GULF PLAS SINCE 1968

مصـــانـع بلاستيك الخلـيج ذ.م.م.
Gulf Plastic Industries W.L.L.

Quality Without Compromise

ISO 9001
BUREAU VERITAS
Certification
Excluding Design
UKAS
QUALITY MANAGEMENT
008

GULF PLAS
SINCE 1968

مصـــانـع بلاستيك الخلـيج ذ.م.م.
Gulf Plastic Industries W.L.L.

P.O BOX: 894, MANAMA
BAHRAIN INTERNATIONAL INVESTMENT PARK
HIDD INDUSTRIAL AREA
KINGDOMOF BAHRAIN
TEL: +973 17677757
FAX: +973 17670695

Sales Department
Tel: +973 17677832
Fax: +973 17670514
Email: gpisales@batelco.com.bh

Business Development Department
Tel: +973 17677829
Fax: +973 17670619
Email: gpibddoff@batelco.com.bh

Purchasing Department
Tel: + 973 17677830
Fax: +973 17670574
Email: gpigmoff@batelco.com.bh

Associate Company:
PLASTIC PRODUCT ESTABLISHMENT, K.S.A
TEL: +966 3 8980244
Fax: +966 3 8985097
Email: ppeksa@gulfplas.com.sa
gulfplasksa@hotmail.com

Contents

Company Profile

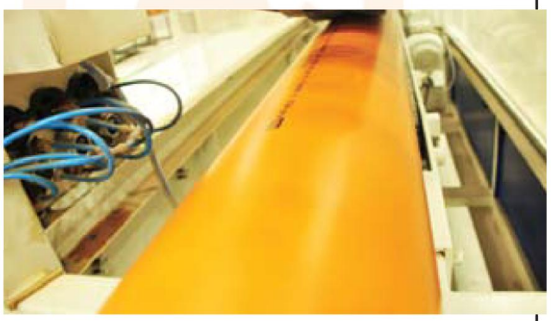
History of Excellence

Gulf Plastic Industries W.L.L., (GULFPLAS) incorporated in 1968 is one of the first industrial ventures established in Bahrain to manufacture thermoplastic pipes & fittings. We manufacture u-PVC, CPVC, PP-R, LDPE, HDPE pipes to internationally recognized standards including BS, ASTM, DIN, NEMA, AS and ISO recommendations.

The company is the first plastic processors established in the Middle East and it is presently located in Bahrain International Investment Park with a total industrial plot area of 30,000m2.

Since its foundation in 1968, GPI has continuous process of increasing its production capacity by adding more production lines to meet its customer's requirements. After the recent successful commissioning of new Polypropylene (PP-R) pipes extrusion line, now we are glad to introduce new extrusion line to manufacture various sizes of MDPE & HDPE (High Density Polyethylene pipes).

GULFPLAS; is in the foremost of plastic technology and strives to retain this position. Quality has always been a cornerstone of our products and it's tested locally as well as in the UK, USA and Kuwait.



History of Excellence

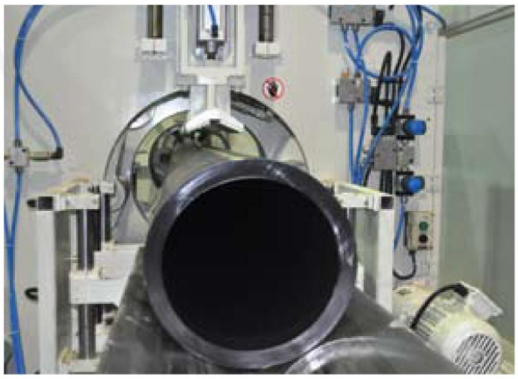
The company takes pride in having participated in various infrastructure, housing and communication projects in Bahrain and its latest are Khalifa Bin Salman Hidd Port & Bahrain International Investment Park, Durrat Al-Bahrain, Amwaj Island, Bahrain Financial Harbor, City Garden, Bahrain World Trade Centre, Al Areen Water Park.

The major share of GULFPLAS products are exported (70%) to various neighboring countries such as K.S.A., Qatar, Kuwait, U.A.E., Jordan, Yemen, Oman, Pakistan and India and the balance 30% has supplied to the local market. The company has a strong presence in the Kingdom of Saudi Arabia through its Associate Company – Plastic Products Establishment, based at Al-Khobar.

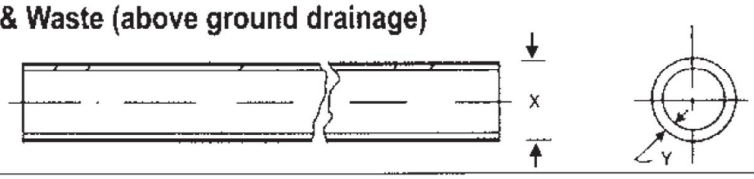
The company consists of more or less 130 highly qualified professionals and skilled workers among them are 56% are Bahraini and 44% are expatriates. GULFPLAS proficient management team is head by Mr. Salman Ramadhan – General Manager.

GULFPLAS got the prestigious ISO 9002:1994 Certificate in February, 2000 and later upgraded to ISO 9001: 2000 in October 2006.

For further information, you may visit our website: www.gulfplas.com



1.1 uPVC Soil & Waste (above ground drainage)



Soil Pipe – BS 4514				
Nominal Size mm	Outside Diameter (X) mm		Wall Thickness (Y) mm	
	Minimum	Maximum	Minimum	Maximum
82 (3")	82.4	82.8	3.2	3.8
110 (4")	110.0	110.4	3.2	3.8
160 (6")	160.0	160.6	3.2	3.8

Waste Pipe – BS 5255				
Nominal Size mm	Outside Diameter (X) mm		Wall Thickness (Y) mm	
	Minimum	Maximum	Minimum	Maximum
32 (1 ¼")	36.15	36.45	1.8	2.2
40 (1 ½")	42.75	43.05	1.9	2.3
50 (2")	55.75	56.05	2.0	2.4

Note: Can be manufactured from MuPVC

Waste Pipe – Cold Water				
Nominal Size mm	Outside Diameter (X) mm		Wall Thickness (Y) mm	
	Minimum	Maximum	Minimum	Maximum
32 (1 ¼")	36.15	36.45	1.8	2.2
40 (1 ½")	42.75	43.05	2.3	2.8
50 (2")	55.75	56.05	2.4	2.9

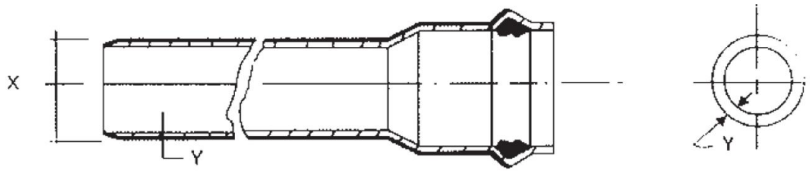
Note: Can be manufactured on customer's request out of uPVC or MuPVC

Manufactured to : BS 4514 - Soil Pipe
: BS 5255 - Waste Pipe
Standard Length : 4, 5.8 & 6 metres
Colour : Grey
Socket type : Solvent weld
: Plain-end

Note:

1. Nominal size pipes of 4" and 6" soil are metric (110mm and 160mm respectively) and fully compatible with metric plumbing systems.
2. Non-standard lengths and colours can be manufactured to meet customer's requirements.
3. A wide range of compatible fittings manufactured to BS 4514 & BS 5255 by Geberit Terrain Ltd of U.K., are available at Gulf Plastic Industries W.L.L.

