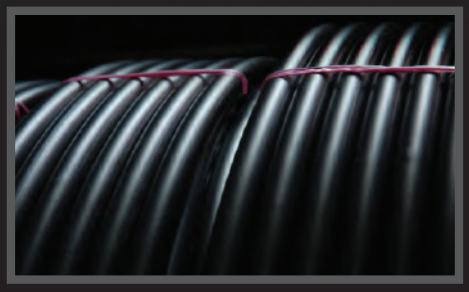
aquapipe®

High Density Polyethylene Pipe

High Quality

HDPE PIPE



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High Density Polyethylene Pipe

The First Manufacturer Of Advanced Piping Systems In Middle East Region

Solar Photovoltaic System

As one of the leading companies in the Jordanian industrial sector, we believe in being part of the solution for its most irritating challenges , the prices of energy have been rapidly increasing in the past few years . We, ***at World plastics***, have taken a major step towards facing this challenge and turning it into an opportunity; we have recently operated a 712 kW on grid solar photovoltaic system that covers 60% of our energy needs, the system consists of 2262 photovoltaic panels distributed on our warehouses rooftops, and will provide the factory with 1145 MWh of electricity annually, thus reducing our factory's environmental impact with up to 550 tons of CO2 emissions per year.

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High Quality HDPE PIPE

Introduction

World Plastics is a leading company in the development and manufacture of advanced plastic piping systems. Our uniquely extensive range of large and small bore piping systems are capable of handling a wide variety of materials in industrial and domestic applications including water, fluid waste, gas and chemicals.

World Plastics also produces piping systems for electrical installations. Pipes are made from high quality raw materials and are manufactured on some of the most advanced machinery in the world to the most exacting standards.

Our commitment to quality also extends to customer service. You will find us more than willing to help with the design of installations and can advise on the development of piping systems to meet particular needs.

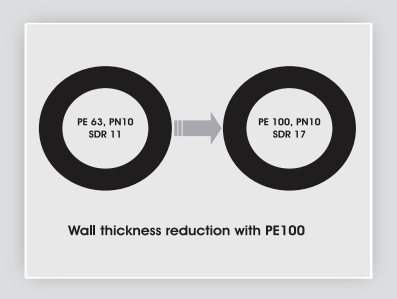
Pipes made from Polyethylene (PE) is a cost effective answer for a number of piping problems in Metropolitan, Municipal, Industrial. Underwater, Mining. Landfill Gas extraction. Cable duct and agricultural applications. It has been tested and proven effective for underground, above ground, surface, under water as well as floating pipe applications. High Density Polyethylene (HDPE) Solid Wall Pipe has been used in Potable Water applications since the '60's, and has been gaining approval and growth in municipalities ever since, HDPE –Aquapinpe is specified and/or approved in International Standards ISO/DP 4427, German Standards DIN 8074, DIN 8075, British Standards 6920, Some distinctive advantages of HDPE – Aquapipe that provide important benefits for water applications are listed below.

Materials

Materials used for pressure pipes are classified according to international standards. Classification is based on the minimum required strength (MRS) given as the minimum tensile circumferential stress in the pipe wall, for which the pipe can be subjected during 50 years when transporting clean water at 20°C. HDPE – Aquapipe compound (PE 80 AND PE 100) contains only those stabilizers (Anti-Oxidant) and pigments (2-2.5% Carbon Black) which protect the pipe from aging, light and heat damage.

PE 100 for Gas and Drinking Water Systems

- Aunique product from the bimodal process, PE 100 remains the highest MRS classified PE today for pressure piping applications. Its high strength has been appreciated for wall thickness reduction or higher pressure rating compared to its PE 80 and PE 63 counterparts market and application.
- Gas Pipe for natural gas distribution networks, for pressure rating up to 10 bars.
- Drinking Water Pipe, for pressure rating up to 25 bars.
- Sewers, Outfall Pipes, Industrial Pipes, Main Characteristics:
- PE 100, MRS 10.0
- Ready-made black compound other colors are available w/wo strips (under request), High Density PE (HDPE).
- Slow Crack Resistance, Pipe notch @ 80°/C/9.2 bars, SCG value over 500 hours.
- Low Sag properties, no sagging during extrusion of large and thick wall PE pipe.
- Pipe made out of PE 100 are now widely used around the world for transporting and distribution water, gas and chemicals.



Features and Benefits

- Good Impact strength: Little handling and installation damage.
- Excellent corrosion resistance: Long and efficient service life.
- Good chemical resistance: Wide variety of applications.
- Low mass: Easy handling.
- Flexibility: Easy installation.
- Long Lengths available: Fewer joints.
- Good abrasion resistance: Can be used to pump slurries.
- Good UV resistance: Can be used in exposed locations.
- Low friction losses: Lower pumping costs.
- Several jointing methods: Wide variety of applications.
- Extensive range of fittings: Wide variety of installations.
- Non Toxic and safe for drinking water.

▸ *Heat Fused Joints – Benefits*

- HDPE – Aquapipe can be heat fused together to form a joint that is as strong as or stronger than the pipe itself and is leak free.
- The Life Cycle Cost of HDPE – Aquapipe differs from other pipe materials because the "allowable water leak-age" is zero rather than typical leakage rates of 10 to 20% for PVC and Ductile Iron.
- HDPE – Aquapipe fused joints are self restraining and costly thrust restraints or thrust blocks are not required.
- HDPE – Aquapipe's fused joints simply do not leak, eliminating infiltration and exfiltration problems experienced with alternate pipe joints.

▸ *Flexible and Fatigue Resistant – Benefits*

- HDPE – Aquapipe can be bent to a radius 20 times the nominal pipe diameter. This can eliminate many fittings required for directional changes in a piping system where fittings and thrust blocks or restraints are required with alternate materials.
- The flexibility of HDPE pressure pipe makes it well suited for dynamic soils including areas prone to earthquake.
- HDPE pressure pipe can accept repetitive pressure surges that significantly exceed the static pressure rating of the pipe.

▸ *Construction Advantages – Benefits*

- The combination of flexibility and leak free joints allow for unique and cost effective types of installation methods that the rigid PVC and Ductile Iron pipes can't use with bell and spigot connections. These alternate installation methods (Horizontal Directional Drilling, pipe Bursting, Slip lining, Plow and Plant, Submerged of Floating Pipe, etc) can save considerable time and money in most potable water applications.
- Polyethylene Pipe is produced in straight lengths up to 12 meter long and coiled of 50 meters and 100 meters in diameters up through 90 mm. upon request 300 m coil could be produced for small diameters.
- Polyethylene is about one-eighth the density of steel; it does not require the use of heavy lifting equipment for installation.

▸ *Chemical Resistance*

Outstanding resistance t a wide range of chemical reagents allows the use of polyethylene systems in application such as tailings pipelines and chemical treatment application used in mining operations.

WORLD PLASTICS HDPE pipes are also not adversely affected by atmospheric condition and are well suited for outdoor installations.

▸ *Weathering Resistance*

WORLD PLASTICS HDPE pipes are stabilized against ultra violet (UV) light degradation by the inclusion of carbon black in the raw material. Black HDPE pipes are suitable for installation where the pipes are exposed to direct sunlight and cold weather.

▸ *Superior flow characteristics*

WORLD PLASTICSHDPE pipes have lower friction factors than most non-plastic material. Hazen Williams c factor is 150 and doesn't change over time the surface energy characteristics of HDPE ensure that material deposition is inhibited and the smooth bore characteristic is maintained over the working life of the pipeline. Because polyethylene is smoother than steel, cast iron, ductile iron, or concrete, a smaller PE pipe can carry an equivalent volumetric flow rate at the same pressure. It has less drag and a lower tendency for turbulence at high flow. Its superior chemical resistance and "non-stick" surface combine to almost eliminate scaling and pitting and preserve the excellent hydraulic characteristic through the pipe service life.

