxic elements. Therefore, PPR pipes can be used to clean drinking water systems.

Suitable Operating Pressure

Permissible Operating Pressure

Projected Service Life

The following table provides a more detailed information with regards to the permissible pressure of various pipe pressure rating at various temperatures. These values derived from the hoop stress chart and formula.

Under normal working pressures and conditions, the average service life of GM pipes is projected to be 50 years or more.

Example

A PN 10, cold water pipe, transporting water at a temperature of 30°C can last for more than 50 years under normal conditions with an operating pressure of 11.1 Bars or 161 P.S.I

A PN 20, cold water pipe, transporting water at a temperature of 70°C can last for more than 50 years under normal conditions with an operating pressure of 8.5 Bars or 123 P.S.I

Suitable Operating Pressure

Temperature °C	Service life in years	Nominal Pressure *		
		PN 10	PN 16	PN 20
10 °C	1	17.6	28.2	35.2
	5	16.5	26.5	33.1
	10	16.1	25.8	32.3
	25	15.6	25	31.2
	50	15.5	24.3	30.4
	100	14.8	23.7	29.6
20 °C	1	14.9	23.9	29.9
	5	14.1	22.6	28.3
	10	13.7	22	27.5
	25	13.3	21.3	26.7
	50	12.9	20.7	25.9
	100	12.5	19.5	25.1
30 °C	1	12.8	20.5	25.6
	5	12.0	19.2	24
	10	11.6	18.6	23.2
	25	11.2	17.9	22.4
	50	10.9	17.5	21.9
	100	10.5	16.8	21.2
40 °C	1	10.8	17.3	21.6
	5	10.1	16.2	20.3
	10	9.9	15.8	19.7
	25	9.5	15.2	18.9
	50	9.2	14.7	18.4
	100	8.8	14.1	17.8

Fusion

Fusion Tool Operating Guidelines

- Socket Fusion Welding Tool
- Electro fusion Welding Kit
- Desktop Welding Machine

Please refer to the operating manual of various welding tools

Four-Step Fusion Process

Step 1

Cut pipe to the required length using a cutter, mark the welding depth on the pipe, ensure that the indicator light on the welding tool signals that the tool is hot enough (260°C) for welding.

Step 2

The tip of pipe to be welded is shaved by special GM shaver to remove outside PP-R layer and aluminium foil. (Applicable only to PN 25 stabe pipes)

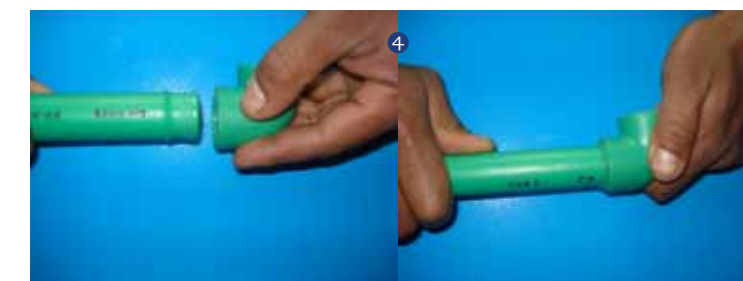
Step 3

Push the pipe and fitting into the welding adaptors, applying even strength at both ends. Do not twist or turn the pipe and fitting while pushing. Wait until heating time is reached.

Step 4

When the welding heating time is reached, remove both pipe and fittings together, again without twisting or turning while pulling out of the welding adaptor. Almost immediately, push both pipe and fitting together until the depth is reached. It is possible to adjust the joints for more than 5 degrees during this time. Joint is now completed. (see welding time table)

50 °C	1	9.1	14.6	18.3
	5	8.5	13.7	17.1
	10	8.3	13.2	16.5
	25	8.0	12.8	16
	50	7.7	12.4	15.5
60 °C	1	7.7	12.4	15.5
	5	7.2	11.5	14.4
	10	6.9	11.1	13.9
	25	6.7	10.7	13.3
	50	6.5	10.4	12.9
70 °C	1	6.5	10.5	13.1
	5	6.0	9.6	12
	10	5.8	9.3	11.6
	25	4.9	7.9	9.9
	50	4.3	6.8	8.5
80 °C	1	5.5	8.8	10.9
	5	4.8	7.7	9.6
	10	4.0	6.4	8
	25	3.2	5.1	6.4
95 °C	1	3.9	6.2	7.7
	5	2.6	4.1	5.2
	10	2.2	3.5	4.3



Welding Time table

The table below provides the necessary information for a good welding joint for various GM pipe and fitting size (applies to Stabe pipes also).

Pipe Diameter (mm)	Welding Depth (mm)	Healing time (sec.)	Welding Time (sec.)	Cooling Time (min.)
20	14.0	5	4	2
25	15.0	7	4	2
32	16.5	8	6	4
40	18.0	12	6	4
50	20.0	18	6	4
63	24.0	24	8	6
75	26.0	30	8	8
90	29.0	40	8	8
110	32.5	50	10	8

- Heating time starts when both pipe and fitting are pushed into correct depth.
- Welding time begins when joints are connected.
- Cooling time is the time taken for the joint to be completely cured. never reduce cooling time by pouring water or by other means

Installation Technique

Installation for GM piping system is not different from any other conventional piping systems, except for the superior leak proof fusion joining system. However, there are some finer points and guidelines that need special attention when installing GM.

Support Intervals

For visible pipe works that need a proper support intervals are necessary. This will prevent unsightly but common «snaking» or sagging found in plastic pipe systems.