1.2 uPVC Underground & Sewer Pipe



BS 4660				
Nominal Size mm	Outside Diameter (X) mm		Wall Thickness (Y) mm	
	Minimum	Maximum	Minimum	Maximum
110 (4")	110.0	110.4	3.2	3.8
160 (6")	160.0	160.6	4.1	4.8

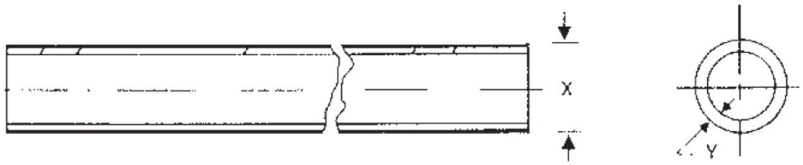
BS 5481				
Nominal Size mm	Mean Outside Diameter (X) mm		Wall Thickness (Y) mm	
	Minimum	Maximum	Minimum	Maximum
200	200.0	200.6	4.9	5.6
250	250.0	250.7	6.1	7.0
315	315.0	315.9	7.7	8.7
400	400.0	401.0	9.8	11.0

Manufactured to : BS 4660 - (110) 4", (160) 6"
: BS 5481
Standard length : 5.8 & 6 metres
Colour : Golden Brown
Socket type : Solvent weld, Rubber Seal Ring & Plain-end

Note:

1. All commonly used dimensions normally ex-stock delivery for other sizes on request.
2. A wide range of compatible fittings manufactured to DIN 19534 by REDI ITALY are available.
3. A wide range of compatible fittings manufactured to BS 4660 by Geberit Terrain Ltd of U.K.., is available.

1.3 uPVC Electrical Conduit



BS 6099 – uPVC CONDUIT						
Nominal Size mm	Minimum Inside Diameter (X) mm			Maximum Wall Thickness (Y) mm		
	Light	Medium	Heavy	Light	Medium	Heavy
20	17.4	16.9	15.8	1.30	1.55	2.1
25	22.1	21.9	20.6	1.45	1.80	2.2
32	28.6	27.8	26.6	1.70	2.10	2.7
50	45.1	44.3	43.2	2.45	2.85	3.4

Manufactured to : BS 6099
Standard length : 2.9 metres / 3 metres
Colour : Black or white
Socket : Solvent weld

Note :

1. Non-standard lengths and colours can be manufactured to meet customer's exact requirements.

2. Electrical conduit 38mm, wall thickness 2.1mm is also available.

1.4 uPVC Pressure (water supply, irrigation & industrial use)

Nominal Size Inch	Outside Diameter mm		Wall Thickness (mm)													
			Class 'B'		Class 'C'		Class 'D'		Class 'E'		Class 'O'		Class '6'		Class '7'	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
½	21.2	21.5							1.7	2.1			2.8	3.3	3.7	4.3
¾	26.6	26.9							1.9	2.5			2.9	3.4	3.9	4.5
1	33.4	33.7							2.2	2.7			3.4	4.0	4.5	5.2
1 ¼	42.1	42.4					2.2	2.7	2.7	3.2			3.6	4.2	4.8	5.5
1 ½	48.1	48.4					2.5	3.0	3.1	3.7	1.8	2.2	3.7	4.3	5.1	5.9
2	60.2	60.5			2.5	3.0	3.1	3.7	3.9	4.5	1.8	2.2			5.5	6.3
2 ½	75.0	75.3			3.0	3.5	3.9	4.5	4.8	5.5	1.8	2.2				
3	88.7	89.1	2.9	3.4	3.5	4.1	4.6	5.3	5.7	6.6	1.8	2.2				
4	114.1	114.5	3.4	4.0	4.5	5.2	6.0	6.9	7.3	8.4	2.3	2.8				
6	168.0	168.5	4.5	5.2	6.6	7.6	8.8	10.2	10.8	12.5	3.1	3.7				
8	218.8	219.4	5.3	6.1	7.8	9.0	10.3	11.9	12.6	14.5	3.1	3.7				

Pressure ratings : Designated by the different classes at 20°C

Class	'B'	'C'	'D'	'E'	'O'
Bar	6	9	12	15	Non Pressure

Note : 2% of rated pressure should be reduced for each 1°C rise above 20°C

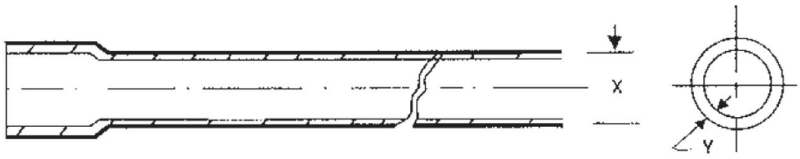
Pressure Rating Bar		
Size-inch	Class '6'	Class '7'
½	28	40
¾	22	32
1	24	32
1 ¼	20	28
1 ½	18	25
2	-	22

Manufactured to : BS 3505 / 3506 Classes B, C, D & E, BS 3506, 1969 Classes O, 6 & 7
Standard length : 5.8 and 6 metres
Colour : Dark grey (except Class O which is white & Class B in black)
Socket : Solvent weld
: Plain-end

Note:

1. A wide range of compatible fittings manufactured to BS 4346 part 1 by Durapipe (U.K) are available
2. Class D pipes are non-stock items, can be produced on request.

1.5 uPVC Electrical & Telephone Duct



BTC/1006/DUCT – 1994							
Sl. No.	Duct No.	Outside Diameter of Duct (mm)	Wall Thickness (mm)	Inside Diameter of Socket at Entry (mm)	Inside Diameter of Socket at Shoulder (mm)	Socket Length (mm)	Effective Duct Length Metres
1.	D96	96.5 ± 0.2	3.25 ± 0.2	97 ± 0.1	96 ± 0.1	100	6
2.	D56	53.9 ± 0.1	2.0 ± 0.1	54.1 ± 0.1	53.7 ± 0.1	70	3
3.	38mm	38.0 ± 0.1	2.0 ± 0.1	38.2 ± 0.1	37.8 ± 0.1	40	3

ETISALAT							
Sl. No.	Duct No.	Outside Diameter of Duct (mm)	Wall Thickness (mm)	Inside Diameter of Socket at Entry (mm)	Inside Diameter of Socket at Shoulder (mm)	Socket Length (mm)	Effective Duct Length Metres
1.	54D	96.5 ± 0.2	3.25 ± 0.4	97 ± 0.1	96 ± 0.1	100	6
2.	56	53.9 ± 0.1	1.55 ± 0.15	54.1 ± 0.1	53.9 ± 0.1	70	3

Q – TEL MAT 1010							
Sl. No.	Duct No.	Outside Diameter of Duct (mm)	Wall Thickness (mm)	Inside Diameter of Socket at Entry (mm)	Inside Diameter of Socket at Shoulder (mm)	Socket Length (mm)	Effective Duct Length Metres
1.	54D	96.5 ± 0.2	3.25 ± 0.2	97 ± 0.1	96 ± 0.1	100	5.8
2.	56A	56.5 ± 0.2	3.25 ± 0.2	57 ± 0.1	56 ± 0.1	70	3

1.6 Polyethylene Pipe (for cold water sypply & irrigation)

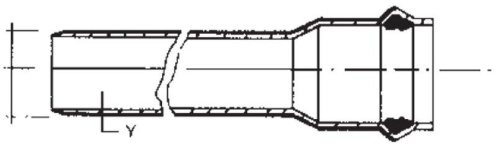
Polyethylene Pipe BS 1972 : 1967							
Nominal Size Inch	Outside Diameter (mm)		Wall Thickness (mm) Class 'B' (86.7 PSI)		Wall Thickness (mm) Class 'C' (130 PSI)		Standard Coil Length
	Min	Max	Min	Max	Min	Max	
½	21.2	21.5			2.7	3.0	90
¾	26.6	26.9			3.4	3.7	90
1	33.4	33.7	3.0	3.3	4.2	4.6	90
1¼	42.1	42.5	3.7	4.1	5.3	5.8	50 / 100
1½	48.1	48.5	4.3	4.7	6.1	6.7	50 / 150
2	60.1	60.6			7.6	8.4	50 / 150

Colour : Black

Note:

1. British Standard 1972 : 1967 applies to black polyethylene pipe (Type 32) for use in cold water services and irrigation systems.
2. Non-standard lengths can be manufactured to meet customer's exact requirements.
3. Polyethylene pipes of Class C normally available in stock.
4. Polyethylene pipes of Class B can be manufactured on special request.

