FLOWGUARD®
PIPE & FITTINGS

AL WAAB PLASTICS

CPVC PIPES & FITTINGS FOR HOT & COLD WATER DISTRIBUTION SYSTEMS

NSF*

WRAS APPROVED PRODUCT

GORD
المنظمة الخليجية للبحث والتطوير
Gulf Organisation for Research & Development

KAHRAMAA كهرماء

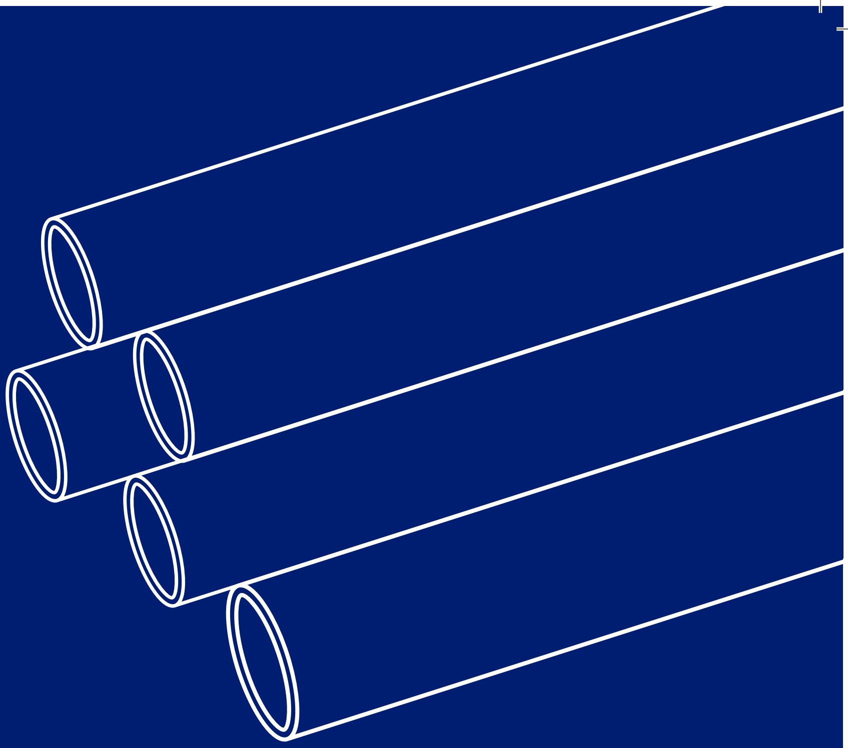
ASHGHAL أشغال

STATE OF QATAR
MINISTRY OF INTERIOR

QATAR NATIONAL VISION 2030

Qatar will meet the needs of this generation without compromising the needs of future generations!

the Goal of LEEDS&GSAS rating system is similar to build more sustainable buildings, thoughtfully designed after considering energy conservation, site orientation, daylighting, indoor air quality material safety, reduction in material needs, local material needs, rapidly renewable material use, water use reduction and choosing sustainable sites.



INTRODUCTION

Al Waab Trading & Contracting Establishment was initiated in the Year 1979 as a family Business by our Founder & Chairman, a self-motived entrepreneur.

AL WAAB PLASTICS, our new venture Licensed by Lubrizol and FlowGuard™ for our new leading product CPVC PIPES AND FITTINGS mainly used for Hot and Cold water distribution system.

Al Waab plastics will continue to grow and prosper by providing innovative technologies to the global industrial and consumer markets. Building on decades of chemical knowledge, a powerful global organization and leading position in the in the markets we serve, we'll continue to offer our customers the best overall solution to challenges of a complex and evolving marketplace.

SUSTAINABILITY

The sustainable development is a process that seeks to meet the needs of present generation without compromising the ability of future generation to meet their needs.this is often called Intergenerational justice.

WHY AL WAAB CPVC

WHY AL WAAB FlowGuard™ PIPE AND FITTINGS ARE THE BEST CHOICE FOR HOT AND COLD POTABLE WATER DISTRIBUTION?

Alwaab FlowGuard™ CPVC Pipes & Fittings systems are being manufactured as per DIN EN ISO15877 & DIN8079 / 8080 standards requirement which are described and recommended in QCS2014 requirement. Al Waab FlowGuard CPVC Pipes & Fittings hod undergone EPD & LCA studies, research & analysis and been declared as "Green Products" as all our Products fulfill the requirement to meet the friendly Environmental needs.

THE RAW MATERIAL

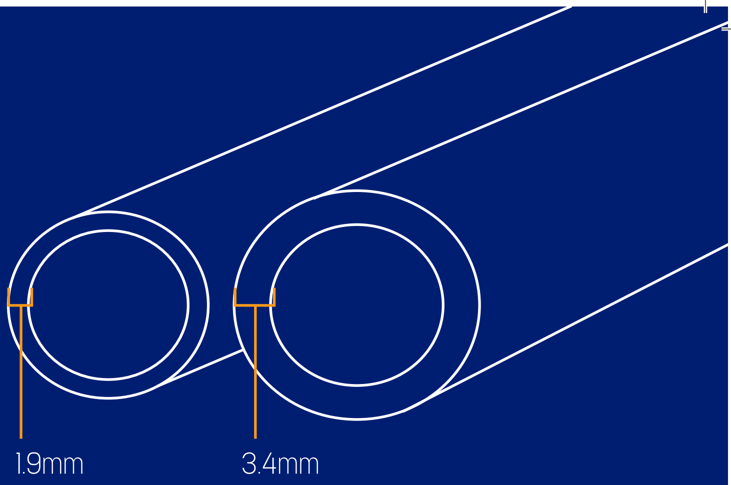
Al Waab FlowGuard CPVC Pipes & Fittings are manufactured in State of Qatar at our manufacturing set up with highly sophisticated. Processing Machineries & Molds with usage of "Lubrizol Corporation" supplied CPVC Compound and following their manufacturing techniques in time to time. FlowGuard Piping systems are in use since 1960 in USA and generally used for Hot & Cold-Water distribution systems in Multi-storey buildings. Apartments. high-rise buildings. hotels / Motels etc Al Waab FlowGuard Piping systems proved to be very much cost effective with comparison of equivalent sizes of Metallic / other Plastic Pipings. Al Waab FlowGuard CPVC Pipes are being joined with corresponding sizes CPVC Fittings by using Solvent Cementing method and this method of joining effectively proved for high strength at even elevated temperatures & pressures. Al Waab FlowGuard CPVC Piping systems are manufactured from -LEAD FREE" materials and hence the leading organisation NSF certified our products as safe for human health / consumption with appropriate NSF certifications.

INTERNATIONAL AND LOCAL APPROVALS

NSF International. USA
WRAS. UK
GORD - G'SAS. GCC
Kahramaa. Qatar
Ashghal. Qatar
Ministry of Interior. Qatar
Ministry of Awqaf and Islamic Affairs

* - for pipes

PHYSICAL PROPERTIES



PN20, 20mm
Wall thickness
CPVC : 1.9mm

CPVC:
Has a higher pressure bearing capability.
This leads to same flow rate with similar pipe size.

Outside Diameter (mm)	Wall Thickness (mm)			
	CPVC	PPR	PEX	PB
16	1.5	-	-	-
20	1.9	3.4	2.8	2.3
25	2.3	4.2	3.5	2.8
32	2.9	5.4	4.4	3.6
40	3.7	6.7	5.5	4.5
50	4.6	8.4	6.9	5.6

Source : DIN EN ISO 15877 DIN 8077/8079/16969/16893

	CPVC	PPR
Tensile strength (Mpa at 23^{0}c)	50	30
Coefficient of Thermal Expansion (x10^{-4} K^{-1})	0.7	1.5
Thermal ConductivIty (W/MK)	0.14	0.22
Oxygen Permeation (cm^{2}/m.day.atmosphere) at 70^{0c}	<1 Insignificant	3.6

CPVC: Needs less hangers and supports
No 'looping' of the pipe
Higher pressure bearing capacity, same flow rate with smaller pipe size

Sources: Saechtling - Intl. Plastics handbook, Modern Plastics Encyclopedia, Chemical engineers Handbook, British Gas

PHYSICAL PROPERTIES

Specific gravity (g/cc)	1.45-1.55
Opacity (%)	≤ 0.2
vicat Softening point (pipe)	≥ 110^{0} C
Vicat Softening point (fitting)	≥ 103^{0} C
Tensile Strength (MPa)	≥ 50
Heat Reversion	≤ 5%

Outside Diameter (mm)	PN 16 Wall Thickness (mm)	PN 16 Inside Diameter (mm)	PN 20 Wall Thickness (mm)	PN20 Inside diameter (mm)
16	1.4	13.2	1.5	13
20	1.5	17	1.9	16.2
25	1.9	21.2	2.3	20.4
32	2.4	27.2	2.9	26.2
40	3.0	34	3.7	32.6
50	3.7	42.6	4.6	40.8
63	4.7	53.6	5.8	51.4
75	5.6	63.8	6.8	61.4
90	6.7	76.7	8.2	73.6
110	8.1	93.8	10	90
160	11.8	136.4	14.6	130.8