▸ *Cost Effective, long term and Permanent*

WORLD PLASTICS HDPE pipes have a proven high reliability record across a wide range of industries and application, now approaching a period of 50 years. HDPE also provides a long maintenance free lifetime with low whole life costs, compared to many other materials. The polyethylene pipe industry estimates a service life for HDPE pipe to conservatively be 50 – 100 years. This relates to saving in replacement cost for generations to come.

▸ *Joining:*

WORLD PLASTICS polyethylene pipes can be joined by variety of methods. The preferred method is heat fusion, saddle fusion, socket fusion and electro-fusion. This type of connection offers a completely leak proof, fuly restrained joint.

▸ *High Impact Strength*

High Impact strength of WORLD PLASTICS HDPE pipes Compared with other plastic materials ensure greater resistance to the rigours of pipe laying conditions.

▸ *Biological Resistance*

WORLD PLASTICS HDPE pipes are not known to be subjected to any form of microbiological corrosion. It has excellent resistance to the attack of termites, fungi, insects, mildew, mold, fungus, rot, and bacteria or biological agents when it is buried in soil. Polyethylene does not support fungi and even relatively virulent fungi.

This is due mainly to the fact that water can easily be wiped off of the surface of the pipe rather than absorbed within it.
Polyethylene has been tested for resistance to marine – biological attack and it was found that in their biochemical oxygen demand – type tests polyethylene was not utilized by bacteria.

▸ *Thermal Conductivity*

WORLD PLASTICS HDPE pipes have lower thermal conductivity than for metal which reduce heat for metal which reduce heat losses (essentially acts as an insulator) and offer better uniform fluid temperature, prevent "sweeting" formation of condensation on the pipe wall. Insulation in certain instances may be completely eliminated.

▸ *Cost Effective, Long Term and Permanent – Benefits*

- Polyethylene Pipe installations for cost effective and have long term cost advantages due to its physical properties, leak free joints and reduced maintenance costs.
- The polyethylene pipe industry estimates a service life for HDPE –Aquapipe to conservatively be 50-100 years.

This relates to savings in replacement costs for generations to come.

▸ *Corrosion and Chemical Resistant – Benefits*

- HDPE – Aquapipe will not corrode, tuberculate or support biological growth. HDPE –Aquapipe has superb chemical resistance and is the material of choice in harsh chemical environments. The advantages of corrosion and chemical resistance over traditional metal pipes are shared by many plastic pipes, but HDPE – Aquapipe uniquely combines these attributes with the aforementioned advantages of heat fused joints, flexibility and fatigue resistance.

▸ *Handling – Benefits*

- It is much easier to handle and install HDPE Pipe vs. the heavier, rigid metallic or concrete pipe segments. Allowing for huge cost advantages in the construction process.
- Polyethylene Pipe is better able to structurally with-stand an impact than PVC Pipe, especially in cold weather installations when other pipes are more prone to cracks and breaks.

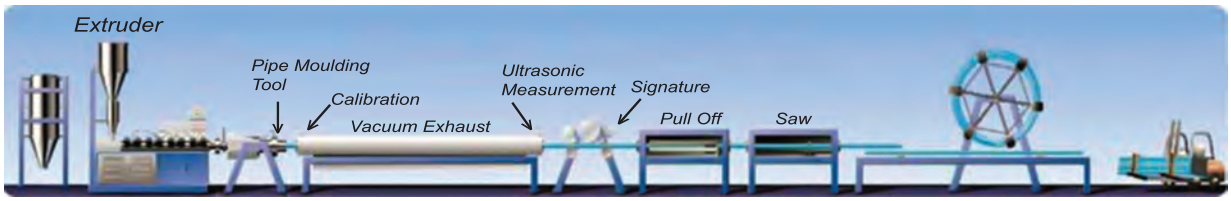
Above - Ground Applications PE Pipe

In above ground applications PE piping may be suspended or cradled in support structures or, it may simply be placed directly on the ground surface. These types of installations may be warranted by any one of several factors. One is the economic considerations of a temporary piping system. Another is the ease of inspection and maintenance. Still another is simply that prevailing local conditions and even the nature of the application itself may require that the pipe be installed above ground.

PE pipe provides unique joint integrity, toughness, flexibility, and low weight. These factors combine to make its use practical for many “above-ground” applications. This resilient material has been used for temporary water lines, various types of bypass lines, dredge lines, mine tailings, and fines-disposal piping. PE pipe is used for slurry transport in many industries such as those that work with kaolins and phosphates. The ease of installation and exceptional toughness of PE pipe often make it practical for oil and gas collection. The economics and continued successful performance of this unique piping material is evident despite the extreme climatic conditions that may sometimes exist in some of these diverse applications.

PE pipe has been used to advantage for many years in above-ground applications.The unique light weight, joint integrity, and overall toughness of PE has resulted in the above-ground installation of PE pipe in various mining, oil, gas production and municipal distribution applications. Many of these systems have provided years of cost-effective service without showing any signs of deterioration.

EXTRUDER MODEL PROCESS



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Borouge
SHAPING the FUTURE with PLASTICS

BorSafe™HE3490-LS BLACK HIGH DENSITY POLYETHYLENE

To Whom It Might Concern,

BorSafe™HE3490-LS is a black, bimodal, high density polyethylene classified as a MRS 10.0 material (PE 100) produced by advanced Borstar© technology. Well dispersed carbon black gives outstanding UV resistance. Long term stability is ensured by an optimised stabilisation system. HE3490-LS is recommended for pressure pipe systems in the application fields of drinking water and natural gas, pressure sewage, relining, sea outfall and industrial.
Here are excerpts from PPI's Plastic Handbook:
" Weatherability
All polymers (resins) are susceptible to gradual degradation when continually exposed to ultraviolet (UV) radiation in sunlight. There are two effective means for protecting a resin against this effect. One is by the addition of a screen that blocks the penetration of UV rays into the material. The other is by the inclusion of a stabilizer that protects the material by chemical means. For PE piping materials it has been shown that the most effective screen is achieved by the incorporation into the material of 2 to 3 % of finely divided carbon black, which also results in a black color. Experience and studies show that in outdoor applications such a material will retain its original performance properties for periods longer than 50-years. "

This is the case, when using state-of-the-art carbon black additives, which is the industry standard of reputable pressure pipe compound manufacturers. 50 years life could not be reached, if carbon black leached out of the pipe wall.

The main concerns when designing for a PE pipe for above ground application are:
- Temperature of the exposed pipe; which will affect the pressure rating/de-rating of the pipe
- Chemical exposure; depending on the surrounding environment.
- Ultraviolet radiation incase the carbon black contents & dispersion are not to standard as mentioned above
- Potential mechanical impact or loading
- Workmanship of production, handling, transportation & installation of the PE pipe.

Yours sincerely,

Farraj Tashman
Technical Service Manager - MC Pipe
Borouge

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CN-1001590

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RINA

▸ *Hazen Williams C Factor is 150 and doesn't change over time - Benefit*

- HDPE – Aquapipe has a smooth ID that does not corrode or tuberculate and maintains its flow capability over time.
- The C Factor of Ductile Iron Pipe is dramatically reduced over time due to corrosion and/or tuberculation.

▸ *Typical Applications*

- Drinking water supply systems in national, urban and rural networks.
- Sewage Systems and Water Treatment Plants.
- Agricultural and Irrigation Systems.
- Systems for marine use.
- Swimming pool Systems.
- Piping Systems for communication and electrical cable protection.
- Systems for conveying suspension and semi-solid materials.
- Gas supply Systems.
- Systems for conveying chemical materials.