Pipe Support Intervals (mm) for GM Pipes PN 10 (SDR11)PN 20 (SDR6)

Temperature Difference (C)	GM Pipe Diameter(mm)									
	20	25	32	40	50	63	75	90	110	
20	600	750	900	1000	1200	1400	1500	1600	1800	
30	600	750	900	1000	1200	1400	1500	1600	1800	
40	600	700	800	900	1100	1300	1400	1500	1700	
50	600	700	800	900	1100	1300	1400	1500	1700	
60	550	650	750	850	1000	1150	1250	1400	1600	
70	500	600	700	800	950	1050	1150	1250	1400	

Pipe Support Intervals (mm) for GM Pipes PN 25 (Stabe pipes)

Temperature Difference (C)	GM Pipe Diameter(mm)									
	20	25	32	40	50	63	75	90	110	
20	1200	1300	1500	1700	1900	2100	2200	2300	2500	
30	1200	1300	1500	1700	1900	2100	2200	2300	2400	
40	1100	1200	1400	1600	1800	2000	2100	2200	2300	
50	1100	1200	1400	1600	1800	2000	2100	2200	2100	
60	1000	1100	1300	1500	1700	1900	2000	2100	2000	
70	900	1000	1200	1400	1600	1800	1900	2000	2000	

Exposed Installation

Cold Water Risers

There is no need for expansion joint as there will be no linear expansion for GM cold water pipes. Vertical Support is necessary like all other piping system.

Ceiling Walls

During the planning and laying of visible pipes for hot water on ceiling or walls, besides taking into account the support intervals, special attention must be given to the linear expansion due to temperature. This will also prevent sagging and «snaking» of pipe lines. No consideration is necessary for Stabe pipes. Hence, to prevent unsightly installation, the following appropriate procedure must be observed:

Linear Expansion

For transportation of hot water, like all metal or plastic pipes, we have to deal with its linear expansion. This applies only to PN 20 (SDR6) pipes for hot water applications. No consideration is necessary for PN 25, Stabe pipes as the coefficient of linear expansion is $3.0 \times 10^{-5} \text{ K}^{-1}$

The coefficient of linear expansion for GM PN 20 (SDR6) pipes is $15.0 \times 10^{-5} \text{ K}^{-1}$

$$\Delta l = \alpha L \times \Delta t$$

Where: Δl = linear expansion, mm

α = coeff. of linear expansion, constant for GM pipes 0.15 mm/mK

L = pipe length, m

Δt = temperature difference between normal water temperature and desired operating hot water temperature, K

Precautionary Measures During Installation

1. To reduce from a large diameter pipe to a smaller diameter pipe, a socket must be used in conjunction with a reducer. For example, to reduce from pipe diameter of 50 mm to 25 mm, a socket 50 mm must first be attached to the 50 mm pipe followed by a reducer 50 / 25 mm and followed by the 25 mm pipe.
2. When using GM fittings with metal threaded parts, white Teflon sealing tapes must be applied adequately to prevent leakage from threads.
3. Over tightening of fixtures to GM fittings with metal parts may cause damages and leakage problems. Care must be taken to prevent over tightening.
4. During fusion welding:
 - * Fusion parts must be free from sand and particles.
 - * Welding time and depths must be observed.
 - * Do not twist and turn pipes and fittings while inserting and detaching from welding machine.
5. Metal plugs must be used during pressure tests.
6. Pressure test must be conducted BEFORE concealing pipe works.

Pressure Test

After installing GM piping system, it is necessary to go through a pressure test. Unlike metal pipes, GM like all other plastic pipe systems, has to follow different pressure test procedure owing to their mechanical properties of expansion when subject to pressure, temperature difference and coefficient of expansion.

A change in temperature of 10 K corresponds to a pressure change of 0.5 - 1.0 bar. Thus, the test medium shall as far as possible, be kept at a constant temperature throughout the test.

Test Procedure (According to DIN 1988 Part 2 or BS 6700: 1977)

Preparation for Filling Testing the System

For pressure testing, pressure gauges that allow reading of changes in pressure of 0.1 bar shall be used, fitted at the lowest possible point in the system.

Pressure testing for leakages must be conducted while pipe works are still accessible and before concealing or plastering.

Finished pipe work must be completely fitted with filtered water and vented.

Procedure

After pipe work is filled with water and completely vented to release air locks in the system, testing can begin:

(a) Test pressure = (permissible working pressure + 5 bars) shall be produced 2 times within 30 minutes at 10 minute intervals.

Note : restore by hand pump to required test pressure after the 10 minute interval if the pressure drops. If leakage is detected, rectify the leakage are and repeat procedure.

(b) If no leakage is detected, for the next 30 minutes, check if the pressure has dropped by more than 0.6 bars and if there is any visible signs of leakage.

Note : If leakage is detected, rectify the leakage area and repeat procedure.

If pressure drops by more than 0.6 bars within this period, leakage must have occurred. Detect and rectify.

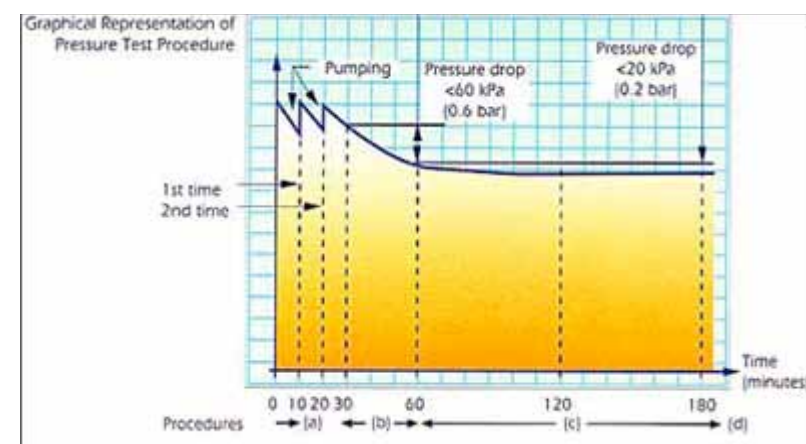
(c) If pressure drop is within 0.6 bars and no leakage detected, continue the test without restoring the required pressure for the next 120 minutes. During this time, it shall be checked if the pressure drop is more than 0.2 bars and no leakage is detected.

