Al-Amal Company For Plastic Pipes & Fittings

(AL-SHARIF)

UPVC Pressure Pipes System and Well Products

INTRODUCTION

Al-AMAL Company for Plastic Pipes and Fitttings (AL-SHARIF) was formed in 1995 with the aim of develpoping a professional UPVC/CPVC/HDPE/PP-R/PP-B/H pipes and fittings industry.

Since the company has bought AL-AMAL's plastic pipes factories with their well known and trusted brand name andsign, AL AMAL Co. is considered one of the largest leading companies in the plastic pipes and fittings field in the Middle East.

Since its foundation,AL-AMAL has a steady growth with high quality standards to fulfill the requirements of its costumers specially for UPVC/ CPVC/HDPE/PP-R/PP-B/H pipes with more than 42000 Tons per year, Fittings with more than 8000 Tons per year, and it already started in 1st. September 2008 production of PP-R with capacity more than 6000 Tons pipes per year, and 1200 Tons of fittings per year,AL-AMAL's Pipes and Fittings are produced according to DIN, BS,ASTM, ISO and Egyptian standerds demand.

There is also the facility of manufacturing products with special specifications according to customer requirements.

As AL-AMAL's target is to become the major producer in the field of plastic pipes and fittings, a strategic program has been carried out to improve the quality standards and increase the quality and variation of production by having its plant in the 10th of Ramadan City, equipped with new injection moulding machines and new moulds with advanced automated tooling and up-to date know how witch permit high capacity if pipes and fittings with exeptionally high consistency in terms of dimensional accuracy, mechanical strength and surface finish.

AL-AMAL UPVC/ CPVC/PP-R/HDPE/PP-B/H Pipes (AL-SHERIF) are well accepted and widely used in domestic water system, warming , cooling , all types of industrial prosses pipe works, water distriution and water treatment as well as irrigation systems.

A new range for the production of all systems required for AL-AMAL's customers has been taken into consideration in its near expanding plans.

The most highly advantage is the well equipped laboratory which is established according to the best international standards to control raw materials, final products and also for the research which is one of the important targets of AL-AMAL to update and develop its products.

Costumers can depend completely on AL-AMAL and consider it their partner in the business.

UPVC PRESSURE, UNDERGROUND DRAINGE AND SEWAGE SYSTEMS PIPES AND FITTINGS

STANDARD PRODUCTION

TECHNICAL DATA

PIPES DIMENSIONS

FITTINGS DIMENSIONS

CHAPTER 1

UPVC

MANUFACTURING STANDARDS

AL-SHARIF UPVC pressure pipes and fittings for water supply, irrigation system, chemical industrial applications are manufactured according to the standard specifications as follows:

1- DIN 8061 - 8062 for pressure UPVC pipes
2- DIN 8063 for pressure UPVC fittings
3- DIN 19534 for UPVC pipes for underground drainge and sewage systems
4- DIN 19531 for UPVC pipes for soil, waste and vent inside the building
5- ISO 4422 for UPVC pressure pipes and fittings
6- ES 848 for UPVC pressure pipes and fittings
7- ES 1717 for UPVC for underground drainge and sewage systems
8- ASTM D 2467 for UPVC pressure fittings

MARKING OF PIPES

1- AL AMAL ( ) AL SHARIF

2- Type of material (UPVC)

3- Production standard

4- Dimension of the pipe (OD x thickness)

5- Class of the pipe (PN and S)

6- Machine name

7- Date and time of production

MARKING OF FITTINGS

1- AL AMAL ( ) AL SHARIF

2- Nominal diameter of fittings

3- Type of material (UPVC)

4- Class of fittings (PN)

FITTINGS PRODUCTS

QUALITY

This is reflected in national and international certificates ,but above all in the satisfaction of ALAMAL-clients, installers and planners the following laws, decrease, guidelines and standards have to be considered on planning and designing ALAMAL for potable water and heating installations, Cables, Drainage sewage and well pipe systems.

SYSTEM SPECIFIC STANDARDS:

General quality requirements, dimensions according to:
DIN ,ISO ,EN ,ASTM ,BS ,ES standard for all products UPVC , CPVC , PP-R , PP-H/B and HDPE.

SYSTEM CONTROL

The production of a quality controlled pipe systems demands the supervision, regulation and control of all work operations. All results and processes have to be documented.
This requires

- Test and acceptance of incoming goods
- Process control
- In-process inspection and test
- Final inspection and test

RELEVANT REGULATIONS FOR THE QUALITY ASSURANCE OF ALL PIPES SYSTEMS ARE:

ISO- guidelines
ISO 9001/2008
ISO 14001/2004
OHSAS 18001/2007
These standards and guidelines detail the minimum requirements for internal control.

Conformance to the standards is verified by independent institutes in form of internal audits and laboratory tests.
ALAMAL has many years of experience in extrusion and injection molding and is the market leader and pioneer in the manufacturing of UPVC, CPVC, PP-R, PP-H/B and HDPE pipe systems.
This experience is reflected in internal quality standards and laid down procedures, which are taken strongest note of and are documented by the constant quality of our products.

INTERNAL CONTROL

Trained and qualified employees and a modern equipped laboratory ensure that all tests are carried out and regulations are complied with in accordance with the quality control policy, which includes

- Control of inspection, measuring and test equipment
- Process and production control
- receiving inspection test
- In-process inspection
- Final inspection

All internal quality controls are documented and recorded in according to the quality control policy.

PROCESS CONTROL

AL-AMAL quality control team has supervision of all machines. They inspect all finish products (systemized sampling) all over the day and at the storage too.
They have high experience and training at the quality measurements of the material and finished products.
In-process inspection and test the quality plan requires that tests and inspections are carried out before and during production. At the start of production all quality relevant data are checked by the quality assurance department. Preproduction samples are tested by the laboratory technicians for

- Surface finish
- Dimensional accuracy of the test samples
- Data from extrusion and injection molding machines

The goods will be released for production only if optimal test results are achieved. These tests are carried out at the beginning of each production series to ensure perfect system quality.

FINAL INSPECTION AND TEST

The quality plan requires that inspections and tests are carried out on all finished products. The results are documented in test reports. Finished products are only released to stock when all tests and inspections conform to the prescribed procedures and specifications.
The final inspection and test includes time lapse test procedures. This enables statements regarding the usability of the products in their later field of application.
These tests are the method for quality assurance during production and for design tests. This is to discover and remove production weaknesses. The results document the system quality and optimize the manufacturing processes.
The final inspection and test covers a lot of test explaining in detail

LABORATORY

ALAMAL laboratory: testing of raw materials and final product, with most modern laboratory equipment (made in Germany) built in a huge area.
AL-AMAL laboratory team is about 50 clever, qualified and trained technicians.

Measurement equipment

1- Digital Caliper device
2- Circumference
3- Micrometer
4- Meter
5- Gauges for GO and NO GO
6- Thread Gauges for Brass
7. Gauges for Rubber

LABORATORY EQUIPMENT'S FOR THE GRANULAR AND POWDER MATERIALS

1. Melt flow Tester (ISO 1133)
Measurement of the melt flow index
2. Sieve analysis test (ES 1992-4)
Measurement of the particle size of the powder
3. Flow test (ES 1991)
Measurement of the flow of material in the feeder of the machine
4. Heat stability test (ES 1991)
Measurement of the heat stability of the material
5. Bulk density (ES 1991)
Measurement the density of the powder
6. K-value (ES 1991)
Measurement the K-value of the resins

LABORATORY EQUIPMENT FOR THE PIPES, FITTINGS AND GASKETS

1. Falling Impact Test

According to (ES 848 – ISO 4422 – ISO 15877 – ASTM D1785 – ASTM D2241)

These depend on the diameter of the pipe at which we fall a certain mass in the pipe from 2 meter height at room temperature according to standard

2. Pendulum Impact Test

According to (ES 848 – ES 5232 – DIN 8061 – DIN 8080)

That tests according to DIN and ES standard that measure notched charpy impact strength of the pipe

3. VST Test

According to (ES 848 – ES 5232 – DIN 8061 – DIN 8080 – ISO 4422)

That measures the softening temperature of the product (Pipes or Fittings)

4. Chemicals Effect Test

According to (ES 848 – ES 5232 – DIN 8061 – DIN 8080)

That measures the effect of the solvent as Acetone and Methylene chloride

5. Hydrostatic Pressure Test

According to (ES 848 – ISO 4422 – ISO 15877 – ASTM D1785 – ASTM D2241 – DIN 8061 – DIN 8080)

Measurement of the Internal Hydrostatic pressure of the pipes and fittings

6. Burst Pressure Test

According to (ASTM D1785 – ASTM D2241 – ASTM F441 – ASTM F439)

Measurement of the Burst pressure of the pipes and the fittings

7. Oven (Heat reversion) Test

According to (ES 848 – ES 5232 – DIN 8061 – DIN 8080 – DIN 8075)

Measurement the effect of the high temperature in the products

8. Tensile Tester

According to (ES 5232 – ASTM 681 – ISO 37)

Measurement of the tensile strength of the products (Pipes, Fittings and gaskets)

9. Compression Tester

According to (BS EN ISO 9969 – EN 1401 – ES 1717 – ISO 4435)

Measurement the stiffness of the pipe

10. Hardness Tester

According to (ISO 48 – DIN 681-1/2 – DIN 53505 – ASTM D 2240)

Measurement the hardness of the gasket

11. Thermocycling Tester

According to (ISO 10508)

Those test a net of the product (pipes and fittings) at different temperature and certain internal pressure for long time

The customer can be assured of the highest quality of the products.

EXTERNAL CONTROL

External supervision consists of tests of a defined scope and in defined intervals. The respective supervising institutions appoint authorized test organizations to carry out these tests.

The external supervision includes external tests of the products and:-
a) Internal audit of AL-AMAL's quality assurance system and test procedures.
b) Calibration of the test equipment.
c) Hygienic and toxicity tests.
The results of the supervisory visits as well as external tests made on pipe and fitting samples are confirmed to ALAMAL in test certificates.
In Egypt, the external supervision of the AL-AMAL pipe system is carried out by the Storage / packing / dispatch upon successful release the products are stored in suitable warehouses.
Internal instructions control the method of packing, storage and dispatch of the products. The warehouse staff is responsible for control of the stored product.

THE ADVANTAGES OF UPVC PIPES SYSTEM

The group of materials known as unplasticized PVC is one of the most important developments of the last few decades as it reduces the cost and improves the reliability of pipeline installations. The properties can be varied by small additions of modifying agents which have definite and controlled mechanical properties.They can be fabricated to close dimensional tolerances, light without being weak. . Rigid without being brittle.

Furthermore, these materials can be converted into pipes and fittings by vary direct processes of extrusion or injection moulding even though these processes demand heavy elaborate machinery and very precise process.

The principal reason for the great economy of AL SHARIF pipes is not so much their cost per meter as delivered to site but rather the dramatic reduction in installation costs which can be achieved by intelligent exploitation of their light weight. Higher availability in longer lengths. Their easy of jointing and their immunity from corrosion. These characteristics are of even greater importance to engineers now that the need to carry out water supply and sewerage schemes. Industrial plant installation . etc. at minimum cost and maximum reliability.

NON – CORROSION

UPVC pipes resist corrosion caused by acid, alkalis, Salts, oils, moisture and the media inside and outside the pipe.

NON – TOXIC

UPVC pipes are entirely non-toxic. It will not affect the taste, Smell or colour of water or liquid nor react with any liquid to cause precipitation.

LOW FLOW LOSSES

UPVC pipes have a mirror – smooth surface which minimize resistance and impede the build – up of deposits and corrosive scales.

MECHANICAL STRENGTH

UPVC pipes have great tensile strength yet they are flexible enough to with stand displacements in the pipe line. They will not dent or flatten under pressure.

LIGHT WEIGHT

UPVC pipes are incredibly light. Their specific weight is one fifth of steel pipe this cuts down transportation costs and facilitates the installation of pipe and reduces its cost.

EASE OF INSTALLATION

UPVC pipes are quick and easy to install, with a complete range of fittings using solvent cement or rubber joints are leakproof UPVC pipes can be cut easily for installation.

EASE OF MAINTENANCE

UPVC pipes can be quickly repaired with a minimum of complication or cost.

FIRE PROOF

UPVC pipes will not support combustion. In the event of fire, flames are unable to travel along the pipe. It is self extinguishing.

INSULATOR

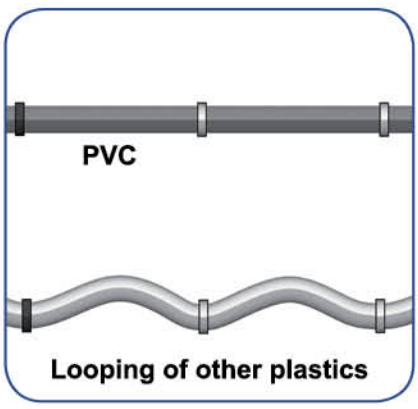
UPVC pipes are ideal for electric conduits. Because UPVC itself is an integral insulator, it eliminates the possibility of electrolytic corrosion which so often destroys underground piping.

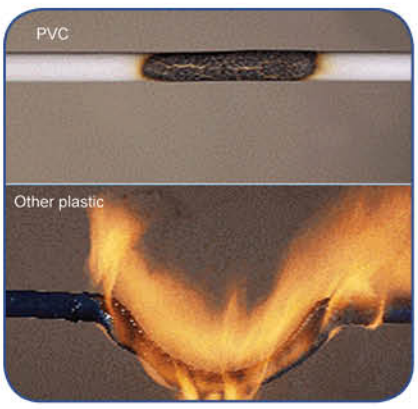
PROVEN EXPERIENCE

UPVC pipes have been used worldwide for 45 years in all climates.The experience of its many users have proved it is supreme quality, economy ease of installation, and its non – corrosive qualities.

Resist scale build-up and corrosion

Ease of installation

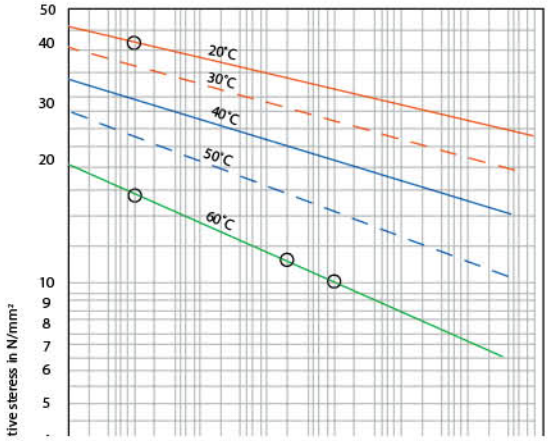




THE ADVANTAGES OF UPVC PIPES SYSTEM

LOW BACTERIA BUILD UP

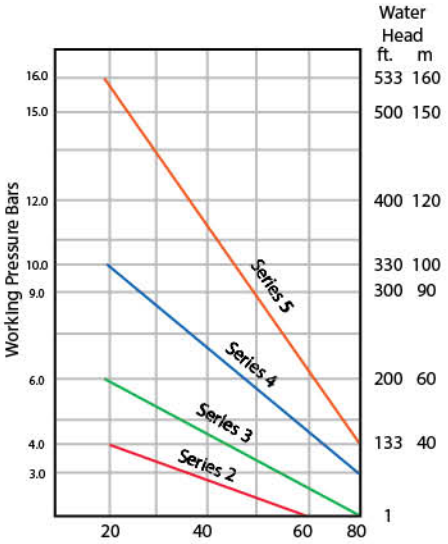
UPVC piping supports the lowest bacterial growth compared with traditional piping materials



LOWER THERMAL EXPANSION COEFFICIENT

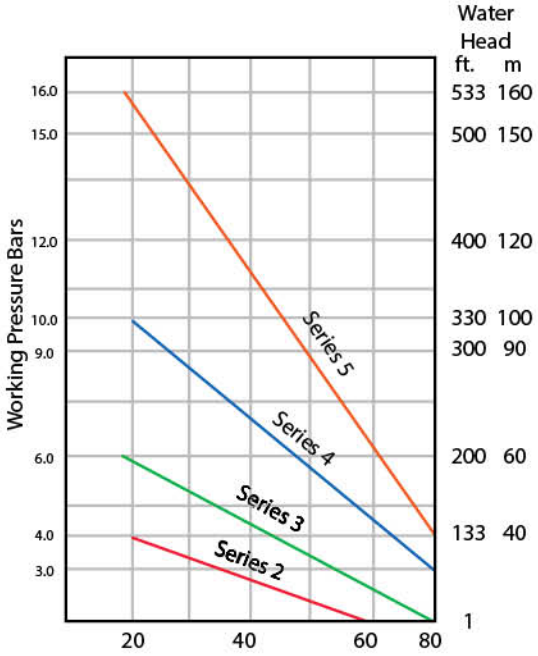
Less expansion of pipe when hot water runs

Less need for expansion loops, less "looping"



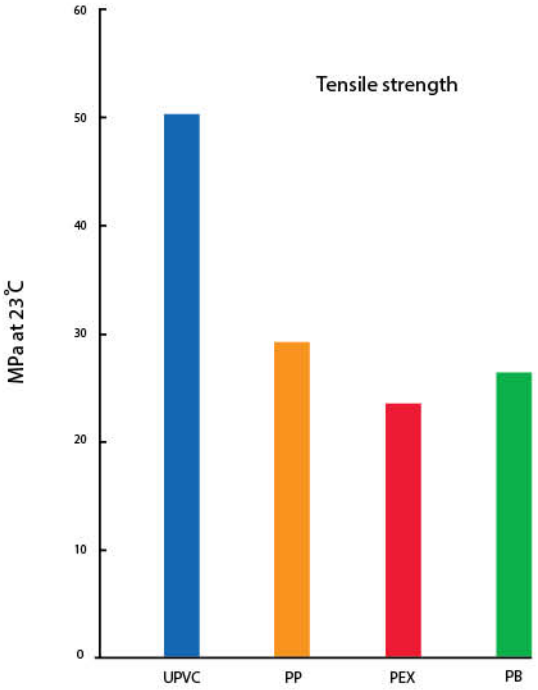
LOWER THERMAL CONDUCTIVITY

Reduced heat losses



TOUGH, RIGID MATERIAL

UPVC has a much higher strength/modulus than other thermoplastics used in plumbing applications