▸ *Standard Dimensional Ratio*

Solid wall PE pipes are classified against outside diameter and the pipes designated by a number of SDR ratings (Standard Dimensional Ratio = outside diameter/pipe wall thickness).

$$SDR = \frac{d_n}{s_n}$$

$$s_n = \frac{PN.d_n}{2\sigma + PN}$$

$$\sigma = \frac{PN.(d_n - s_n)}{2\,s_n}$$

s_n : Pipe wall thickness (mm)
PN: Operating pressure (MPa)
d_n : Pipe outside diameter (mm)
σ : Design stress (MPa)

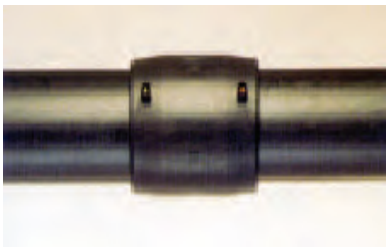
Designation	MRS (MPa)	Design stress (MPa)
PE 100	10,0	8.0

- In accordance to ISO 4427 with overall service coefficient 1.25 at 50 years and 20°C

Typical data for PE 100		
Design stress	MPa	8.0
Density (black compound)	kg / m3	957 - 961
Melt flow rate (190 °C/5 kg)	g / 10 min	0.2 - 0.4
Tensile strength at yield	MPa	23 - 25
Elongation at break	%	> 600
Brittleness temperature	°C	< - 70
Flexural Modules E	MPa	1000 - 1200
Charpy impact strength	kJ / m2	no break
Linear expansion coefficient	mm / m • °C	0.17

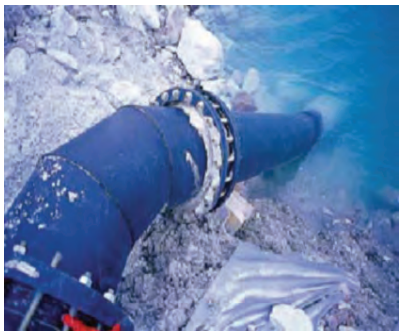
Jointing methods

1- Electro fusion jointing (E. F.)



Electrofusion jointing is used for both the jointing of pipes and pipes to fittings. The Electrofusion fitting is supplied with a "heating-coil" pre-installed during the manufacturing process. By applying an electrical charge to the fitting, the wires of the coil heat up to a pre-determined temperature, which causes the PE to melt and form a high-tensile, leaktight joint. Modern Electrofusion control boxes are designed to set time and power requirements automatically for each different fitting.

2- Flange joints



Flange joints are made by welding a "stub-end" to a piece of pipe and by using "loose-flanges", nuts and bolts. They are connected to similar fittings on another pipe or fitting. "loose-flanges" can be supplied in different materials (i.e. steel, aluminum etc), with different surface coatings. The finished joint offers a high tensile strength and ease of assembly.

3- Compression fitting (Mechanical Joint)

Compression fittings are normally only available in relatively small diameters. They are fairly simple and easy to use and can be supplied either in plastic or metal. The finished joint however, has a low tensile strength compared to the butt-fusion and Electrofusion joints.

4- Butt welding (Butt Fusion) (BF.)

Butt welding (or butt fusion) is the most common jointing method for PE-pipes. The butt-fusion joint is made by inserting a heater-plate between the ends of two pipes, which are then brought together under pressure - this softens the ends of the pipe. The heater-plate is then removed and the pipes brought together again and allowed to cool under pressure. This results in a high-tensile, leaktight homogeneous joint. Modern butt-fusion welding machines are normally fitted with an automatic recording unit, which not only can set the actual welding parameters, but also provide data-retrieval facilities for each butt-fusion operation.

Installation :

- The pipe and fittings to be installed comply with the requirements of the project, and with any applicable code requirements. For this purpose, pipe and fittings markings should be carefully checked .
- The pipe markings do include a section noting that the pipe is suitable for potable water service.
- The fittings have been designed and sized to be compatible with the pipe dimensions
- The pipe and fitting manufacturer's installation recommendations have been consulted and all those that are supplementary to these general recommendations have been noted.
- The maximum anticipated working and surge pressures and maximum anticipated operating temperatures are within the rated capacity of the pipe and fittings
- The proposed routing of the service line – while largely dictated by expediency and economy – results in a minimum number of sharp changes in direction, with no bend having a smaller bending radius than recommended.

CHECK LIST FOR PROPER PIPE INSTALLATION:

- Provide stable and continuous support to the pipe over its entire length.
- Place pipe in trench with moderate slack (e.g., by gradual snaking).
- Allow the pipe to cool to trench temperature prior to trimming it and . connecting it to rigidly held fittings.
- Do not allow pipe bends within 10 pipe diameters of a fitting or connection to a rigid structure.
- Do not bend pipe tighter than the recommended minimum bending radius for the pipe being installed. Bend with the coil whenever possible.
- Provide a firm and stable foundation under pipe sections next to rigidly held fittings, where pipes enterrigid structures, or wherever differential soil settlement could occur.
- Prevent excessive bending and shear stresses at taps, by placing a short section of protective sleeve over the tap connection and short section of water service pipe.
- Place select backfill next to the pipe for proper support and protection.
- Conduct pressure test prior to final backfilling.

Aquapipe Technical Data Table (
ISO 4427-2 , EN 12201

aquapipe
High Density Polyethylene Pipe

Nominal Outside Diameter	PN 6.3 - SDR 26 (S 12.5)		PN 8 - SDR 21 (S 10)		PN 10 - SDR 17 (S 8)		PN 12.5 - SD (S 6.3)
Diameter **mm**	Wall Thickness **mm**	Approx. Weight **Kg / m**	Wall Thickness **mm**	Approx. Weight **Kg / m**	Wall Thickness **mm**	Approx. Weight **Kg / m**	Wall Thickness **mm**
16							
20							
25							2
32					2	0.194	2.4
40			2	0.25	2.4	0.294	3
50	2	0.32	2.4	0.372	3	0.453	3.7
63	2.5	0.492	3	0.58	3.8	0.721	4.7
75	2.9	0.69	3.6	0.827	4.5	1.018	5.6
90	3.5	0.977	4.3	1.186	5.4	1.463	6.7
110	4.2	1.44	5.3	1.78	6.6	2.177	8.1
125	4.8	1.85	6	2.275	7.4	2.777	9.2
140	5.4	2.331	6.7	2.849	8.3	3.487	10.3
160	6.2	3.057	7.7	3.74	9.5	4.551	11.8
180	6.9	3.81	8.6	4.696	10.7	5.756	13.3
200	7.7	4.721	9.6	5.818	11.9	7.103	14.7
225	8.6	5.932	10.8	7.353	13.4	9.009	16.6
250	9.6	7.35	11.9	8.997	14.8	11.04	18.4
280	10.7	9.167	13.4	11.358	16.6	13.87	20.6
315	12.1	11.678	15	14.273	18.7	17.565	23.2
355	13.6	14.76	16.9	18.123	21.1	22.356	26.1
400	15.3	18.716	19.1	23.109	23.7	28.253	29.4
450	17.2	23.664	21.5	29.224	26.7	35.795	33.1
500	19.1	29.191	23.9	36.056	29.7	44.228	36.8
560	21.4	36.591	26.7	45.127	33.2	55.407	41.2
630	24.1	46.364	30	57.006	37.4	70.175	46.3
710	27.2	59.026	33.9	72.697	42.1	89.183	52.2

* : for Pipes of Standard Nominal Pressure (PN 16 - SDR 11)
* Sigma = Design Stress = MRS (MPa) / 1.25 = 10 / 1.25 = 8 Mpa
* S : Pipe Series = (SDR - 1) / 2

(HDPE - PE 100) According to :
-2 , DIN (8074 , 8075)