2.1 uPVC Drain Pipe (above ground)



DIN 19531				
Nominal Size mm	Mean Outside Diameter (X) mm		Wall Thickness (Y) mm	
	Minimum	Maximum	Minimum	Maximum
40	40.0	40.2	1.8	2.2
50	50.0	50.2	1.8	2.2
75	75.0	75.3	1.8	2.2
110	110.0	110.3	2.2	2.7
160	160.0	160.4	3.2	3.8

Manufactured to : DIN 19531
Standard Length : 4, 5.8 & 6 metres
Colour : Grey
Socket Type : Plain-end, Solvent Weld or Rubber Seal Ring (75mm and above)

Note:
All commonly used dimensions normally available, delivery for other sizes on request.

2.2 uPVC Pressure Pipe

uPVC Pipe DIN 8061 / 62:19532												
Nominal Size mm	Outside Diameter		Series									
			1		2		3		4		5	
			W.T.		W.T.		W.T.		W.T.		W.T.	
	Min mm	Max mm	Min mm	Max mm	Min mm	Max mm	Min mm	Max mm	Min mm	Max mm	Min mm	Max mm
20	20	20.2									1.5	1.9
25	25	25.2							1.5	1.9	1.9	2.3
32	32	32.2							1.8	2.2	2.4	2.9
40	40	40.2					1.8	2.2	1.9	2.3	3.0	3.5
50	50	50.2					1.8	2.2	2.4	2.9	3.7	4.3
63	63	63.2					1.9	2.3	3.0	3.5	4.7	5.4
75	75	75.3			1.8	2.2	2.2	2.7	3.6	4.2	5.6	6.4
90	90	90.3			1.8	2.2	2.7	3.2	4.3	5.0	6.7	7.6
110	110	110.3	1.8	2.2	2.2	2.7	3.2	3.8	5.3	6.1	8.2	9.3
160	160	160.4	1.8	2.2	3.2	3.8	4.7	5.4	7.7	8.7	11.9	13.3
200	200	200.4	1.8	2.2	4.0	4.6	5.9	6.7	9.6	10.8	14.9	16.6
225	225	225.5	1.8	2.2	4.5	5.2	6.6	7.5	10.8	12.1	16.7	18.6
250	250	250.5	2.0	2.4	4.9	5.6	7.3	8.3	11.9	13.3	18.6	20.7
280	280	280.6	2.3	2.8	5.5	6.3	8.2	9.3	13.4	15.0	20.8	23.1
315	315	315.6	2.5	3.0	6.2	7.1	9.2	10.4	15.0	16.7	23.4	26.0
400	400	400.7	3.2	3.8	7.9	8.9	11.7	13.1	19.1	21.3	29.7	32.9

Pressure rating at 20°C

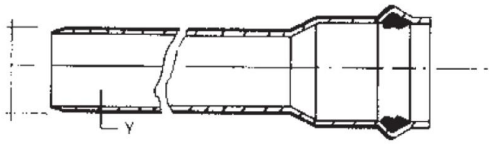
Pipe Series	1	2	3	4	5
Bar	-	4	6	10	16

Manufactured to : DIN 8061 / 62
Standard Length : 5.8 & 6 metres
Colour : Grey / Dark Grey
Socket Type : Solvent Weld or Rubber Seal Ring Produced on request

Note:

1. Non-standard lengths and colours can be manufactured to meet customer's exact requirements.
2. All commonly used dimensions normally available, delivery for other sizes on request.

2.3 uPVC Sewer Pipe (gravity)



Nominal Size mm	Outside Diameter (X) mm		DIN 19534 Wall Thickness (Y) mm	
	Minimum	Maximum	Minimum	Maximum
110	110.0	110.3	3.0	3.5
160	160.0	160.4	3.6	4.2
200	200.0	200.4	4.5	5.2
250	250.0	250.5	6.1	7.0
315	315.0	315.6	7.7	8.7
400	400.0	400.7	9.8	11.0

Manufactured to : DIN 19534
Standard Length : 5.8 & 6 metres
Colour : Golden brown
Socket Type : Solvent Weld or Rubber Seal Ring

Note:

1 All commonly used dimensions normally available, delivery for other sizes on request.
2 A wide range of compatible fittings manufactured to EN 1401, by REDI of Italy are available.

2.4 CPVC Pipe for Elevated Temperature

The specification covers chlorinated polyvinyl chloride (CPVC) pipe made for water distribution at elevated temperature.

DIN 8079 / 8080						
Nominal Size mm	Outside Diameter (mm)		Wall Thickness (mm)		Pressure Rating Bars*	
	Minimum	Maximum	Minimum	Maximum	At 20°C	At 80°C
20	20.00	20.20	2.30	2.80	25.00	6.20
25	25.00	25.20	2.80	3.30	25.00	6.20
32	32.00	32.20	2.40	2.90	16.00	4.00
32	32.00	32.20	3.60	4.20	25.00	6.20
50	50.00	50.20	3.70	4.30	16.00	4.00
63	63.00	63.20	4.70	5.40	16.00	4.00

* 1 Bar = 14.50 P.S.I.

Manufactured to : DIN 8079 / 8080
Standard Length : 4 metres
Colour : Cream

3.1 uPVC Soil, Waste & Vent Pipes

AS 1415				
Nominal Size mm	Outside Diameter (mm)		Wall Thickness (mm)	
	Minimum	Maximum	Minimum	Maximum
32 (1¼")	36.2	36.5	2.1	2.4
40 (1½")	42.8	43.1	2.3	2.6
50 (2")	55.7	56.0	2.4	2.7
80 (3")	82.3	82.7	3.0	3.4

Manufactured to : AS 1415
Standard Length : 4, 5.8 & 6 metres
Colour : Grey
Socket Type : Solvent Weld

Note :

1. Compatible fittings manufactured to BS 4514 & BS 5255 by Geberit Terrain Ltd. of UK are available.

4.1 uPVC Electrical Conduit & Tubing and Utilities Duct

These Standards specify unplasticised uPVC polyvinyl chloride utilities duct for underground installation for telecommunications and electrical wire & cable. They also specify electrical plastic conduit and tubing for above and underground use.