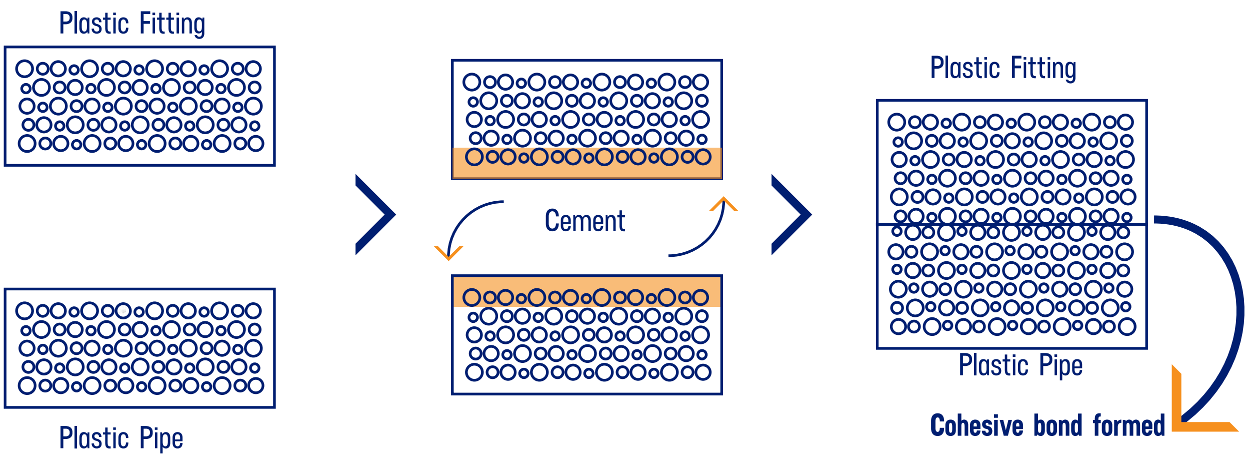
INSTALLATION TECHNIQUES

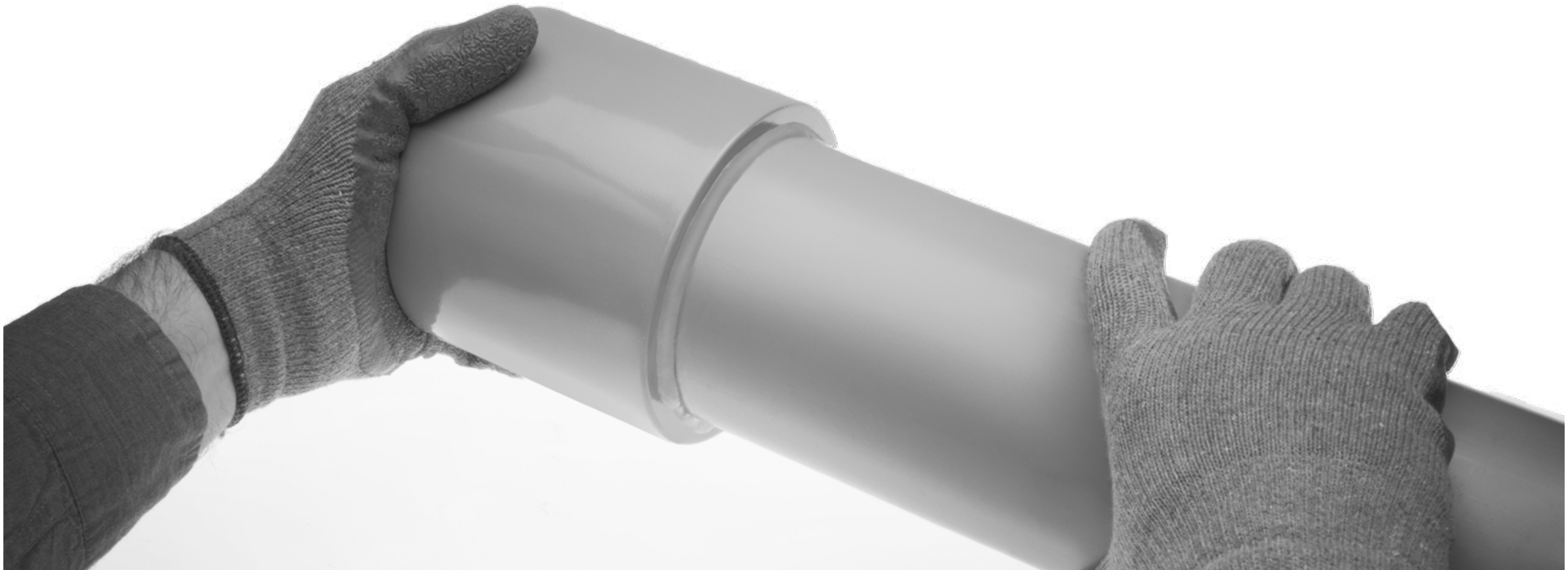
CPVC: Solvent Welding

Tools required are simple and cheap.
Solvent welding process allows for fast and easy assembly.
Same procedure for CPVC as for PVC
Chemically welded joints are the strongest part of the system.
No need for an electrical source.

ONLY TOOLS REQUIRED:

CPVC : Solvent Cement Mechanism





Plastic pipe and fittings are composed of large polymer molecules (illustrated by). Solvent cement is made by dissolving a polymer in a liquid. When solvent cement is applied to the plastic part, the liquid penetrates the surface and softens the outer layer of the plastic part. The polymer chains then interpenetrate with one another to form a strong cohesive bond

INSTALLATION TECHNIQUES

CUTTING

In order to make a proper and neat joint, measure the pipe length accurately and make a small mark. Ensure that the pipe and fittings are size compatible. You can easily cut with a wheel type plastic pipe cutter or hacksaw blade. Cutting tubing as squarely as possible providers optimal bonding area within a joint.

SOLVENT CEMENT APPLICATION

Use only CPVC cement or an all - purpose cement conforming to DIN EN ISO 15877, ASTM F493, ASFD 2846 or joint failure may result. When making a joint apply a heavy even coat of cement to the pipe end. Use the same applicator without additional cement to apply a thin coat inside the fitting socket. Too much cement can cause clogged water ways.

DEBURRING/BEVELING

Burrs and fillings can prevent proper contact between tube and fitting during assembly and should be removed from the outside and inside of the pipe. Deburring tool, pocket knife or file are suitable for this. A sight bevel on the end of the tubing will easy entry of the tubing into the fitting socket.

ASSEMBLY

Immediately insert the tubing into the fitting socket, rotate the tube 1/4 to 1/2 while inserting. The motion ensures and even distribution of cement within the joint properly align the fittings. Hold the assembly for approximately 10 seconds allowing the joint to set-up.

FITTING PREPARATION

In order to make a proper and neat joint, measure the pipe length accurately and make a small mark. Ensure that the pipe and fittings are size compatible. You can easily cut with a wheel type plastic pipe cutter or hacksaw blade. Cutting tubing as squarely as possible providers optimal bonding area within a joint.

SET AND CURE

Solvent cement set and cure times are a function of pipe size, temperature and relative humidity. Curing time is shorter for drier environments, smaller sizes and higher temperatures.

Note : For sizes above 65 mm (2'/2) use IPS 70 primer before applying solvent cement. The purpose of a primer is to penetrate and soften the surfaces so that can stick together. The proper use of a primer ensures that the surface is prepared for fusion in a wide variety of weather conditions.

INSTALLATION PROCEDURES

HOW TO USE SOLVANT CEMENT, PRIMER & CLEANER

Recommended Minimum Curing Time Vs Testing Pressure For FlowGuard CPVC Pipes With FlowGuard Solvent Cement Assembly					
Temperature	**Testing Pressure**	**16mm - 32mm**	**40mm - 63mm**	**75mm - 110mm**	**160mm & above**
23°C	10 Bar	12 Hour	12 Hour	24 Hour	48 Hour
23°C	20 Bar	36 Hour	48 Hour	60 Hour	72 Hour
23°C	30 Bar	48 Hour	60 Hour	72 Hour	96 Hour
*	If the ambient temerature below 15°C, then curing duration shall be two times of the above said hours.				

CHOOSING CEMENT & PRIMERS :

Solvent cement for Flowguard CPVC systems must conform to the requirements of DIN EN ISO 15877, ASTM F493, ASTM 2846 or equivalent and should carry this identification on the can label. A primer or cleaner must be used on CPVC Primers for PVC pipe are acceptable for CPVC. The National Sanitation Foundation mark (NSF) or other portable water approval should also be located on the container.