DR 13.6)	PN 16 - SDR 11 (S 5)		PN 20 - SDR 9 (S 4)		PN 25 - SDR 7.4 (S 3.2)		Packing *
Approx. Weight **Kg / m**	Wall Thickness **mm**	Approx. Weight **Kg / m**	Wall Thickness **mm**	Approx. Weight **Kg / m**	Wall Thickness **mm**	Approx. Weight **Kg / m**	
			2	0.091	2.3	0.103	Coil / 100 Mtr.
	2	0.116	2.3	0.133	3	0.163	Coil / 100 Mtr.
0.149	2.3	0.173	3	0.211	3.5	0.242	Coil / 100 Mtr.
0.231	3	0.279	3.6	0.328	4.4	0.39	Coil / 100 Mtr.
0.361	3.7	0.434	4.5	0.52	5.5	0.606	Coil / 100 Mtr.
0.55	4.6	0.672	5.6	0.792	6.9	0.946	Coil / 100 Mtr.
0.876	5.8	1.06	7.1	1.27	8.6	1.482	Coil / 100 Mtr.
1.241	6.8	1.48	8.4	1.78	10.3	2.111	Coil / 100 Mtr.
1.778	8.2	2.14	10.1	2.563	12.3	3.024	Coil / 100 Mtr.
2.634	10	3.17	12.3	3.81	15.1	4.532	Coil / 100 Mtr.
3.394	11.4	4.12	14	4.926	17.1	5.832	Coil / 100 Mtr.
4.25	12.7	5.13	15.7	6.171	19.2	7.326	Pipe / 12 Mtr.
5.547	14.6	6.725	17.9	8.036	21.9	9.535	Pipe / 12 Mtr.
7.041	16.4	8.5	21.1	10.55	24.6	12.055	Pipe / 12 Mtr.
8.635	18.2	10.5	22.4	12.572	27.4	14.913	Pipe / 12 Mtr.
10.966	20.5	13.3	25.2	15.913	30.8	18.849	Pipe / 12 Mtr.
13.508	22.7	16.4	27.9	19.557	34.2	23.268	Pipe / 12 Mtr.
16.925	25.4	20.5	31.3	24.584	38.3	29.176	Pipe / 12 Mtr.
21.45	28.6	25.895	35.2	31.099	43.1	36.933	Pipe / 12 Mtr.
27.197	32.2	32.873	39.7	39.499	48.5	46.83	Pipe / 12 Mtr.
34.488	36.3	41.734	44.7	50.103	54.7	59.479	Pipe / 12 Mtr.
43.685	40.9	52.846	50.3	63.437	61.5	75.242	Pipe / 12 Mtr.
53.904	45.4	65.209	55.8	78.17			Pipe / 12 Mtr.
67.628	50.8	81.691	62.5	98.076			Pipe / 12 Mtr.
85.479	57.2	103.504	70.3	124.106			Pipe / 12 Mtr.
108.771	64.5	131.696	79.3	158			Pipe / 12 Mtr.

Handling :

Do

- Store pipe on firm and flat surfaces.
- Keep pipe and fittings away from sharp objects, heat, and toxic and aggressive materials.
- Take care not to cut, kink, abrade, or otherwise damage the pipe during handling.
- Keep protective packaging intact until pipes and fittings are required for use.
- Release coils carefully, keeping in mind they may be coiled under tension.
- Take care when handling pipe under wet or frosty conditions, as the pipe may become slippery.
- Temporarily cap cut pipe ends to prevent dirt or other material from entering the pipe.
- Uncoil pipe and allow it to warm in the sun before burial for ease of installation.

DON'T

- Throw pipe from delivery vehicles.
- Drag pipe or roll pipe coils.
- Place pipe and fittings in contact with lubricating oil, gasoline, solvents, or other aggressive materials.
- Heat pipe with an open flame.

FIELD PRESSURE TESTING PROCEDURE (HYDRO TESTING)

Principles

A closed pipe section is filled with water. An overpressure is applied in the pipe, following a specified time/pressure scheme. At the end of the pressure test an amount of water is added to the pipe volume to maintain a given constant pressure. The water tightness is deduced from the volume of added water. The procedure is based on SFS 3115 : E Plastics Pipes Water-tightness Test for Pressure Pipelines (English Edition) modified to suit local conditions.

A typical testing program would be performed as follows – assuming the working pressure is 4 bar. If working pressure is higher the figures given in the example below will need to be modified.

Test Pressures

Required test pressure is as follows:

Phase I	Pt = 4 Bar	-	working pressure
Phase II	Pt = 6.0 Bar	-	1.3 x working pressure
Phase III	Pt = 4 Bar	-	working pressure

Method

Phase I Pressure = working pressure - raised to
Pt = 4 bar
t = 2 hours + 0.1 h

Whenever the pressure drops by 0.2 bar, water is added to maintain an internal pressure Pt = 4 bar

Phase II Test pressure (= 1.3 working pressure) raised – within a reasonable time to
Pt = 6.0 bar
t = 2 hours + 0.1 h.
Add water as for Phase I whenever the pressure drops by 0.2 bar.

Phase III Pressure returned to initial pressure, i.e. Pt = 4 bar as quickly as possible. The valve is then closed.

After a period of one hour, the test programme requires measuring of the quantity of water – if any – which must be added to raise the pressure to its initial value, i.e to Pt = 6 bar.

Figure 2 shows a typical curve for the procedure.

Test Result

The pipe is acceptable if the quantity of water added is less than that given in the expression.

$$Q \quad \frac{Di - 1}{50} \text{ (litre/km.h)}$$

Q = added water in litres.

Di = internal diameter for Pressure Pipe in mm.

Fig: Test Requirement for Pressure Pipe

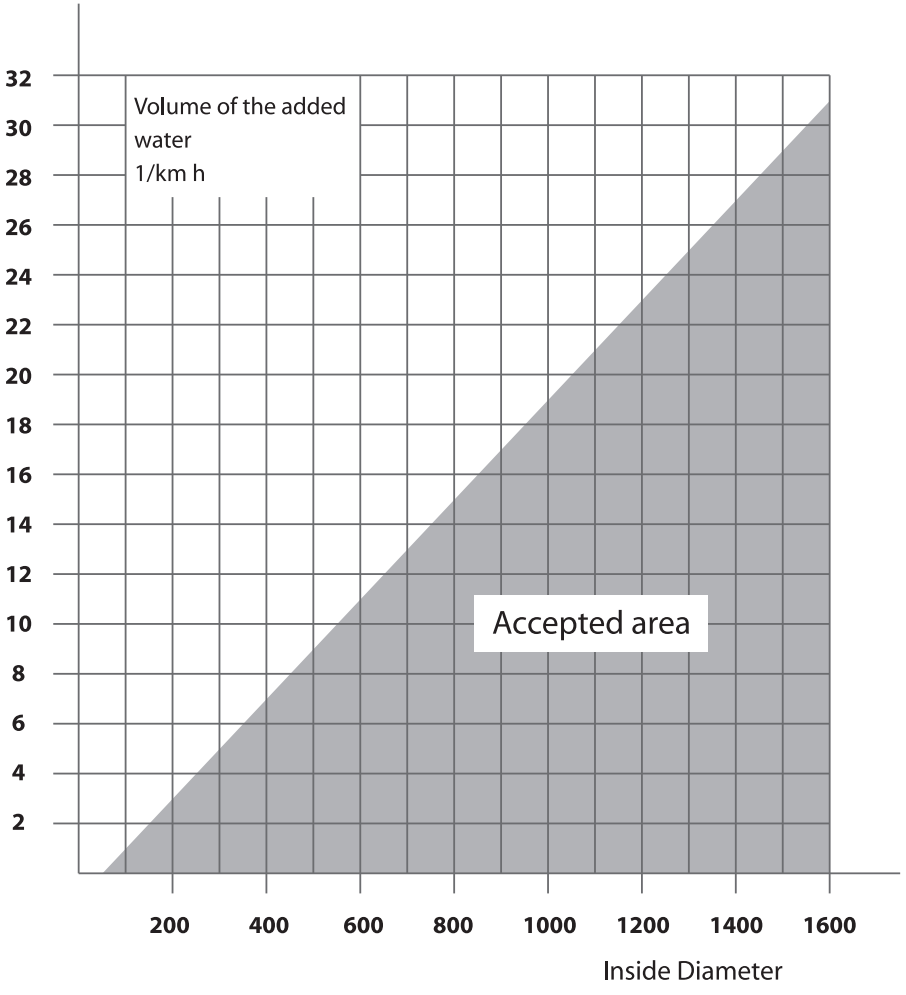


Figure 1. Test Requirement for Pressure Pipe.