Conduit Tubing NEMA TC - 2

Nominal Size inch	Outside Diameter (mm)		Wall Thickness (mm)					
			EPT		EPC 40		EPC 80	
	Min	Max	Min	Max	Min	Max	Min	Max
½	21.24	21.44	1.52	2.03	2.77	3.28	3.73	4.24
¾	26.57	26.77	1.52	2.03	2.87	3.38	3.91	4.42
1	33.27	33.53	1.52	2.03	3.38	3.89	4.55	5.08
1 ¼	42.03	42.29	1.78	2.29	3.56	4.06	4.85	5.43
1 ½	48.11	48.41	2.03	2.54	3.68	4.19	5.08	5.69
2	60.17	60.47	2.54	3.05	3.91	4.42	5.54	6.20
2 ½	72.84	73.20	2.79	3.30	5.16	5.77	7.01	7.85
3	88.70	89.10	3.18	3.68	5.49	6.15	7.62	8.53
4	114.07	114.53	3.81	4.32	6.02	6.73	8.56	9.58
6	168.00	168.56	-	-	7.11	7.98	10.97	12.29

PVC Utilities Duct, NEMA TC - 6 and NEMA TC - 8

Nominal Size inch	Outside Diameter (mm)		Minimum Wall Thickness (mm)			
			TC - 6		TC - 8	
	Minimum	Maximum	EB	DB	EB	DB
1	32.27	33.53	-	-	-	1.52
1 ½	48.11	48.41	-	-	-	1.52
2	60.17	60.47	1.52	1.52	1.52	1.96
3	88.70	89.10	1.55	2.34	1.93	3.00
4	114.07	114.53	2.08	3.07	2.54	3.91
6	168.00	168.56	3.18	4.62	3.86	5.77

Manufactured to : NEMA TC-2, NEMA TC-6 and NEMA TC-8
Standard Length : 5.8 & 6 metres
Colour : Grey
Socket Type : Solvent Weld

Note :

1 EPT (Electrical Plastic Tubing) - To be encased in concrete.
EPC-40 (Electrical Plastic Conduit) - For direct burial underground.
EB (Encased Burial) - To be encased in concrete.
DB (Direct Burial) - For direct burial underground.

2 Nominal Sizes from 1/2 in. to 1 1/2 in. - Plain end.
Nominal Sizes from 2 in. - One end with solvent weld socket.

3 These sizes are non-stock items. Can be produced on special request only.

5.1 ASTM D 1785, ASTM D 2665

The specification ASTM D 1785-88 covers unplasticised polyvinyl chloride (PVC) pipes, made in SCH-40 and 80 for water distribution and irrigation systems.

The specification ASTM D 2665-88 covers unplasticised polyvinyl chloride (PVC) pipe for Drain, Waste and Vent applications.

Nominal Size inch	Outside Diameter (mm)		Wall Thickness (mm)					
			ASTM D 1785 Schedule 40		ASTM D 1785 Schedule 80		ASTM D 2665 (Drain, Waste, Vent)	
	Min	Max	Min	Max	Min	Max	Min	Max
½	21.24	21.44	2.77	3.28	3.73	4.24	-	-
¾	26.57	26.77	2.87	3.38	3.91	4.42	-	-
1	33.27	33.53	3.38	3.89	4.55	5.08	-	-
1 ¼	42.03	42.29	3.56	4.07	4.85	5.43	3.56	4.07
1 ½	48.11	48.41	3.68	4.19	5.08	5.69	3.68	4.19
2	60.17	60.47	3.91	4.42	5.54	6.20	3.91	4.42
2 ½	72.84	73.20	5.16	5.77	7.01	7.85	-	-
3	88.70	89.10	5.49	6.15	7.62	8.53	5.49	6.15
4	114.07	114.53	6.02	6.73	8.56	9.58	6.02	6.73
6	168.00	168.56	7.11	7.97	10.97	12.29	7.11	7.97
8	218.70	219.46	8.18	9.17	12.70	14.22	8.18	9.17

Pressure rating at 23°C

	Pressure Rating (P.S.I)											
Size (inch)	½	¾	1	1 ¼	1 ½	2	2 ½	3	4	5	6	8
SCH 40	600	480	450	370	330	280	300	260	220	190	180	160
SCH 80	850	690	630	520	470	400	420	370	320	290	280	250

Manufactured to : ASTM D 1785-88 SCH 40, 80 and ASTM D 2665
Standard Length : 4, 5.8 & 6 metres
Colour : SCH 40 - White, SCH 80 - Dark Grey, ASTM D 2665 - White
Socket Type : Solvent Weld
Plain-end

Note:
The pipes will be manufactured as PVC - 1120

5.2 ASTM D 2241

The specification covers unplasticised polyvinyl chloride (PVC) pressure rated pipes (SDR-Series)

Nominal Size inch	Outside Diameter mm		Wall thickness (mm)											
			Standard Dimension Ratio (SDR)											
			41		32.5		26		21		17		13.5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
½	21.24	21.44											1.57	2.08
¾	26.57	26.77							1.52	2.03	1.57	2.08	1.98	2.49
1	33.27	33.53					1.52	2.03	1.60	2.11	1.96	2.46	2.46	2.97
1 ¼	42.03	42.29			1.52	2.03	1.63	2.13	2.01	2.52	2.49	3.00	3.12	3.63
1 ½	48.11	48.41			1.52	2.03	1.85	2.36	2.29	2.80	2.84	3.35	3.58	4.09
2	60.17	60.47			1.85	2.36	2.31	2.82	2.87	3.38	3.56	4.06	4.47	4.98
3	88.70	89.10	2.16	2.67	2.74	3.25	3.43	3.94	4.24	4.75	5.23	5.87	6.58	7.37
4	114.07	114.53	2.80	3.30	3.51	4.01	4.39	4.90	5.44	6.10	6.73	7.54	8.46	9.47
6	168.00	168.56	4.11	4.62	5.18	5.79	6.48	7.26	8.03	9.00	9.91	11.10	12.47	13.97
8	218.70	219.46	5.33	5.97	6.73	7.54	8.43	9.45	10.41	11.66	12.90	14.45		

Pressure rating at 23°C

Pipe-SDR	41	32.5	26	21	17	13.5
Rating – p.s.i	100	125	160	200	250	315

Manufactured to : ASTM D 2241-88
Standard Length : 5.8 & 6 metres
Colour : White
Socket Type : Solvent Weld

Note :
The pipes will be manufactured as PVC - 1120

$$SDR = \frac{\text{Outside Diameter}}{\text{Minimum Wall Thickness}}$$

5.3 CPVC Pipes for Elevated Temperature

The specification covers chlorinated polyvinyl chloride (CPVC) pipe made for water distribution at elevated temperatures

ASTM F-441						
Nominal Size Inch	Outside Diameter (mm)		Wall thickness (mm)			
			SCH 80		SCH 40	
	Min	Max	Min	Max	Min	Max
½	21.20	21.40	3.73	4.24	2.77	3.28
¾	26.60	26.70	3.91	4.42	2.87	3.38
1	33.27	33.53	4.55	5.08	3.38	3.89
1 ¼	42.07	42.33	4.85	5.43	3.56	4.07
1 ½	48.15	48.45	5.08	5.69	3.68	4.19
2	60.15	60.45	5.54	6.20	3.91	4.42
2 ½	72.84	73.20	7.01	7.85	5.16	5.77
3	88.70	89.10	7.62	8.53	5.49	6.15
4	114.07	114.53	8.56	9.58	6.02	6.73
6	168.02	168.58	10.97	12.29	7.11	7.97
8	218.72	219.48	12.70	14.22	8.18	9.17
10	272.67	273.43	15.06	16.86	9.27	10.39
12	323.47	324.23	17.45	19.53	10.31	11.55
14	355.22	355.98	19.05	21.34	11.10	12.45
16	405.92	406.88	21.14	23.71	12.70	14.22

Manufactured to : ASTM F-441
Standard Length : 6 mtres
Colour : Grey

Pressure rating at 23^{O}C & 83^{0}C

Pressure Rating (P.S.I)																
Size (inch)	½	¾	1	1 ¼	1 ½	2	2 ½	3	4	5	6	8	10	12	14	16
SCH 40	600	480	450	370	330	280	300	260	220	190	180	160	140	130	130	130
SCH 80	850	690	630	520	470	400	420	370	320	290	280	250	230	230	220	220

Temperature De-Rating Factors - CPVC Pipe
To be applied to 73.4^{O}F working

Pressures with water for SCH 40 & 80 CPVC Pipe.