PVC EXCELLENT CHEMICAL RESISTANCE

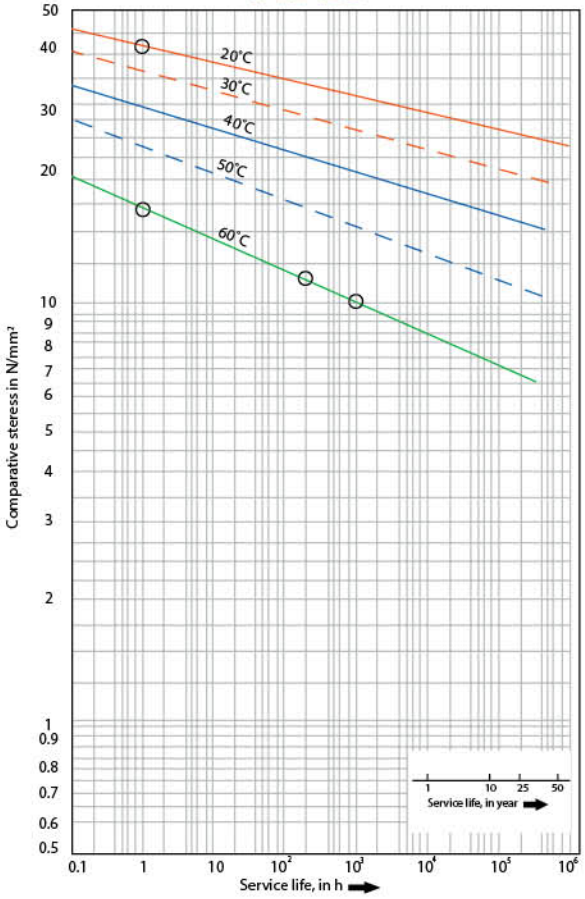
PROPERTY COMPARISONS OF THERMOPLASTIC PIPE

	UPVC	PPR	PEX	PB	CU
Tensile strength (MPa At 23 °C)	50	30	25	27	>300
Coefficient of thermal expansion ($^{-4}$ (X10 K)	0.7	1.5	1.5	1.3	0.2
Termal conductivity (W/MK)	0.14	0.22	0.22	0.22	>400
Limit oxidation intiation	45	18	17	18	
Oxygen Permeation (cm /m.day.atm)(at 70°C)	(not available) similar to CPVC	(not available) similar to PB-PEX	13	16	(not available) insignificant

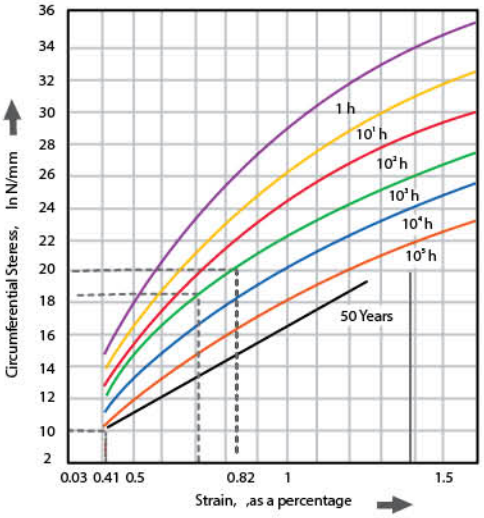
UPVC PIPES & FITTINGS DIAGRAMS

PIPES

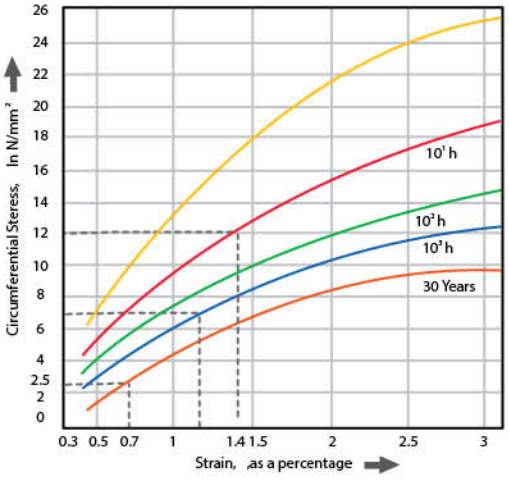
Behaviour of UPVC pipes under long-term stressing



FITTINGS



Stress-strain diagram for UPVC at 20°C

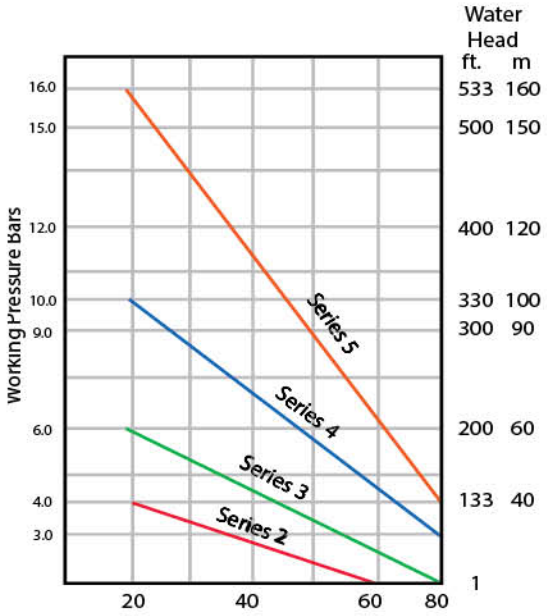


Stress-strain diagram for UPVC at 60°C

When UPVC pressure pipe operates at temperature other than the temperature at which the pipe is rated (20° - OR 23°C) pressure rating should be established on thermal design factors.

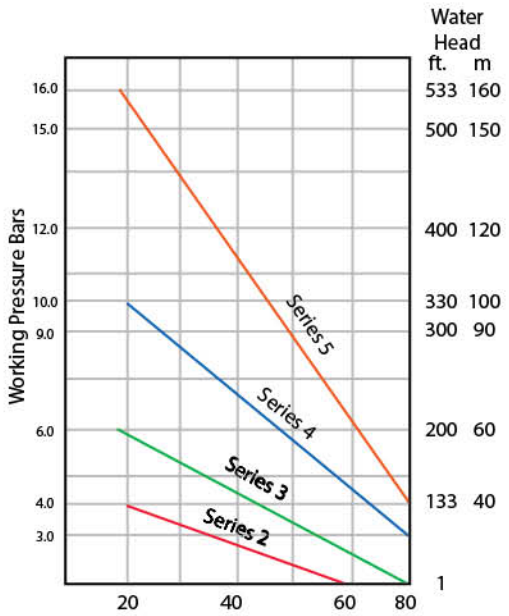
EXAMPLES GIVEN BELOW ARE FOR GUIDANCE ONLY.

PRESSURE TEMP. RELATIONSHIP
Amibient Variable Internal Temp. 20°



AMBIENT TEMPERATURE OF 40°C
required working pressure of 6.5 bars
use a 10 bar rated pipe

PRESSURE TEMP. RELATIONSHIP
Internal Variable Amibient Temp. 20°



Required Working pressure of 7.0 bars
use with a liquid temperature of 40°C
therefore a 10 bar rated pipe to be used.

MATERIAL PROPERTIES

MATERIAL

Unplasticized Polyvinyl Chloride (UPVC)

General Properties	UPVC VALUE	UNITS
Density	1.38	g/cm^3
Water absorption	<4	mg/cm^2
Flammability	Self extinguishing	
Mechanical Properties		
Ultimate Tensile Strength	492	Kg/cm^2
Compressive Strength	668	Kg/cm^2
Flexural Strength	950	Kg/cm^2
Modulus of Elasticity	$2.7x10^4$	Kg/cm^2
Impact Strength (Charpy)	No Break> 10%	
Shore Hardness (Rockwell)	115	R
Thermal Properties		
Softening Point		
v.s.t. 5 Kg	Pipes ≥79° Fittings ≥ 76°	°c
Max. Operating temperature	60	°c
Coefficient of Thermal Expansion	$0.8 X 10^{-4}$	K^{-1}
Specific Heat	0.25	Cal/g . °c
Thermal Conductivity	0.13	Kcal/m.h. °c
Electrical Properties		
Volume Resistively	$>10^{14}$	Ohm.cm
Surface Resistance	$>10^{12}$	Ohm
Dielectric Strength	>40	Kv/mm
Power Factor (at 10^6cycle)	3.3	

UPVC are non-conductor of electricity and are not subjected to galvanic or electrolytic attack.

Note: All the above-mentioned values at 20°C.

UPVC CHEMICAL RESISTANCE

Explanation of Chemical Resistance Guide

Mark	Chemical Resistance
++	Excellent Resistant
+	Good Resistant
–	Conditionally Resistant
– –	Not Recommended

*Cautionary Note Regarding The Chemical Resistance Guide
This table is intended to serve as a guide only. The information based on data accumulated from immersion test and experiments herein is believed to be reliable, but no repesentations, guarantee or warranties of any kinds are made as to its accuracy, suitability for paticular applications or results to be obtained.

Before actual permanet installation, the final decision regarding material suitability must be based on in-service testing. We are providing the consultation service based on your specific use condition.

Chemicals	Concentration	Temp.(°C)	PVC
Acetaldehyde CH_3CHO	Pure	20	--
Acetic acid CH_3COOH	10	20 40 60	++ ++ ++
Acetic acid CH_3COOH	20	20 40 60	++ + -
Acetic acid CH_3COOH	50	20 40 60	++ + -
Acetic acid CH_3COOH	80	20 40 60	++ + -
Acetic anhydride $(CH_3CO)_2O$	Pure	20	--
Acetone CH_3COCH_3	Pure	20	--
Acetonitrile CH_3CN		20	--
Acetophenone $C_6H_5COCH_3$		20	--
Acetyl acetone $CH_3COCH_2COCH_3$		20	--
Acetylene C_2H_2		20	--
Acrylonitrile $CH_2=CHCN$		20	--
Adipic acid Aqueous	Satu	20 40 60	++ ++ ++
Allyl alcohol $CH_2=CHCH_2OH$		20	--
Allyl chloride $CH_2=CHCH_2Cl$		20	--

Chemicals	Concentration	Temp.(°C)	PVC
Alum(Potassium alum) $K_2SO_4Al_2(SO_4)_324H_2O$	Satu	20 40 60	++ ++ ++
Aluminium acetate $(CH_3COO)_3Al$	Satu	20 40	++ +
Aluminium bromide $AlBr_3$	Satu	20 40 60	++ ++ ++
Aluminium chloride $AlCl_3$	Satu	20 40 60	++ ++ +
Aluminium fluoride AlF_3	Satu	20 40 60	++ ++ ++
Aluminium hydroxide $Al(OH)_3$	Satu	20 40 60	++ ++ ++
Aluminium nitrate $Al(NO_3)_3 \cdot 9H_2O$	Satu	20 40 60	++ ++ ++
Aluminium sulfate $Al_2(SO_4)_3$	Satu	20 40 60	++ ++ ++
Amber acid (Succinic acid) $COOH(CH_2)_2COOH$	Satu	20 40 60	++ ++ ++
Aminoacetic acid NH_2CH_2COOH	10	20 40	++ ++
Ammonia gas NH_3	100	20 40 60	++ ++ ++
Ammonia liquid NH_3	100	20 40	- --
Ammonia water NH_3Aq	10	20 40 60	++ ++ ++
Ammonia water NH_3Aq	40	20 40 60	++ ++ ++
Ammonium phosphate		20 40 60	++ ++ ++

Chemicals	Concentration	Temp.(˚C)	PVC
Ammonium acetate CH_3COONH_4	Satu	20	++
		40	++
		60	++
Ammonium carbonate $(NH_4)_2CO_3$	Satu	20	++
		40	++
		60	++
Ammonium chloride NH_4Cl	Satu	20	++
		40	++
		60	++
Ammonium fluoride NH_4F	20	20	++
		40	+
		60	--
Ammonium hydrogen carbonate NH_4HCO_3		20	++
		40	++
		60	++
Ammonium hydrogendifluoride NH_4HF_2	Satu	20	++
		40	++
		60	++
Ammonium metaphosphate NH_4PO_3		20	++
		40	++
		60	++
Ammonium nitrate NH_4NO_3		20	+
		40	+
		60	+
Ammonium perchlorate NH_4ClO_4	10	20	++
		40	++
		60	++
Ammonium sulfate $(NH_4)_2SO_4$	Satu	20	++
		40	++
		60	++
Ammonium sulfide $(NH_4)_2S$		20	++
Ammonium sulfite $(NH_4)_2SO_3$		20	++
		40	++
Amyl acetate $CH_3CO_2(CH_2)_4CH_3$	pure	20	--
Amyl alcohol $C_5H_{11}OH$	pure	20	++
		40	++
		60	++
Amyl chloride $CH_3(CH_2)_4Cl$	pure	20	--
Aniline $C_6H_5NH_2$	pure	20	-
		40	--
Aniline hydrochloride $C_6H_5NH_2 \cdot HCl$	pure	20	+
		40	+
		60	-
Animal oil(Lard)		20	++
		40	++
		60	++
Antimony trichloride $SbCl_3$	satu	20	++
		40	++
		60	+

Chemicals	Concentration	Temp.(˚C)	PVC
Aque regia $3HCl+HNO_3$		20	-
		40	-
Arsenic acid H_3AsO_4	Satu	20	++
		40	+
		60	-
Asphalt		20	--
Balium sulfate $BaSO_4$	Satu	20	++
		40	++
		60	++
Balium sulfide BaS	Satu	20	++
		40	++
		60	++
Barium carbonate $BaCO_3$	Satu	20	++
		40	++
		60	++
Barium chloride $BaCl_2 \cdot 2H_2O$	Satu	20	++
		40	++
		60	++
Barium hydroxide $Ba(OH)_2$	Satu	20	++
		40	++
		60	++
Barium nitrate $Ba(NO_3)_2$	Satu	20	++
		40	++
		60	++
Beer		20	++
		40	++
		60	++
Beet suger liquors		20	++
		40	++
		60	++
Benzaldehyde C_6H_5CHO	10	20	--
Benzene C_6H_6	Pure	20	-
		40	--
Benzensulfonic acid $C_6H_5SO_3H$		20	--
Benzine	Pure	20	--
Benzoic acid C_6H_5COOH	Pure	20	++
		40	++
		60	+
Bleaching liquor $Ca(ClO)_2$	5	20	++
		40	++
		60	++
Bleaching liquor $Ca(ClO)_2$	12	20	++
		40	++
		60	++
Borax $Na_2B_4O_7$	Satu	20	++
		40	++
		60	++

Chemicals	Concentration	Temp.(˚C)	PVC
Boric acid H_3BO_3	Satu	20	++
		40	++
		60	++
Boron trichloride BCl_3		20	++
		40	++
		60	++
Brine		20	++
		40	++
		60	++
Bromic acid $HBrO_3$	Pure	20	++
Bromine vapor	25	20	+
		40	-
Bromine water	Satu	20	+
		40	-
Butadiene $CH_2=CH-CH=CH_2$	Gas	20	++
		40	++
		60	++
Butane $CH_3(CH_2)_2CH_3$	Gas	20	++
		40	++
		60	++
Butyl acetate $CH_3COOC_4H_9$	Pure	20	-
		40	--
Butyl acrylate $CH_2CHCOOC_4H_9$	Pure	20	--
Butyl alcohol C_4H_9OH	Pure	20	++
		40	++
		60	+
Butyl amine $CH_3(CH_2)_3NH_2$	Satu	20	--
Butyl chloride $CH_3(CH_2)_3Cl$		20	--
Butyl ether $[CH_3(CH_2)_3]_2O$		20	--
Butyl phenol $C_6H_4(OH)(C_4H_9)$		20	-
Butynediol $HOCH_2C\equiv CCH_2OH$		20	+
		40	-
Butyric acid $CH_3CH_2CH_2COOH$	Pure	20	+
Calcium acetate $Ca(CH_3COO)_2$	Satu	20	++
		40	++
		60	++
Calcium bromide $CaBr_2$	Satu	20	++
		40	++
		60	++

Chemicals	Concentration	Temp.(˚C)	PVC
Calcium carbonate $CaCO_3$	Satu	20	++
		40	++
		60	++
Calcium chlorate $Ca(ClO_3)_22H_2O$	Satu	20	++
		40	++
		60	++
Calcium chloride $CaCl_2$	Satu	20	++
		40	++
		60	++
Calcium hydrogen sulfite $Ca(HSO_3)_2$	Satu	20	++
		40	++
Calcium hydroxide $Ca(OH)_2$	Satu	20	++
		40	++
		60	++
Calcium hypochlorite $Ca(ClO)_2$	Satu	20	++
		40	++
		60	+
Calcium nitrate $Ca(NO_3)_2$	Satu	20	++
		40	++
		60	++
Calcium sulfate $CaSO_4$	Satu	20	++
		40	++
		60	++
Calcium sulfide CaS	Satu	20	++
		40	++
		60	++
Cane suger liquor		20	++
		40	++
		60	++
Carbitol $HOC_2H_4OC_2H_4OC_2H_5$	Pure	20	++
		40	+
Carbon dioxide CO_2	Wet · Dry	20	++
		40	++
		60	++
Carbon disulfide CS_2	Pure	20	-
		40	-
		60	--
Carbon monoxide CO	gas	20	++
		40	++
		60	++
Carbon tetrachloride CCl_4	pure	20	--
Carbonic acid H_2CO_3		20	++
		40	++
		60	++
Casein		20	++
Castor oil	pure	20	++
		40	++
		60	++
Caustic potash (Potassium hydroxide) KOH	14	20	+
		40	+
		60	+

Chemicals	Concentration	Temp.(˚C)	PVC
Caustic potash (Potassium hydroxide) KOH	25	20 40 60	++ ++ ++
Chloric acid $HClO_3$	20	20 40 60	++ ++ +
Chlorine dioxide ClO_2	pure	20 40 60	- -- --
Chlorine gas Cl_2	wet	20 40 60	+ - -
Chlorine gas Cl_2	Dry	20 40 60	++ ++ ++
Chlorine water Cl_2Aq	400 ppm	20 40 60	++ ++ -
Chloro benzene C_6H_5Cl	pure	20	--
Chloro sulfonic acid $SO_2Cl(OH)$	pure	20	--
Chloroacetic acid $CH_2ClCOOH$	50	20 40 60	++ + +
Chloroform $CHCl_3$	pure	20	--
Chromic acid H_2CrO_4	10	20 40 60	++ ++ -
Chromic acid H_2CrO_4	20	20 40 60	+ - --
Chromic acid H_2CrO_4	40	20 40 60	+ - --
Chromic acid H_2CrO_4	50	20 40	- --
Chromic acid H_2CrO_4	60	20	--
Chromium alum $KCr(SO_4)_2$	satu	20	++
Citric acid $C_6H_8O_7$	10	20 40 60	++ ++ ++
Coconut oil		20 40 60	++ ++ ++
Copper acetate $Cu(CH_3COO)_2$	satu	20	++