Note : If leakage is detected, rectify the leakage area and repeat procedure.

If pressure drops by more than 0.2 bars within this period, leakage must have occurred. Detect, rectify and repeat procedure.

(d) Pressure test is successful when all the above are met and the readings should be recorded.

Graphical Representation of Pressure Test Procedure



Chemical Resistance Tables

E: Good

S: Satisfactory

N: Non Satisfactory

Reagent	Concentration	Temperature C°		
		20C	60C	100C
acetic anhydride	100%	E	-	-
acetic di-tri-chloroacetic	Sol	E	-	-
acetic acid	up to 40%	E	E	-
acetic acid	50%	E	E	S
acetic glacial acid	over 96%	E	S	N
acetone	100%	E	S	-
acetophenone anhydride	100%	E	S	-
acrylonitrile	100%	E	-	-
air		E	E	E
almond oil		E	-	-
alum	Sol	E	-	-
ammonia (gas)	100%	E	-	-
ammonia (saturated in water)		E	E	-
ammonia liquor	up to 30%	E	E	-
ammonium acetate	Sat. Sol	E	E	-
ammonium bicarbonate	Sat. Sol	E	E	-
ammonium chloride	Sat. Sol	E	E	-
ammonium fluoride	Sol	E	E	-
ammonium hydroxide	Sol	E	-	-
ammonium methaphosphate	Sat. Sol	E	E	E
ammonium nitrate	Sat. Sol	E	E	E
ammonium phosphate	Sat. Sol	E	E	-
ammonium sulphate	Sat. Sol	E	E	E
amyl acetate	100%	S	-	-
amyl alcohol	100%	E	E	E
aniline	100%	S	-	-
anisole	100%	S	-	-
apple juice		E	E	-
barium carbonate	Sat. Sol	E	E	E
barium chloride	Sat. Sol	E	E	E
barium hydroxide	Sat. Sol	E	E	E
barium sulphate	Sat. Sol	E	E	E
benzoic acid	Sat. Sol	E	-	-
benzoyl acid	100%	E	E	-

Reagent	Concentration	Temperature C°		
		20C	60C	100C
benzoil alcohol	100%	E	S	-
borax	Sol	E	E	-
boric acid	sat. sol.	E	E	-
sodium hypochlorite	20%	E	-	-
sodium metaphosphate	sol.	E	-	-
sodium nitrate	sat. sol.	E	E	-
sodium ortho-phosphate	sat. sol.	E	E	-
sodium perborate	sat. sol.	E	-	-
sodium silicate	sol.	E	E	-
sodium sulfide	sat. sol.	E	-	-
sodium sulfite	40%	E	E	E
sodium sulphate	sat. sol.	E	E	-
sodium thiosulphate	sat. sol.	E	-	-
soybean-oil		E	S	-
stannic chloride	Sat. Sol	E	E	-
succinic acid	Sat. Sol	E	E	-
sulphur dioxide, dry, gas	100%	E	-	-
sulphur dioxide, wet, gas	100%	E	-	-
sulphuric acid	up to 10%	E	E	E
sulphuric acid	100%	E	E	-
sulphuric acid	50%	E	S	E
sulphuric acid	96%	E	S	N
sulphurous acid	sol.	E	-	-
tartaric acid	10%	S	E	-
thiophene	100%	E	S	-
trichloroacetic acid	up to 50%	S	E	-
triethano amine	sat. sol.	S	-	-
urea	sat. sol.	E	-	-
vinegar		E	E	-
water, brackish		E	E	E
water, distilled	Sat. Sol	E	E	E
water, drinkable		E	E	E
water, mineral		E	E	E
water, sea water		E	E	E

Chemical Resistance Tables

E: Good

S: Satisfactory

N: Non Satisfactory

Reagent	Concentration	Temperature C°		
		20C	60C	100C
Formic acid	85%	S	N	N
Formic acid (anhydrous)	100%	S	S	S
fructose	Sol.	E	E	E
Fruit juice		E	E	E
glucose	20%	E	E	E
Glycerine	100%	E	E	E
Glycolic acid	30%	E	-	-
Hexane	100%	S	S	-
Hydrobromic. Acid	Up to 48%	E	S	N
Hydrochloric acid	27%	E	E	E
Hydrochloric acid	10%	E	E	-
Hydrochloric acid	30%	E	S	S
Hydrochloric acid	3576%	E	-	-
Hydrochloric acid, gas, dry	100%	E	E	-
Hydrofluoric acid	Dil. Sol.	E	-	-
Hydrofluoric acid	40%	E	-	-
hydrogen	100%	E	-	-
Hydrogen peoxide	Up to 10%	E	-	-
Hydrogen peoxide	Up to 30%	E	-	-
Hydrogen sulphide, gas ,dry	100%	E	E	-
iodine (alcoholic solution)		E	-	-
isopropylalcohol	100%	E	E	E
isopropylether	100%	S	-	-
jelly	100%	E	E	-