Working Temperature (^{o}F)	D-Rating Factor
73	1.00
110	0.72
120	0.65
130	0.57
140**	0.50
150**	0.42
160**	0.40
170**	0.29
180**	0.25
200**	0.20

**Pipe should not be threaded. Use flanged joints, unions, or victaulic rolled groove couplings where disassembly is necessary. Operating temperatures above 140^{O}F for PVC and 200^{O}F for CPVC are not recommended.

GPI S 101 – Sewerage and Underground Pipe						
Nominal Size (mm)	Outside Diameter (mm)		Wall Thickness (mm)			
			Series 1		Series 2	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
110 (4")	110.0	110.4	2.2	2.7	4.0	4.6
114 (4")	114.1	114.5	2.8	3.3	5.0	5.7
160 (6")	160.0	160.6	2.5	3.0	4.0	4.6
168 (6")	168.0	168.5	3.0	3.5	-	-

Manufactured to : Local standards
Standard Length : 5.8 metres
Colour : Grey / Golden Brown / White
Socket Type : Non-socket end Solvent Weld & Gasket socketed

GPI S 102 – Cable and Duct Pipe								
Nominal Size (mm)	Outside Diameter (mm)		Wall Thickness (mm)					
			Series 1		Series 2		Series 3	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
75	75.0	75.3	1.6	2.2	-	-	-	-
82 (3")	82.4	82.8	2.2	2.7	-	-	-	-
110 (4")	110.0	110.4	1.8	2.4	2.5	3.0	4.0	4.6
160 (6")	160.0	160.6	2.5	3.0	3.1	3.6	-	-
200	200.0	200.6	-	-	4.5	5.2	-	-
250	250.0	250.7	4.90	5.60	6.1	7.0	7.3	8.3

Manufactured to : Local Standards
Standard Length : 5.8 metres
Colour : Grey / Black
Socket Type : Non-socket end Solvent Weld

GPI S 103 – Polyethylene Pipe (Inch Series)					
Nominal Size (mm)	Class	Outside Diameter (mm)		Wall Thickness	
		Minimum	Maximum	Minimum	Maximum
½" LG	Irrigation	15.8	16.0	1.2	1.4
½"	Irrigation	15.8	16.0	1.4	1.6
5/8" NG	Normal Gauge	19.8	20.0	2.0	2.4
¾" HG	Heavy Gauge	27.5	28.2	4.3	4.8
1" HG	Heavy Gauge	33.8	34.6	4.3	4.8

Manufactured to : Local standards
Standard Length : 50/90/200/250 metres coil
Colour : Black

GPI S 104 – Polyethylene Pipe (Metric Series)								
Nominal Size (mm)	Outside Diameter (mm)		Wall Thickness (mm)					
			Series 1		Series 2		Series 3	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
20	20.0	20.3	-	-	-	-	27	3.0
25	25.0	25.3	-	-	1.7	2.0	3.4	3.7
32	32.0	32.3	1.8	2.1	2.5	3.0	4.2	4.6
40	40.0	40.4	-	-	-	-	-	-
50	50.0	50.5	-	-	-	-	6.1	6.7
60	60.0	63.6	-	-	-	-	7.6	8.4

Manufactured to : Local standards
Standard Length : 50/100/150 metres coil
Colour : Black

GPI S 105 – Conduit Pipe						
Nominal Size (mm)	Outside Diameter (mm)		Wall Thickness (mm)			
			Series 1		Series 2	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
20	19.7	20.0	1.2	1.5	1.3	1.6
25	24.6	25.0	1.3	1.5	1.6	1.9
32	31.6	32.0	1.8	2.1	2.2	2.5
38	37.6	38.0	2.1	2.6	-	-
50	49.5	50.0	1.8	2.2	2.3	2.7

Manufactured to : Local standards
Standard Length : 2.9 or 3.0 metres
Colour : Black / White
Socket Type : Plain end or Solvent Weld

1. Jointing Procedure

1.1 Jointing Elastomeric Gasket

1. Collect the appropriate materials.
2. Clean chamfered end of pipe and socket.
3. Insert gasket.
4. If no depths of entry are marked, mark the spigot end for the full socket length less 6mm (to allow for thermal movement.
5. Lubricate evenly around the spigot.
6. Align pipes or fittings so the leading edge is just engaging the socket mouth and push spigot to the depth of the entry mark. Do not try to insert spigot at an angle.

1. Jointing Procedure

1.2 Using Solvent Cement

1. Jointing Procedure

1.2 Using Solvent Cement

1. Cut the pipe square using a fine pitch hand saw.
2. To remove burrs use a medium file. The end of the pipe must be chamfered with a 2mm x 45° average chamfer.
3. The pipe and fitting should be marked. This will help determine proper penetration of pipe into socket.
4.5.6. Lightly abrade pipe and fitting, then clean the contacting surfaces thoroughly by using a clean rag and cleaning fluid.
7. Apply sufficient Solvent Cement to pipe and fitting using a clean brush. The number of coats needed will vary depending on the diameter of pipe and fitting. About one or two coats are usually needed.
8. Assemble joint immediately. Avoid twisting and hold the pipe and fitting together for 15 seconds for 1/2" & 60 seconds for 8" pipe. A pipe joining device should be used when pipe with a diameter of 6" or more is to be joined. This will ensure full entry of spigot.
9. Remove excess cement.
10. Close solvent cement tin tightly.
11. Clean brush after use.
12. DO NOT smoke near can, DO NOT leave can near open flame, AVOID skin contact, DO NOT inhale.

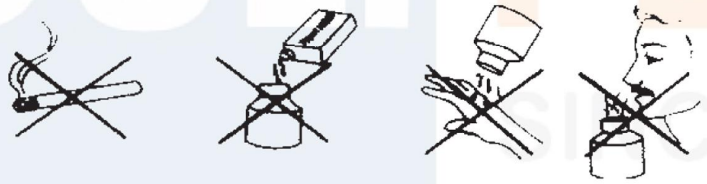


Table indicating approximate number of joints which can be made with standard size Lubricant, Cleaning Fluid and Solvent Cement :

Nominal Size (inch)	½ - 1	1 ¼ - 2	3	4	6	8
* Lubricant 50g	100	60	40	30	20	10
Cleaning Fluid 500 ml.	300	180	72	45	21	12
Solvent Cement 500 ml.	100	60	25	15	7	4

Notes:
All Solvent Cement must be carefully used in accordance with the instructions on the can. Never dilute with other fluids. Joint cannot be done properly in wet, oily or dirty conditions.
Drying time will vary according to amount of Solvent Cement applied, ambient temperature and testing pressure. Temperatures of more than 25°C (76°F) will reduce the jointing time from 3 minutes to approximately 1 minute. Full rated pressure should not be applied for at least 24 hours.

WARNING: SMOKE TESTING OF uPVC IS RECOMMENDED BUT CARE MUST BE TAKEN AS CERTAIN SMOKE GENERATING DEVICES IN THE MARKET HAVE PRODUCTS OF COMBUSTION WHICH ARE DETRIMENTAL TO PLASTIC PIPE WORK.

2. Underground Installation

2.1 General Requirements

Installation to be according to the relevent Codes of practise and to the manufacturer's recommendations.

- The trench should not be opened too far in advance of pipe laying and should be backfilled as soon as possible.
- If pipes are jointed above ground before being laid in the trench, they should be brought to the temperature of the ground and backfill material in order to avoid contraction.
- Excavation should be made under the bell of each pipe so that the entire length of the pipe, except the bell, will be supported on the bottom of the trench.
- At any change of direction, anchoring by concrete blocks must be provided. A flexible membrane is recommended between concrete and fitting for protection.
- Mechanical rammers should only be used above 300 mm from the pipe crown.
- After testing, exposed joints should be filled by pad gravel, compacted and then backfilling should follow.
- For water distribution, disinfecton of pipes is essential before the system is put into use (also sometimes during use). The pipe should be flushed (velocity at least 2 ft. per seconds), then refilled with chlorinated water with a dose of 50-100 ppm. At the end of 5 hours, chlorine residual should not be less than 5 ppm.