Chemicals	Concentration	Temp.(˚C)	PVC
Copper borofluoride $CuBF_4$		20	++
copper carbonate $CuCO_3$	satu	20	++
Copper chloride $CuCl_2$		20 40 60	++ ++ ++
Copper cyanide CuCN		20	++
Copper fluoride CuF	Satu	20 40 60	++ ++ +
Copper sulfate $CuSO_4$	Satu	20 40 60	++ ++ ++
Corn oil		20 40 60	++ ++ ++
Corn syrup		20 40 60	++ ++ ++
Cottonseed oil		20 40 60	++ ++ ++
Creosote		20	--
Cresol $C_6H_4(CH_3)OH$	Pure	20	--
Croton aldehyde $CH_3CH=CHCHO$	Pure	20	--
Cryolite Na_3AlF_6		20 40 60	+ + +
Cupric fluoride CuF_22H_2O	Satu	20 40 60	++ ++ ++
Cupric nitrate $Cu(NO_3)_2$		20 40 60	++ ++ +
Cuprous chloride CuCl	Satu	20 40 60	++ ++ ++
Cyclohexane C_6H_{12}	Pure	20	--
Cyclohexanol $C_6H_{11}OH$	Pure	20	--
Cyclohexanone $C_6H_{10}O$	Pure	20	--

Chemicals	Concentration	Temp.(˚C)	PVC
Dextrine $(C_6H_{10}O_5)n$	Satu	20 40 60	++ ++ ++
Diacetone alcohol $(CH_3)_2C(OH)CH_2COCH_3$	Pure	20	--
Dibutyl ether $[CH_3(CH_2)_3]_2O$	Pure	20	--
Dibutyl phthalate $C_6H_4(COOC_4H_9)_2$	Pure	20	--
Dichlorobenzene $C_6H_4Cl_2$	Pure	20	--
Dichloroethylene $CH_2=CCl_2$	Pure	20	--
Diethylamine $(C_2H_5)_2NH$	Pure	20	--
Diethylene triamine $NH(C_2H_4NH_2)_2$		20	--
Diethyl ether $C_2H_5CO_2H_5$	Pure	20	--
Diglycolic acid $O(CH_2COOH)_2$	Satu	20 40	++ ++
Diisobutyl keton $[(CH_3)_2CHCH_2]_2CO$	Pure	20	--
Diisobutylene C_8H_{16}	Pure	20	--
Diisopropyl keton $[(CH_3)_2CH]_2CO$	Pure	20	--
Dimethyl acetamide $CH_3CON(CH_3)_2$		20	--
Dimethyl formamide $HCON(CH_3)_2$	Pure	20	--
Dimethyl phthalate $C_6H_4(COOCH_3)_2$		20	--
Dimethylamine $(CH_3)NH_2$	Pure	20	--
Dimethylaniline $C_8H_{11}N$	Pure	20	--
Dioctyl phthalate $C_6H_4(COOC_8H_{17})_2$		20	--

Chemicals	Concentration	Temp.(˚C)	PVC
Dioxane $C_4H_8O_2$	Pure	20	--
Dioxolane $OCH_3CH_2OCH_2$		20	--
Diphenyl oxide $C_6H_5OC_6H_5$	Satu	20	--
Epichlorohydrin $CH_2\text{-}CH\text{-}CH_2Cl$ (O)	Pure	20	--
Ethanolamine $H_2NCH_2CH_2OH$	Pure	20	--
Ethyl acetate $CH_3COOC_2H_6$	Pure	20	--
Ethyl acetoacetate $CH_3COCH_2COOC_2H_5$	Pure	20	--
Ethyl acrylate $CH_2CHCOOC_2H_5$	Pure	20	--
Ethyl alcohol C_2H_5OH	Pure	20 40 60	++ ++ +
Ethyl benzene $C_6H_5C_2H_5$		20	--
Ethyl chloride C_2H_5Cl		20	--
Ethyl ether $(C_2H_5)_2O$	Pure	20	--
Ethyl Monochloroacetate $ClCH_2COO_2H_5$	Pure	20	-
Ethylene chloride (Ethylene dichloride)		20	--
Ethylene chlorohydrine $ClCH_2CH_2OH$	Pure	20	--
Ethylene diamine $NH_2CH_2CH_2NH_2$	Pure	20	--
Ethylene glycol CH_2OHCH_2OH		20 40 60	++ ++ ++
Ethylene oxide $(CH_2)_2O$	Pure	20	--
Etnylene bromide $CH_2Br\text{-}CH_2Br$	Pure	20	--

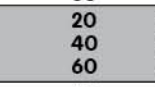
Chemicals	Concentration	Temp.(˚C)	PVC
Fatty acids RCOOH		20	++
		40	++
		60	++
Ferric chloride $FeCl_3$		20	++
		40	++
		60	+
Ferric hydroxide $Fe(OH)_3$	Satu	20	++
		40	++
		60	++
Ferric nitrate $Fe(NO_3)_3$	Satu	20	++
		40	++
		60	++
Ferric sulfate $Fe_2(SO_4)_3$		20	++
		40	++
		60	++
Ferrous acetate $Fe(CH_3COO)_2$	Satu	20	++
		40	++
		60	+
Ferrous chloride $FeCl_2$	Satu	20	++
		40	++
Ferrous hydroxide $Fe(OH)_2$	Satu	20	++
		40	++
		60	++
Ferrous nitrate $Fe(NO_3)_2$	Satu	20	++
		40	++
		60	++
Ferrous sulfate $FeSO_4$		20	++
		40	++
		60	++
Fluoboric acid HBF_4	pure	20	++
		40	++
		60	+
Fluorine gas F_2	wet	20	--
Fluosilicic acid H_2SiF_6	50	20	++
		40	++
		60	+
Formaldehyde HCHO	35	20	++
		40	++
		60	-
Formic acid HCOOH	90	20	++
		40	+
		60	--
Freon-11 CCl_3F		20	-
Freon-113 $CCl_2F\text{-}CClF_2$		20	+
Freon-114 $CClF_2\text{-}CClF_2$		20	+
Freon-12 CCl_2F_2		20	++

Chemicals	Concentration	Temp.(˚C)	PVC
Freon-21 $CHCl_2F$		20	--
Freon-22 $CHClF_2$		20	--
Fructose (Fruits sugar)		20	++
		40	++
		60	++
Fuming sulfuric acid $H_2SO_4+SO_3$		20	--
Furfural C_4H_3OCHO	pure	20	--
Furfuril alcohol $C_4H_3OCH_2OH$	pure	20	--
Furric sulfide Fe_2S_3		20	++
		40	++
		60	++
Gasoline		20	+
Gelatine		20	++
		40	++
		60	++
Glacial acetic acid CH_3COOH		20	--
Glucose $C_6H_{12}O_6$		20	++
		40	++
		60	++
Glycerol(Glycerine) $C_3H_5(OH)_3$	pure	20	++
		40	++
		60	++
Grape suger $C_6H_{12}O_6$		20	++
		40	++
		60	++
Heavy oil		20	-
Heptane $CH_3(CH_2)_5CH_3$		20	++
		40	++
		60	++
Hexane C_6H_{14}		20	++
		40	+
Hexyl alcohol $CH_3(CH_2)_5OH$	pure	20	++
		40	++
		60	+
Hydeogen peroxide H_2O_2	5	20	++
		40	++
		60	-
Hydrazine H_2NNH_2	pure	20	--

Chemicals	Concentration	Temp.(˚C)	PVC
Hydrobromic acid HBr		20	++
		40	++
		60	+
Hydrochloric acid HCl	15	20	++
		40	++
		60	++
Hydrochloric acid HCl	25	20	++
		40	++
		60	++
Hydrochloric acid HCl	35	20	++
		40	++
		60	+
Hydrochloric acid HCl	38	20	++
		40	++
		60	+
Hydrocyanic acid HCN	10	20	++
		40	++
		60	++
Hydrofluoric acid HF	Dilute	20	++
		40	++
		60	-
Hydrofluoric acid HF	30	20	++
		40	+
		60	-
		80	--
Hydrofluoric acid HF	40	20	+
		40	-
		60	--
Hydrofluoric acid HF	50	20	+
		40	-
		60	--
Hydrogen H_2		20	++
		40	++
		60	++
Hydrogen peroxide H_2O_2	20	20	++
		40	++
		60	-
Hydrogen peroxide H_2O_2	30	20	++
		40	+
		60	+
Hydrogen peroxide H_2O_2	50	20	+
		40	-
Hydrogen peroxide H_2O_2	90	20	+
Hydrogen sulfide H_2S		20	++
		40	++
		60	++
Hydrogen sulfide H_2S	Gas	20	++
		40	++
		60	++
Hydroiodic acid HI		20	++
		40	++
Hydroquinone $C_6H_4(OH)_2$	Satu	20	++
		40	++
		60	++

Chemicals	Concentration	Temp.(˚C)	PVC
Hypochlorous acid HClO	10	20	++
		40	++
		60	--
Iodine I_2		20	+
		40	-
Iodine solutions	10	20	++
		40	++
Iso-octane $(CH_3)_3CCH_2$		20	++
Isophrone $C_9H_{14}O$	Pure	20	--
Isopropyl alcohol $(CH_3)_2CHOH$	Pure	20	++
		40	++
		60	++
Kerosene(kerosine)		20	+
		40	+
		60	-
Lactic acid $CH_3CH(OH)COOH$	25	20	++
		40	++
		60	+
Lactic acid $CH_3CH(OH)COOH$	80	20	++
		40	+
		60	+
Laquer		20	--
Lead acetate $Pb(CH_3COO)_2$	Satu	20	++
		40	++
		60	++
Lead chloride $PbCl_2$		20	++
		40	++
		60	++
Lead nitrate $Pb(NO_3)_2$	Satu	20	++
		40	++
		60	++
Lead sulfate $PbSO_4$		20	++
		40	++
		60	++
Linolenic acid $C_{17}H_{29}COOH$		20	+
		40	+
		60	+
Linolenic oil $C_{17}H_{31}COOH$		20	+
		40	+
		60	+
Linseed oil		20	++
		40	++
		60	++
Lithium bromide LiBr	60	20	++
		40	++
		60	++
Lithium chloride LiCl	Satu	20	++
		40	++
		60	++

Chemicals	Concentration	Temp.(˚C)	PVC
Lithium hydroxide LiOH		20 40 60	++ ++ ++
Lubricating oil (ASTM1)		20 40 60	++ + -
Lubricating oil(ASTM2)		20 40 60	++ + -
Lubricating oil(ASTM3)		20 40 60	++ + -
Magnesium hydroxide	Satu	20 40 60	++ ++ ++
Magnesium carbonate		20 40 60	++ ++ ++
Magnesium chloride $MgCl_2$	Satu	20 40 60	++ ++ +
Magnesium citrate $Mg_3(C_6H_5O_7)_2$		20 40 60	++ ++ ++
Magnesium notrate $Mg(NO_3)_2 \cdot 6H_2O$		20 40 60	++ ++ ++
Maleic acid $(CHCOOH)_2$		20 40 60	++ ++ +
Malic acid $HOOCCH_2CH(OH)COOH$	10	20 40 60	++ ++ ++
Manganese chloride $MnCl_2$		20 40 60	++ ++ +
Manganese sulfate $MnSO_4$		20 40 60	++ ++ ++
Mercuric chloride $HgCl_2$		20 40 60	++ ++ ++
Mercuric cyanide $Hg(CN)_2$	Satu	20 40 60	++ ++ ++
Mercuric sulfate $HgSO_4$	Satu	20 40 60	++ ++ ++
Mercurous nitrate $Hg_2(NO_3)_2$	Satu	20	++
Mercury Hg		20 40 60	++ ++ ++
Methane CH_4	Satu	20 40 60	++ ++ +

Chemicals	Concentration	Temp.(˚C)	PVC
Methyl acetate CH_3COOCH_3	Pure	20	--
Methyl Alcohol CH_3OH	Pure	20 40 60	++ + +
Methyl Alcohol CH_3NH_2		20	--
Methyl bromide CH_3Br		20	--
Methyl cellosolve $HOCH_2CH_2OCH_3$		20	++
Methyl chloride CH_3Cl		20	--
Methyl chloroform CH_3CCl_3		20	--
Methyl ethyl ketone $CH_3COC_2H_5$		20	--
Methyl isobutyl ketone $(CH_3)_2CHCH_2COCH_3$		20	--
Methyl isopropyl ketone $CH_3COCH(CH_3)_2$		20	--
Methylene chloride CH_2Cl_2		20	--
Mgnesium sulfate $MgSO_4$		20 40 60	++ ++ ++
Morpholine 	Pure	20	--
Naphthalene $C_{10}H_8$		20	--
Natural gas		20 40 60	++ ++ +
Nickel acetate $Ni(CH_3COO)_2$		20 40 60	++ ++ ++
Nickel chloride $NiCl_2$	Satu	20 40 60	++ ++ ++
Nickel Nitrate $Ni(NO_3)_2.6H_2O$	Satu	20	++
Nickel sulfate $NiSO_4$	Satu	20 40 60	++ ++ ++

Chemicals	Concentration	Temp.(˚C)	PVC
Nitric acid HNO_3	10	20	++
		40	++
		60	-
Nitric acid HNO_3	30	20	++
		40	+
		60	-
Nitric acid HNO_3	50	20	++
		40	+
		60	-
Nitric acid HNO_3	70	20	++
		40	+
		60	-
Nitric acid HNO_3	98	20	--
Nitrobenzene $C_6H_5NO_2$		20	--
Nitrogen dioxide NO_2		20	++
Nitrogen monoxide NO		20	++
		40	++
		60	++
Nitrotoluene $NO_2C_6H_4CH_3$	Pure	20	--
Nitrous oxide N_2O		20	++
		40	++
		60	++
Oleic acid $C_8H_{17}CH=CH(CH_2)_7COOH$		20	++
		40	++
		60	+
Olive oil		20	++
		40	++
		60	++
Oxalic acid HOOCCOOH	20	20	++
		40	++
		60	++
Oxalic acid HOOCCOOH	50	20	++
		40	++
		60	++
Oxygen gas O_2		20	++
Ozone O_3		20	+
		40	+
Palmitic acid $C_{15}H_{31}COOH$	Pure	20	++
Paraffin		20	++
		40	++
Peanut oil		20	++

Chemicals	Concentration	Temp.(˚C)	PVC
Perchloric acid $HClO_4$	10	20	++
		40	-
		60	--
Perphosphate		20	++
		40	++
		60	++
Petroleum oil		20	+
Phenol C_6H_5OH	Pure	20	++
Phenylhydrazine $C_6H_5NHNH_2$		20	--
Phosgene gas $COCl_2$		20	--
Phosphoric acid H_3PO_4	10	20	++
		40	++
		60	++
Phosphoric acid H_3PO_4	50	20	++
		40	+
		60	--
Phosphoric acid H_3PO_4	80	20	+
		40	-
		60	--
Phosphorus pentoxide P_2O_5		20	++
Phosphorus red P_4		20	++
Phosphorus trichloride PCl_3	Pure	20	--
Phosphrus oxychloride $POCl_3$		20	--
Phtharic acid $C_6H_4(COOH)_2$		20	--
Picric acid $C_6H_2(OH)(NO_2)_3$	10	20	++
		40	++
		60	++
Poly aluminium chloride $[Al_2(OH)nCl_{6-n}]m$		20	++
		40	++
Polyethylene glycol $H(OCH_2CH_2)nOH$		20	++
		40	++
		60	++
Polyvinyl alcohol $[-CH_2-CH(OH)-]n$		20	++
		40	++
		60	++
Potassium hypochlorite		20	++
		40	++

Chemicals	Concentration	Temp.(˚C)	PVC
Potassium permanganate $KMnO_4$	10	20	++
		40	++
		60	+
Potassium permanganate $KMnO_4$	25	20	++
		40	++
		60	+
Potassium acetate CH_3COOK	Satu	20	++
Potassium aluminium silicate $Al_2O_3 \cdot K_2O \cdot 6SiO_2$		20	++
		40	++
		60	++
Potassium bichromate $K_2Cr_2O_7$	Satu	20	++
		40	++
		60	-
Potassium bisulfate (Potassium hydrogen sulfate) $KHSO_4$		20	++
		40	++
		60	++
Potassium borate $K_2B_4O_7$		20	++
		40	++
		60	++
Potassium bromate $KBrO_3$		20	++
		40	++
		60	++
Potassium bromide KBr		20	++
		40	++
		60	++
Potassium carbonate K_2CO_3		20	++
		40	++
		60	++
Potassium chlorate $KClO_3$		20	++
		40	++
		60	+
Potassium chloride KCl		20	++
		40	++
		60	++
Potassium chromate K_2CrO_4		20	++
		40	++
		60	+
Potassium coppercyanide $K_3[Cu(CN_4)]$		20	++
		40	++
		60	++
Potassium cyanide KCN		20	++
		40	++
		60	++
Potassium ferricyanide $K_3[Fe(CN)_6]$		20	++
		40	++
		60	++
Potassium ferrocyanide $K_4[Fe(CN)_6]$		20	++
		40	++
		60	++
Potassium fluoride KF		20	++
Potassium hydrogen carbonate $KHCO_3$	Satu	20	++
		40	++
		60	++