Certain code bodies require orange CPVC solvent cement and purple primer to facilitate identification by plumbing inspectors. However, unpigmented (clear) CPVC solvent cement and primer are available and accepted by various jurisdictions. If you decide to use clear products, we strongly recommend contacting the local plumbing inspector prior to beginning a job to determine if these clear cement and primers are acceptable.

CPVC CEMENT'S SELF LIFE :

CPVC solvent cement is formulated to have a Self-life of two years. Cans are usually marked with manufacturing dates. Good CPVC cement should have the consistency of syrup or honey with no undissolved materials. Ages cement will often change color or begin to thicken and become gelatinous or jelly-like. When this occurs, the cement must be thrown away.

SOLVENT CEMENT FREEZING :

Use the same precautions to protect CPVC solvent cement from freezing as you would with PVC cement. Once cement gels, it cannot be recovered and should be discarded.

BEFORE BEGINNING:

01. Verify the cement is the same as the pipes and fittings being used

02. Check the temperature where the cementing will take place.

- Cement takes longer time to set up in cold weather. Be sure to allow extra time for curing. Do not try to speed up the cure by artificial means this could cause porosity and blisters in the cement film.

- Solvents evaporate faster in warm weather. Work quickly to avoid the cement setting up before the joint is assembled. Keep the cement as cool as possible. Try to stay out of direct sunlight.

03. Keep the lid on cement, cleaner, and primers when not is use evaporation of the solvent will affect the cement.

04. Stir or shake cement before using

05. Use 20mm (3/4") dauber on small diameter pipes, 40mm(11/2") dauber up through 80mm (3") pipe, and a natural bristle brush, swab, or roller 1/2 the pipe diameter on the pipes 4" and up

06. Do not mix cleaner or primer with cement

07. Do not use thickened or lumpy cement. It should be like the consistency of syrup or honey.

08. Do not handle joints immediately after assembly.

09. Do not allow daubers to dry out

10. Maximum temperature allowable for CPVC pipe is 180°F

11. All colored cement, primers, and cleaners will have a permanent strain.There is no known cleaning agent.

12. Use according to the step outline in DIN EN ISO 15877, joining of pipe and fittings.

CPVC UV RESISTANCE

The main degradation process is dehydrochlorination, not oxidation. This dehydrochlorination, whilst slightly accelerated by U.V., does not break down the polymer chains to any significant extent after outdoor exposure, being mainly limited to a surface discoloration effect.

There is a loss of impact resistance due to impact modifiers losing efficiency. This may even result in increased modulus.

PPR

U.V. acts as a strong catalyst for the oxidation process which breaks down polymer chain, leading to weakness in pipe and loss of hydrostatic strength.

CPVC STUDY

NATURAL WEATHERING EFFECT ON SOME PROPERTIES OF CPVC MATERIAL

Samples from locally manufactured CPVC commercial pipes have been naturally weathered for different periods in harsh Saudi weather conditions.

Standard tensile and SEN fracture toughness tests were performed after natural exposure periods of 1,2,3 and 6 months.

The tensile test result showed that exposure for periods up to 9 months, including summer season, had limited effects on the tensile strength and modulus of elasticity of the material. The damage due to weathering is mainly a surface phenomenon.

Source: Study from Mechanical Engineering Dept. - King Fahad University Of Petroleum & Minerals, Dhahran, KSA - 2007

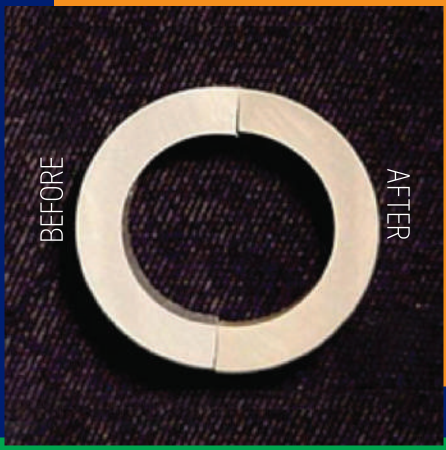
CHLORINE RESISTANCE TESTING

CPVC: Real Life Testing

CPVC plumbing pipe installed in Baltimore, Mary land in 1960's.

No erosion of pipe wall after 23 years of installation.

No decrease in long-term hydrostatic performance.



PPR Manufacturer A

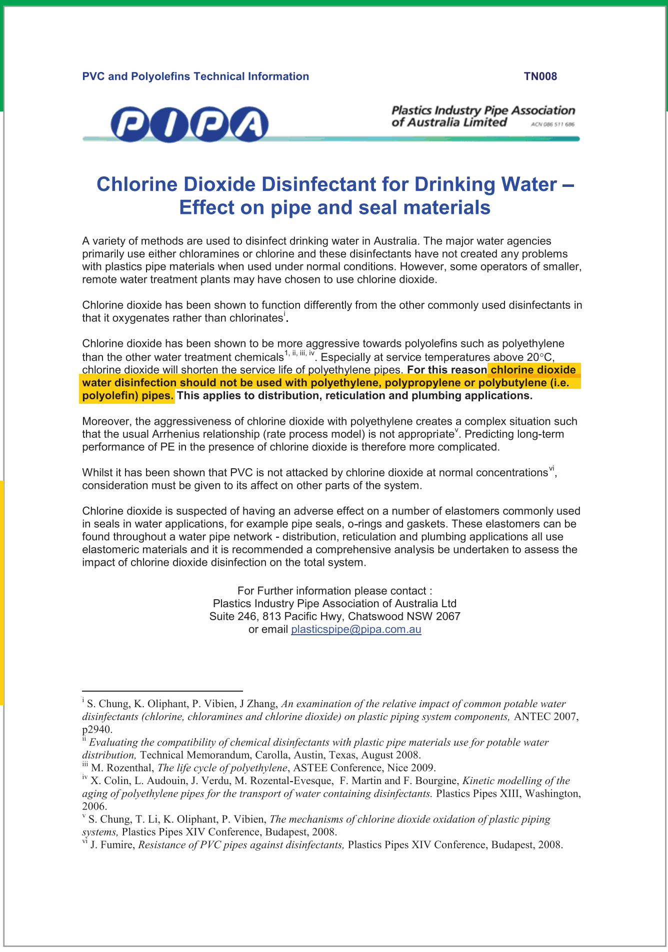
Tested in general accordance with NSF P-171 Protocol for Chlorine Resistance of Plastic Piping Materials and ASTM F-2023-04 Test Method for Evaluating the Oxidative Resistance of PEX Tubing and Systems to Hot Chlorinated Water.

Significant erosion of pipe wall after testing (up to 50% after 7000 hrs) using low water flowrate (-0.1 gpm).

The similar phenomenon as in dip tubes.

Warning letter from Plastics Industry Pipe Association in Australia - premature aging of polyolefin pipes are causing concerns!

For this reason chlorine dioxide water disinfection should not be used with polyethylene, polypropylene or polybutylene (i.e. polyolefin) pipes.



PVC and Polyolefins Technical Information TN008

PIPA — Plastics Industry Pipe Association of Australia Limited ACN 086 511 686

Chlorine Dioxide Disinfectant for Drinking Water – Effect on pipe and seal materials

A variety of methods are used to disinfect drinking water in Australia. The major water agencies primarily use either chloramines or chlorine and these disinfectants have not created any problems with plastics pipe materials when used under normal conditions. However, some operators of smaller, remote water treatment plants may have chosen to use chlorine dioxide.

Chlorine dioxide has been shown to function differently from the other commonly used disinfectants in that it oxygenates rather than chlorinates[i].

Chlorine dioxide has been shown to be more aggressive towards polyolefins such as polyethylene than the other water treatment chemicals[1, ii, iii, iv]. Especially at service temperatures above 20°C, chlorine dioxide will shorten the service life of polyethylene pipes. **For this reason chlorine dioxide water disinfection should not be used with polyethylene, polypropylene or polybutylene (i.e. polyolefin) pipes. This applies to distribution, reticulation and plumbing applications.**

Moreover, the aggressiveness of chlorine dioxide with polyethylene creates a complex situation such that the usual Arrhenius relationship (rate process model) is not appropriate[v]. Predicting long-term performance of PE in the presence of chlorine dioxide is therefore more complicated.

Whilst it has been shown that PVC is not attacked by chlorine dioxide at normal concentrations[vi], consideration must be given to its affect on other parts of the system.

Chlorine dioxide is suspected of having an adverse effect on a number of elastomers commonly used in seals in water applications, for example pipe seals, o-rings and gaskets. These elastomers can be found throughout a water pipe network - distribution, reticulation and plumbing applications all use elastomeric materials and it is recommended a comprehensive analysis be undertaken to assess the impact of chlorine dioxide disinfection on the total system.