Chemical Resistance Tables

E: Good

S: Satisfactory

N: Non Satisfactory

Reagent	Concentration	Temperature C°		
		20C	60C	100C
Lactic acid	Up to 90%	E	E	-
lanolin		E	S	-
Linseed-oil		E	E	-
Magnesium carbonate	Sat. sol.	E	E	E
Magnesium chloride	Sat. sol.	E	E	-
Mercurous nitrate	Sol.	E	E	-
mercury	100%	E	E	-
Metly acetate	100%	E	-	-
Metly alcohol	5%	E	S	S
Metly ethly ketone	100%	E	-	-
metylamine	Up to 32%	E	-	-
milk		E	E	E
Monochloracetic acid	Over 85%	E	E	-
naphta		E	N	N
nickel chloride	Sat. sol.	E	E	-
nickel nitrate	Sat. sol.	E	E	-
nickel sulphate	Sat. sol.	E	E	-
nitric acid	10%	E	N	N
nitric acid	30%	S	-	-
nitric acid, fuming		N	N	N
nitrobenzene	100%	E	S	-
olive-oil		E	E	S
oxalic acid	Sat. sol.	E	S	N

Reagent	Concentration	Temperature C°		
		20C	60C	100C
butane	100%	E	E	-
butanol	100%	E	S	S
butyglycol	100%	E	-	-
butyphenol	Cold sat. sol.	E	-	-
Butly phtalate	100%	E	S	S
Calcim carbonate	Sat. sol.	E	E	E
Calcium chloride	Sat. sol.	E	E	E
Calcium hydroxide	Sat. sol.	E	E	-
Calcium nitrate	Sat. sol.	E	E	-
Carbon doioxide, gaseus, dry	100%	E	E	-
Carbon doioxide, gaseus, wet		E	E	-
Carbon di-sulphide	100%	N	N	N
Carbon tetrachloride	100%	N	N	N
Castor- oil	100%	E	E	-
Chloroethanol (- fchlorethanol)	100%	E	-	-
Chrome alum	Sat. sol.	E	E	-
Chromic acid	Up to 40%	S	S	N
Citric acid	10%	E	E	E
Coconut-oil		E	-	-
Corn-oil		E	S	-
Cotton-oil		E	S	-
cresol	Over 90%	E	-	-
Cupric chloride	Sat. sol.	E	E	-
Cupric nitrate	30%	E	E	E

Dimensions table according to DIN 8077

Reagent	Concentration	Temperature C°		
		20C	60C	100C
Cupric sulphate	Sat. sol.	E	E	-
cyclohexane	100%	E	-	-
cyclohexanol	100%	E	S	-
dextrin	Sol.	E	E	-
dextrose	Sol.	E	E	-
di-butly phtalate	100%	E	S	N
di-chloroacetic acid	100%	S	-	-
di-chloroethylene	100%	S	-	-
di-ethanolamine	100%	E	-	-
di-ethyl ether	100%	E	S	-
di-ethylen glycol	100%	E	E	-
di-glycolic acid	Sat. sol.	E	-	-
di-isooctyl phtalate	100%	E	S	-
di-methylamine	100%	E	-	-
di-methylformamide	100%	E	E	-
di-octyl phtalate	100%	S	S	-
dioxan	100%	S	S	-
ethanolamine	100%	E	-	-
Ethylalcohol (ethanole)	Up to 95%	E	E	-
Ethylene chloride	100%	N	N	-
athyleneglycole	100%	E	E	E
formaldehyde	40%	E	-	-
Formic acid	10%	E	E	S

Wall thickness and mass																
D	20		26		12.5		8.3		5		3.2		2.5		2	
PN (bar)	2.5		3.2		4		6		10		16		20		25	
SDR	41		33		26		17.6		11		7.4		6		5	
	S	Mass In Kg/m	S	Mass In Kg/m	S	Mass In Kg/m	S	Mass In Kg/m	S	Mass In Kg/m	S	Mass In Kg/m	S	Mass In Kg/m	S	Mass In Kg/m
10	-	-	-	-	-	-	-	-	-	-	-	-	1.8	0.046	2.0	0.050
12	-	-	-	-	-	-	-	-	-	-	1.8	0.057	2.0	0.062	2.4	0.071
16	-	-	-	-	-	-	-	-	-	-	2.2	0.095	2.7	0.110	3.3	0.128
20	-	-	-	-	-	-	-	-	1.9	0.107	2.8	0.148	3.4	0.172	4.1	0.198
25	-	-	-	-	-	-	-	-	2.3	0.164	3.5	0.230	4.2	0.266	5.1	0.307
32	-	-	-	-	-	-	1.8	0.172	2.9	0.261	4.4	0.370	5.4	0.434	6.5	0.498
40	-	-	-	-	1.8	0.217	2.3	0.273	3.7	0.412	5.5	0.575	6.7	0.671	8.1	0.775
50	-	-	1.8	0.274	2.0	0.301	2.9	0.422	4.6	0.638	6.9	0.896	8.3	1.04	10.1	1.21
63	1.8	0.349	2.0	0.382	2.5	0.471	3.6	0.659	5.8	1.01	8.6	1.41	10.5	1.65	12.7	1.91
75	1.9	0.438	2.3	0.528	2.9	0.647	4.3	0.935	6.3	1.41	10.3	2.01	12.5	2.34	15.1	2.70
90	2.2	0.616	2.8	0.758	3.5	0.936	5.1	1.33	8.2	2.03	12.3	2.87	15.0	3.36	18.1	3.88
110	2.7	0.903	3.4	1.12	4.2	1.37	6.3	1.99	10.0	3.01	15.1	4.30	18.3	5.01	22.1	5.78
125	3.1	1.18	3.9	1.45	4.8	1.76	7.1	2.55	11.4	3.91	17.1	5.53	20.8	6.47	25.1	7.46
140	3.5	1.48	4.3	1.80	5.4	2.23	8.0	3.20	12.7	4.87	19.2	6.95	23.3	8.12	28.1	9.35
160	4.0	1.91	4.9	2.32	6.2	2.92	9.1	4.17	14.6	6.33	21.9	9.04	26.6	10.6	32.1	12.2
180	4.4	2.38	5.5	2.94	6.9	3.63	10.2	5.25	16.4	8.07	24.6	11.4	29.0	13.4	36.1	15.4
200	4.9	2.92	6.2	3.68	7.7	4.50	11.4	6.50	18.2	9.95	27.4	14.1	33.2	16.5	-	-
225	5.5	3.70	6.9	4.57	8.6	5.65	12.3	8.19	20.5	12.6	30.8	17.9	37.4	20.9	-	-
250	6.2	4.63	7.7	5.67	9.6	6.99	14.2	10.1	22.7	15.5	34.2	22.1	-	-	-	-