Chemicals	Concentration	Temp.(˚C)	PVC
Potassium iodide KI		20	++
		40	++
		60	++
Potassium nitrate KNO_3		20	++
		40	++
		60	++
Potassium perborate KBO_3		20	++
		40	++
		60	++
Potassium perchlorate KCl_4		20	++
		40	++
		60	++
Potassium persulfate $K_2S_2O_8$		20	++
Potassium phosphate K_3PO_4		20	++
		40	++
		60	-
Potassium sulfate K_2SO_4	Pure	20	++
		40	++
		60	++
Potassium sulfite K_2SO_3		20	++
		40	++
		60	++
Potassium thiocyanate KSCN		20	++
		40	++
		60	++
Propane $CH_3CH_2CH_3$		20	++
Propionic acid CH_3CH_2COOH	50	20	++
		40	++
Propyl alcohol C_3H_7OH	Pure	20	++
		40	++
		60	+
Propylene dichloride $CH_3CHClCH_2Cl$	Pure	20	--
Propylene oxide C_3H_6O		20	--
Pyridine C_5H_5N		20	--
Salicylic acid $C_6H_4(OH)(COOH)$		20	++
Silicic acid $SiO_3 \cdot nH_2O$		20	++
		40	++
		60	++
Silicon oil		20	++
		40	++
		60	++
Silver chloride AgCl		20	++
		40	++
		60	++

Chemicals	Concentration	Temp.(˚C)	PVC
Silver cyanide AgCN		20	++
		40	++
		60	++
Silver nitrate $AgNO_3$		20	++
		40	++
		60	++
Silver sulfate Ag_2SO_4		20	++
		40	++
		60	++
Soaps		20	++
		40	++
		60	++
Sodium bisulfite $NaHSO_3$		20	++
		40	++
		60	++
Sodium acetate CH_3COONa	Satu	20	++
		40	++
		60	++
Sodium Ammonium sulfate $NaAl(SO_4)_2$	Satu	20	++
		40	++
		60	++
Sodium benzoate C_6H_5COONa		20	++
		40	++
		60	++
Sodium bichromate $Na_2Cr_2O_7$	Satu	20	++
		40	++
		60	-
Sodium bromide NaBr	Satu	20	++
		40	++
		60	++
Sodium carbonate Na_2CO_3		20	++
		40	++
		60	++
Sodium chlorate $NaClO_3$	Satu	20	++
		40	++
		60	++
Sodium chloride NaCl		20	++
		40	++
		60	++
Sodium chlorite $NaClO_2$	25	20	--
Sodium cyanide NaCN		20	++
		40	++
		60	++
Sodium Dithionite $Na_2S_2O_4$	10	20	++
		40	++
Sodium ferricyanide $Na_3[Fe(CN)_6]H_2O$	Satu	20	++
		40	++
		60	+
Sodium ferrocyanide $Na_4[Fe(NC)_6]_{10}H_2O$	Satu	20	++
		40	++
		60	+
Sodium fluoride NaF		20	++
		40	++
		60	++

Chemicals	Concentration	Temp.(˚C)	PVC
Sodium hydrogen carbonate Na_2HCO_3		20	++
		40	++
		60	++
Sodium hydrogen sulfate $NaHSO_4$		20	++
		40	++
		60	++
Sodium hydroxide NaOH	5	20	+
		40	+
		60	+
Sodium hydroxide NaOH	15	20	++
		40	++
		60	++
Sodium hydroxide NaOH	30	20	++
		40	++
		60	++
Sodium hydroxide NaOH	50	20	++
		40	++
		60	++
Sodium hypochlorite NaClO	3	20	++
		40	++
		60	-
Sodium hypochlorite NaClO	5	20	++
		40	++
		60	-
Sodium hypochlorite NaClO	7	20	++
		40	++
		60	-
Sodium hypochlorite NaClO	10	20	++
		40	++
		60	-
Sodium hypochlorite NaClO	13	20	++
		40	++
		60	-
Sodium iodide NaI		20	++
		40	++
Sodium metasilicate Na_2SiO_3		20	++
		40	++
		60	++
Sodium nitrate $NaNO_3$	Satu	20	++
		40	++
		60	++
Sodium nitrite $NaNO_2$	Satu	20	++
		40	++
		60	+
Sodium perchlorate $NaClO_4$		20	++
		40	++
		60	+
Sodium peroxide Na_2O_2		20	++
		40	++
		60	+
Sodium persulfate $Na_2S_2O_8$	Satu	20	++
		40	++
		60	+
Sodium phosphate $NaH_2PO_4 \cdot 2H_2O$		20	++
		40	++
		60	++

Chemicals	Concentration	Temp.(°C)	PVC
Sodium phosphate $Na_2HPO_4 \cdot 12H_2O$		20 40 60	++ ++ ++
Sodium phosphate $Na_3PO_4 \cdot 12H_2O$		20 40 60	++ ++ ++
Sodium silicofluoride Na_2SiF_6		20 40 60	++ ++ ++
Sodium sulfate Na_2SO_4	Satu	20 40 60	++ ++ ++
Sodium sulfide Na_2S		20 40 60	++ ++ ++
Sodium sulfite Na_2SO_3		20 40 60	++ ++ ++
Sodium thiocyanate NaSCN		20 40 60	++ ++ ++
Sodium thiosulfate $Na_2S_2O_3$		20 40 60	++ ++ ++
Soybean oil		20 40 60	++ ++ +
Stannic chloride (Tin(Ⅳ) chloride) $SnCl_4$		20 40 60	++ ++ ++
Stannous chloride (Tin(Ⅱ) chloride) $SnCl_2$		20 40 60	++ ++ ++
Stearic acid $CH_3(CH_2)_{16}COOH$		20 40 60	++ ++ ++
Sulfomic acid HSO_2NH_2	20	20	--
Sulfonated caster oil		20	++
Sulfur S		20 40 60	++ ++ +
Sulfur dioxide SO_2	Dry	20 40 60	++ ++ +
Sulfur dioxide SO_2	Wet	20 40 60	++ ++ +
Sulfuric acid H_2SO_4	10	20 40 60	++ ++ ++
Sulfuric acid H_2SO_4	30	20 40 60	++ ++ ++

Chemicals	Concentration	Temp.(°C)	PVC
Sulfuric acid H_2SO_4	50	20 40 60	++ ++ ++
Sulfuric acid H_2SO_4	60	20 40 60	++ ++ ++
Sulfuric acid H_2SO_4	70	20 40 60	++ ++ ++
Sulfuric acid H_2SO_4	80	20 40 60	++ ++ +
Sulfuric acid H_2SO_4	90	20 40 60	++ + +
Sulfuric acid H_2SO_4	98	20 40 60	+ - --
Sulfuric anhydride SO_3		20	--
Sulfurous acid H_2SO_3		20 40 60	++ ++ ++
Sulfuryl chloride SO_2Cl_2	Pure	20	--
Sumition® (Insecticide)		20	--
Tall oil		20	++
Tannic acid $C_{76}H_{52}O_{46}$		20 40 60	++ ++ ++
Tar	Satu	20	--
Tartaric acid (Dioxysuccinic acid) CH(OH)COOH | CH(OH)COOH		20 40 60	++ ++ +
Tertiary butyl alcohol $(CH_3)_3COH$		20	++
Tetra chloroethylene $Cl_2C=CCl_2$	Pure	20	--
Tetrachloroethane $Cl_2CHCHCl_2$	Pure	20	--
Tetraethyl lead $Pb(C_2H_5)_4$	Pure	20	++
Tetrahydrofuran C_4H_8O	Pure	20	--

Chemicals	Concentration	Temp.(˚C)	PVC
Tetraline(Tetrahydro naphthalene) $C_{10}H_{12}$	Pure	20	--
Titanic sulfate $Ti(SO_4)_2$		20 40 60	++ ++ ++
Titanium tetrachloride $TiCl_4$		20	+
Titanous sulfate $Ti_2(SO_4)_3$		20 40 60	++ ++ ++
Toluene(Toluol) $C_6H_5CH_3$		20	--
Tributyl phosphate $(C_4H_9O)_3PO$		20	--
Trichloroethylene $ClHC=CCl_2$		20	--
Tricresyl phosphate $(CH_3C_6H_4O)_3PO$	Pure	20	--
Triethanolamine $N(CH_2CH_2OH)_3$		20	--
Triethylamine $(C_2H_5)_3N$		20	+
Turbine oil(#140)		20	++
Turpentine oil		20	++
Urea $CO(NH_2)_2$	Pure	20 40 60	++ ++ ++
Urine		20 40 60	++ ++ ++
Vaseline(Petrolatum)		20 40 60	++ ++ ++
Vineger		20 40 60	++ ++ ++
Vinyl acetate $CH_3COOCH=CH_2$		20	--
Water (Potable water)		20 40 60	++ ++ ++
Xylene $C_6H_4(CH_3)_2$		20	--

Chemicals	Concentration	Temp.(˚C)	PVC
Yellow Phosphorus P_4		20	++
Zinc acetate $(CH_3COO)_2Zn$		20 40 60	++ ++ ++
Zinc bromide $ZnBr_2$	Satu	20 40 60	++ ++ ++
Zinc chloride $ZnCl_2$		20 40 60	++ ++ ++
Zinc cyanide $Zn(CN)_2$		20	++
Zinc nitrate $Zn(NO_3)_2 \cdot 6H_2O$		20 40 60	++ ++ ++
Zinc sulfate $ZnSO_4$		20 40 60	++ ++ ++

TRANSPORT, STORAGE AND HANDLING

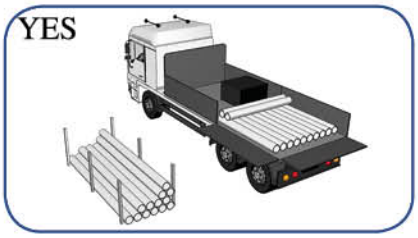
PIPES

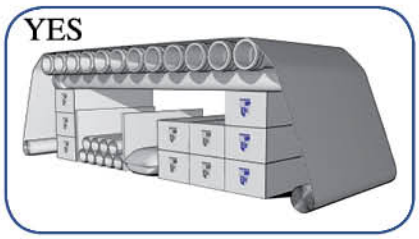
On trucks the 6m or longer pipes must be fully supported on the loading area. Avoid loading at the same time with sharp objects. Pipes should not be thrown or dragged along the ground.

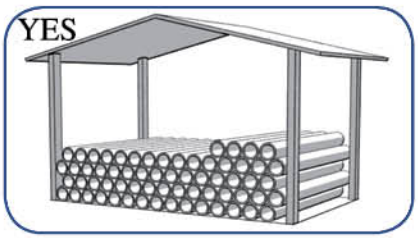
Pipes should be given adequate support at all times. Pipes should not be stacked in large piles, especially in warm temperature conditions as the lower layers may distort, resulting in difficulties in jointing and pipe alignment. Any pipe with ends prepared for jointing (sockets and spigot joints, A joints, etc.) should be stacked in layers with sockets placed at alternate ends of the stacks and with the sockets protruding to avoid unstable stacks and the possibility of imparting a permanent set to the pipes.

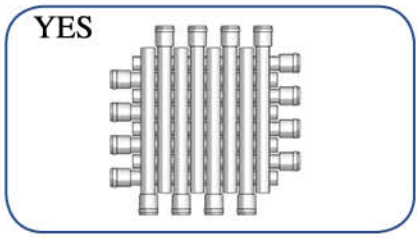
For long –term storage, pipe racks should provide continuous support, but if this is not possible timber of at least 3 in. (75mm) bearing width at spacing not greater than 3 ft.(915mm) centers for pipe sizes 160mm and above, should be placed beneath the pipes and at 6 ft. (1.8m) centres at the side, if the stacks are rectangular. These spacing apply to pipe size 160 mm and above. Closer supports will be required for sizes below 160mm in such pipe racks. Pipes may be stored not more than seven layers, or 6 ft.(1.8m) high, whichever is the lesser. But if different classes of pipe are kept in the same racks, than the thickness classes of largest diameter must always be placed at the bottom.

When loading pipes on to vehicles, care must be taken to avoid their coming into contact with any sharp corners such as cope irons, loose nail-heads, etc. as pipes may be damaged by being rubbed against these during transit. Whilst in transit . pipes shall be well secured over their entire length and not allowed to project unsecured over the tailboard of the lorry pipes may be off-loaded from lorries by rolling them gently down timbers, care being take to ensure that pipes do not fall one upon another, nor on to any hard or uneven surfaces.







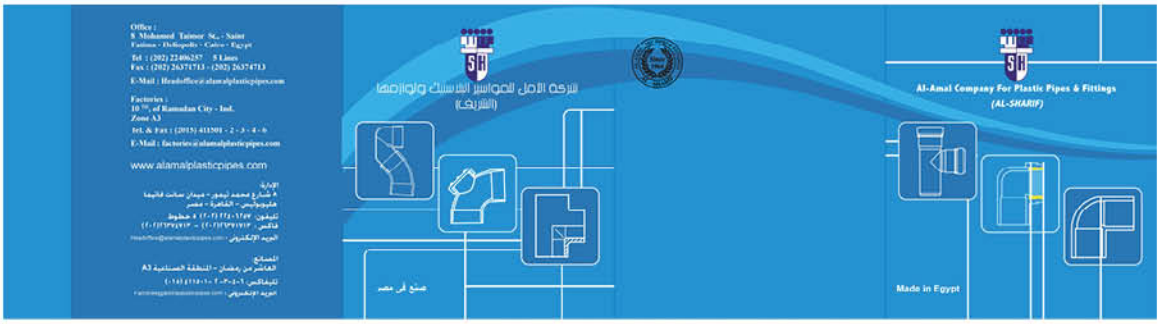


Rubber sealing rings should not be stored in the open period, nor should be exposed to sun light.

It is recommended not to keep rubber sealing rings on stock for too long time it cannot be avoided to keep them in stock for several years, they should be kept free of tension in a cool place without radiation of light, if possible. In rooms where no electrical equipment is in operation.
Rubber sealing rings should not come into contact with chemicals, grease or fuels.

FITTINGS

Store fittings in their original packaging. If they must be removed from their boxes, separate them by geometric type and size. Never combine your plastic fitting inventory with metallic materials. Avoid storing Fittings near an open flame or source of extreme heat.



For CPVC Pressure Metric Fittings

For Non Pressure Metric Fittings

For UPVC Pressure Fittings

For CPVC Pressure Inch Fittings

APPLICATION OF UPVC PIPES AND FITTINGS

WATER SUPPLIES

Non-toxic AL-SHARIF UPVC Pipes and fittings will not affect the taste, color, or smell of drinking water. They will never corrode and are therefore extremely sanitary. Deposits and scales will not build up inside as in the case for conventional steel pipes. Their strength is greater than that of asbestos pipes.

IRRIGATION SYSTEM

AL-SHARIF UPVC Pipes and Fittings are ideal for agricultural irrigation and sprinkler systems. Noncorrosive UPVC Pipes are perfect for carrying water which contains chemical fertilizing and insect inhibitors. In thick – wall and large diameter UPVC pipes liquids can be transport under high pressure, which is convenient for the management of large farms.

INDUSTRY

Resistant to the most chemicals, AL-SHARIF UPVC Pipes and fittings have an important role to play in industrial plants. Light, Noncorrosive and easy to assemble, they allow more complex piping work than steel or cast-iron pipes.

UNDERGROUND DRAINAGE & SEWAGE SYSTEMS

AL-SHARIF UPVC Pipes and Fittings are ideal for underground drainage and sewage systems. Noncorrosive and easy to assemble, they allow more complex piping work.

EXPANSION AND CONTRACTION

All piping products expand and contract with changes in temperature. Linear expansion and contraction of any pipe on the longitudinal axis relates to the coefficient of thermal expansion for the specific material used in the manufacturing of the product. Variation in pipe length due to thermal expansion or contraction depends on the coefficient of thermal expansion and the variation in temperature (ΔT). It should be noted that change in pipe diameter or wall thickness with piping material properties remaining constant does effect a change in rates of thermal expansion or contraction.

Approximate coefficients of thermal expansion for different pipe materials are presented below. Expansion and contraction of PVC piping in response to change in temperature will vary slightly with changes in PVC compounds. However, these coefficients can be considered reasonably accurate.

COEFFICIENTS OF THERMAL EXPANSION

Piping Material	Coefficient of Linear Thermal Expansion (K^{-1})	Thermal Conductivity ($W.K^{-1}.M^{-1}$)
UPVC	0.8×10^{-4}	0.16

Thermal Linear Expansion and Contraction

Expansion or contraction of UPVC pipe can be calculated from the following formula;

$\Delta L = Y . L . \Delta T$

where ;

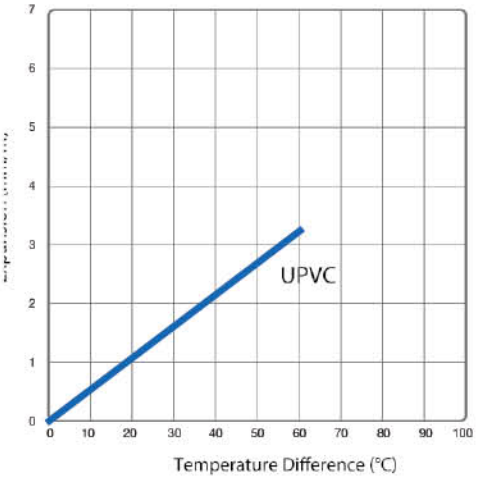
ΔL : length of expansion or contraction

L : pipe length of a straight line

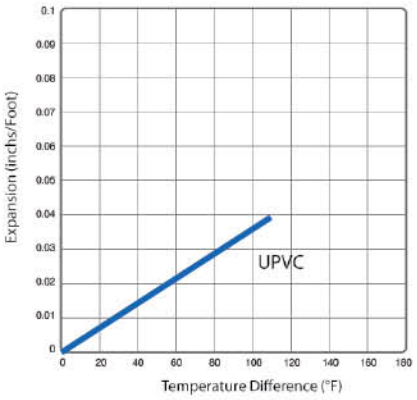
Y : coefficient of thermal $0.8 \times 10^{-4} K^{-1}$ for UPVC

ΔT : temperature difference between installation and operation.

S I Unit



inch-lb Unit



- THERMAL EXPANSION (ΔL) IN MM OF UPVC

Length of run 10 meter

Temp. Change ΔT °C	Thermal Expansion(ΔL) in mm of UPVC
10	15
15	17
20	19
30	22
35	25
40	26

Length of run 15 meter

Temp. Change ΔT °C	Thermal Expansion(ΔL) in mm of UPVC
10	23
15	27
20	32
30	37
35	41
40	46

Length of run 20 meter

Temp. Change ΔT °C	Thermal Expansion(ΔL) in mm of UPVC
10	32
15	38
20	45
30	51
35	58
40	64

Length of run 25 meter

Temp. Change ΔT °C	Thermal Expansion(ΔL) in mm of UPVC
10	36
15	44
20	51
30	58
35	66
40	73

Length of run 30 meter

Temp. Change ΔT °C	Thermal Expansion(ΔL) in mm of UPVC
10	46
15	55
20	64
30	73
35	82
40	91

RULES AND GUIDE LINES

THREADING UPVC PIPES (MAKING THE PIPE THREAD)

CUTTING AND DEBURRING

UPVC pipe should be cut square and smooth for easy and accurate threading. Amiter box or similar guide should be used when sawing is done by hand. Burrs should be removed inside and outside by using file.