For Further information please contact :
Plastics Industry Pipe Association of Australia Ltd
Suite 246, 813 Pacific Hwy, Chatswood NSW 2067
or email plasticspipe@pipa.com.au

[i] S. Chung, K. Oliphant, P. Vibien, J Zhang, *An examination of the relative impact of common potable water disinfectants (chlorine, chloramines and chlorine dioxide) on plastic piping system components,* ANTEC 2007, p2940.
[ii] *Evaluating the compatibility of chemical disinfectants with plastic pipe materials use for potable water distribution,* Technical Memorandum, Carolla, Austin, Texas, August 2008.
[iii] M. Rozenthal, *The life cycle of polyethylene*, ASTEE Conference, Nice 2009.
[iv] X. Colin, L. Audouin, J. Verdu, M. Rozental-Evesque, F. Martin and F. Bourgine, *Kinetic modelling of the aging of polyethylene pipes for the transport of water containing disinfectants.* Plastics Pipes XIII, Washington, 2006.
[v] S. Chung, T. Li, K. Oliphant, P. Vibien, *The mechanisms of chlorine dioxide oxidation of plastic piping systems,* Plastics Pipes XIV Conference, Budapest, 2008.
[vi] J. Fumire, *Resistance of PVC pipes against disinfectants,* Plastics Pipes XIV Conference, Budapest, 2008.

CPVC RESISTANCE TO CHLORINE & CHLORINE DI-OXIDE

Polymer Chemistry: When chlorine is added to water for disinfection, it transforms to hypochlorous acid. Hypochlorous acid is a strong oxidizer which is capable of breaking the carbon-to-carbon bonds of the polymer chain, effectively disintegrating it. Chlorine & Chlorine dioxide are both excellent water sanitizing agents. Whilst chlorine dioxide is more powerful.

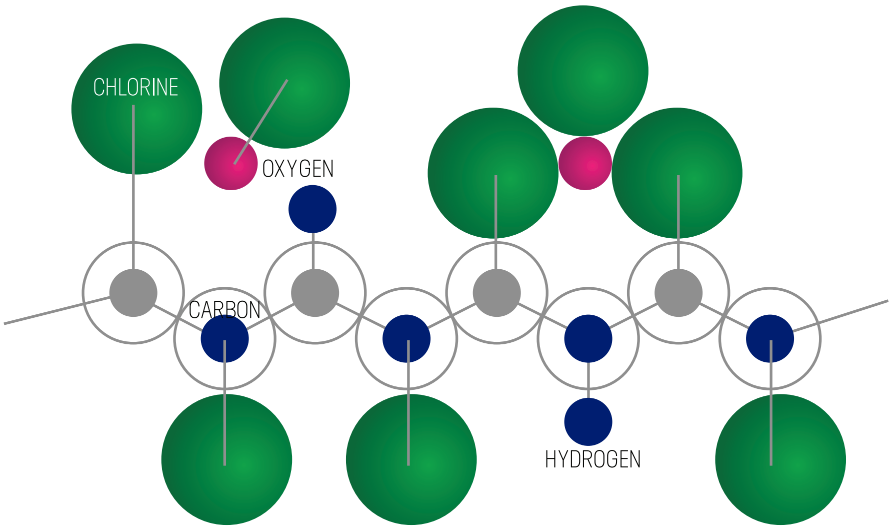
CPVC

The chlorine atoms surrounding the carbon chain of CPVC, however, are large atoms which protect the chain from attack by hypochlorous acid in the water.

PPR:

The hydrogen atoms surrounding the carbon chain of polyolefins, such as PPR, PEX and polybutylene, are small atoms which are incapable of protecting the chain from attack by hypochlorous acid in the water.

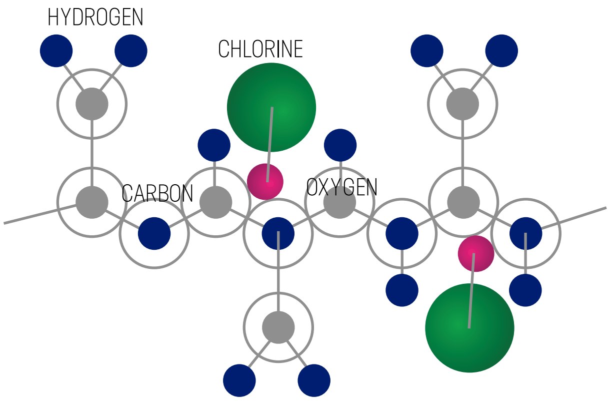
Access to the CPVC carbon chain is restricted by the chlorine on the molecule



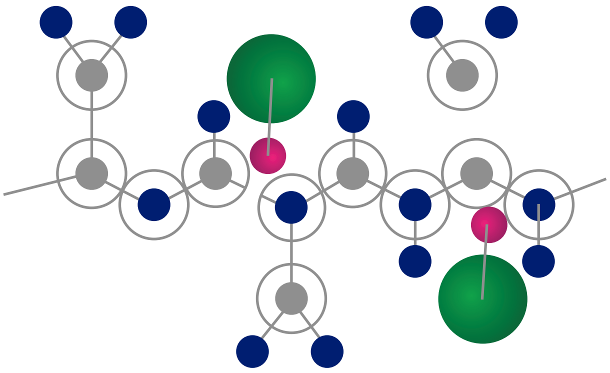
Any chlorine which actually reaches the backbone, simply chlorinates it further. The effect is the same as the resin chlorination process.

PPR:

Hypochlorous acid attack on polypropylene.



Bonds are broken at tertiary carbon sites.



FIRE RELATED PROPERTIES

	CPVC	PPR
Limiting Oxygen Index [% of Oxygen needed in an atmosphere to support combustion]	60	17
Flash Ignition Temperature	480° C	340° C
Heat of combustion of PPR is about 3x more than CPVC generating more heat and easy burning		

CPVC

Low flame spread and smoke generation
Self-extinguishing
No flaming drips

EN 13501-1:2002 – FIRE CLASSIFICATION OF CONSTRUCTION PRODUCTS AND BUILDING ELEMENTS

CPVC Rating: B s1 d0

Fire Behavior	B –> Low flammability, no contribution to flashover
Smoke Development	s1 –> Low smoke development
Flaming Droplets	d0 4 No burning drops

★★★★★

THE BEST POSSIBLE RATING

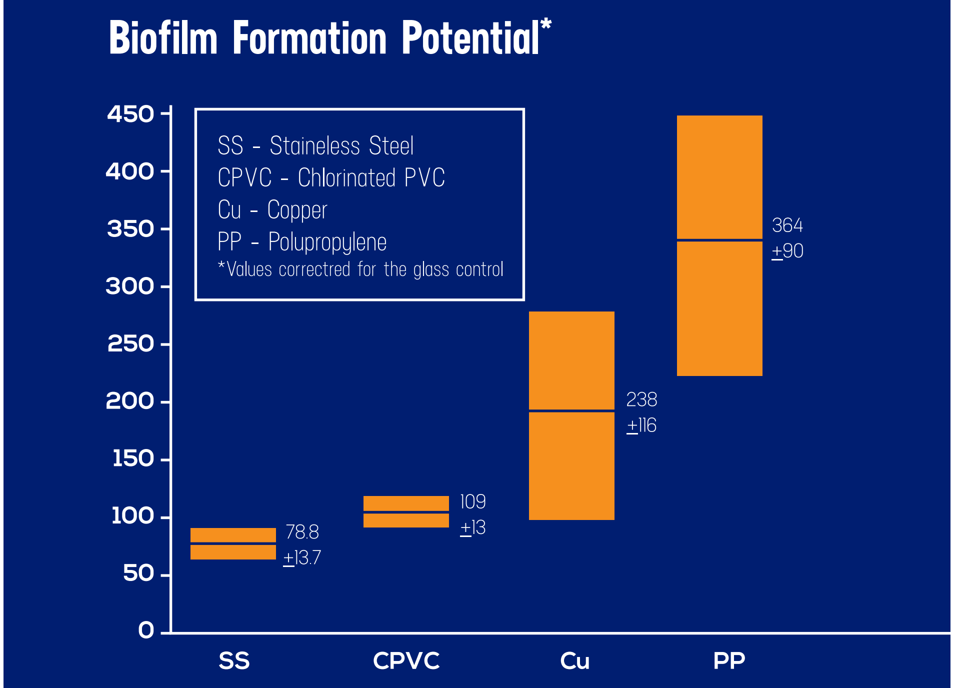
A NON-METAL MATERIAL CAN RECEIVE

CPVC Antimicrobial Performance

Dr. Paul Sturman concludes:

"CPVC consistently outperforms most other non-metallic piping materials with regard to its ability to resist the formation of biofilms"

Source: Dr. Paul Sturman, research professor and industrial coordinator for The Center for Biofilm Engineering at Montana State University based on his evaluation of Dutch Research and Knowledge Institute for Drinking Water [KIWA] 1999 study Biofilm Formation Potential of Pipe Materials in Plumbing Systems, 2006 study Standardizing the Biomass Production Potential Method for Determining the Enhancement of Microbial Growth by Construction Products in Contact With Drinking Water, and 2007 study Assessment of the Microbial Growth Potential of Materials in Contact with Treated Water Intended for Human Consumption.