2. Underground Installation

2.2 Trench Preparation & Bedding

This recommended practice describes procedures for installing single wall thermoplastic pipe in excavated trenches. Consideration should be given to allowable deflection due to pipe/soil interactions.

When preparing the trench, certain conditions may be encountered which require special treatment in order to provide adequate bedding and foundation.

1. The trench width below the top of the pipe affects the soil load imposed upon the pipe. Therefore, this width should not be greater than that necessary to provide adequate room for joining the pipe and compacting the haunching and initial backfill.

2. When unstable trench walls are encountered, this condition must be stabilized before laying the pipe. To obtain the desired lateral support for pipe laid, the trench width should be a maximum of 5 pipe diameters; otherwise sheeting, trench box or any other method would be used to control such conditions. In some severe cases, well points or under-drain may be used to control excessive ground water conditions.

3. The trench should be as narrow as possible. If trench width is greater than 6 pipe diameters, haunching and initial backfill should be compacted to at least 2.5 pipe diameters on either side of the pipe.

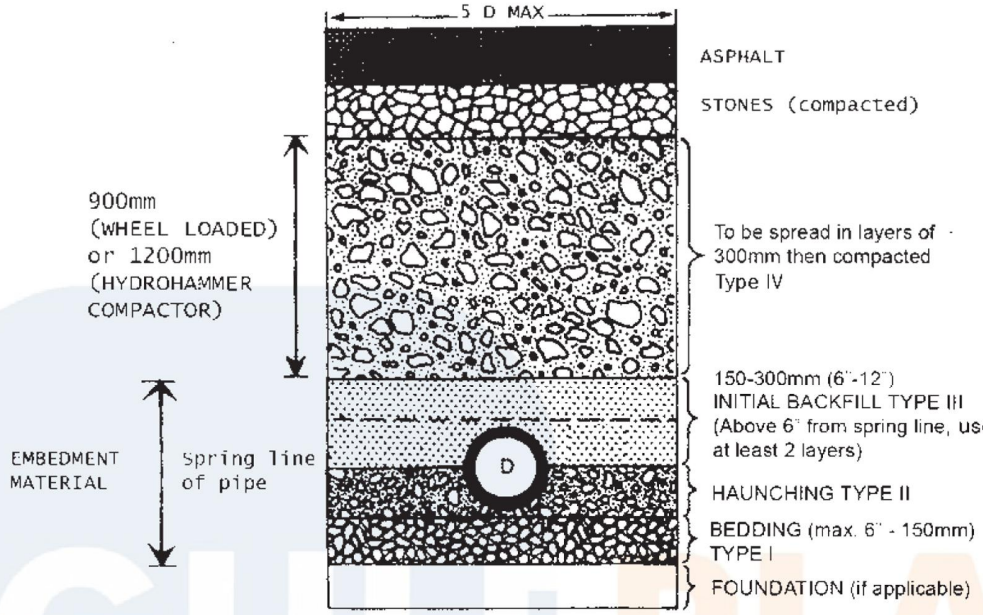
4. When an unstable trench, bottom condition is encountered, it must be stabilized before laying pipe, or an alternative foundation should be utilized. A 150 mm layer of processed stone or gravel, of suitable grade and which the unstable soil will not be penetrate, should be used. This material should be compacted.

5. If the trench is over-excavated below a point of 150mm from the bottom of the pipe, but not beyond a point of 300mm, it would be necessary for this area to be filled with an embedment material and compacted. However, if the trench is more than 300mm deeper than the bottom of the pipe, return fill and ram selected stone-free soil to within 100mm. Then proceed as in para 4.

6. Bedding material should be to grade along the entire length of the pipe to be installed. Differential settlement is to be avoided and blocking should not be used to bring the pipe to grade.

2 Underground Installation

2.3 Gravity Sewer



Materials used for bedding, haunching and initial backfill are as follows:

TYPE I Angular, 6mm to 12mm (1/4" to 1/2") graded stone. When used for bedding, a depth of 100mm to 150mm is generally sufficient to provide uniformity with little or no compaction due to the nature of angular particles. Type 1 is also suitable for haunching and initial backfill.

TYPE II Coarse sands and gravels with maximum particle size of 12mm (1/2"). This type is also suitable for bedding. However, when in use for haunching and initial backfill, place initial backfill in two stages in order to prevent movement of the pipe: Stage 1 - to the top of the pipe, Stage - 2 to at least 150mm over the top of the pipe. Mechanical or hand tamping compaction should be used.

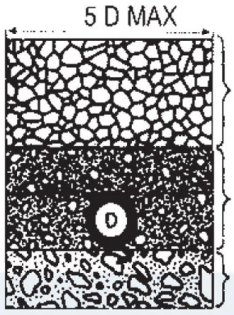
TYPE III Fine sand and clayey gravel. In bedding this type should be well compacted. In haunching and initial backfilling it should be used in the same way as Type II, but with maximum compaction.

TYPE IV Earth and debris of rocks larger than 20mm (3/4") diameter and other materials. This type is not suitable for bedding, haunching or initial backfill. It is used for the filling itself, to cover the trench. A layer of about 800mm (31.5") over the initial backfill before the trench is well loaded and a layer of about 1200mm (47") before utilising a hydro-hammer during compaction.

Backfilling should be carried out between joints to pressure testing. After testing joint should be covered with TYPE I or TYPE II material, provided particles larger than 12mm (1/2") have been taken out. Then continue as mentioned above for the rest of the backfill.

2 Underground Installation

2.4 Pressure Pipe



Min. 600 (heavy over head Traffic) 300mm - 450mm is sufficient

BACKFILL

HAUNCHING & INITIAL BACKFILL (75mm+D)

BEDDING (SAND & GRAVEL) 75mm

Requirements for beddng and backfill is practically the same as sewer pipes except for few items:

a) Haunching and backfill materials are of 12mm (1/2") particle size of smaller and surround the pipe completely. Type "III" is recommended as materials, also Type 1, provided particles are 12mm and smaller.

b) Sand and gravel containing a significant proportion of fine-grained material, such as silt and clay, should be compacted by hand, preferebly by mechanical tamper.

c) During trench cover and fill - up, rocks of 76mm (3") and above must be removed; rolling equipment or heavy tampers should only be used to consolidate the final backfill.

d) When pipe has been assembled on top of the trench, it is advisable to cool the pipe to ground temperature before backfilling to prevent pull-out due to thermal contraction.

e) When rubber-ring joints are used, suitable anchoring methods should be used to prevent excessive longitudinal or bending movement of the piping: anchor points are at all sudden changes in direction, such as elbows, tees, bends, etc.. It is necessary to withstand the pressure thrust.

f) If pipes are jointed above ground, they should remain undisturbed for 2 hours before being 'snaked' into the trench. Particular care should be taken to ensure pipes and jointing materials are throughly dry when following the jointing procedure.

In overall use, gravel with fines and sands is the best backfill material for pressure pipe. Sand and gravel mixed with silts and clays, in which sand or gravel constitute at least 50% of the mixture, is also suitable.

IMPORTANT NOTE:

GRAVEL : Minimum grain size 6.4mm (1/4")

SAND : Individual grains visible to the naked eye with maximum particle size of 6.4mm (1/4")

SILT : Individual grain difficult to see with naked eye. May be slightly plastic. Easily washed from finger. Low dry strength.