THREADING

Threading UPVC pipe can easily be accomplished using a standard hand pipe stock or power threading machine. Cutting dies should be clean and sharp.A cutting lubricant such as a soap and water solution should be used while the threads are being cut to avoid the increment of the temperature of pipes.

PREPARING THE THREADED PIPE

The threads should be cleaned by brushing away cuttings and ribbons, After cleaning, apply TEFLON tap around the entire length of threads, the tape should slightly overlap itself going in the same direction as the threads.

ASSEMBLY OF THREADED JOINTS

Screw the threaded fitting onto the pipe. Screwed fittings should be started carefully and hand tightened . Fittings should be screwed on until hand tight with an additional 1 to 1.5 turn more by using a strap wrench.

CAUTION

Never apply solvent cement to threaded pipes of threaded fittings.

SOLVENT WELDING UPVC PIPES AND FITTINGS

CUTTING

Pipe must be squarely cut to allow for the proper interfacing of the pipe end and the fitting socket bottom. This can be accomplished with a miter box saw.

DEBURRING

Use file to remove burrs from the end of pipe. A slight chamfer about 15° should be added to the end to permit easier insertion of the pipe into the fitting. Failure to chamfer the edge of the pipe may remove cement from the socket, causing the joint to leak.

INSPECTION AND CLEANING

Visually inspect the inside of the pipe and fitting sockets and remove all dirt, grease or moisture with a clean dry rag. Measure the fitting socket depth and mark this distance on the pipe O.D. Clean the surface of the pipe and fitting socket by using a cleaner.

APPLICATION OF SOLVENT CEMENT

Apply the solvent cement evenly and quickly around the outside of the pipe at a width a little greater than the depth of the fitting socket. Apply a light coat of cement evenly around the inside of the fitting socket.

JOINT ASSEMBLY

Immediately insert the pipe into the socket up to the entry mark, align pipe and socket, hold in position for a few seconds.

CLEAN UP

Remove all excess cement from around the pipe and fitting with a dry cotton rag. This must be done while the cement is still soft.

AFTER JOINTING

Joints should not be moved or distributed for 10-15 minutes then the jointed pipe may be handled with care allow 4 hours if the jointed pipe lengths are to be laid in a trench.

TESTING

Allow 8 hours to elapse before applying working pressure or 24 hours for tests pressure with pipe sizes up to 50 mm, it is possible to reduce this time.

Allow 1 hour for each 3.5 atmospheres of pressure.

SOLVENT WELDING UPVC PIPES AND FITTINGS

IMPORTANT NOTICE

Close the open tin of solvent cement when not in use, do not work near a naked flame and do not mix. Cleaning fluid with the solvent cement.

CONSUMPTION OF CLEANER AND SOLVENT CEMENT (NO. - OF JOINT/KG)

Dia./mm	Cleaner-Kg	Solvent Cement-Kg
16	400	200
20	340	170
25	300	150
32	200	125
40	140	90
50	110	60
63	75	55
75	70	45
90	55	25
110	50	12
125	47	10
140	45	8
160	40	5
200	30	4
225	20	3.5
250	15	3
280	12	2.5
315	10	2

Brushes must be clean and dry before commencing solvent welding Brushes must be thoroughly cleaned after use by washing out in cleaning fluid.

Do not dilute solvent adhesive with cleaning fluid.

Use Solvent adhesive and cleaning fluid in a well ventilated area.
Keep away from naked flames and do not smoke. Always replace lids of containers, in any event, attention is drawn to the instructions printed on the containers.

When laying continues runs of pipe, joints may be made quicker than the setting times advised above. The joint will not be disturbed with long lengths, providing that the pipe is not twisted or the previously made joint lifted out of place.

PUSH FIT FITTINGS IN UPVC

CUTTING

Pipe must be squarely cut to allow for proper interfacing of the pipe end and the fitting socket bottom. This can be accomplished with a miter box saw.

DEBURRING

Use file to remove burrs from the end of pipe. A slight chamfer of about 15° should be added to the end to permit easier insertion of the pipe into the fitting. Failure to chamfer the edge of the pipe may remove cement from the fitting socket, causing the joint to leak.

CLEAN UP

Clean the profile ring, the inside of the socket and the groove for the ring.

PREPARING THE PROFILE RING

Wet the profile ring with clean water. Squeeze it to a heart shape, then let it snap into the groove, and check alignment.

PREPARING THE PIPE END

The pipe end with 15° chamfer must be cleaned and coated with lubricant before pushing into the socket.

ASSEMBLY THE PUSH FIT FITTING

Push together, an insertion device may be used for larger dimensions.

FLANGE ASSEMBLY

1- Join the flange to the pipe as outlined in the solvent cementing section or in the threading section depending on the joining.

2- Align the flanges and gasket by inserting all of the bolt through the matching bolt holes proper mating of flanges and gaskets is very important for a positive seal.

3- Using a torque wrench, tighten each bolt in a gradual sequence as outlined by the flange sketch.

WARNINGS

1- Do not over – torque flange bolts.

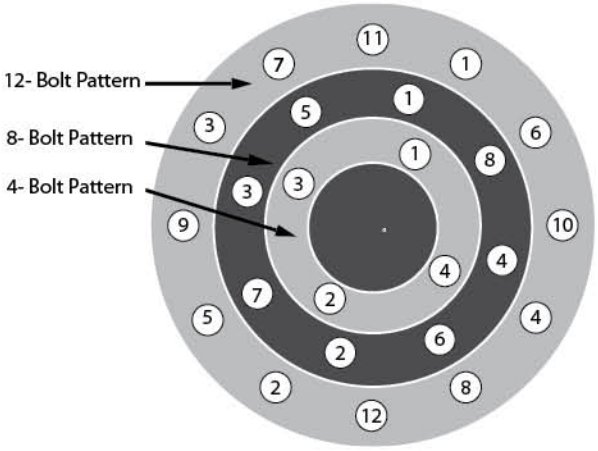
2- Use the proper bolt tightening sequence.

3- Make sure the system is in proper alignment.

4- Flat washers must be used under every nut and bolt head.

FLANGE BOLT TIGHTENING PATTERN

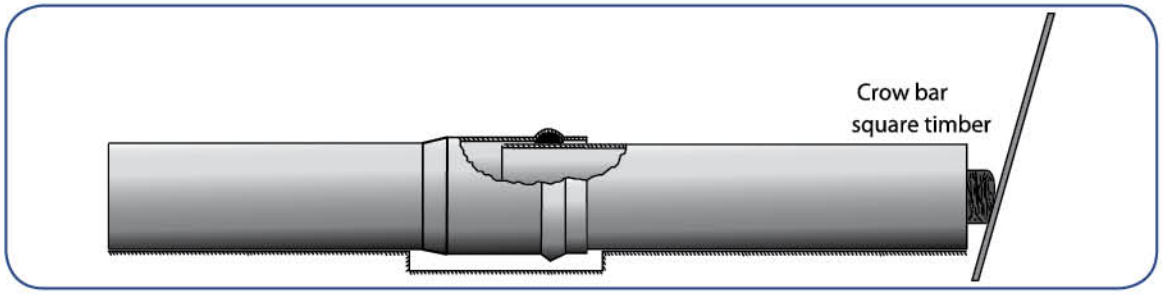
**(Tighten bolts evenly;
follow numerical sequence)**



JOINTING CLAMPS

Jointing clamps may be used for ease of assembly. The clamps are available in sizes, from 355 to above.

CROW BAR AND WOODEN BLOCK



IMPORTANT NOTICE

If pipes are cut on site , make sure that the new spigot end are cut square with a fine toothed saw and are chamfered to half pipe thickness with a coarse file before jointing.

For 100 joints use the following amounts of lubricant

Dia./mm	Kg.of Lubricant
63	0.50
90	0.85
110	1.10
140	1.35
160	1.80
225	2.40
280	3.15
315	3.85

Dia./mm	Kg.of Lubricant
355	4.35
400	4.90
450	5.50
500	6.15
560	6.85
630	7.70
710	8.70

ABOVE GROUND INSTALLATION

PRESSURE INSTALLATION

Ring seal joints should not be used above the ground installations unless all the joints are anchored against end thrust.

PROTECTION OF PIPELINES

UPVC pipelines must be protected from sunlight and external heat

SUPPORT OF FITTINGS, HEAVY VALVES ETC..

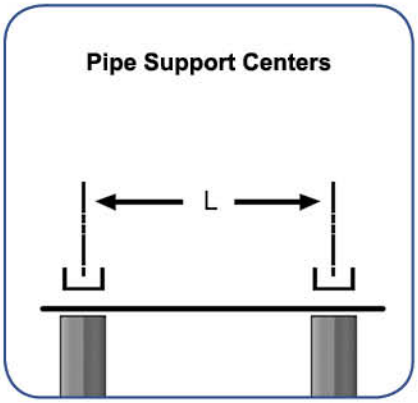
Where plastic pipelines incorporate metal valves or other heavy fittings it is essential to support the valve directly rather than allow their weight to be carried by the plastic pipe.For the same reason it is usually advisable to fix pipe supports on either side of flanged connections.

PIPE BRACKET SUPPORTS

For light duty and small pipe size, plastic pipe support brackets are suitable for heavier duty installation matching formed metal pipe supports should be used with cork or P.E. liner for fixed points.

PIPE BRACKET SPACING

Plastic pipeline need to be supported at specific intervals. These intervals will depend on the specific gravity of the material being conveyed. The temperatures of the liquid and the environment and the pipe wall thickness and type of plastic used. Some deflection may be allowed between brackets and changes of direction. The average deflection between centers should be up to a maximum of 2.5 mm.



Pipes bracket spacing in the case of fluids specific gravity = 1 as well as for gases

UPVC Pipes	d mm	Pipe support centers L in CM at : 20°C	30°C	40°C	50°C
Class 4 & 5	16	75	60	40	Continuous
	20	85	70	50	Continuous
	25	90	75	55	45
	32	100	85	65	50
	40	110	100	80	60
	50	125	115	95	70
	63	140	130	110	85
Class 3 should be reduced by 10%	75	150	140	120	95
	90	165	155	135	105
	110	185	175	155	120
	140	215	205	185	160
	160	225	215	200	170
	200	240	225	215	185
	225	250	240	225	200
	250	260	250	240	205
Class 5 may be increased by 10%	280	270	260	250	215
	315	280	270	260	225
	355	290	275	265	230
	400	300	280	270	235
	450	310	285	275	240
	500	320	290	280	245

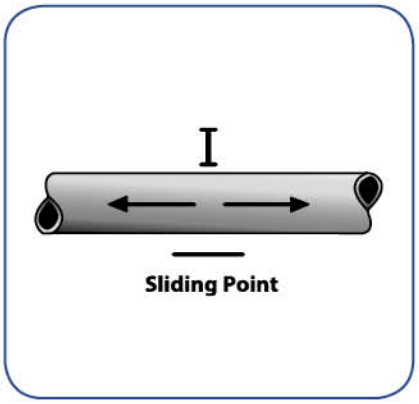
S.G	Factor
1.25	0.90
1.50	0.83
1.75	0.77
2.00	0.70

S.G : Specific Gravity

For vertical installations, the above support distances may be increased 30% (multiply the values given by last table) For fluids with a specific gravity exceeding 1 multiply by the factors shown.

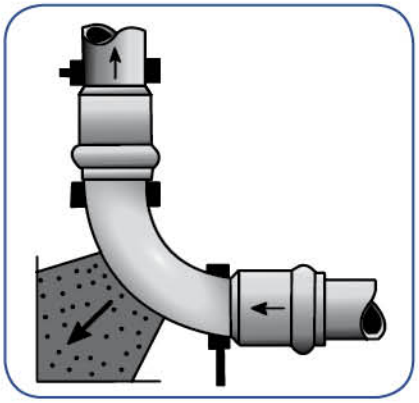
PIPE SUPPORTS LOOSE AND FIXED ARRANGEMENTS

Axial movement of the pipe line must not prevented, loose brackets or sliding points allow the pipe to move or slide as expansion or contraction taked place.



Sliding Point

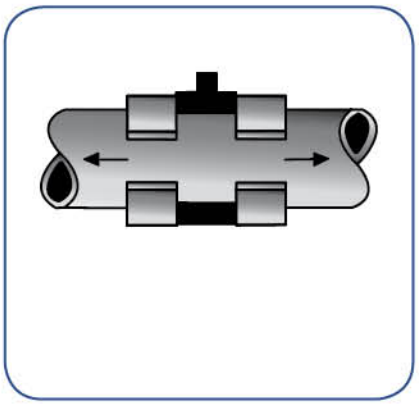
To ensure that this movement is controlled it is necessary to create fixed points. Fixed points may be positioned at one end of a pipe run, at bends or changes of direction or in the center of a pipe run.

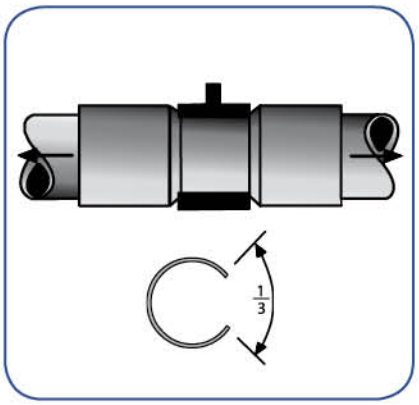


Fixed Points
Arrow indicated
end thrust &resultant forces
that must be resisted with seal
ring Joints by inclusion
of a concrete pad
or extra bracket

A fixed point may be created in pipeline by solvent welding two split collars on to the pipe. The collars should be positioned and clamped for 12 hours. Collars may be manufactured from pipe, a section of approximately 1/3 of circumference removed.

Split collars solvent welded on to pipe to provide a fixed points





Fixed center points movement either way

LAYING PIPES IN STEEP TERRAIN

In steep terrain. The pipe line must be secured against sliding off by aboutments (for instance made of concrete). TO prevent the stonefree subsoil and the pipe bedding from being washed away by hill side water, a drainage is recommended (drainage pipes or road drainage pipes of unplasticized PVC) The pipes are to be laid with the sockets facing in up-hill direction.

PIPE LAYING IN SWAMP OR MARSHY SOILS

To prevent the sagging of the pipe line in unstable soils, one of the following steps is recommended to drain the soil, or to build up a foundation on piles or bed the pipe line on a boardwalk or to lay a stone riprap with a fine gravel fill, Spot supporting of the pipe line is not permitted.

In case of changing soil layers with different carrying capacities of the trench bottom, we recommend underbidding of fine gravel and sand at the transition points. In cases where it is especially difficult to lay pipes, we recommend to use the pressure pipes of unplasticized PVC with cementing joints.

PIPE LINES PASSING UNDER ROADS AND RAILWAY EMBANKMENTS

PVC pressure pipes can also be used in road or railway embankments, even under heavy load conditions. When crossing such an embankment (Pushing through) the PVC pipe must be encased by a protective tube. The PVC pipe must be supported by spacers inside the tube. Up to d 225 one spacer every meter is required and for d 280 –d 450 one spacer every 1.5 meters. The spacer must have an elastic insert around the pipe and there should be as little as possible clearance between the spacer and the protective tube. Additional safety regulations of the federal railways must be complied with.

RIVER CROSSING WITH PVC PRESSURE PIPES

Several large river crossings have been carried out successfully with PVC pressure pipe. The pipe are cemented and the complete jointed pipe line complex is then hauled across the river and laid into the trench dredged in the river bed.
We recommend consultation with our technical advisory service before undertaking such specialized projects.

BELOW GROUND INSTALLATION

GENERAL NOTES

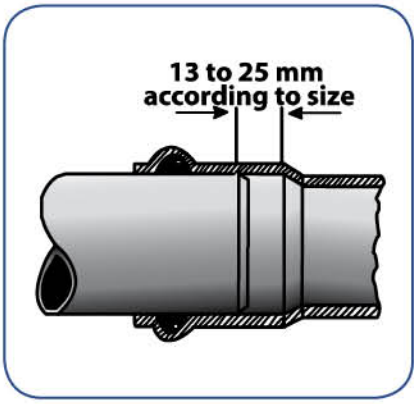
A As with all pipe jointing. Clean lines is of prime importance, and pipes. Specially spigot ends, should be supported clear of the ground to prevent dirt being smeared on with the lubricant. Placing the pipes on blocks also reduces friction and consequently facilitates the making of the joint.
THESE BLOCKS MUST BE REMOVED BEFORE BACKFILLING. AND EVERY CARE MUST BE TAKEN TO ENSURE THAT THE PIPE NOT BEDDED ON SUBMERGED ROCK.

B The pipeline should be tested initially after a few joints (certainly not more than 500 meters) to ensure that they have been made correctly. And subsequently at convenient intervals, preferably not exceeding 1000 meters.

C All changes of direction must be anchored. Concrete thrust blocks are suitable but the unit should only be launched and a flexible membrane interposed between the concrete and the unit, to protect it against damage by abrasion.

D Before testing, the line must be backfilled leaving the joints exposed. If the joints must be covered, it is useful to mark their pulsation.

Expansion Gap
13 to 25 mm
according to size



E The pipe should be marked so that the spigot enters the socket to within 13 to 25 mm of the bottom of the socket dimension. The depth of chamfer should be one third the wall thickness.