Pipes



PIPE PN 10 (SDR 11)

PPGMP 10

DIMENSION (mm)	Packing Quant.
20	25
25	20
32	10
40	5
50	5
63	3
75	2
90	2
110	1
125	1

PIPE PN 20 (SDR 6)

PPGMP 20

DIMENSION (mm)	Packing Quant.
16	30
20	25
25	20
32	10
40	5
50	5
63	3
75	2
90	2
110	1
125	1



ALUMINIUM FOILED PIPE

PPGPP20AL

DIMENSION (mm)	Packing Quant.
16	25
20	20
25	15
32	10
40	5
50	3
63	2

FIRST: SPECIAL FITTINGS PRODUCED BY INJECTION



Socket

CODE	DIMENSION (mm)
GM-20S	20
GM-25S	25
GM-32S	32
GM-40S	40
GM-50S	50
GM-63S	63
GM-75S	75
GM-90S	90
GM-110S	110



End Cap

CODE	DIMENSION (mm)
GM-20C	20
GM-25C	25
GM-32C	32
GM-40C	40
GM-50C	50
GM-63C	63
GM-75C	75
GM-90C	90
GM-110C	110



Tee 90 Reducer

CODE	DIMENSION (mm)
GM-RT25 / 20	25 / 20
GM-RT32 / 20	32 / 20
GM-RT32 / 25	32 / 25
GM-RT50 / 20	50 / 20
GM-RT50 / 25	50 / 25
GM-RT50 / 32	50 / 32
GM-RT63 / 20	63 / 20
GM-RT63 / 25	63 / 25
GM-RT63 / 32	63 / 32
GM-RT63 / 50	63 / 50
GM-RT75 / 32	75 / 32
GM-RT75 / 50	75 / 50
GM-RT75 / 63	75 / 63
GM-RT90 / 32	90 / 32
GM-RT90 / 50	90 / 50
GM-RT90 / 63	90 / 63
GM-RT90 / 75	90 / 75
GM-RT110 / 63	110 / 63
GM-RT110 / 75	110 / 75
GM-RT110 / 90	110 / 90



Reducer

CODE	DIMENSION (mm)
GM-R 25 / 20	25 / 20
GM-R 32 / 20	32 / 20
GM-R 32 / 25	32 / 25
GM-R 40 / 20	40 / 20
GM-R 40 / 25	40 / 25
GM-R 40 / 32	40 / 32
GM-R 50 / 20	50 / 20
GM-R 50 / 25	50 / 25
GM-R 50 / 32	50 / 32
GM-R 63 / 20	63 / 20
GM-R 63 / 25	63 / 25
GM-R 63 / 32	63 / 32
GM-R 63 / 50	63 / 50
GM-R 75 / 32	75 / 32
GM-R 75 / 50	75 / 50
GM-R 75 / 63	75 / 63
GM-R 90 / 50	90 / 50
GM-R 90 / 63	90 / 63
GM-R 90 / 75	90 / 75
GM-R 110 / 63	110 / 63
GM-R 110 / 75	110 / 75
GM-R 110 / 90	110 / 90



Elbow 90°

CODE	DIMENSION (mm)
GM-20E90	20
GM-25E90	25
GM-32E90	32
GM-40E90	40
GM-50E90	50
GM-63E90	63
GM-75E90	75
GM-90E90	90
GM-110E90	110



Elbow 45°

CODE	DIMENSION (mm)
GM-20E45	20
GM-25E45	25
GM-32E45	32
GM-40E45	40
GM-50E45	50
GM-63E45	63
GM-75E45	75
GM-90E45	90
GM-110E45	110



Flangeadapter

CODE	DIMENSION (mm)
GM-ST75	75
GM-ST90	90
GM-ST110	110



Tee 90°

CODE	DIMENSION (mm)
GM-20T	20
GM-25T	25
GM-32T	32
GM-40T	40
GM-50T	50
GM-63T	63
GM-75T	75
GM-90T	90
GM-110T	110



Female Adaptor with Brass Insert

CODE	DIMENSION (mm)
GM-FS20 / 0.5	20 / 1 / 2
GM-FS20 / 3 / 4	20 / 3 / 4
GM-FS25 / 0.5	25 / 0.5
GM-FS25 / 3 / 4	25 / 3 / 4
GM-FS32 / 3 / 4	32 / 3 / 4
GM-FS32 / 1	32 / 1
GM-FS50 / 1.5	50 / 1.5
GM-FS63 / 2	63 / 2
GM-FS75 / 2.5	75 / 2.5
GM-FS90 / 3	90 / 3
GM-FS110 / 4	110 / 4