3 Design Aspects

3.1 Supports

Because of thermoplastic high co-efficient of thermal expansion, special attention should be given during design to control expansion. Support should be provided at adequate intervals.

1. Fixing support and expansion joint distances for soil and waste systems:

Nominal Size Inch	(mm)	Maximum Horizontal Metres	Support Distance Vertical Metres	Maximum Expansion Joint Distance Metres
1 ¼	(32)	0.75	1.2	1.8
1 ½	(40)	0.75	1.2	1.8
2	(50)	1.0	1.2	1.8
3	(75)	1.2	1.8	3.6
4	(110)	1.5	1.8	3.6
6	(160)	1.5	1.8	3.6

2. Fixing support and expansion loops for pressure system.

Nominal Size	Inch	½"	¾"	1"	1 ¼"	1 ½"	2"	3"	4'	6"	8"
Support Distance	Metres	0.85	0.95	1.05	1.1	1.1	1.2	1.4	1.8	2.2	2.4

Expansion Loops:

When designing an above ground system maximum practical changes in direction should be introduced to allow for expansion. When these changes of directions cannot be naturally introduced, loops or expansion units should be integrated.

It should be borne in mind when designing that both ambient external temperature and internal liquid temperature affect the expansion of the systems.

To calculate pipe wall temperature change, the following equation can be used:

$\Delta T = 0.65\ \Delta TL + 0.10\ \Delta TA$

ΔT = Change in average temperature of pipe wall

ΔTL = Maximum change in temperature of pipe contents

ΔT = Maximum change in temperature of external air.

Expansion can then be calculated using:

$\Delta L = \Delta T \times L \times \alpha$ (alpha)

ΔL = Change in length of pipework considered.

$\alpha = 7.0 \times 10^{-5}$ per °C = co-efficient of linear expansion of uPVC pipe.

L = Original length of pipe considered.

3. Design Aspects

3.2 Expansion Loops

Flexibility and sizing of loops can be determined by using the graph.

Example:
Determine the loop size required in a straight 4 in uPVC pipe with a leg length of 20 metres: water flows through the pipe at temperature varying between 20°C and 40°C and the external air temperature varies between 15°C and 45°C.

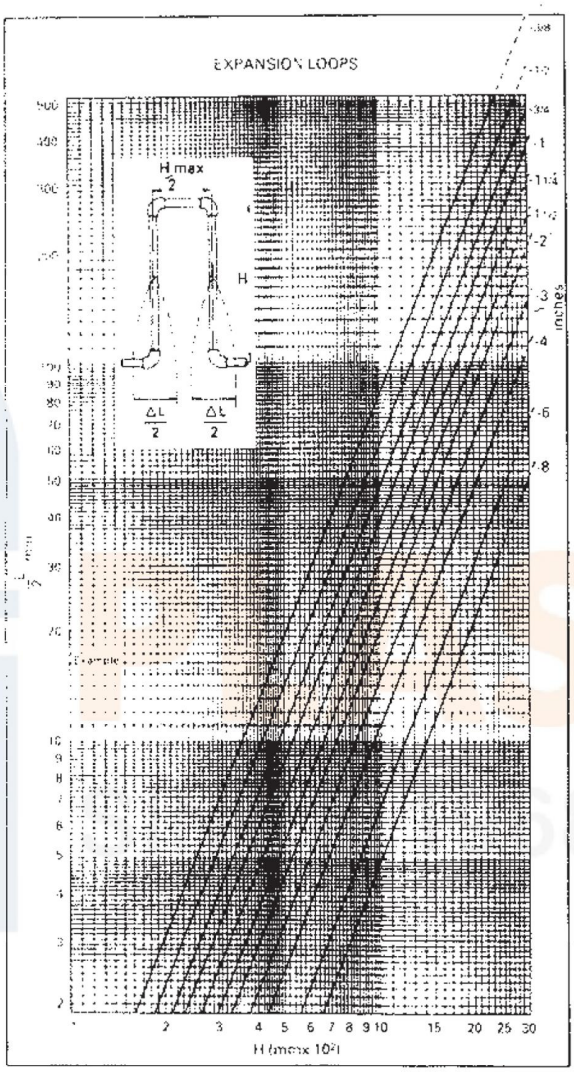
1. TO CALCULATE MID PIPE WALL TEMPERATURE CHANGE (ΔT)
   $\Delta T = 0.65\ \Delta TL + 0.10\ (45\text{-}15)$

   i.e.
   $\Delta T = 0.65 \times 20 + 0.10 \times 30 = 16^{o}C$

2. TO CALCULATE EXPANSION α
   $\Delta L = \Delta T \times Lx$
   therefore
   $\Delta L = 16 \times 20 \times (7.0) \times 10^{-5}$
   $= 22.4mm$

3. TO CALCULATE LOOP SIZE
Using the value of $\Delta L/2$ draw a horizontal line on the graph from the vertical scale to meet the 4in. pipe gradient line. Drop a perpendicular from the inter--section point to the horizontal scale. The figue obtained is the length of loop offset required = $10.1 \times 10^2 = 1010mm$.

The distance between loop legs should not exceed H/2 i.e., in this case 505mm.



3 Design Aspects — 3.3 Flow & Friction

The smooth bores of uPVC pipes have better flow characteristics than those of metal pipes. The following is the co-efficient of friction given when using the Hazen-Williams formula:-

$$f = 0.2083 \left(\frac{100}{C} \right)^{1.85} \frac{Q^{1.85}}{di^{4.87}}$$

Q = Flow in gallons/min
di = inside dia of pipe in inches
C = constant for inside roughness of pipe
f = friction head in feet of water / 100 feet of pipe

up to 315mm C = 137 - 150
over 315mm C = 151

Head losses attributable to fittings can be found by applying:

$$h = \frac{KV^2}{2g}$$

Value of K
Elbow 90° - 1.00
Elbow 45° - 0.40
Moulded Bends 90° - 0.75
Formed Bends 90° - 0.40
Formed Bends 45° - 0.20
Formed Bends 22 1/2° - 0.10
Tees 90°
Flow in Line - 0.35
Flow in Line to branch or branch to line - 1.20

h = Head loss (m)
K = Constant
V = Velocity of fluid (m/s)
g = Acceleration due to gravity (m/s²)

Surge Pressure.
Surge Pressures commonly termed as "Water Hammer" are generated in any piping system when a flowing liquid changes its velocity.

$$P = \frac{4660\ V}{2.31g \sqrt{\frac{1 + K\ (DR - 2)}{E}}}$$

P = Surge pressure in PSI
V = Maximum Velocity change in Ft/Sec.
g = Acceleration due to gravity 32.2 Ft/Sec 2
K = Fluid bulk modulus, 3 x 10^5 PSI for water
DR = Pipe outside diameter/wall thickness
E = Modulus of elasticity of the pipe in PSI

3 Design Aspects

3.4 uPVC at Elevated Temperatures

When uPVC pressure pipe operates at temperature other than the temperature at which the pipe is rated 20°C or 23°C, the pressure rating should be established on thermal design factors. Examples given below for guidance only.