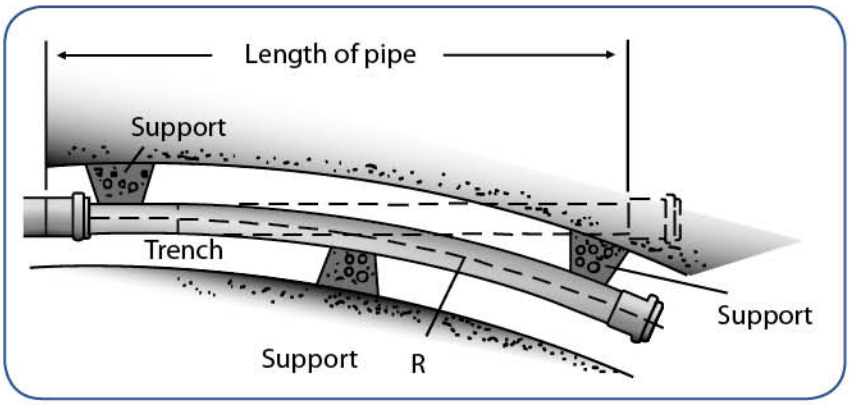
F Never cut the leg of a ring seal joint. Some distortion of the shape may occur during processing which might cause a leak.

G If jointing above ground. Observe the depth of entry after installation.

H UPVC pipes may be cold flexed to accommodate ground contours and road curvatures in outside diameters up to 225 mm. The bending radius (R) should The cold bending and supporting is illustrated for standard pipe length of 6 meters.

Pipe larger than 225 mm diameter should be regarded as rigid and changes in direction should be accommodated by use of special bends of flexible couplings.

COLD FLEXING IN THE TRENCH



Outside Diameter mm	Radius R(m)
63	18.9
75	22.5
90	27.0
110	33.0
140	42.0
160	48.0
225	67.5

LAYING

It is very important when laying UPVC pipes for gravity drainage to ensure that the pipe is laid in accordance with the recommendations made on the following pages these are extracted from the U.K. ministry of Housing and local Government's working party report on the design and construction of underground sewers, but are equally applicable to pressure pipes.

EXCAVATION

The trench should not be opened to far in advance of pipe laying and should be backfilled as soon as possible. The width of the trench at the crown of the pipe should be as narrow as practicable but not less than the outside diameter of the pipe plus 300 mm to allow proper compaction of the sidefill, 225 mm above the crown of the pipe, the trench may be any convenient width. The inherent flexibility of UPVC drainage pipe can be used to advantage but care must be taken to ensure that the bed of the trench will support the pipeline adequately so as to prevent localized loss of gradient of bridging projections must be removed to avoid point loading of the pipe.

MATERIAL FOR BEDDING AND SIDEFILLING

Some soils, as excavated from the trench (such as free drainage coarse sand, gravel, loam and soil of a friable nature) may be suitable for use as sidefill material, but they must be capable of being compacted sufficiently to provide adequate support for the pipe. Soils such as hard chalk which break up when wet. And clay should not be used immediately around the pipe for bedding, sidefill or backfill, unless arotary type excavator has been used. Should material excavated from the trench be unsuitable, then a backfill medium. Granular material is very satisfactory as it requires little compaction once placed.

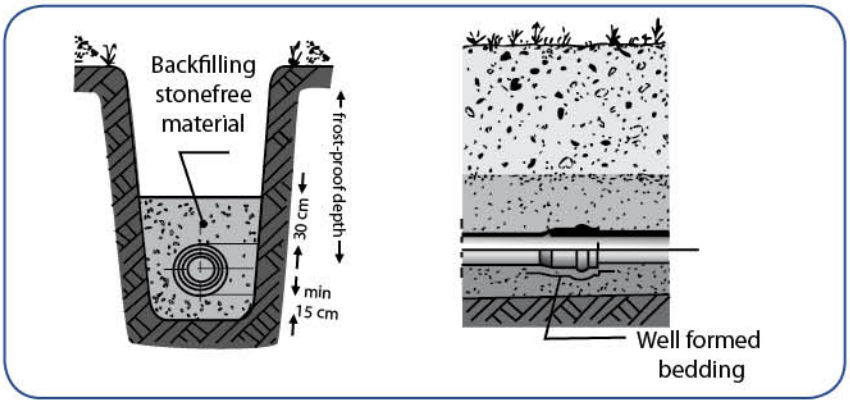
BEDDING AND SIDEFILLING

With Flexible pipes it is of great importance that the sidefill should be very firmly compacted between the sides of the pipe and the trench. Any trench Sheeting should be partially withdrawn to allow this to be done.

Before backfilling, and leveling pages or temporary packing should be removed. The thickness of the bedding under the barrel of the pipe should be not less than 1/3 of the diameter, and a minimum of 100 mm thick. In every soft or wet conditions, or where the bottom of the trench is very irregular. This thickness should be increased as necessary to give a suitable bed. The bedding should be thoroughly compacted in layers not more than 150 mm thick to give a uniform bed, true to gradient. On which the pipe may be laid. Pipes should be laid directly on this bedding. Bricks or other hard material must not be placed around the pipe and be thoroughly compacted in 75 mm layers by careful tamping up to the crown of the crown of the pipe, eliminating all cavities under the two tower quadrants of the pipe. The same material should then be placed over the crown of the pipe for not less than 2/3 of the diameter, with a minimum height of 100 and maximum of 300 mm and be thoroughly compacted. The process of filling and tamping should proceed equally on either side of the pipe, so as to maintain an equal pressure on both sides.

BACKFILLING

Normal filling of the trench should then proceed in layers not exceeding 300 mm in thickness, each layer being well rammed. Heavy mechanical reamers should not be used until the fill has reached a depth of 300 mm above the top of the pipe. Special consideration and selection of back filling material will be necessary if the risk of surface subsidence is an important consideration, for example under roads.



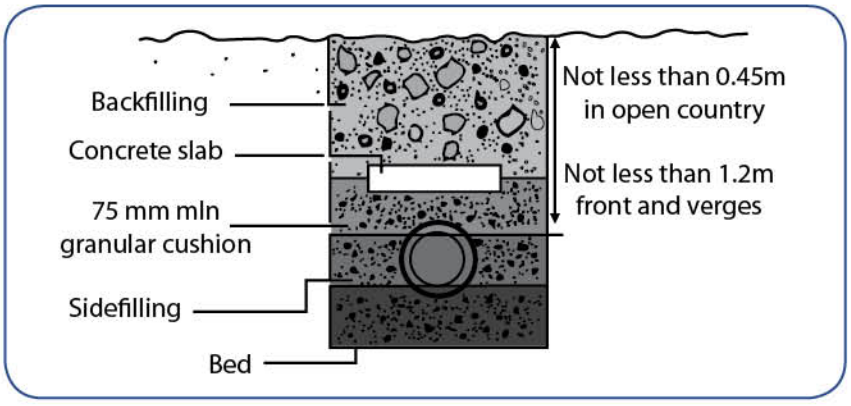
A pipe line composed of several pipe lengths can easily be laid even in narrow trench, by putting wooden bearers on which the pipe line is laid, across the trench. The pipe line is lowered by removing the wooden bearers one after the other, When work is in corrupted, the openings of the pipe line must be sealed.

MAXIMUM AND MINIMUM COVER DEPTH

Whether under roads and verges or in open country, UPVC pipes may be buried with a maximum cover depth of 6.1 meters.

However, a minimum cover depth of 1.2 meters should be allowed when pipes are installed under roads. Tests have shown that traffic loads (wheel loads) do not affect pipes with this amount of cover depth provided they are properly installed and backfilled at depths less than 1.2 meters, special consideration should be given to all the engineering factors involved, such as class of road, its construction and the position of other services. Under these circumstances. Concrete may be used as a protecting raft above the pipe line. Provided a cushion of fill is laid between the pipe crown and the raft.

In open country where top loading is unlikely to occur, pipes may be laid with a minimum cover depth of 0.45 meters without any protection. At depths less than 0.45 meters, else where than under roads, concrete slabs on a cushion of fill materials above the pipe should be used as a protection against picks. Gardening implements, etc.



SUPPORT OF FITTINGS

Before pressure test take place, all fittings flanged T-piece, and the N-pieces must be sufficiently supported against axial stress by concrete abutments. The supporting strength on the pipe diameter and the working pressure (test pressure) of the maximum permissible surface loading has to be taken into account.

Thrust force and required support area of concrete abutments for fittings and flanged T-piece at various permissible surface loading of 1.2 and 0.4 kp/cm^{2}as shown in table below.

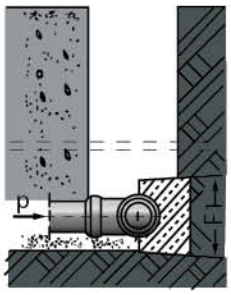
P = pressure (kp) depending on the interior pressure at 15 bar in the pipe
P1 = permissible surface loading in kp/ cm^2
F1 = required supporting area of concrete abutment in cm^2

d	63	75	90	110	140	160	225	280	315	450
p(kp) at 15 bar	468	663	954	1425	2308	3015	5962	9232	11684	23844
F1 (cm^2) p1 =1 kp/cm^2	468	663	954	1425	2308	3015	5962	9232	11684	23844
F1 (cm^2) p1 =2 kp/cm^2	234	332	477	713	1154	1508	2981	4616	5842	11917
F1 (cm^2) p1 =0.4 kp/cm^2	1170	1658	2385	3563	5770	7538	14905	23080	29210	59585

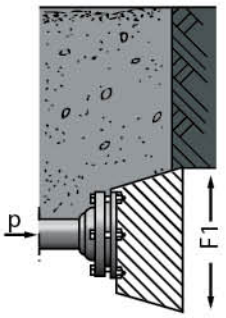
Supports for pipe socket bends, double socket and for double socket bends

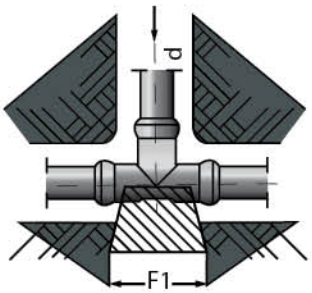
A sufficiently large bearing area of the pipe bend is required at the support. Before the concrete work start, it is recommended to envelop the bend with unsanded roofing paper. Concrete encased parts must not load the pipe line by their weight. Pipe bends must not be swan off. With these fittings, the precision of the outside diameter at the inserting end can be guaranteed only using pipe bends that have been furnished by the factory.

EXAMPLES OF HOW TO SUPPORT



Branch

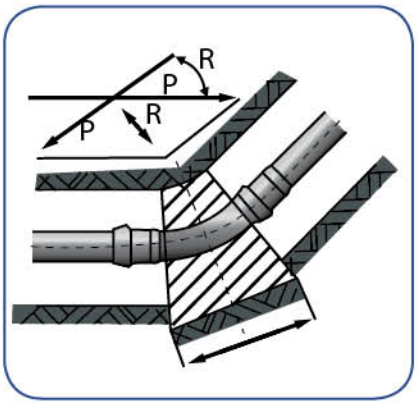




Double socket with socket with concrete abutment

Press-on flange and build flange with concrete abutment

Thrust force and required concrete supporting area for bends with varying angles and permissible surface loading of 1.2 and 0.4 kp/cm²

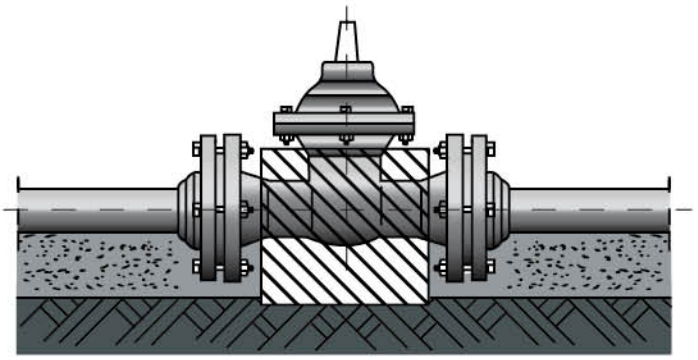


P = pressure (kp) depending on interior pressure at 15 bar (test pressure) in the pipe
R = resulting thrust (kp)
P1 = permissible surface loading (kp/cm²)
F2 = required concrete supporting area (cm²)

d		63	75	90	110	140	160	225	280	315	450
p(kp) at 15 bar		468	663	954	1425	2308	3015	5962	9232	11684	23844
R(kp)		662	938	1349	2016	3264	4264	8432	13056	16524	33720
F2 (cm2)	p1=1kp/cm²	662	938	1349	2016	3264	4264	8432	13056	16524	33720
F2 (cm2)	p1=1kp/cm²	331	469	675	1008	1632	2132	4216	6528	8262	16820
F2 (cm2)	p1=1kp/cm²	1655	2345	3373	5038	8160	10660	21078	32640	41310	84300
R (kp)		358	507	730	1091	1767	2308	4563	7066	8943	18250
F2 (cm2)	p1=1kp/cm²	358	507	730	1091	1767	2308	4563	7066	8943	18250
F2 (cm2)	p1=2kp/cm²	179	254	365	546	884	1154	2282	3533	4972	9152
F2 (cm2)	p1=0.4kp/cm²	895	1268	1825	2728	4418	5770	11408	17665	22358	4563
R (kp)		242	343	494	738	1195	1561	3086	4778	6048	12776
F2 (cm2)	p1=1kp/cm²	242	343	494	738	1195	1561	3086	4778	6048	12776
F2 (cm2)	p1=2kp/cm²	121	172	247	369	598	781	1543	2389	3024	6388
F2 (cm2)	p1=0.4kp/cm²	605	858	1235	1845	2988	3903	7715	11945	15120	31940
R (kp)		179	253	364	544	881	1151	2275	3523	4459	9099
F2 (cm2)	p1=1kp/cm²	179	253	364	544	881	1151	2275	3523	4459	9099
F2 (cm2)	p1=2kp/cm²	90	127	182	272	441	576	1138	1762	2230	4550
F2 (cm2)	p1=0.4kp/cm²	448	633	910	1360	2203	2878	5688	8808	11148	22748
R (kp)		90	127	183	273	442	578	1142	1769	2239	4569
F2 (cm2)	p1=1kp/cm²	90	127	183	273	442	578	1142	1769	2239	4569
F2 (cm2)	p1=2kp/cm²	45	64	92	137	221	289	571	885	1120	2285
F2 (cm2)	p1=0.4kp/cm²	225	318	458	683	1105	1445	2855	4423	5598	11422

SUPPORTS FOR VALVES

As the rapid closing of valves can produce considerable pressure peaks in the pipe line, it is advisable to encase valves in concrete.



Lab & Q.C

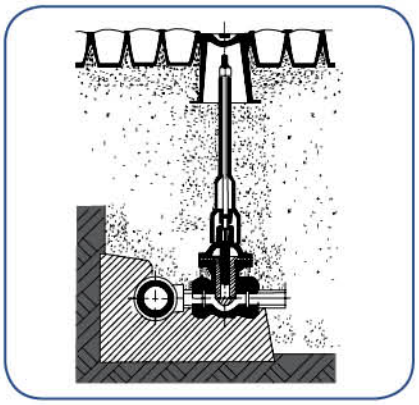
Internal Hydrostatic pressure tester

Lab & Q.C

Specimen milling Machine
for machining of plastic test specimens for tensile and impact teste

HOW TO MAKE HOUSE CONNECTIONS

The following fittings and pipe connections and serve this purpose :
a) Branch piece
b) Tapping Saddle without valve
c) Tapping Saddle with valve
A) In case of new installations the use of our branch piece is recommended.
If a shut – off connections is wanted, a sluice valve with interior thread may be used in connection with a Double nipple.



(B+C) The installation of tapping saddles requires a great deal of care: therefore for pressure pipes use only the products recommended by us.
Before setting up the tapping saddle, the inside and outside of the protective inlay and the rubber sealing ring are lubricated with "Gabofix" ; this will overcome friction and aid the correct bedding of the tapping saddle on the pipe, The bolts should be tightened evenly and with care.
For tapping PVC – pressure pipes, square bits have given best results, but make sure that the flutes on the bit are sufficiently big to allow an unobstructed flow of shaving, as otherwise, especially with thick – walled pipes, the PVC pipe could be overstressed. Conventional drills as used for steel or cast iron are not suitable for tapping pipe of unplasticized PVC. Suitable drilling equipment can be supplied (on lease if required) by us.

Thermal cycling tester for hot water and heating pipe systems

Lab & Q.C

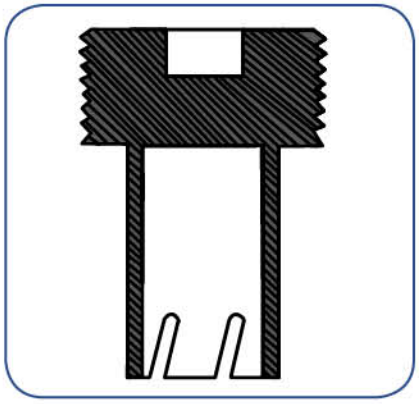
Square bit with deep flute for easy disposal of shavings

The tapping size is restricted, according to DIN 19532:

For diameter 90	**maximum 1 ¼"**
Up to diameter 160	**maximum 1 ½"**
And from diameter 225	**maximum 2"**

Pipes of diameter 63 and 75 should not be tapped.
When using tapping saddles with valves, pipes under pressure can also be tapped with suitable tools.

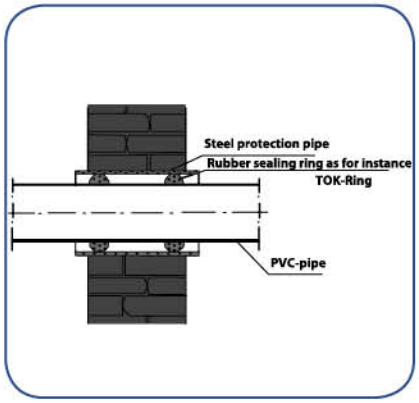
Attention is to be paid that the tapping saddle has a satisfactory foundation. The weight of the saddle should not be borne by the pipe.



LAYING PIPES THROUGH WALLS

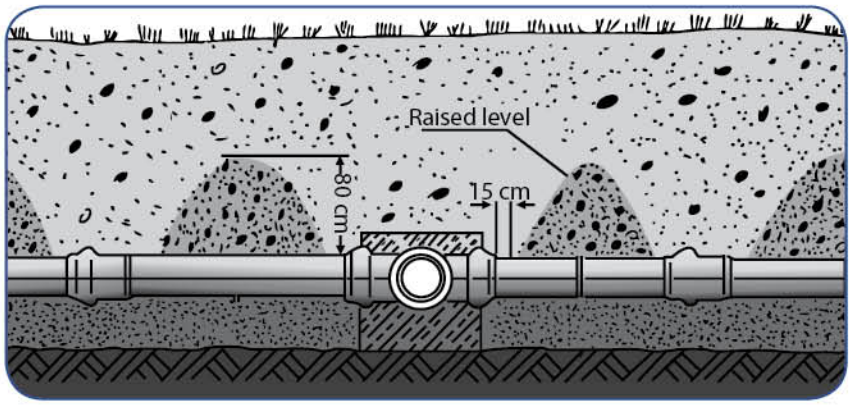
The passing of PVC pipes through masonry with a waterproof joint between pipe and wall can present problems, as cement or mortar do not bond to PVC.