Male Socket With Brass Insert

CODE	DIMENSION (mm)
GM-20 MS 20 / 0.5	20 / 0.5
GM-20 MS 20 / 3 / 4	20 / 3 / 4
GM-25 MS 25 / 0.5	25 / 0.5
GM-25 MS 25 / 3 / 4	25 / 3 / 4
GM-32 MS 32 / 3 / 4	32 / 3 / 4
GM-32 MS 32 / 1	32 / 1
GM-50 MS 50 / 1.5	50 / 1.5
GM-63 MS 63 / 2	63 / 2
GM-75 MS 75 / 2.5	75 / 2.5
GM-90 MS 90 / 3	90 / 3
GM-110 MS 110 / 4	110 / 4



Tee 90° with Brass Insert

CODE	DIMENSION (mm)
GM-TF20 / 0.5	20 / 0.5
GM-TF25 / 0.5	25 / 0.5
GM-TF25 / 3 / 4	25 / 3 / 4
GM-TF32 / 0.5	32 / 0.5
GM-TF32 / 3 / 4	32 / 3 / 4
GM-TF32 / 1	32 / 1



Valve Base

CODE	DIMENSION (mm)
GM-VB20 / 3 / 4	20 x 3 / 4
GM-VB25 / 3 / 4	25 x 3 / 4



Elbow with Brass Insert

CODE	DIMENSION (mm)
GM-EF20 / 0.5	20 / 0.5
GM-EF25 / 0.5	25 / 0.5



Elbow with Brass Insert

CODE	DIMENSION (mm)
GM-EFB25 / 3 / 4	25 x 3 / 4
GM-EFB32 / 1	32 x 1



Cross over with socket

CODE	DIMENSION (mm)
GM-B20	20



Cross over

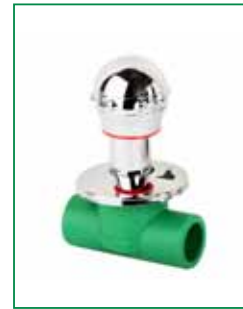
CODE	DIMENSION (mm)
GM-B20	20
GM-B25	25

CERTIFICATES



Ball Valve

CODE	DIMENSION (mm)
GM-BV20	20
GM-BV25	25
GM-BV32	32
GM-BV40	40
GM-BV50	50
GM-BV63	63



Valve

CODE	DIMENSION (mm)
GM-V20	20
GM-V25	25
GM-V32	32



Super Valve

CODE	DIMENSION (mm)
GM-SV20	20
GM-SV25	25
GM-SV32	32



Global Valve

CODE	DIMENSION (mm)
GM-GV20	20
GM-GV25	25
GM-GV32	32



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 قسم السيراميك والبلاستيك والمواد الصلبة

ملخص نتائج الاختبارات

على عينة مواسير بولي بروپيلين قطر ١١٠مم

من إنتاج الشركة الخليجية للتصنيع - رواسو

الاختبارات	النتائج	حدود المواصفات الفنية
الوزن (كجم)	٢٠,١٢	(١٨,٣ + ٢,١)
القطر الخارجى	١١٠,٣٠٠	(١١٠ + ٠,٩)
نتائج اختبار الشدقة (كجم/سم ²)	٠,٩١٢	٠,٩١
نتائج اختبار انحناس الماء (%)	٠,٨٠٤٧	—
نتائج اختبار التمدد الطولى (%)	١,٨٠٠	٢
نتائج اختبار قوة التحمل للتشد :-		
قوة التحمل للتشد عند الضغط (كجم/سم ²)	٢٠٣,١٩٢	٢٤٠
قوة التحمل للتشد عند الصنوع (كجم/سم ²)	٢٧٧,٣١٢	٢٧٠
نتائج اختبار الإسطقة :-		
الإسطقة عند الضغط (%)	٧٨,٠٧٧	—
الإسطقة عند الصنوع (%)	٢٠,٠٠٠	—
نتائج اختبار قوة التحمل للشدات (Impact Test) (كجم/سم ²)	٢١,٢٢٢	٢١
نتائج اختبار معامل التمدد (الحرارة - التقلص)	٠,٢٣٤	—
نتائج اختبار الطرق والقصام	لم يحدث كسر	لم يحدث كسر
نتائج اختبار الضغط الداخلي	لم يحدث انفجار	لم يحدث انفجار
نتائج اختبار تأثير الكيمويات	لم يحدث تأثير	لم يحدث تأثير
نتائج اختبار مقاومة الصدم	لم يحدث كسر	لم يحدث كسر

٢٢٢٧١٩٢٤, ٢٢٢٧١٩٢٤, ٢٢٢٧١٩٢٤, ٢٢٢٧١٩٢٤
 داخلى: ١٢٢١
 مباشر: ٢٢٢٧٨٨٠٢
 وفاكس: ١٠٨٤

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ملخص تقرير

عن صلاحية المواسير المصنعة من البولي بروپيلين ووصلاتها

(PP-R) المنتجة من الشركة الخليجية للتصنيع (رواسو)