Allowable losses and temperature

Alternatively, the pipe is acceptable if the quantity of additional water needed during Phase III appears under the straight line illustrated in the Figure. The quantity of water may vary with the temperature. A 10% variation is considered to be within acceptable limits

Test pressures at elevated temperature

Where the phase II pressure is within the pressure rating of the pipe and test temperatures are 40 OC or less no adjustment of test pressure is necessary.

When test pressures are over 40 °C and test pressures are over the pressure rating of the pipe then it may be necessary to modify the test pressure according to the table below or as agreed with the manufacturer.

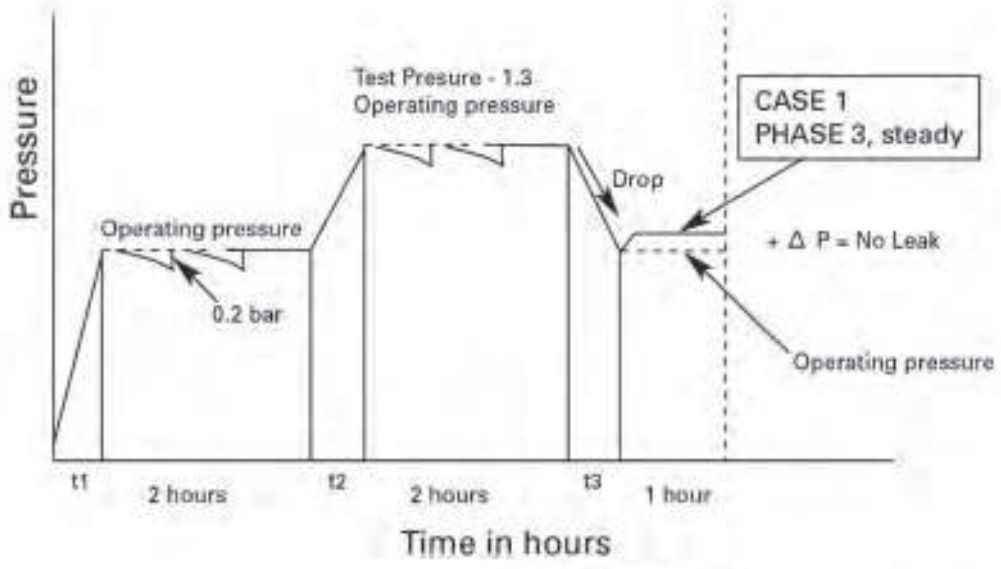
Test temp.˚C	27	32	38	43	49	54	60
Multiplier	1.0	0.9	0.8	0.75	0.65	0.6	0.5

Test Length

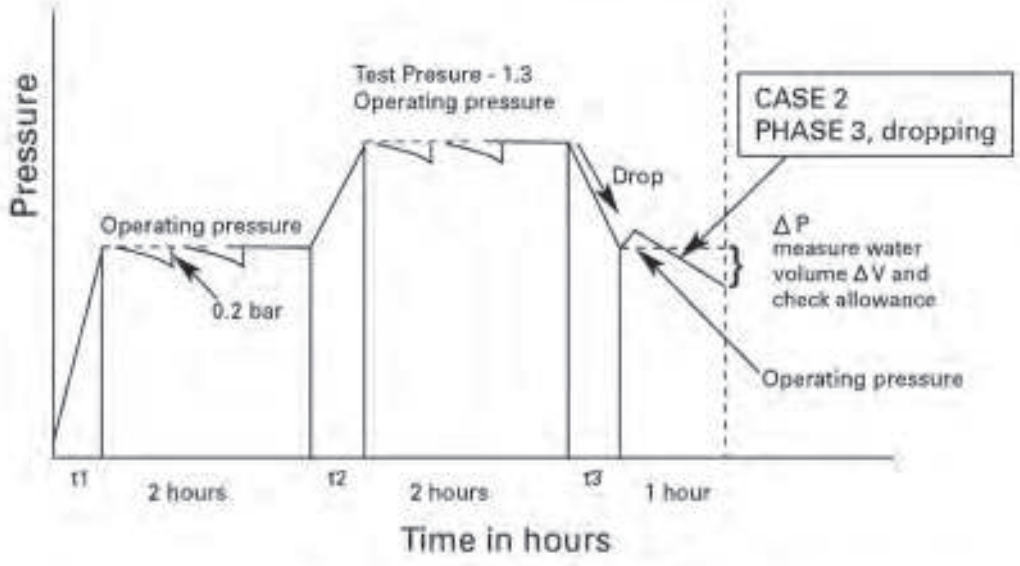
The test equipment must be capable of pressurizing the test length within a reasonable time. If the procedure becomes protracted (beyond one working day) the test length may be modified or reviewed. Extremely long lengths may be subject to special procedures.

Differences in Elevation

Care should be taken not to over pressure the lower end of the system during testing. Gauges should always be placed at the lower end of the length under test. As far as possible the difference between the lower and upper end should be kept to one bar. It is recognized that this may not always be possible when longer lengths are being tested, or where the slope of the pipeline makes it impractical.



t1 - as quickly as possible
t2 - as quickly as possible
t3 - 10-30 minutes depending on diameter & length.



t1 - as quickly as possible
t2 - as quickly as possible
t3 - 10-30 minutes depending on diameter & length.

Quality Management

Our Quality Assurance team ensures that ; all products are manufactured to stringent international quality standards. This has made World Plastics the leading manufacturer and supplier within the sector. Most of our divisions are ISO 9001: 2008 certified and our quality procedures are in line with their certification standards .

World Plastics had adopted the highest international quality standards in manufacturing products across all its plants and established a reputation for quality, offering clearly superior products and services to its customers , its commitment to quality has been growing in parallel to its expanding production.

Through World Plastics global technology and innovation network , World Plastics not only seeks to fulfil the ambitions of its customers, but also to add value to their business .

aquapipe
High Density Polyethylene Pipe

List of References

World Plastics for Construction Industries certify that : we have Supplied High Density Polyethylene Pipes – PE 100 of trade name (Aquapipe) to Projects of both Governmental and Private Sectors . Here below , some examples for these projects and tenders :

1 – Ministry of Water and Irrigation – MWI (Including all Directorates) .
2 – Water Authority of Jordan – WAJ .
3 - Jordan Water Company (Miyahuna) .
4 - Aqaba Water Company (aw) .
5 - Yarmouk Water Company (YWC) .
6 – Ministry of Agriculture .
7 - Arab Potash Company .
8 - Bromine Company .
9 - Royal Palace – Al Hummar .
10 - Millennium (C 3) Project – MCA – Jordan / Hussein Atieh Contracting Company .
11 - Millennium (C 5) Project – MCA – Jordan / Hussein Atieh Contracting Company .
12 - Millennium (C 2) Project – MCA – Jordan / Mango Tree Construction Company.
13 - Millennium (C 2) Project – MCA – Jordan / Al Omaria Contracting Company .
14 - Mercy Corps – USA Projects .
15 - OXFAM – UK Projects .
16 - World Vision – UK Projects .
17 - International Committee of the Red Cross (ICRC) – Jordan .
18 - Projects Funded by KFW Development Bank .
19 - Dai Nippon Construction Company – Japan Projects .
20 - Royal Aircraft Projects – Jordan .
21 - Tala Bay Infrastructure Potable Water Network – Aqaba .
22 - Saraya Al Aqaba Infrastructure Potable Water Network – Aqaba .
23 - Gulf Grant Projects .
24 - Jordanian Armed Forces Projects .
25 - Rehabilitation of Greater Amman Potable Water Network – Morganti Group .
26 – Za'atari Refugee Camp Water & Wastewater Networks – UNICEF .
27 – Rehabilitation of Husban – Kafrain Irrigation Project – Central Tender (133 / 2016) – WAJ .
28 – Water Supply for Syrian Refugees in Jordan – MWI .