This Figure Shows a method proven in practice.



PRESSURE TEST IN FIELD

Before begin of the pressure test the pipe line should, as described in chapter (Underground installation) be covered with the backfill, From experience app. 80 cm of normal soil (more in the case of light soil) are required to load the pipe sufficiently. All sockets and connections must be left uncovered for app. 15cm before and after each joint and should be kept free of water, the concrete abutments must be fully cured.



UPVC pressure pipelines should be pressure tested at intervals initially not exceeding 500 meters and subsequently not exceeding 1000 meters. ALL flexible joints should be careful examined when the pipe has reached its working pressure.

The line should be backfilled, leaving the joints exposed until a satisfactory test has been carried out. All air must be purged from the line before applying pressure. Air release valved should be installed at highest points and a further precaution against air entrapment, is to pass a foam swab through the line. The passage of the foam swab will additionally cleans the line of any debris left in the line during laying.

THE MAXIMUM TEST PRESSURES FOR AL SHARIF PIPES ARE

Max. Working pressure at 20°C		Max. Test pressure at 20°C
Class 2	4 BAR	6 BAR
Class 3	6 BAR	9 BAR
Class 4	10 BAR	15 BAR
Class 5	16 BAR	21 BAR

Note:

Under no circumstances should compressed air be used for testing UPVC pipelines, as in the event of failure which under test, injury or damage may result.

UPVC Non pressure pipelines are tested to low pressures for a specific period of time (for leakage test) the advice of our Technical Department should be obtained.

WATER FLOW CHARACTERISTICS WATER HAMMER

When a pipe contains a column of moving liquid. Considerable kinetic energy by virtue of its mass and velocity. If the velocity is suddenly destroyed by the quick closing of a valve this energy cannot be absorbed because liquid is nearly incompressible.

Therefore, an instantaneous shock is created which may represent excessively high pressures. Maximum pressure caused by water-hammer may be calculated with the following formula.

Inch-lb Unit

$$a = \frac{4660}{\sqrt{1+\frac{kdi}{Et}}}$$ **(wave velocity for water in PVC pipe)**

$$Ps = \frac{aV}{2.31.g}$$ **(Pressure surge)**

Where;
Ps: pressure surge (psi)
a: wave velocity (ft/sec)
V: maximum velocity change (ft/sec)
g: acceleration of gravity (32.2 ft/sec2)
k: fluid bulk modulus, 300,000 psi for water
di: pipe inside diameter (inches)
E: modulus of elasticity of the pipe, 420,000 psi for PVC, 360,000 psi for CPVC
t: wall thickness (inches)

S I Unit

$$a = \frac{1420.4}{\sqrt{1+\frac{kdi}{Et}}}$$

$$Ps = \frac{aV}{102.1.g}$$

Where;
Ps: pressure surge (MPa)
a: wave velocity (m/sec)
V: maximum velocity change (m/sec)
g: acceleration of gravity (9.81 m/sec2)
k: fluid bulk modulus, 2069 MPa for water
di: pipe inside diameter (m)
E: modulus of elasticity of the pipe, 2897 MPa for PVC, 2483 Mpa for CPVC
t: wall thickness (m)

Water-hammer calculated by the above formula is only about 1/3 of steel and cast iron pipe.

Water-hammer is a commonly used term for pressure surge in piping system. One of the major causes of surge is a rapid change in velocity. The maximum safe velocity in UPVC piping system depends on the specific details of the system and the operating conditions. In general, 1.5 m per second is considered to be safe. Higher velocities may be considered where the operating characteristics of valves and pumps are known so that sudden changes in flow velocity can be controlled.

The total pressure in the system at any one time (operating pressure , surge) should not exceed 150 % of the pressure rating for the minimum – rated component
(e.g..150 # flanges, union, valves, and threaded parts) in the system.

CAUSES

Here are some of the more common causes of pressure surge that should be reviewed when a plastic piping system is being considered.

Speed of opening or closing of regulating type valves.
Action of pumps starting or stopping.
Movement of entrapped air through the system.
Formation of vacuum and column separation.

PREVENTIVE MEASURES

Understanding the concept of water – hammer and designing the system to minimize it is the best possible preventive measure. A few tips to consider when attempting to reduce the causes of surge in a piping system are:

Keep fluid velocities under 5 feet per second.

Check the cycling time of valves to prevent abrupt changes in flow. Both manual and actuated valving should be checked for specific closing time.

Evaluate flow at pump start – up and during spin – down. Also determine how much air, is introduced during start – up.

Use surge control devices and standpipes wisely to give flow storage during surge and to minimize column separation. Check valves can be used near pumps to help keep lines full.

Use properly sized vacuum breaker-air valves to control the amount of air that is admitted or exhausted throughout the system

WATER FLOW CHARACTERISTIC

Friction Loss

The friction loss in hydraulic flow can be evaluated through the use of various flow coefficients. One such coefficient is the Hazen-Williams C factor. This factor for UPVC and CPVC plastic piping systems has been set as C=150. The following formula express the friction loss in feet of water and the water velocities in feet per second.

Friction loss is based on the Hazen-Williams formula

$$f = 0.2083 \times (100/C)^{1.852} \times Q^{1.852} / di^{4.8655}$$

Where

F = friction head loss in feet of water per 100 feet of pipe
C = constant for inside pipe roughness
(C = 150 for extruded smooth wall thermoplastic pipe)
Q = flow in U.S. Gallons per minute
di = inside diameter of pipe in inches

The value of C = 150 for thermoplastic pipe is based in engineering measurements made with new and used thermoplastic pipe in several laboratories.
Thus, the value of C = 150 has a conservative bias. Using C = 150, the equation reduces to

$$F = 0.09830\ Q^{1.852} / di^{4.8655}$$

Water velocities in feet per second V may be calculated as follows

$$V = 0.408709\ Q / di^{2}$$

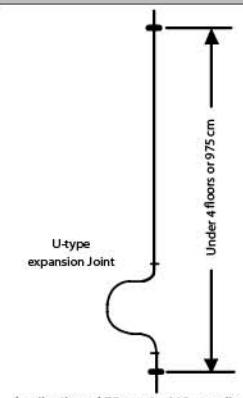
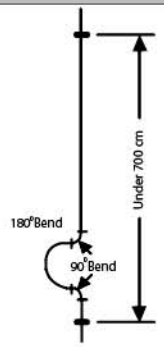
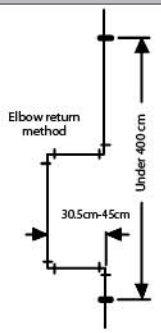
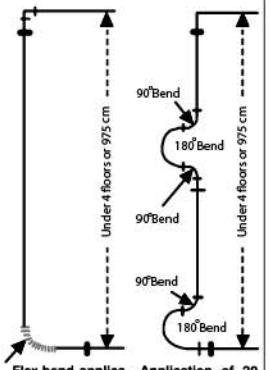
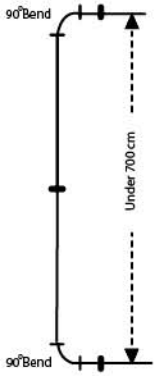
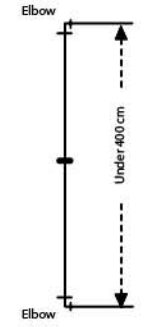
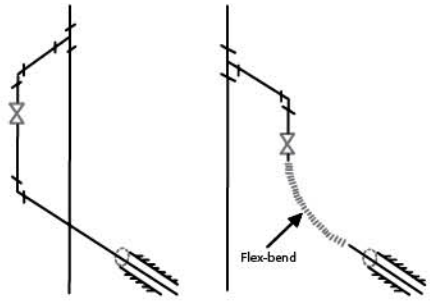
Nominal Pipe Size (in)	1/2" 20mm	3/4" 25mm	1" 32mm	1¼" 40mm	1½" 50mm	2" 63mm	2½" 75mm	3" 90mm	4" 110mm	6" 160mm	8" 200mm
Tee Flow Thru Run	1.0	1.4	1.7	2.3	2.7	4.3	5.1	6.3	8.3	12.5	16.5
Tee Flow Thru Branch	4.0	5.0	6	7.0	8.0	12.0	15.0	16.0	22.0	32.0	38.0
90°Elbow, Standard	1.5	2.0	2.25	4.0	4.0	6.0	8.0	8.0	12.0	18.0	22.0
45°Elbow, Standard	0.75	1.0	1.4	1.75	2.0	2.5	3.0	4.0	5.0	8.0	10.0
Insert Coupling	0.5	0.75	1.0	1.25	1.5	2.0	3.0	3.0	4.0	6.25	-
Male-Female Adapters	1.0	1.5	2.0	2.75	3.5	4.5	-	6.5	9.0	14.0	-

Fundamentals of Adjusting for Expansion and Contraction of Horizontal Pipe

	Long straight sections	Straight sections 400 cm to 700 cm long	Straight sections 215 cm to 400 cm long	Straight sections 215 cm or less
Absorbing expansion and contraction in straight sections	U-type 75 mm - 110 mm dia. 700 - 1400 cm Loop-type 20 mm - 63 mm dia. 700 - 1000 cm Flex-bend 20 mm - 32 mm dia. 700 - 1500 cm	In accordance with the methods of absorbing expansion and contraction in bending sections	In accordance with the methods of absorbing expansion and contraction in bending sections	Adjusting for expansion and contraction is not necessary
Absorbing expansion and contraction in bending sections	Flex-bend 20 mm - 32 mm dia. 1500 cm 45 cm	Bend Bend 350 cm OR LESS 350 cm OR LESS 350 cm OR LESS Full size Bend Flex-bend 3 OR LESS 350 cm 750 cm 750 cm 20 mm - 32 mm dia	400 cm OR LESS Elbow Elbow Elbow Elbow 400 cm OR LESS	Using an elbow
	Long distance from anchored point to branch point	**Distance of 400 cm to 700 cm from anchored point to branch point**	**Distance of 215 cm to 400 cm from anchored point to branch point**	
Locating branch points on the main pipe and absorbing expansion and contraction in the branch sections	Main pipe Usag of 3 pcs of elbow Main pipe line Flex-bend 20 mm - 32 mm dia.	Main pipe Bend Usag of 1 pcs of bend and 1 pc. of elbow **(Remarks) Be sure to use bend on the main pipe side**	Elbow Elbow Usag of 2 pcs of elbow	**Adjusting for expansion and contraction is not necessary**
Location of branching	Anchored point Expansion joint Anchored point Expansion joint Anchored point **Branch as near as possible to anchored points**			

(remarks) —+— **make in the above table expresses "anchored supports"**

Fundamentals of Adjusting for Expansion and Contraction of Vertical Pipe

Sections to absorb expansion and contraction	Long vertical pipes	Vertical pipes of 400 cm to 700 cm long	Vertical pipes of 215 cm to 400 cm long	Vertical pipes of 215 mm or less
Absorbing expansion and contraction in straight sections	 Application of 75 mm to 110 mm dia.	 Application of 20 mm to 63 mm dia.	 Application of Full size	Adjusting for expansion and contraction is not necessary
Absorbing expansion and contraction in bending sections	 Flex-bend application of 20 mm to 32 mm dia. Application of 20 mm to 63 mm dia.	 Application of Full size	 Application of Full size	Adjusting for expansion and contraction is not necessary
Branching on vertical pipes				Adjusting for expansion and contraction is not necessary

(remarks) ——+—— make in the above table expresses “anchored supports”

ALLOWANCE FOR UNDERGROUND CONTRACTION

PVC PIPE SNAKING PROCEDURE

Installation and operating temperatures for underground pipelines frequently vary. PVC expands under increasing temperatures and contracts with decreasing temperatures. Allowance for thermal expansion and contraction is easily made by snaking the pipe in the trench. Snaking is recommended for pipe using solvent cemented joints or other rigid couplings 20 mm through 75 mm nominal size.

When installation temperature is lower than the operating temperature, install the pipe in straight alignment and bring the pipe up to operating temperature after the joints are cured but before backfilling.

When installation temperature is considerably higher than the operating temperature. The pipe should be installed by "snaking" in the trench. Recommended offsets and loop lengths for up to 75 nominal size are shown in the chart below.

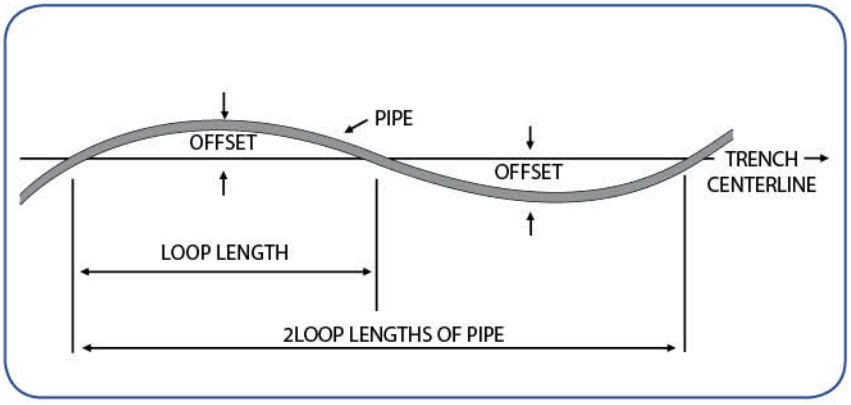
LOOP OFFSET IN PIPE SNAKING PROCEDURE FOR UNDERGROUND CONTRACTION

Inch-lb Unit (feet)

Difference Temprature										
Loop Lenght(feet)	10°	20°F	30°F	40°F	50°F	60°F	70°F	80°F	90°F	100°F
20	3.03	.5	4.55	.0	6.06	.5	7.07	.0	8.08	.0
50	7.09	.0	11.0	13.0	14.0	15.5	17.0	18.0	19.0	20.0
100	13.0	18.0	22.0	26.0	29.0	31.5	35.0	37.0	40.0	42.0

S I Unit (cm)

Difference Temprature					
Loop Lenght(m)	10°C	20°C	30°C	40°C	50°C
6	91	31	61	82	0
15	22	31	37	44	50
30	44	62	76	90	107



FRICTION LOSS

S I Unit

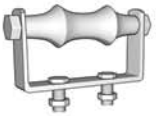
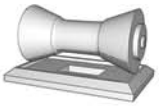
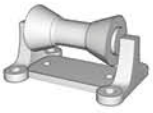
Flow Rate		Flow Velocity V	Friction Head loss	Friction loss	Flow Velocity V	Friction Head loss	Friction loss	Flow Velocity V	Friction Head loss	Friction loss	Flow Velocity V	Friction Head loss	Friction loss	Flow Rate	
Gallon/min	Liter/min	m/sec	m/100m	MPa/100m	m/sec	m/100m	MPa/100m	m/sec	m/100m	MPa/100m	m/sec	m/100m	MPa/100m	Gallon/min	Liter/min
		20mm													
1	3.8	0.45	2.23	0.02	25mm									1	3.8
2	7.6	0.90	8.05	0 08	0.48	1 73	0.02	32mm						2	7.6
5	18.9	2.25	43.96	0.43	1.19	9.44	0.09	0.71	2.67	0.03	40mm			5	18.9
7	26.5	3.15	81.97	0.80	1 67	17.61	0.17	1.00	4.99	0.05	0.55	1.20	0.01	7	26.5
10	37.9	4.50	158.68	1.56	2.39	34.09	0.33	1.42	9.65	0.09	0.79	2.31	0.02	10	37.9
15	56.8				3.58	72.24	0.71	2.13	20.45	0.20	1.19	4.90	0.05	15	56.8
20	75.7							2.84	34.85	0.34	1.58	8.35	0.08	20	75.7
25	94.6	110mm						3.56	52.68	0 52	1.98	12.63	0.12	25	94.6
30	114	0.26	0.08	0.00				4 27	73.84	0.72	2.37	17.70	0.17	30	114
35	132	0 30	0.11	0 00				4.98	98.23	0.96	2.77	23.55	0.23	35	132
40	151	0.35	0.14	0.00				5.69	125.79	1.23	3.16	30.15	0.30	40	151
45	170	0.39	0.17	0.00	125mm						3.56	37.51	0.37	45	170
50	189	0.43	0.21	0.00	0.27	0.07	0.00				3.95	45.59	0.45	50	189
60	227	0.52	0.30	0 00	0.33	0.10	0.00				4.74	63.90	0.63	60	227
70	265	0.61	0.39	0.00	0.38	0.13	0.00							70	265
75	284	0.65	0.45	0.00	0.41	0.15	0.00	160mm						75	284
80	303	0.70	0.51	0.00	0.44	0.16	0.00	0.31	0.07	0.00				80	303
90	341	0 78	0.63	0.01	0 49	0.20	0.00	0.34	0.09	0.00				90	341
100	379	0 87	0 76	0.01	0.55	0.25	0.00	0.38	0.10	0.00				100	379
125	473	1.09	1.16	0 01	0 68	0.38	0.00	0.48	0.16	0.00	200mm			125	473
150	568	1.30	1.62	0.02	0.82	0 53	0.01	0.57	0.22	0.00	0.33	0.06	0.00	150	568
175	662	1.52	2.16	0.02	0.96	0.70	0.01	0.67	0.29	0.00	0.38	0.07	0.00	175	662
200	757	1.74	2.76	0.03	1 10	0.90	0.01	0.76	0.37	0.00	0.44	0.10	0.00	200	757
250	946	2.17	4.17	0.04	1.37	1.36	0.01	0.96	0.57	0.01	0.54	0.14	0.00	250	946
300	1136	2.61	5.85	0.06	1 64	1.90	0.02	1.15	0.79	0.01	0.65	0.20	0.00	300	1136
350	1325	3 04	7.78	0 08	1.92	2.53	0.02	1 34	1.05	0.01	0.76	0.27	0.00	350	1325
400	1514	3.48	9.96	0.10	2.19	3.24	0.03	1.53	1.35	0.01	0.87	0.34	0 00	400	1514
450	1703				2.47	4.04	0.04	1.72	1.68	0.02	0.98	0.43	0.00	450	1703
500	1893				2.74	4.91	0.05	1.91	2.04	0.02	1.09	0.52	0.01	500	1893
750	2839	450mm						2 87	4.32	0.04	1.63	1.10	0.01	750	2839
1000	3785	0 49	0.05	0.00	500mm			3.82	7.37	0.07	2.18	1.87	0.02	1000	3785
1250	4731	0.61	0.07	0.00	0.49	0.04	0.00				2.72	2.83	0.03	1250	4731
1500	5678	0.73	0.10	0 00	0 59	0.06	0.00	630mm			3.26	3.97	0.04	1500	5678
2000	7570	0.97	0.18	0.00	0.79	0.10	0.00	0.54	0.04	0.00				2000	7570
2500	9463	1.21	0 27	0.00	0.98	0.16	0.00	0 68	0.06	0.00				2500	9463
3000	11355	1.46	0.37	0.00	1.18	0.22	0.00	0.81	0.09	0.00				3000	11355
3500	13248	1 70	0.50	0.00	1.37	0.30	0.00	0.95	0.12	0.00				3500	13248
4000	15140	1.94	0.64	0.01	1 57	0.38	0.00	1.09	0.15	0.00				4000	15140
4500	17033	2.19	0.79	0 01	1.77	0.47	0.00	1.22	0.19	0.00				4500	17033
5000	18925	2.43	0.96	0.01	1.96	0.57	0.01	1.36	0.23	0.00				5000	18925
5500	20818	2.67	1.15	0.01	2.16	0.68	0.01	1.49	0.28	0.00				5500	20818
6000	22710	2.91	1.35	0.01	2.36	0.80	0.01	1.63	0.33	0.00				6000	22710
6500	24603	3.16	1 56	0.02	2 55	0.93	0.01	1.77	0.38	0.00				6500	24603
7000	26495	3.40	1.79	0.02	2 75	1.07	0.01	1.90	0.44	0.00				7000	26495
7500	28388				2.94	1 21	0.01	2 04	0.49	0.00				7500	28388
8000	30280				3.14	1.37	0.01	2.17	0.56	0.01				8000	30280
8500	32173							2.31	0.62	0.01				8500	32173
9000	34065							2.44	0.69	0.01				9000	34065
9500	35958							2.58	0.77	0.01				9500	35958
10000	37850							2.72	0.84	0.01				10000	37850