استخدامها لشبكات نقل وتوصيل مياه الشرب وشبكات المياه المنزلية

قامت الشركة الخليجية للتصنيع (رواسو) بتقديم عينات من المواسير المصنعة من مادة البولي بروپيلين (Polypropylene - Random) وذلك لغرض وأداء صلاحيتها للاستخدام فى شبكات نقل وتوصيل مياه الشرب والمياه المنزلية وذلك تم بناء على طلب الشركة مع تقديمها لعينات من هذه المواسير وذلك على مستوايتها لغرض والفحص وتقديم صلاحية هذه المنتجات فى الاستخدام لمياه الشرب وكذلك لشبكات المياه المنزلية ، وقد تم فحص والقياس هذه المنتجات طبقا للمعايير التالية:-

١- مطابقة خواص هذه المواسير والوصلات من مادة البولي بروپيلين للمواصفات الأمريكية العالمية التالية :-
 ASTM - D - 258 , ASTM - D - 638 , ASTM - D - 790 , ASTM - D - 792 , ASTM - D - 1238

٢- مطابقة المواصفات الألمانية العالمية التالية :-
 DIN 8077 , DIN 8078 , DIN 16962, DIN4726, DIN4728

٣- مطابقة المواصفات الأوروبية والأورو أرقام :-
 EN 12202 , ISO / DIS 15- 874 , ISO 1133 , ISO 1183 , ISO 527 , ISO 179 , ISO 180 , ISO 37

٤- مدى تغير الخواص فى خواص المياه المختلفة نتيجة مرورها وبالتسا مع جسم المواسير والوصلات

٥- أية تغيرات فى صفات المياه البيولوجية والتي يمكن ان تساعد على نمو البكتريا والفطريات خلال تلامسها مع جسم المواسير والوصلات المنتجة من مادة البولي بروپيلين لمدة ثلاث أسابيع كفترة دراسة .

نتائج الاختبارات والفحوص للمواسير والوصلات المصنعة من مادة البولي بروپيلين :-

١- ثبت ان خواص المياه من ناحية المكونات المسببة للتلوث الزرارى لم تتغير لديها فى الماء وكذلك قيمة الـ pH والمواد الجذبية وذلك مع عدم زيادة تركيز المعادن الثقيلة ومع عدم أرتفاع أى مركبات ضوئية للمياه .

٢- لم تتغير أعداد خلايا البكتريا والفطريات فى امواس مياه الشرب بالتلامس مع امواس المواسير والوصلات .

٣- لم يحدث أى تأثير أو تغير فى خواص المياه أو جسم المواسير أو الوصلات المختلفة بمرور المياه الساخنة بها

الخلاصة وخاتمة الدراسة :-

بناء على جميع النتائج التي تم الحصول عليها ومصدر بها التقرير فى ٢٧/١٢/٢٠١١ فإن المواسير المصنعة من مادة البولي بروپيلين الواردة من الشركة الخليجية للتصنيع (رواسو) ليس لها أى تأثير على نوعية مياه الشرب تحت ظروف درجات الحرارة المختلفة ولا مانع من استخدامها فى نقل مياه الشرب والمياه المنزلية.

رئيس مجلس الإدارة ورئيس معمل السيراميك والبلاستيك

٢٢٢٧١٩٢٤, ٢٢٢٧١٩٢٤, ٢٢٢٧١٩٢٤, ٢٢٢٧١٩٢٤
 داخلى: ١٢٢١
 مباشر: ٢٢٢٧٨٨٠٢
 وفاكس: ١٠٨٤

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٣- الصفات الطبيعية والكيميائية للمياه التي تعرضت

المعادن التحليلية	الوحدة	قبل التعرض للهادة	بعد التعرض للهادة
الاس الهيدروجينى		٧,٢	٧,٢
العاذرة (NTU)	وحدة عذارة	٠,٤	٠,٤
التوصيل الكهربى	ميكرومولى/سم	٣٨٠	٣٨٠
القلوية الكلية (كك أ ^٢) (as Ca CO ₃)	ملجم/لتر	١٣٠	١٣٠
لصعركلى (كك أ ^٢) (as Ca CO ₃)	ملجم/لتر	١٤٦	١٤٦
عسر الكلسيوم (كك أ ^٢) (as Ca CO ₃)	ملجم/لتر	٩٢	٩٢
عسر الماغنسيوم (كك أ ^٢) (as mg CO ₃)	ملجم/لتر	٥٤	٥٤
التشورينات	ملجم/لتر	٣٤	٣٤
الكبريتات	ملجم/لتر	٢٥	٢٥
السليكا (as SiO ₂)	ملجم/لتر	٢,٥	٢,٥
النيتريت (as N)	ملجم/لتر	معلوم	معلوم
النترات (as N)	ملجم/لتر	٠,١١	٠,١١
الفوسفات (as P)	ملجم/لتر	٠,٠٢	٠,٠٢
الحديد	ملجم/لتر	٠,١	٠,١
المنجنيز	ملجم/لتر	معلوم	معلوم

٢٢٢٧١٩٢٤, ٢٢٢٧١٩٢٤, ٢٢٢٧١٩٢٤, ٢٢٢٧١٩٢٤
 داخلى: ١٢٢١
 مباشر: ٢٢٢٧٨٨٠٢
 وفاكس: ١٠٨٤

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Short Report

On The Validity of Polypropylene Pipes and Fittings Produced By " GULF MANUFACTURERS COMPANY" Manufactured from Random- Polypropylene for use in Drinking and Hot Water Network.

Polypropylene pipes and Fittings were delivered by the " GULF MANUFACTURERS COMPANY" to test and assess their validity for use in drinking and hot water connection network systems. Under the responsibility of the produced company, samples of polypropylene and fittings were delivered and handed to the " Central Unit for Analysis and Scientific Services " - CUASS " of the National Research Center NRC.