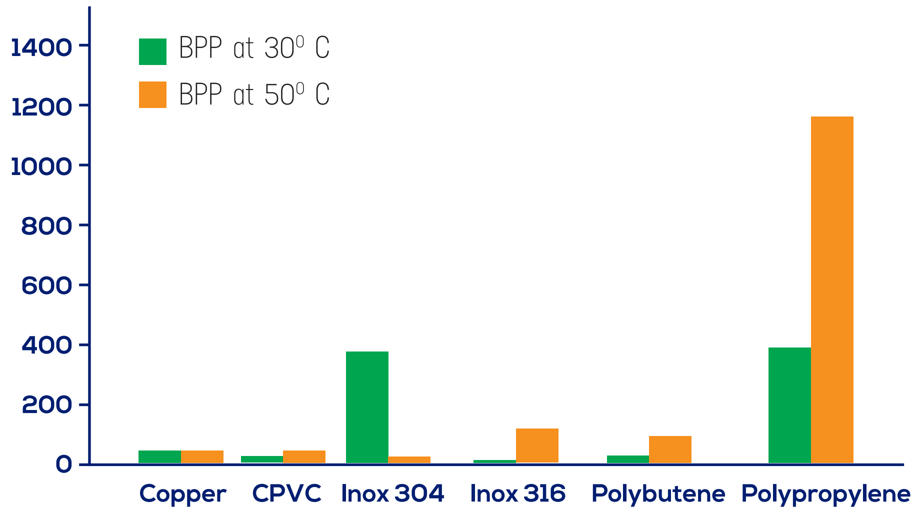


Source: Assessment of the Microbial Growth Potential of Materials in Contact with Treated Water Intended for Human Consumption, KIWA, 2007

Study conducted by CRECEP in France, confirm the ability of CPVC to resist biofilm formation

Comparison of BPP [Biomass Production Potential] values* observed at 30°C and 50°C

Source: Study of 6 different materials used for drinking water distribution and their capacity to support bacterial growth conducted by Crecep [Research and Control of drinking water Centre in Paris] according to a European Standard project by means of the Biomass Production Potential test in 2005.

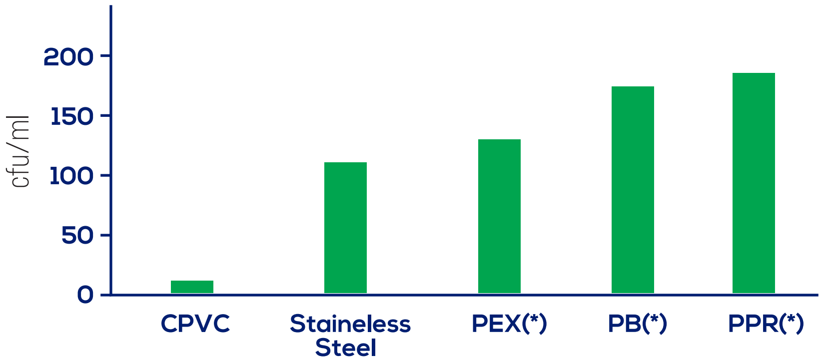


[Inox 304/316 = Stainless Steel] * Values measured at 8,12 and 16 weeks

"In the presence of the two CPVC materials, the growth of Legionella bacteria in the water was low"

Study: Biofilm Formation Potential of Pipe Materials in internal installations by H.R. Veenendaal / D. van de Kooiy —KIWA - 1999 (KIWA is the approvals agency for potable water piping systems in The Netherlands)

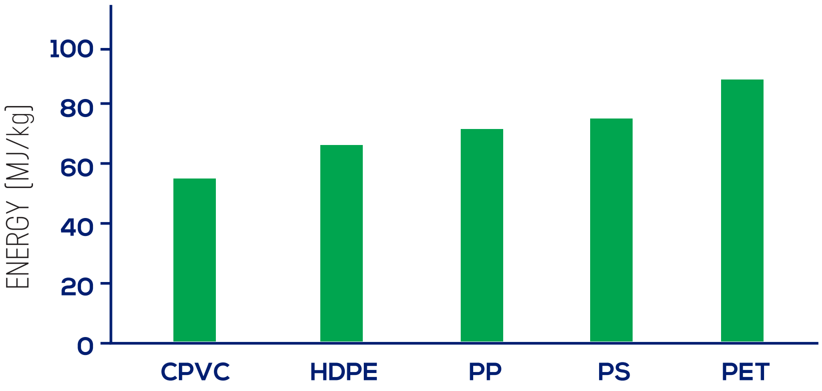
The number of Legionella bacteria in the test water (average after 8, 12 and 16 weeks - static test, no flow.)



* Average of 2 sample

CPVC Environmental Impact

Total energy requirements for CPVC production are lower than other plastic materials, due primarily to the low petroleum content.



CPVC Recycling

CPVC

CPVC piping can easily be recycled as PVC or window profiles

Regrind piping material into granules

Mix regrined into applications such as floor filling, floor coating, cable trays, speed bumps and car mats

CPVC : Head Loss Calculations

Operation Analysis Based on Head Loss Due to Friction Requirements	Steel	PEX and PPR	Copper	CPVC
Pump Size Horsepower	15.1 HP	11.4 HP	13 HP	10 HP
Yearly Operation Cost	$10.754	$8.086	$9.274	$7.117
Yearly Cost Difference with CPVC	$3.637	$0.969	$2.157	$0
Present Value of the Difference Over 50 Years od Operations	$181.85	$48.45	$107.85	$0

The KW/hr cost is the average cost in the USA as per EIA, which is 12.31 cents, knowing that the average cost in Europe is $0.35.

Temperature & Pressure

Temperature (°C)	Working Pressure PN 16 (bar)	Working Pressure PN 20 (bar)
20	16	20
40	11	14
60	6	8
80	4	5
95	2	3

Product Range

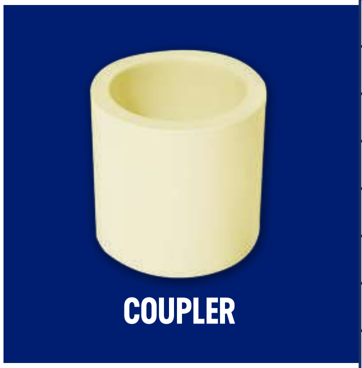
PIPES

Size (mm)	Pressure Ratings
16	**PN 16 & PN 20**
20	
25	
32	
40	
50	
63	
75	
90	
110	
160	

Warranty applicable only if Al Waab FlowGuard pipe, fittings & CPVC cement are used.

Solvent Cement
VOC Content 490g/Ltr

Product Range



SIZE (mm)	REFERENCE	
16	CPLR0016	PN 25
20	CPLR0020	
25	CPLR0025	
32	CPLR0032	
40	CPLR0040	
50	CPLR0050	
63	CPLR0063	
75	CPLR0075	PN 20
90	CPLR0090	
110	CPLR0110	PN 16
160	CPLR0160	

SIZE (mm)	REFERENCE	
16	ELBW9016	PN 25
20	ELBW9020	
25	ELBW9025	
32	ELBW9032	
40	ELBW9040	
50	ELBW9050	
63	ELBW9063	
75	ELBW9075	PN 20
90	ELBW9090	
110	ELBW90110	PN 16
160	ELBW90160	

SIZE (mm)	REFERENCE	
16	ELBW4516	PN 25
20	ELBW4520	
25	ELBW4525	
32	ELBW4532	
40	ELBW4540	
50	ELBW4550	
63	ELBW4563	
75	ELBW4575	PN 20
90	ELBW4590	
110	ELBW45110	PN 16
160	ELBW45160	

Product Range

REDUCER ELBOW 90 deg.

SIZE (mm)	REFERENCE	
25x20	REDEL2520	PN 25
32x25	REDEL3225	

TEE 90 deg.

SIZE (mm)	REFERENCE	
16	TEE90016	
20	TEE90020	
25	TEE90025	PN 25
32	TEE90032	
40	TEE90040	
50	TEE90050	
63	TEE90063	
75	TEE90075	PN 20
90	TEE90090	
110	TEE90110	PN 16
160	TEE90160	

REDUCER TEE 90 deg.