Fig 1
PRESSURE TEMP. RELATIONSHIP
Ambient Variable
Internal Temp 20°C

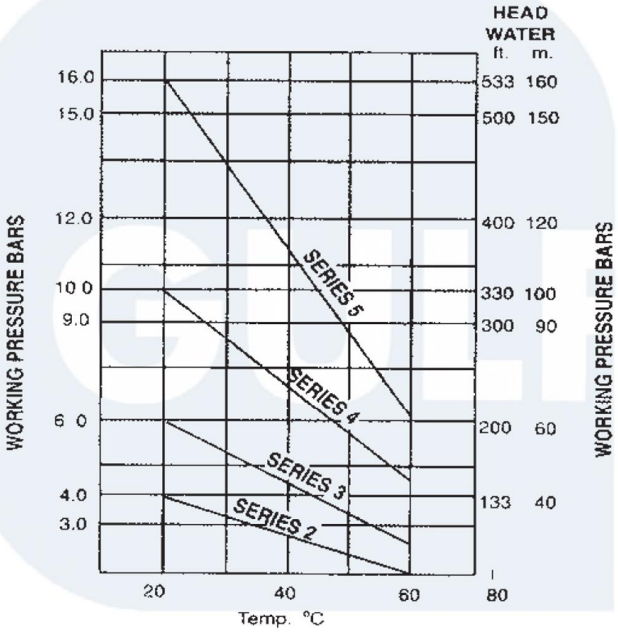


Fig 2
PRESSURE TEMP. RELATIONSHIP
Ambient Temp. 20°C
Internal Variable

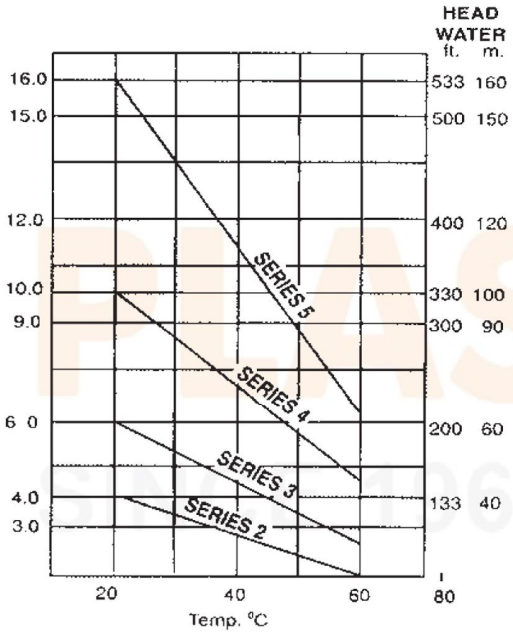


Fig 1
ENT TEMPERATURE of 40°C a
Required working pressure of 6.0 bars
use a 10 bar rated pipe.

Fig 2
Required working pressure 7.0 bar
with a liquid temperature of 40°C
therefore a 10 bar rated pipe to be used.

TEMPERATURE CONVERSION

°F = 9/5°C + 32

°C = 5/9°F - 32

4 Conversion Factors

1 inch (in)	=	2.54×10^{-2} Metres (M)
1 Pound (ib)	=	4.536×10^{-1} Kilogram (kg)
1 Newton (N)	=	1.0197×10^{-1} Kilopound (kp)
1 Pound force (ibf)	=	4.448 Newton (N)
1 Bar (bar)	=	10^{5} Pascal (pa)
1 Bar (bar)	=	10^{5} Newton/Metre2 (N/m2)
1 Bar (bar)	=	1.0^{2} Kilopound/Centimetre2 (kp/cm2)
1 Bar (bar)	=	14.5 Pounds/Square Inch (psi)
1 Kg force/Centimetre 2 (kgf/cm2)	=	9.806650×10^{4} Pascal (Pa)
1 Pound force/Inch2 (ibf/in2)	=	6.894757×10^{3} Pascal (Pa)
1 Physical Atmosphere (atm)	=	1.01325 Bar (bar)
1 Inch of water (60F)	=	2.4884×10^{2} Pascal (Pa)
1 Inch of mercury (60F)	=	3.377×10^{3} Pascal (Pa)
1 American gallon	=	3.785 Litres
1 British gallon	=	4.546 Litres
1 Joule (J)	=	1.01972×10^{-1} Kilogram Metre (kg)
1 Joule (J)	=	2.388×10^{-4} Kilo Calorie (kcal)
1 Foot-Pound force (ft-ibf)	=	1.3558 Joules (J)

5 Storage & Handling

uPVC pipes and fittings should ideally be stored in a well ventilated and shady area. However, when pipes need to be stored in the sun and to protect from UV light, they should be covered in a way which leaves the ends of pipes open for air to pass through. This should keep heat accumulation to a minimum.

A six month exposure to sunlight will change the colour of uPVC pipe. This will be limited to 0.15 mm in depth after approximately 12 months exposure.

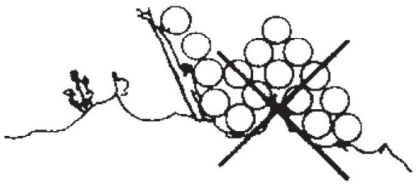
Elastomeric rings should be stored in the shade and fitted in the socket when the pipe in the trench and ready for jointing.

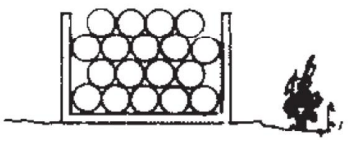
Solvent Cement and cleaning fluid should always be stored in a cool and dry place.

Pipe should always be stored on level and flat ground which is free from stones and sharp projections. Wooden planks with a minimum width of 75mm (3 inches) whose centres are one metre (yard) apart, should be used.

Stacking of individual pipes should not be more than one metre high. Stacking of bundles of pipes is possible upto three metres high. Nested pipes should be kept at bottom of a stack. Larger diameter pipes of sufficient wall thickness should be kept at the bottom of a stack or in a lower bundle. Loose pipes should have side supports which are not more than 1.5 metre apart. For heavier pipes (160mm or 6" and above), bundles should not be stacked more than two metres high. The principle is to reduce the load on lower rows of pipe as much as possible either by having smaller and lighter pipe on top and distributing the weight of the upper rows of pipes as much as possible by using wooden planks or bundle frames.

Pipes and components should be unloaded from lorries by hand in order to avoid damage. Forklift trucks will have to be used for bundles and large unit loads.





BUREAU VERITAS
Certification

Certification

Awarded to

GULF PLASTIC INDUSTRIES W.L.L

P.O. BOX 894, MANAMA, KINGDOM OF BAHRAIN

Bureau Veritas Certification (Bahrain) certify that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the standard detailed below

STANDARD

ISO 9001:2008

SCOPE OF SUPPLY

MANUFACTURING AND SALES OF PVC PIPES FOR SOIL, WASTE, DUCT AND UNDERGROUND APPLICATIONS; POLYETHYLENE PIPES FOR IRRIGATION AND POTABLE WATER DISTRIBUTION; PRESSURE PIPES FOR COLD WATER, AGRICULTURE AND INDUSTRIAL APPLICATIONS; CPVC PIPES FOR HOT WATER DISTRIBUTION

Exclusions : 7.3 : Design and Development, 7.5.1(f) : Post delivery activities, 7.5.2 : Validation of processes for production and service provision, 7.5.4 : Customer Property

Original Approval Date: **24th February 2000**

Subject to the continued satisfactory operation of the organisation's Management System, this certificate is valid until: **16th September 2012**

To check this certificate validity please call: **+97317877574**

Further clarifications regarding the scope of this certificate and the applicability of the Management System requirements may be obtained by consulting the organisation.

Certificate Number: **IND91555** *Date:* **21st October 2009**

NICOLAS MEY
Country Chief Executive
BUREAU VERITAS CERTIFICATION
KINGDOM OF BAHRAIN

Bureau Veritas Certification using the accreditation certificate number 008

UKAS QUALITY MANAGEMENT

008

Certification Office Address: "Marwah Centre" 6th Floor, Krishanlal Marwah Marg, Opp. Ansa Industrial Estate, Off Saki Vihar Road, Andheri (East), Mumbai – 400 072, India.

Managing Office Address: Flat No. 11, Building No. 574, Road 1111, Tubli 711, Kingdom of Bahrain.

Notes