Explanation and Testing Criteria of the Pipes and Fittings :-

The test were carried out according to the followings :-
 1- ASTM - D - 258 , ASTM - D - 638 , ASTM - D - 790 , ASTM - D - 792 , ASTM - D - 1238
 2- DIN 8077 , DIN 8078 , DIN 16962, DIN4726, DIN4728
 3- EN 12202 , ISO / DIS 15- 874 , ISO 1133 , ISO 1183 , ISO 527 , ISO 179 , ISO 180 , ISO 37 .
 4- Any effect on water properties were studied .
 5- Toxicity test was carried out with the testing of heavy elements .
 6- Microbiological tests were done using bacteria growth test and algae growth one .

Tests Results

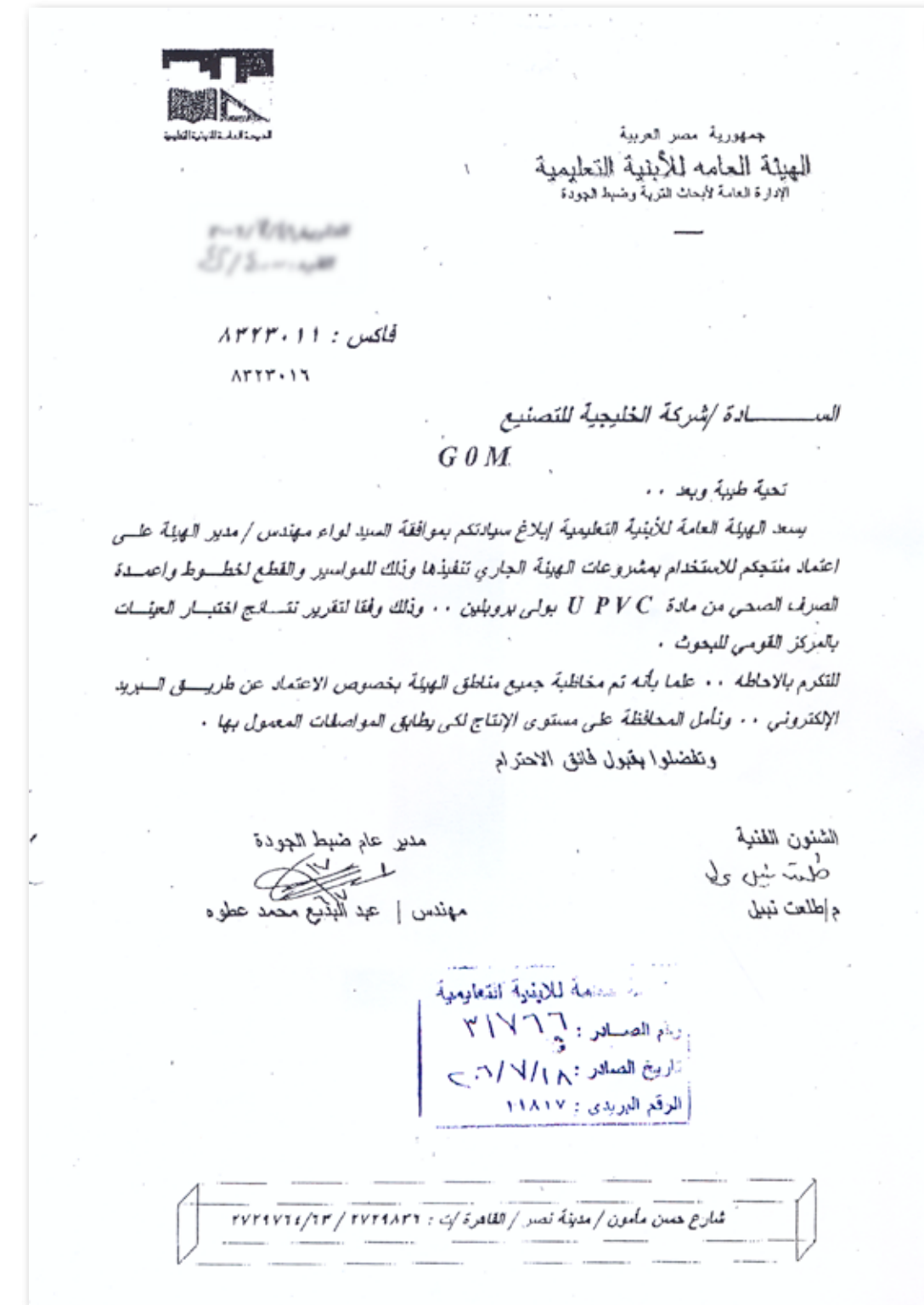
1- IR and UV spectrophotometer results showed that there was no release of organic compounds from pipes or fittings .
 2- Heavy toxic metals as lead, chromium, zinc, cadmium and copper were not detected .
 3- The tests indicated that no traced or observed physicochemical changes (in PH, hardness, inorganic cations & anions)
 4- Bacteria and Algae growth tests were carried out over a period of 3 weeks which showed that the pipes and fittings material did not support the growth of either bacteria or fungi .

General Notes and Conclusions :-

According to the given results of this study with the issued report in 27/1/2011, the random polypropylene material of the delivered pipes and fittings produced by " GULF MANUFACTURERS COMPANY" have no effects on water properties. So these pipes and fittings are suitable for use in drinking and hot water networks.

SUPERVISOR
 OF CERAMICS, POLYMER AND SOLID MATTER DEPARTMENT
PROF. DR. MOSTAFA ZAKI MOSTAF

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 مباشر: ٢٢٢٧٨٨٠٢
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