SIZE (mm)	REFERENCE	
20x20x16	RDTE2016	
25x25x20	RDTE2520	
32x32x25	RDTE3225	PN 25
32x32x20	RDTE3220	
40x40x20	RDTE4020	
40x40x32	RDTE4032	
50x50x25	RDTE5025	
50x50x32	RDTE5032	
50x50x40	RDTE5040	
63x63x32	RDTE6332	
63x63x50	RDTE6350	PN 16
75x75x63	RDTE7563	
110x11063	RDTE11063	
160x160x110	RDTE160110	

Product Range

LONG REDUCER

SIZE (mm)	REFERENCE	
20x16	RDCR2016	
25x20	RDCR2520	
32x25	RDCR3225	PN 25
40x32	RDCR4032	
50x40	RDCR5040	
63x50	RDCR6350	
75x32	RDCR7532	
90x63	RDCR9063	
110x32	RDCR11032	PN 16
110x63	RDCR11063	
110x90	RDCR11090	
160x110	RDCR160110	

REDUCER BUSH

SIZE (mm)	REFERENCE	
20x16	BUSH2016	
25x20	BUSH2520	
32x25	BUSH3225	PN 25
40x32	BUSH4032	
50x40	BUSH5040	
63x50	BUSH6350	
40x20	BUSH4020	
50x25	BUSH4025	
50x32	BUSH5025	PN 20
63x32	BUSH5032	
63x32	BUSH6332	
75x50	BUSH7550	
75x63	BUSH7563	PN 16
90x75	BUSH9075	
110x90	BUSH11090	
160x110	BUSH160110	

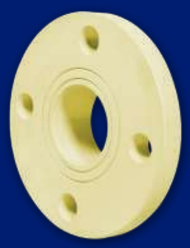
STEP OVER BEND

SIZE (mm)	REFERENCE	
16	STOB0016	
20	STOB0020	PN 25
25	STOB0025	
32	STOB0032	

Product Range

END CAP

SIZE (mm)	REFERENCE	
16	ECAP0016	PN 25
20	ECAP0020	
25	ECAP0025	
32	ECAP0032	
40	ECAP0040	
50	ECAP0050	
63	ECAP0063	
75	ECAP0075	PN 16
90	ECAP0090	
110	ECAP00110	PN 20
160	ECAP00160	



FLANGE

SIZE (mm)	REFERENCE	
20	SFL0020	PN 16
25	SFL0025	
32	SFL0032	
40	SFL0040	
50	SFL0050	
63	SFL0063	
75	SFL0075	
90	SFL0090	
110	SFL0110	
160	VSFL160	

UNION

SIZE (mm)	REFERENCE	
16	UNION016	PN 20
20	UNION020	
25	UNION025	
32	UNION032	
40	UNION040	
50	UNION050	
63	UNION063	

Product Range

DOUBLE UNION BALL VALVE

SIZE (mm)	REFERENCE	
20	DUBVL020	PN 16
25	DUBVL025	
32	DUBVL032	
40	DUBVL040	
50	DUBVL050	
63	DUBVL063	
75	DUBVL075	
90	DUBVL090	
110	DUBVL110	

BRASS MALE THREADED ADAPTOR

SIZE (mm)	REFERENCE	
16x1/2"	MTA16050	PN 25
20x1/2"	MTA20050	
25x3/4"	MTA25075	
32x1"	MTA32100	
40x1-1/4"	MTA40125	
50x1-1/2"	MTA50150	
63x2"	MTA63200	

BRASS FEMALE THREADED ADAPTOR

SIZE (mm)	REFERENCE	
16x1/2"	FTA16050	PN 25
20x1/2"	FTA20050	
25x1/2"	FTA25075	
25x3/4"	FTA32100	
32x3/4"	FTA40125	
32x1"	FTA50150	
63x2"	FTA63200	

BRASS FEMALE THREADED TEE

SIZE (mm)	REFERENCE	
16x1/2"	FTT16050	PN 25
20x1/2"	FTT20050	
25x1/2"	FTT25050	
25x3/4"	FTT25075	
32x3/4"	FTT32075	
32x1"	FTT32100	
40x3/4"	FTT40075	
50x3/4"	FTT50075	
63x3/4"	FTT63075	

Product Range

STOP VALVE

SIZE (mm)	REFERENCE	
16	STVL0016	PN 25
20	STVL0020	
25	STVL0025	
32	STVL0032	

CONCEALED VALVE

SIZE (mm)	REFERENCE	
16	CONVL016	PN 25
20	CONVL020	
25	CONVL025	
32	CONVL032	

MONO CLIPS

SIZE (mm)	REFERENCE	
16	CLIP0016	PN 25
20	CLIP0020	
25	CLIP0025	
32	CLIP0032	

BRASS THREADED ELBOW

SIZE (mm)	REFERENCE	
16x1/2"	BEF16050	PN 25
20x1/2"	BEF20050	
25x1/2"	BEF25050	
25x3/4"	BEF25075	
32x3/4"	BEF32075	
32x1"	BEF32100	

Product Range

BRASS THREADED WALL MOUNTED ELBOW

SIZE (mm)	REFERENCE	
16x½"	WEF16050	PN 25
20x½"	WEF20050	
25x½"	WEF25050	
25x¾"	WEF25075	
32x¾"	WEF32075	
32x1"	WEF32100	

BLIND FLANGE

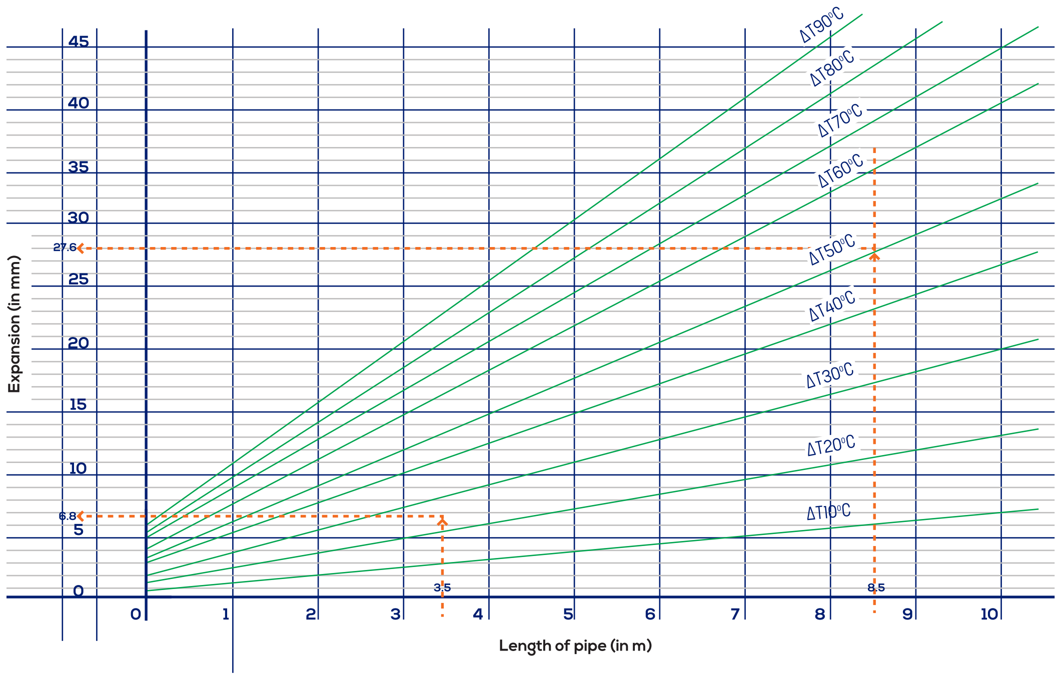
SIZE (mm)	REFERENCE	
75	BLFL0075	PN 16
90	BLFL0090	
110	BLFL0110	
160	BLFL0160	

THERMAL EXPANSION

The stressed development in FlowGuard™ CPCV are generally much slower than those developed in metal systems for equal temperature changes because of significant differences in elastic modulus. Therefore, expansion loop requirements are not significally different than those recommended for copper tubing.

Thermal expansion can be generally be accommodated at changes in direction. On a long straight run, an offest or loop based on the following chart is required.

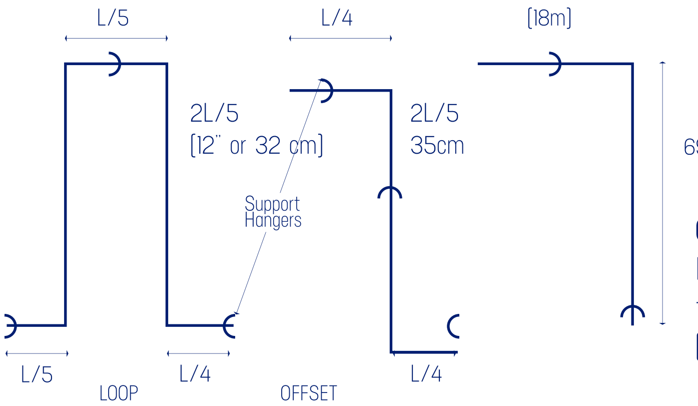
CPVC pipe expansion table



EXPANSION LOOP LENGTH (cm) FOR (44°C) TEMERATURE CHANGE					
Normal Pipe Size	Length of run in meters				
	6	12	18	24	30
20mm	43	56	69	79	86
25mm	48	66	81	91	104
32mm	53	74	91	104	117
40mm	58	81	102	117	130
50mm	63	89	109	127	142
63mm	71	102	124	145	163

CPVC pipe expansion loop calculation

Example:
Pipe size = 25mm
Length of run = 18m
L = 69 cm from table



CHANGE IN DIRECTION
Do not butt up against fixed structures (joist, stud, wall)

THERMAL EXPANSION & CONTRACTION

CPVC has a much lower thermal conductivity than metals used in piping systems (0.14 W/mK for CPVC versus >400 W/mK for copper). For this reason in most cases it is not necessary to thermally insulate CPVC piping. However the equation below can be used to calculate the approximate heat loss from CPVC pipes per 1 meter length of pipe.

$$Q/L = \frac{2.\Pi.\lambda\pi.\Delta T}{Ln\ (do/di)} \quad (1)$$

Q/L	Heat loss per meter of pipe, W/m
λ	Thermal conductivity, (W/mK) for CPVC, l = 0.14 W/mK
Π	3.14
di	Inside diameter, mm
do	Outside diameter, mm
ΔT	Temperature differential between inner and outer surface of pipe. This can be approximated to : T water - T ambient (K)

In fact, the outside pipe surface temperature is significantly different to T ambient. However, this will be ignored to facilitate comparison between CPVC and other materials.