HDPE Electrofusion & Buttfusion Fittings:















HDPE Compression Fittings :

HAZEN AND SAWYER
DAR AL-OMRAN

HUSSEIN ATIEH & Son's Co.
HUSSEIN ATIEH EST.
For Contracting & Constructions

شركة حسين عطية وأولاده
(مؤسسة حسين عطية للأبنية والمقاولات)

Submittal Sheet

PROJECT : Contract 3; Russaifah Low Water Networks Restructuring And Rehabilitation Project (29/2013 - Central)

Central Tender No.: (29/2013 - Central)

Funded By : MCC

CONTRACTOR: Hussein Atieh & Sons CO. L.L.C

OWNER : MCA- Jordan

PMC : HAZEN AND SAWYER/ DAR ALOMRAN JV

Submission Date: 13.Jan.2014

Previous Submition Date: 11.Dec.2013

Submittal No.: Section 12,HAE-RL-C3-010,(REV.1))-HDPE PIPES MATERIAL

DIVISION	Item	Detailed Description	Manufacturer	Source of Origin	Location	Attachment
Part III - Section IX	12.1-12.8	HDPE Pipes and Fittings Mateial	pipes:World Plastics Fittings:Fusion Provida	Jordan UK	Jordan UK	4 copies of submittal and CD

Certification Statement: We certify below that the material / equipment / drawing or any of the document types listed in this submittal meets all requirements specified by the contract documents,

Submitted by the Contractor's Representative :

Name : Imad Omeish Signature : Date : 13-1-2014

Received by the PMC's Representative

Name : Mahmoud alachhab Signature : Date : 13.1.2014

PMC'S REVIEW COMMENTS

The submittal is being returned with action Code #2 (Make Correction Noted). The following are the Engineer's review comments to the submittal:

1. Provide a copy of third party inspection and testing agreement.
2. Provide samples for all pipes and pipe fittings for all sizes.
3. Provide production schedule.
4. Schedule factory visit for PMC and Employer staff prior to first shipment.

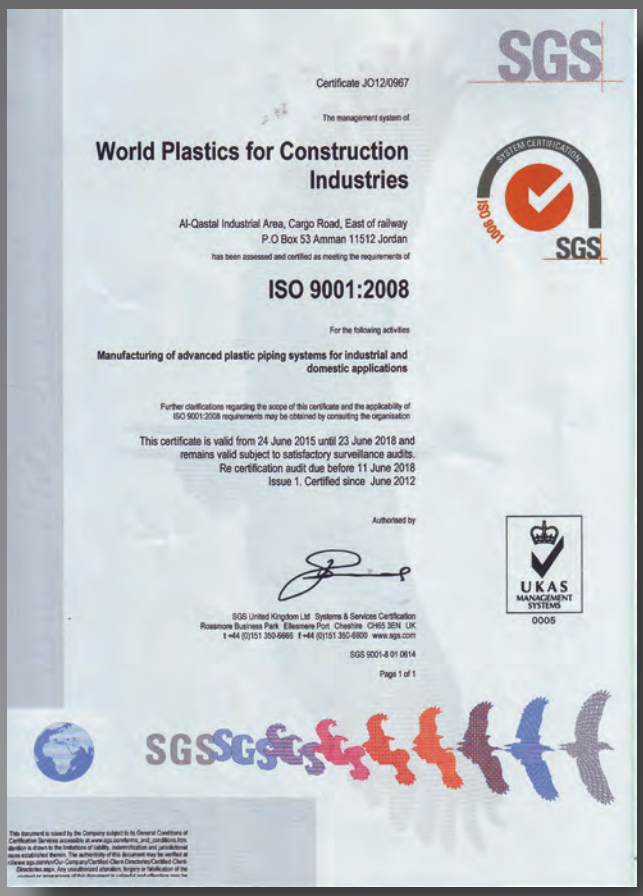
☐	Code 1	NO EXCEPTIONS TAKEN	☐	Code 3	AMEND RESUBMIT
☒	Code 2	MAKE CORRECTIONS NOTED	☐	Code 4	REJECTED

PMC's Representative

Name : H. Khaeis Signature : Date : June 14, 2014

Received by the Contractor's Representative

Name : Signature : Date :



SGS

Certificate JO12/0967

The management system of

World Plastics for Construction Industries

Al-Qastal Industrial Area, Cargo Road, East of railway
P.O Box 53 Amman 11512 Jordan

has been assessed and certified as meeting the requirements of

ISO 9001:2008

For the following activities

Manufacturing of advanced plastic piping systems for industrial and domestic applications

Further clarifications regarding the scope of this certificate and the applicability of ISO 9001:2008 requirements may be obtained by consulting the organisation

This certificate is valid from 24 June 2015 until 23 June 2018 and remains valid subject to satisfactory surveillance audits.
Re certification audit due before 11 June 2018
Issue 1. Certified since June 2012

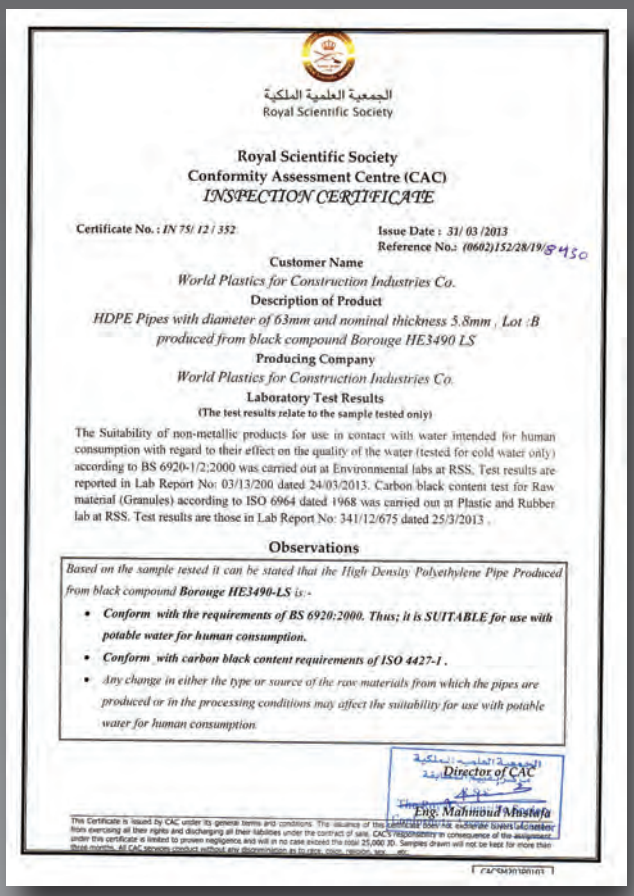
Authorised by

SGS United Kingdom Ltd Systems & Services Certification
Rossmore Business Park Ellesmere Port Cheshire CH65 3EN UK
t +44 (0)151 350-6666 f +44 (0)151 350-6600 www.sgs.com

SGS 9001-8 01 0614

Page 1 of 1

UKAS MANAGEMENT SYSTEMS 0005



الجمعية العلمية الملكية
Royal Scientific Society

Royal Scientific Society
Conformity Assessment Centre (CAC)
INSPECTION CERTIFICATE

Certificate No. : *IN 75/ 12 / 352*
Issue Date : *31/ 03 /2013*
Reference No.: *(0602)152/28/19/8450*

Customer Name
World Plastics for Construction Industries Co.
Description of Product
HDPE Pipes with diameter of 63mm and nominal thickness 5.8mm , Lot :B produced from black compound Borouge HE3490 LS
Producing Company
World Plastics for Construction Industries Co.
Laboratory Test Results
(The test results relate to the sample tested only)

The Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water (tested for cold water only) according to BS 6920-1/2:2000 was carried out at Environmental labs at RSS. Test results are reported in Lab Report No: 03/13/200 dated 24/03/2013. Carbon black content test for Raw material (Granules) according to ISO 6964 dated 1968 was carried out at Plastic and Rubber lab at RSS. Test results are those in Lab Report No: 341/12/675 dated 25/3/2013 .