CPVC PIPING IN WALLS

As pipe thermally expands tensile stresses will be developed. Concrete will contain the CPVC. Other materials may not, e.g plasterboard.

The developed tensile stress, σ, is given by the equation.

$$\sigma = C.\ \Delta T\ .E$$

C = Coefficient of thermal expansion.

ΔT = Temperature change.

E = Young modulus

This calculated developed tensile stress may be compared to the tensile strength of the sorrounding material (plasterboard, concrete, etc) to give an indication whether material will contain the pipe, or whether the pipe will crack the wall.

HANGERS AND SUPPORTS

Because FlowGuard™ CPVC tubing is rigid, it requires fewer supports than flexible plastic systems. The table below shows the required vertical and horizontal spacing of the hangers.

Piping should not be anchored tightly to supports, but rather be secured with smooth straps or hangers that allow for movement caused by expansion and contraction. Most hangers designed for metal pipes are suitable for FlowGuard CPVC Hangers should not have rough or sharp edges which come in contact with the tubing.

Horizontal / Vertical Spacer with appropriate Pipe Clamps for various temp.											
Pipe Size	16mm	20mm	25mm	32mm	40mm	50mm	63mm	75mm	90mm	110mm	160mm
Temp											
20°C	850	950	1050	1200	1350	1500	1700	2000	2000	2250	3000
30°C	800	925	1000	1200	1350	1500	1700	1900	1900	2100	2800
40°C	750	900	1000	1100	1300	1400	1650	1800	1800	1800	2700
50°C	725	875	950	1100	1300	1400	1650	1800	1700	1600	2550
60°C	700	850	950	1100	1300	1400	1650	1800	1600	1600	2520
70°C	665	800	900	1000	1200	1400	1550	1500	1500	1500	2340
80°C	600	750	850	1000	1150	1350	1550	1300	1300	1450	1550

EXPANSION LOOP - CEN PROPOSALS

$\Delta L = \Delta T \,.\, L \,.\alpha$

BA (bending arm) $C(Do \,.\, \Delta L)^{1/2}$

eg : for

$\Delta T = 50^\circ$ C

L = 20 m

Do = 25 mm

	CPVC	PP
ΔL =	70mm	150mm
BA =	1.42 m	1.84m

	CPVC	PPR
α	0.07	0.15
C	34	30

THERMAL INSULATION

K has been calculated below for DIN standard CPVC pipe (PN 16, 20 and 25)

Outside Diameter	K Value (W/mKs)		
16 - 160	PN16 (S=6.25) SDR 13.5	PN20 (S=5) SDR 11	PN25 (S=4) SDR 9
	5.5	4.4	3.5

SCALE BUILD UP

The Function of the roughness of pipe, as measured by Hazen-Williams 'C' factor used in Hazen-Williams formula for calculating friction head losses in piping systems.

Higher value for C → Less Friction
Less head loss

Material	C Factors	
	New	After 4-40 years service
CPVC	130 - 140	150
Copper / Steel	130 - 140	60 - 120

Once Corrosion attack stars (e.g green color from copper reacting with chlorides in water to roem copper chlorine), this starts a vicious circle leading to scale build up.

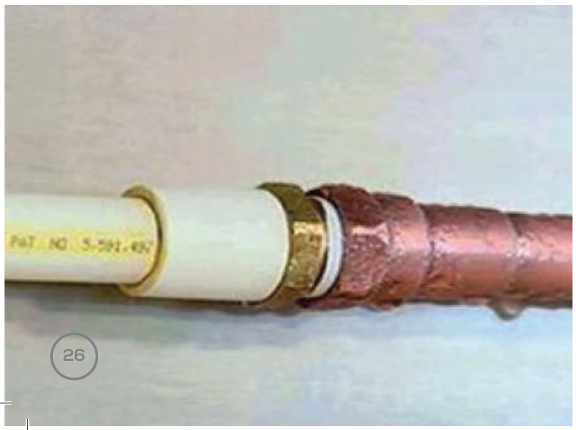
With CPVC, there is no corrosion and hence scale build-up is inhibited.

CONDENSATION

For a given ambient air temperature and water temperature in the pipe, the relative humidity must be 10 to 15 % higher with CPVC to get the same degree of condensation

or

For the same humidity level and water temperature, the external air temperature can be ± 10°C higher than for copper to get the same degree of condensation.



CPVC Versus Copper

CPVC AND CHILLER WATER SYSTEM

FlowGuard Tm CPVC pipe and fittings are acceptable for use with chilled water provided that the water stays above freezing point.

Particular care must be paid when other fluids or agents are used or added to the water:

1 Heat transfer fluids: Ethylene glycol, propylene glycol, and glycerine: see Lubrizol published recommendations.

For other products - please ask your Lubrizol representative.

2 Anti-corrosion agents may be used to protect the chiller system from corrosion. In general, corrosion inhibitors at their ordinary use concentrations are not detrimental to CPVC but please ask your Lubrozol representative for confirmation.

HEAT EXCHANGER SYSTEM :

Should be flushed out before connecting to CPVC piping. [The heat exchanger coil may have on its surface some metal forming oils or other types of lubricants left over the manufacturing process. Certain of these lubricants may be detrimental to CPVC and therefore need removing]

The refrigerant: is used in combination with an oil component in the compressor side of the chiller to provide cooling. As long as the heat exchanger coil remains intact, the refrigerant and associated oil should not come in contact with the CPVC piping. If the heat exchanger coils recirculating piping. Some types of refrigerants oils used may lead to failures of the CPVC re-circulating piping [e.g. POE oils can be highly detrimental]. Proper operation conditions and preventive maintenance of the chiller system can prevent such a repture.

WATER HAMMER

Pressure surge resulting from an instant change in velocity of the flowing water Governing equation is a modified version of Newton's speed of sound equation.
[velocity of propagation of elastic vibration]

VELOCITY = [YOUNGS MODULES / DENSITY] ½

"The maximum theoretical shockwave for both CPVC and Polybutylene is much lower than the values for copper tubing. This is easily understood when it is recognized that the modulus of elasticity for the plastic piping material is much lower than the modules of elasticity for copper."

Source: JB Engineering and code Consulting, P.C. Munster, IN | Water hammer control in small systems, October 18, 1994

QUIETER THAN COPPER

The velocity of sound in :
CPVC = 1350 M/S
COPPER = 3600 M/S
WATER = 1473 M/S

Based on classical approach [Newton] using Young's modules:

VELOCITY = [YOUNGS MODULES/DENSITY]'
This means that in a :

Copper System: Sound travel In the Copper
CPVC System: Sound travel in the water and system is as quiet as physically possible.

CPVC GLOBAL STANDARDS, CODES & APPROVALS

STANDARDS

- DIN-8079 Chlorinated polyvinyl chloride (PVC-C) pipes - Dimensions
- DIN-8080 Chlorinated polyvinyl chloride (PVC-C) pipes - General quality requirements, testing.
- ASTM D2846 CPVC Hot & Cold water distribution systems.
- STM D1784, Specification for Rigid Poly(Vinyl Chloride) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
- ASTM F437, Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80
- ASTM F439, Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80
- ASTM F441, Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 & 80
- ASTM F2855, Standard for CPVC/AI/CPVC • EN ISO 15877, Plastics piping systems for hot and cold water installations Chlorinated polyvinyl chloride) (PVC-C)
- AFNOR PVC-C Piping systems for hot and cold water installations
- BS 7291 / 4 Thermoplastics pipes and associated fittings for hot and cold water for domestic purposes and heating installations in buildings

PERFORMANCE STANDARDS & APPROVALS

- ASTM F493, Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings
- ASTM F656, Standard Specification for Primers for Use in Solvent Cement Joints in Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings
- NSF SE 8459 CPVC Schedule 40 & 80 Pipe and Fitting with High HDB at 180° F
- NSF Standard 14, Plastic Piping Components and Related Materials
- NSF Standard 61, Drinking Water System Components - Health Effects
- NSF SE16558 Performance Testing for DIN Standard CPVP Pipers

INSTALLATION STANDARDS

- ASTM D2855, Standard Practice for Making Solvent Cemented Joints and Poly(Vinyl Chloride) (PVC) Pipe and Fittings
- ASTM F402, Standard Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings

APPLICATION CODES

- UPC, Uniform Plumbing Code
- UMC, Uniform Mechanical Code .
- IBC, International Building Code
- IMC, International Mechanical Code
- IPC, International Plumbing Code
- NBCC, National Building Code of Canada
- CPC, Canadian Plumbing Code
- NSPC, National Standard Plumbing Code
- AFNOR, Association Francaise de Normalisation

GSAS COMPLIANCE

Considering the sustainability features shown earlier, our products may help in achieving the following GSAS Criteria:

SITES: [5]
[S.6] Rainwater runoff
The FBC products are suits for the application of Rainwater pipelines.

ENERGY: [E]
[E.2] Energy delivery performance
HVAC:
The FBC products can be used for chilled water systems with insulation because it has normal heat transfer rate compared to copper and cost is low.
DHW system:
The heat transfer rate for all the FBC products is lower than the copper. Hence it suits the application.

WATER: [W]
[w.1] Water Efficiency
The FBC products are related with carrying water to the thermal application. Hence the FBC products will not create any water reduction.

Materials: [M]
[M.1] Regional materials
The Plumbing components are not included in the material criteria. Hence it will not create any impact on rating system.
[M.2] Responsible sourcing of materials
The Plumbing components are not included in the materials criteria. Hence it will not create any impact on rating system.
[M.3] Recycled Materials
The plumbing components are not included in the materials criteria. Hence it will not create any impact on rating system.

[M.6] Design for disassembly
The Plumbing components are not included in the materials criteria. Hence it will not create any impact on rating system.

[M.7] Life Cycle Assessment
The FBC products are applicable to this criteria and Lubrizol needs to submit Environmental Product Declaration (EPD) letter.

Indoor Environment [1E]
[1E.9] Low Emitting Materials
The FBC products are applicable for plumbing systems and most of the elements are concealed in the wall or facing exterior. Hence the materials are need not to meet the compliance.

Cultural & Economic value [CE]
[CE.2] Support of National Economy
If the products are manufactured within the Qatar, FBC products may earn these criteria.

Sustainability:
The sustainable development is a process that seeks to meet the needs of the present generation without compromising the ability of future generations to meet their needs. This is often called intergenerational justice.

REFERENCES

RAYYAN STADIUM AND PRECINCT

MESAIEED POWER

HAMAD SIMULATION CENTRE

ENERGY CITY HEAD QUARTERS – LUSAIL


KATARA TOWERS, LUSAIL


EDUCATION CITY STADIUM


BARWA AFFORDABLE HOUSING


KAHRAMAA CUSTOMER CARE AND AMI CENTER

ORYX INTERNATIONAL SCHOOL – MESAIMEER


WORKERS HOSPITALS & HEALTH CENTER - MESAIEED


MANATEQ HEAD QUARTERS


GENERAL DIRECTORATE OF NEW PASSPORT OFFICE- MOI


AL BAYT STADIUM ENERGY CENTER

CERTIFICATIONS

Public Works Authority

24/4/2016 9:10 AM

2016/0008718/5

Date: 24/04/2016

AL Waab Plastics Factory
P.O. Box: - Doha,
Fax: 44937664

Subject: Your Submittal For CPVC Pipes and Fittings

With reference to your letter dated: 14th, February, 2016, regarding your request to accept flow guard CPVC pipes and its fittings produced in your factory in Ashghal projects.

Having examined your pre-qualification documents, material certificate reports, project references and brochures pertaining to your products of CPVC pipes, and after visiting your factory facilities in the industrial area, please be informed that "flow guard CPVC pipes and fittings" for hot and cold water systems produced in your factory are found satisfactory according Ashghal standards of QCS 2014.

Final approval of the products is subject to full compliance with the requirements of any particular project and specifications, as decided by our project engineers.

Please note that this letter of approval shall not incur any liability upon the Public Works Authority, or any obligation to purchase or procure such products from your factory, and that any required purchase or procurement will be according to the conditions and current procedures in the Public Works Authority.

Regards,

Mahdi Rashed A A Aldosari
Construction Engineering Advisor

Ministry of Interior
General Directorate of Logistics
Purchase Dept.

السادة / مصنع الوعب للبلاستيك المحترمين
فاكس رقم (44783634) الدوحة...
السلام عليكم ورحمة الله وبركاته ...

الموضوع : التسجيل بقوائم الموردين لدى وزارة الداخلية

بالإشارة للموضوع أعلاه ، وكتابكم الخاص بطلب منحكم إفادة بأنكم مسجلين ضمن الموردين لدى ادارة المشتريات بوزارة الداخلية .

نود إفادتكم بأن المصنع مسجل لدينا بقوائم الموردين .

وتفضلوا بقبول فائق الاحترام ...

ع/المقدم
خميس سيف المنصوري
مدير إدارة المشتريات

Qatar Sustainability Awards 2017

Together, let's build a sustainable tomorrow

Green Building Product Award

Awarded to

AL WAAB PLASTICS FACTORY

For

CPVC Pipes & Fittings

Certificate of Appreciation

This is to certify that

ALWAAB PLASTICS

has successfully received/completed the
Gulf Green Mark - Environmental Product Declaration (GGM-EPD) for the following products:

C - PVC Pipe products; diameter range from ½" to 2 ½"

March, 2017

Dr. Yousef Mohammed Alhorr
Founding Chairman

GORD

Ref: GORD/ LT10-16/608
Date: October 16, 2016

To whom it may concern

Alwaab Plastics has applied for the Gulf Green Mark- Environmental Product Declaration (GGM-EPD) for the following products:

- C-PVC Pipe products; diameter range from ½" to 2 ½"

The above-mentioned products can be used to claim GSAS scores as per M.7 Life Cycle criterion in GSAS Design & Build schemes.

Sincerely,

Dr. Yousef Al-Horr
Founding Chairman

KAHRAMAA
Qatar General Electricity & Water Corporation

To:	مصنع الوعب للبلاستيك	إلى:
From:	إدارة خدمات المشتركين	من:
Date:	2017/08/20 م 1438/11/27 هـ	التاريخ:
Our Ref.:	CS/674/2017	مرجعنا:
Subject:	اعتماد انابيب CPVC ومستلزماتها	الموضوع:

السادة/ مصنع الوعب للبلاستيك المحترم
ص.ب: 10009
فاكس: 44937664

تحية طيبة وبعد ...

يسر إدارة خدمات المشتركين بالمؤسسة العامة القطرية للكهرباء والماء (كهرماء) أن تهديكم أطيب تحياتها وبالإشارة للموضوع أعلاه، وإلى كتابكم المرفق بتاريخ 2017/07/06 , يرجى التكرم بالعلم انه تمت الموافقة على طلبكم باستخدام هذا النوع من الانابيب في التمديدات الداخلية للمباني والمنشآت (للتمديدات الداخلية) وذلك من غير تحديد الأقطار كما هو الحال مع باقي المواد في كتيب التمديدات الداخلية كهرماء.

وتفضلوا بقبول فائق الشكر،

م. يوسف أحمد الجيدة
مدير إدارة خدمات المشتركين

NSF International
789 N. Dixboro Road, Ann Arbor, MI 48105 USA

RECOGNIZES

Al Waab Plastics Factory
Facility: Doha, Qatar

AS COMPLYING WITH NSF/ANSI 14 AND ALL APPLICABLE REQUIREMENTS. PRODUCTS APPEARING IN THE NSF OFFICIAL LISTING ARE AUTHORIZED TO BEAR THE NSF MARK.

WRAS APPROVED MATERIAL

Approval Number: 1611517
Test Report: M106217/A

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

22nd November 2016

Al Waab Plastics Factory
PO Box 10009,
Street 47,
Gate 4,
East Industrial Area,
Doha,
Qatar

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.

POLYVINYLCHLORIDE (PVC, PVC-U AND CPVC) - COMPONENTS - ONLY LEAD FREE PVC-U LISTED IN THIS SECTION. 5300

'FlowGuard™'. Tan coloured, extruded CPVC pipe. For use with water up to 85°C.

APPROVAL NUMBER: 1611517
APPROVAL HOLDER: AL WAAB PLASTICS FACTORY

The Scheme reserves the right to review approval.
Approval 1611517 is valid between November 2016 and November 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

AL WAAB PLASTICS

CPVC PIPES & FITTINGS FOR
HOT & COLD WATER DISTRIBUTION SYSTEMS

AL WAAB PLASTICS
P.O. Box No : 14918
Gharaffa DOHA-QATAR
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fax:44937664
web:www.alwaabplastics.com
email:info@alwaabplastics.com