Observations

Based on the sample tested it can be stated that the High Density Polyethylene Pipe Produced from black compound ***Borouge HE3490-LS*** *is :-*

- ***Conform with the requirements of BS 6920:2000. Thus; it is SUITABLE for use with potable water for human consumption.***
- ***Conform with carbon black content requirements of ISO 4427-1 .***
- *Any change in either the type or source of the raw materials from which the pipes are produced or in the processing conditions may affect the suitability for use with potable water for human consumption.*

Director of CAC
Eng. Mahmoud Mustafa

This Certificate is issued by CAC under its general terms and conditions. The issuance of this certificate does not exonerate buyers or others from exercising all their rights and discharging all their liabilities under the contract of sale. CAC's responsibility in consequence of the assignment under this certificate is limited to proven negligence and will in no case exceed the total 25,000 JD. Samples drawn will not be kept for more than three months. All CAC services conduct without any discrimination as to race, color, religion, sex ...etc.

مؤسسة المواصفات والمقاييس الأردنية
Jordan Standards & Metrology Organization

مؤسسة المواصفات والمقاييس الأردنية
www.jsmo.gov.jo
مديرية شهادات المطابقة
هيئة مانحة لشهادات المطابقة للمنتجات تعمل وفق
ISO/IEC 17065:2012

قد منحت

شهادة علامة الجودة الأردنية

رقم: ج أ ٠٠٢/١٦١

لمنتج

" أنابيب متعدد الإيثيلين لنقل المياه" العلامة التجارية "أكوابايب"

والذي تنتجه

شركة عالم البلاستيك للصناعات الإنشائية

ص.ب ٥٣ عمان ١١٥١٢ الأردن

حيث أن المنشأة قد استكملت جميع متطلبات منح علامة الجودة الأردنية لمنتجها
وذلك حسب تعليمات علامة الجودة الأردنية رقم: ٢٠٠٧/٤
وتشمل مطابقة المنتج للمتطلبات الفنية لعلامة الجودة الأردنية رقم: ٢٠١٤/٣٥
" الأنابيب اللدائنية - أنابيب متعدد الإيثيلين لنقل المياه"

وبناءً عليه فإن هذه المنشأة مخولة أن تضع على منتجها المذكور شعار علامة الجودة الأردنية

علامة الجودة
JQM
Quality Mark
ج أ ٠٠٢/١٦١

تاريخ الإصدار : ٠٥-حزيران-٢٠١٦
تاريخ الانتهاء : ٠٤-حزيران-٢٠١٩

بشرط أن تبقى متطلبات منح هذه الشهادة مستوفاة

مدير مديرية شهادات المطابقة
م. نائلا القطارنة

المدير العام
د. حيدر الزبن

Jordan Standards and Metrology Organization (JSMO)
www.jsmo.gov.jo
Certification Department
A Product Certification Body operating according to
ISO/IEC 17065:2012

has granted this

Jordan Quality Mark Certificate

No.: JQM 161002

for the product

"Polyethylene Pipes for water supply" for the trade mark " Aquapipe"
which is produced by

World Plastic For Construction Industries

P.O Box :53- Amman-11512 - Jordan

After the organization has fulfilled all the requirements of granting Jordan Quality Mark for its product according to Jordan Quality Mark instructions no.:4/2007
including the conformity of product to the technical requirements JQM-TR 35:2014

"Plastic pipes - Polyethylene (PE) pipes for water supply"

Hence, this organization is entitled to label its product with Jordan Quality Mark logo

علامة الجودة
JQM
Quality Mark
JQM161002

Issue Date : 3rd June 2016
Expiry Date : 4th June 2019

Provided that the preconditions for the certification still exist

Certification Department Director
Eng. Tamara Qatarneh

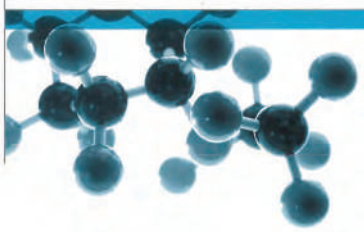
Director General
Dr. Hayder Al Zaben

Exova (UK) Ltd
Salford Polymer
6 Coronet Way
Centenary Park
M50 1RE Salford
United Kingdom

T : +44 (0) 161 787 3250
F : +44 (0) 161 787 3298
E : info@exova.com
W: www.exova.com

Exova

BS 6920 Cold water of 25mm Dia. PE100 Pipe Tasnee 100 Black



A Report To: Eng. Hisham KHADER
World Plastics for Construction Industries
P.O. Box 53 Amman 11512 Jordan

Date: 03/11/16
Copy: 01
Issue No.: 01
Page 1

Document Reference: U450703/9097/16

Testing
Advising
Assuring

Intertek

Suntury Technology Centre
Unit A, Shaws Way
Brooklands Close
Suntury-on-Thames
TW16 7RE, United Kingdom

Telephone: +44 1932 732100
Facsimile: +44 1932 732111
www.intertek.com

Test Report

REPORT NO. MA5730/L

Section 2

PE

BorSafe HE3490-LS (black)

CLIENT:
Abu Dhabi Polymer (Borouge Pte Ltd.)
13th Floor, Borouge Tower
Shaikh Khalifa Energy Complex
Corniche Road
Abu Dhabu
United Arab Emirates

reported by:

SAM CLARKE
CUSTOMER CARE COORDINATOR

DATE: 23 DECEMBER 2016
Re-issued with amendments: 4 APRIL 2017

reviewed by:

CLIENT'S REFERENCE:
4500006735-P40 & 4500006914-P20 & 4500007184

HANNAH SNELL
SECTION HEAD OF MATERIALS

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

ITS Testing Services (UK) Ltd
Registered office: Academy Place, 1-9 Brook Street, Brentwood, CM14 5LA, United Kingdom
Registered No. 1408264, VAT No: GB 572 783 996

1049

WRAS
APPROVED MATERIAL

Approval Number: 1612549
Test Report: MA5730/L/2

5th April 2017

Borouge Pte Ltd
1 George Street #18-01,
Singapore,
049145

Water Regulations Advisory Scheme Ltd.
Unit 13,
Willow Road,
Pen y Fan Industrial Estate,
Crumlin,
Gwent,
NP11 4EG

WATER REGULATIONS ADVISORY SCHEME LTD. (WRAS)
MATERIAL APPROVAL

The material referred to in this letter is suitable for contact with wholesome water for domestic purposes having met the requirements of BS6920-1:2000 and/or 2014 'Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water'.

The reference relates solely to its effect on the quality of the water with which it may come into contact and does not signify the approval of its mechanical or physical properties for any use.

POLYETHYLENE - MATERIAL ONLY. **5245**

'BorSafe HE3490-LS', Black coloured, extruded PE material. For use with water up to 60°C.

APPROVAL NUMBER: 1612549
APPROVAL HOLDER: BOROUGE PTE LTD

The Scheme reserves the right to review approval.
Approval 1612549 is valid between December 2016 and December 2021

An entry, as above, will accordingly be included in the Water Fittings Directory on-line under the section headed, "Materials which have passed full tests of effect on water quality".

The Directory may be found at: www.wras.co.uk/directory

Yours faithfully

Jason Furnival
Approvals & Enquiries Manager
Water Regulations Advisory Scheme

WRAS MATERIAL APPROVAL - MATERIALS WHICH HAVE PASSED FULL TESTS OF EFFECT ON WATER QUALITY

The material referred to in this letter is suitable for contact with water for domestic purposes. **Approval of this material does not signify the approval of its mechanical or physical properties for any use.**

Manufacturers or applicants may only quote in their sales literature terms which are used in this letter, namely that: 'the material as listed, having passed the tests of effect on water quality, is suitable for use in contact with wholesome water'.

This may be abbreviated to 'Water Regulations Advisory Scheme - Approved Material' or 'WRAS Approved Material'.

The scope of an Approval does not extend to rebranded materials unless otherwise agreed by the Scheme.

Use of the WRAS Approved Material Logo

Approval holders may use the WRAS Approved Material logo and make reference to any approval issued by WRAS Ltd. in respect of a particular material or range of materials provided the approval is, and remains valid.

Approval holders are entitled to use the logo on the packing, promotional literature and point of sale advertising Approved Materials.

Modifications to existing Approvals

It is a condition of WRAS Material Approval that NO changes or modifications to the Approved Material, be made without the Approval Holder first notifying WRAS Ltd. Full details of the proposed changes must be provided to the Scheme. Failure to comply with this condition will immediately invalidate a previously granted Approval.

Re-Approval

WRAS will write to you 1 year before the approval expires asking whether you would like to renew it. Please complete the relevant section of the MA3 application form which will be included with the letter and return to WRAS (via e-mail or post).

Please note it is the responsibility of the Approval Holder to ensure the Approval remains valid. WRAS Ltd. accepts no liability for the delay in granting approval where this is caused by circumstances outside of the Scheme's control.

The Water Regulations Advisory Scheme Ltd. Registered in England No. 08652660 Registered office: 50 Lowndes Close, Hazel Grove, Stockport, SK7 5DY.
Tel: +44(0)333 207 9300 Fax: +44(0)1495 246 540 Email:info@wras.co.uk website:www.wras.co.uk

BODYCOTE/P-04/86

RAPPORT

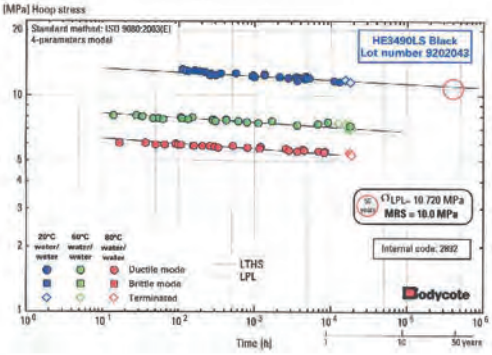
Utförd av ackrediterat laboratorium
Report issued by an Accredited Laboratory

Bodycote Report

STANDARD EXTRAPOLATION METHOD (SEM)
SEM-evaluation according to ISO 9080:2003(E) of the PE pipe grade HE3490LS Black from Borouge Pte. Ltd.

Final report

Ulrika Andersson



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2004-09-03

P-8060

handled by:
Ulrika Andersson

Borouge Pte Ltd.
Mrs. King Peek Tze
438A Alexandra Road #08-01/02
Alexandra Technopark
Singapore 119967
SINGAPORE

STANDARD EXTRAPOLATION METHOD (SEM)
SEM-evaluation according to ISO 9080:2003(E) of the PE pipe grade HE3490LS Black from Borouge Pte Ltd.

Final report

Summary

The aim of this project was to perform a regression analysis, according to ISO 9080:2003(E), of the hydrostatic pressure test data of the PE pipe grade HE3490LS Black, presented in the Bodycote Report P-04/66, in order to obtain a MRS-classification for the material. Borouge Pte Ltd. ordered the work on August 6, 2004.

The standard extrapolation method ISO 9080:2003(E) was used to fit the data obtained for the PE pipe grade HE3490LS Black at 20, 60 and 80°C. Bodycote Polymer performed the hydrostatic pressure testing.

Different analyses were performed adding pipe specimens still in progress and using the 3- or 4-parameters models.

Knees were detected at both 60 and 80°C at 7.22 and 5.60 MPa after 18 293 and 3 244 h, respectively. However, visually no knees can be seen and also only ductile failures have been observed. The knee detections were only due to running pipe specimens. The knee detections were therefore disregarded at both temperatures by manually changing the Type B failures to Type A failures in the Becetel SEM V 1.16 program.

The 4-parameters model was finally chosen, as the probability level for C_3 was ≤0.05.

شركة مياه الأردن Jordan Water Company

مياهنا miyahuna

Ref : Date : ٢٠١٧/٧/١٢ التاريخ الرقم

الى من يهمه الامر

تشهد شركة مياه الاردن (مياهنا) بأنه قد تم احالة العطاءات التالية على الساده شركة عالم البلاستيك للصناعات الانشائيه خلال عامي 2015 /2016 :

1- عطاء رقم (C-T-15-0023) والمتعلق بتوريد ISO 180 mm HDPE Pipes بقيمة اجماليه (60,933.00) دينار ستون الفاً وتسعماية وثلاثه وثلاثون دينار .

2- عطاء رقم (O-T-15-0030) والمتعلق بتوريد Polyethyene Pipe 25 mm بقيمة اجماليه (50550.00) دينار خمسون الفاً وخمسماية وخمسون دينار .

علماً بأنه قد تم استلام مواد العطاءات اعلاه حسب الاصول .

وقد تم اصدار هذا الكتاب بناءاً على طلب المورد دون ان تتحمل شركة مياه الاردن اية مسؤوليه .

وتقبلوا فائق الإحترام،،،

الرئيس التنفيذي
المهندس عازر خلبن

رؤيتنا... أن نسير بالإلتزام نحو المستهلك والمهنية في إدارة قطاع المياه والصرف الصحي
مهمتنا... أن نرتقي بنوعية الحياة بتزويد جميع المستهلكين بخدمة مستدامة وفعالة يعتمد عليها للمياه والصرف الصحي
قيمنا الأساسية... الجودة والخبرة الفنية والمصداقية والإلتزام الإجتماعي

وزارة المياه والري
سلطة وادي الأردن

الرقم ٦٢٧٣ / ١ / ٨ / ٥٥٥
التاريخ ٢٠١٧/٦/١٩
الموافق

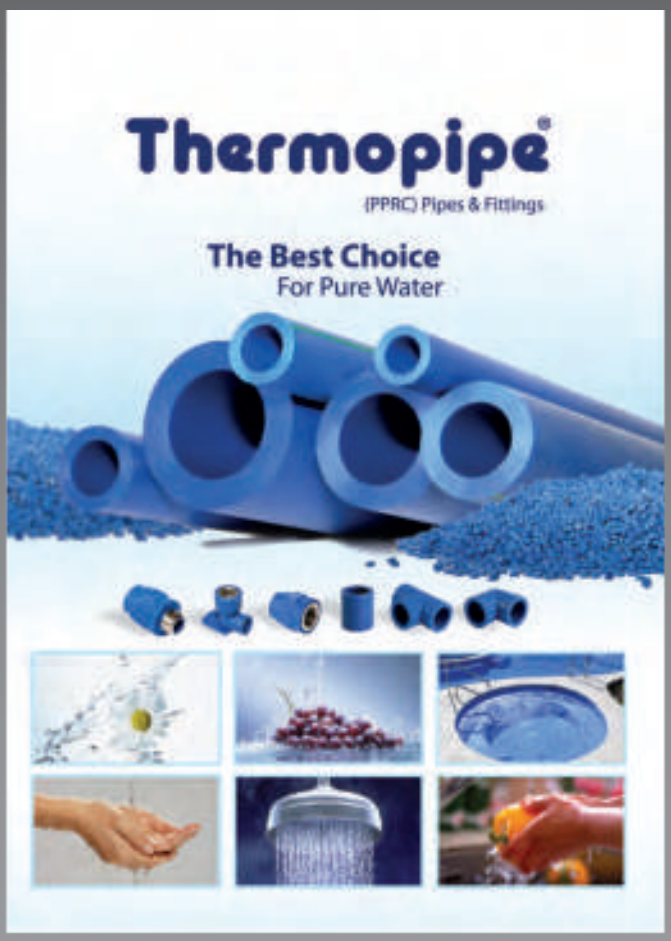
الموضوع : اعتماد انابيب الاكوا بايب

تشهد سلطة وادي الاردن/مديرية المشاريع بأن انابيب البولي ايثلين عالي الكثافة (HDPE-PE 100) وذات الاسم التجاري (اكوا بايب) تم إعتمادها في مشروع اعادة تأهيل ري حسبان /الكفرين- المرحلة الثانية بأقطار (180،250.63) ملم .

امين عام سلطة وادي الاردن
المهندس سعد ابو حمور

E-mail:jvadewan2@mwi.gov.jo


Thermopex
Cross Linked Polyethylene
APE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For Pure Water


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High Quality


Electropipe
PVC conduits
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Fax : +962 6 4711500
P.O.Box 53 Amman 11512 Jordan
E-mail: export@advanced-piping.com