Flow Rate		Flow Velocity V	Friction Head loss	Friction loss	Flow Velocity V	Friction Head loss	Friction loss	Flow Velocity V	Friction Head loss	Friction loss	Flow Velocity V	Friction Head loss	Friction loss	Flow Rate	
Gallon/min	Liter/min	m/sec	m/100m	MPa/100m	m/sec	m/100m	MPa/100m	m/sec	m/100m	MPa/100m	m/sec	m/100m	MPa/100m	Gallon/min	Liter/min
1	3.8													1	3.8
2	7.6													2	7.6
5	18.9													5	18.9
7	26.5	50mm												7	26.5
10	37.9	0.57	1.05	0.01	63mm									10	37.9
15	56.8	0.86	2.23	0.02	0.51	0.63	0.01	75mm						15	56.8
20	75.7	1.14	3.80	0.04	0.68	1.07	0.01	0.47	0.45	0	90mm			20	75.7
25	94.6	1.43	5.74	0.06	0.85	1.62	0.02	0.59	0.68	0.01	0.38	0.23	0.00	2	94.6
30	114	1.72	8.04	0.08	1.02	2.28	0.02	0.71	0.95	0.01	0.46	0.32	0.00	30	114
35	132	2.00	10.70	0.10	1.19	3.03	0.03	0.83	1.26	0.01	0.53	0.43	0.00	35	132
40	151	2.29	13.70	0.13	1.36	3.88	0.04	0.95	1.62	0.02	0.61	0.54	0.01	40	151
45	170	2.57	17.04	0.17	1.53	4.83	0 05	1.07	2.01	0.02	0.68	0.68	0.01	45	170
50	189	2.86	20.72	0.20	1.70	5.87	0.06	1.19	2.44	0.02	0.76	0.82	0.01	50	189
60	227	3.43	29.04	0.28	2.04	8.22	0.08	1.42	3.43	0.03	0.91	1.15	0.01	60	227
70	265	4.00	38.63	0.38	2.38	10.94	0.11	1.66	4.56	0.04	1.06	1.53	0.02	70	265
75	284				2.55	12.43	0 12	1.78	5.18	0.05	1. 14	1.74	0.02	75	284
80	303				2.72	14.01	0.14	1.90	5.84	0.06	1.21	1.97	0.02	80	303
90	341				3.06	17.42	0.17	2.14	7.26	0.07	1.37	2.44	0.02	90	341
100	379				3.40	21.17	0.21	2.37	8.82	0.09	1.52	2.97	0.03	100	379
125	473				4.25	32.01	0.31	2.97	13.34	0.13	1.90	4.49	0.04	125	473
150	568							3.56	18.69	0.18	2.28	6.30	0.06	150	568
175	662							4.16	24.87	0.24	2.66	8.38	0.08	175	662
200	757										3 04	10.73	0.11	200	757
250	946	250mm									3.80	16.22	0.16	250	946
300	1136	0.41	0.06	0.00										300	1136
350	1325	0.48	0.09	0 00	315mm									350	1325
400	1514	0.55	0.11	0.00	0.39	0.05	0.00							400	1514
450	1703	0.62	0 14	0.00	0.44	0.06	0.00	355mm						450	1703
500	1893	0.69	0.17	0.00	0.49	0.07	0.00	0.40	0.05	0.00	400mm			500	1893
750	2839	1.04	0.36	0.00	0.73	0.16	0.00	0.61	0.10	0.00	0.46	0.05	0.00	750	2839
1000	3785	1.38	0 62	0.01	0 98	0.27	0.00	0.81	0.17	0.00	0.62	0.09	0.00	1000	3785
1250	4731	1.73	0 94	0.01	1.22	0.40	0.00	1.01	0.25	0.00	0.77	0.13	0.00	1250	4731
1500	5678	2.07	1.32	0.01	1.46	0.56	0.01	1.21	0.36	0.00	0.92	0.18	0.00	1500	5678
2000	7570	2.76	2 24	0.02	1.95	0.96	0.01	1.62	0.61	0.01	1.23	0.31	0.00	2000	7570
2500	9463	3.46	3.39	0.03	2.44	1.45	0.01	2.02	0.92	0.01	1.54	0.48	0.00	2500	9463
3000	11355				2.93	2.04	0.02	2.43	1.29	0.01	1.85	0.67	0.01	3000	11355
3500	13248				3.42	2.71	0.03	2.83	1.72	0.02	2.16	0.89	0.01	3500	13248
4000	15140							3.24	2 20	0.02	2.47	1.14	0.01	4000	15140
4500	17033							3.64	2.73	0.03	2.77	1.41	0.01	4500	17033
5000	18925										3.08	1.72	0.02	5000	18925
5500	20818													5500	20818
6000	22710													6000	22710

CAUTION

Flow velocity should not exceed 5 feet per second PVC pipe cannot be used for compressed air service.

RECOMMENDED PIPE HANGERS FOR UPVC & CPVC PIPING SYSTEM

Pipe Rings		Pipe Rolls		Straps Hooks
 Adj. Swivel Ring Split Ring type 25 to 200 mm pipe	 Split Ring 25 to 200 mm pipe	 Adj. Steel Yoke Pipe Roll 75 to 500 mm pipe	 Adj. Swivel Pipe Roll 75 to 315 mm pipe	 Wrought Strap Short 75 to 315 mm pipe
 Adj. Ring 20 to 200 mm pipe	 Adj. Swivel Ring 20 to 200 mm pipe	 Single Pipe Roll 32 to 710 mm pipe	 Adj. Pipe Roll Support 32 to 710 mm pipe	 One Hole Clamp 32 to 710 mm pipe
 Adj. Clevis - Standard 20 to 710 mm pipe	 Adj.Clevis For Insulated Lines 25 to 315 mm pipe	 Roller Chair 63 to 315 mm pipe	 Pipe Roll and plate 63 to 630 mm pipe	 Tin Strap 20 to 63 mm pipe
		 Pipe Roll Stand Complete 63 to 710 mm pipe		

Pipe Clamps		Pipe Covering
 Pipe Clamp Medium 20 to 630 mm pipe	 Double Bolt Pipe Clamp 25 to 710 mm pipe	 Insulation Protection Shield 20 to 630 mm pipe

U - Bolt
 Standard 20 to 710 mm pipe Light weight 20 to 250 mm pipe

Also Availble Plastic Coated

CAUTION

PVC plastic piping systems will give excellent, maintenance free performance over many years use when the application and system designs is correct for the product and installation is properly done. It is most important to know the physical properties and limitations of PVC plastic pipes when selecting the system for their use. These points should be taken into consideration in order to avoid problems caused by misapplication or poor installation.

Impact resistance is lower than for metals therefore plastic pipe must be protected from contact with hard and pointed objects.

Expansion and contraction is greater that for metals. This can cause breaks and leaking joints if system design is not flexible to allow for movement.

Temperature pressure relationship has to be taken into consideration. The pressure rating (tensile strength) of PVC decreases as temperature increases.

Extremes of heat and cold can cause failure. Allowing liquids to freeze inside of PVC can cause the pipe and / or the joints to crack. Heat beyond design limits can cause failures.

Certain chemicals, especially petroleum distillates and derivatives, can cause failure. Every chemical should be verified and approved in the manufactures chemical resistance chart.

* Non-liquid transport is not recommended. Compressed air or gasses can surge to high pressures and cause failures which could endanger personnel.

* Protection from sunlight : PVC pipe compounds normally do not provide extended protection from the ultraviolet rays of the sun. Therefore. Unless the material has been specially formulated to provide protection. The product must be protected from sunlight or some damage may occur after years of exposure otherwise you must use AL-SHARIF anti UV Pipes.

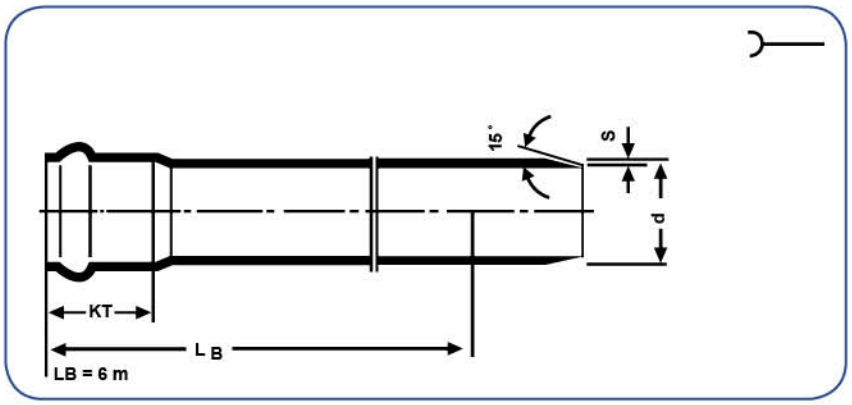
* Water hammer (surge) in a PVC system can cause pipe, fittings, and valves to burst. Safeguards should be designed into the system to prevent excessive surge pressures. Liquid velocities should not exceed five feet per second maximum. Always bleed all trapped air from the system before testing and start up.

* Trenches for buried pipe should be free of rocks and debris that can rupture the pipe. Backfilling and top loading should be watched very carefully.

* In every case installation procedures should be carefully read followed. It is very important to know the reputation and abilities of your installation crew or contractor. Professional engineering design of the system and close supervision of the assembly-installation procedures are recommended. Any questions concerning the application or installation or PVC piping products should be directed to the supplier, manufacturer or consultant.

AL-SHARIF UPVC PIPES DIMENSIONS ACCORDING TO DIN 8061/62 STANDARD

Nominal outside diameters and nominal wall thickness of unplastized PVC PIPES.



NOMINAL OUTSIDE DIAMETER mm	(Kt) mm	CLASS I S62.5 SDR126		CLASSII S25 SDR51 PN4		CLASS III S16.667 SDR34.334 PN6		CLASS IV S10 SDR21 PN10		CLASS V S6.25 SDR13.5 PN16		CLASS VI S4 SDR9	
		wt Kg/m	s mm	wt Kg/m	s mm	wt Kg/m	s mm	wt Kg/m	s mm	wt Kg/m	s mm	wt Kg/m	s mm
10										0.045	1.0	0.053	1.2
12										0.055	1.0	0.073	1.4
16										0.090	1.2	0.123	1.8
20										0.137	1.5	0.196	2.3
25								0.174	1.5	0.212	1.9	0.294	2.8
32								0.264	1.8	0.342	2.4	0.482	3.6
40						0.334	1.8	0.350	1.9	0.525	3.0	0.75	4.5
50	75					0.422	1.8	0.552	2.4	0.809	3.7	1.16	5.6
63	100					0.562	1.9	0.854	3.0	1.29	4.7	1.82	7
75	110			0.642	1.8	0.782	2.2	1.22	3.6	1.82	5.6	2.6	8.4
90	110			0.774	1.8	1.13	2.7	1.75	4.3	2.61	6.7	3.7	10
110	115	0.950	1.8	1.16	2.2	1.64	3.2	2.61	5.3	3.90	8.2	5.57	12.3
125	120	1.08	1.8	1.48	2.5	2.13	3.7	3.34	6.0	5.01	9.3	7.13	13.9
140	125	1.21	1.8	1.84	2.8	2.65	4.1	4.18	6.7	6.27	10.4	8.96	15.6
160	132	1.39	1.8	2.41	3.2	3.44	4.7	5.47	7.7	8.17	11.9	11.7	17.8
180	145	1.57	1.8	3.02	3.6	4.37	5.3	6.88	8.6	10.4	13.4	14.7	20
200	145	1.74	1.8	3.70	4.0	5.37	5.9	8.51	9.6	12.8	14.9	18.3	22.3
225	152	1.96	1.8	4.70	4.5	6.76	6.6	10.8	10.8	16.1	16.7	23	25
250	160	2.40	2.0	5.65	4.9	8.31	7.3	13.2	11.9	19.9	18.6	28.4	27.8
280	170	3.11	2.3	7.11	5.5	10.4	8.2	16.6	13.4	24.9	20.8		
315	180	3.78	2.5	9.02	6.2	13.2	9.2	20.9	15.0	31.5	23.4		
355	180	4.88	2.9	11.4	7.0	16.7	10.4	26.5	16.9	39.9	26.3		
400	200	6.10	3.2	14.5	7.9	21.1	11.7	33.7	19.1	50.8	29.7		
450	200	7.65	3.6	18.3	8.9	26.8	13.2	42.7	21.5				
500	250	9.38	4.0	22.4	9.8	32.9	14.6	52.6	23.9				
560	260	11.8	4.5	28.1	11.0	41.4	16.4	65.8	26.7				
630	300	14.7	5.0	35.7	12.4	52.2	18.4	83.2	30.0				
710	320	18.9	5.7	45.3	14.0	66.1	20.7						

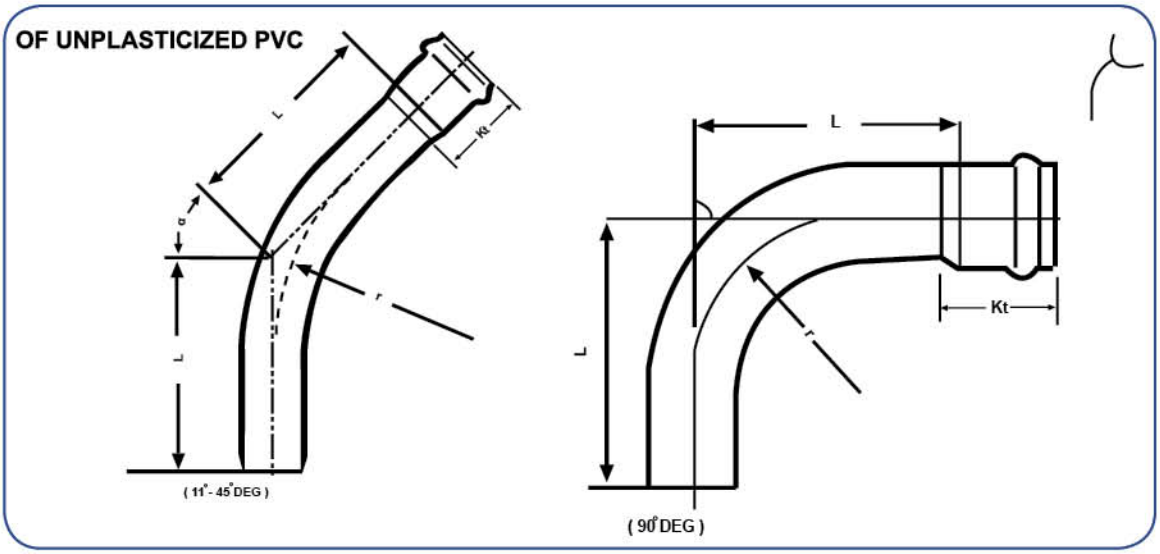
AL-SHARIF anti ultra violet pipes has been specially formulated to provide protection from sun light (UV) if client required that.

AL-SHARIF UPVC PIPES DIMENSIONS ACCORDING TO ISO 4422 & ES 848 - 1/2008

Nominal outside diameter dn	pipe series S, SDR series and nominal pressure PN equivalents S 20 SDR41 PN5	S 16.7 SDR34.4 PN6	S 16 SDR33 PN6.3	S 12.5 SDR26 PN8	S 10 SDR21 PN10	S 8 SDR17 PN12.5	S 6.3 SDR13.6 PN16	S 4 SDR9 PN25
	Nominal wall thickness							
10	-	-	-	-	-	-	-	1.5
12	-	-	-	-	-	-	-	1.5
16	-	-	-	-	-	-	1.5	1.8
20	-	-	-	-	-	-	1.5	2.3
25	-	-	-	-	-	1.5	1.9	2.8
32	-	-	-	-	1.6	1.9	2.4	3.6
40	-	-	1.5	1.6	1.9	2.4	3	4.5
50	-	-	1.6	2	2.4	3	3.7	5.6
63	1.6	1.9	2	2.5	3	3.8	4.7	7.1
75	1.9	2.2	2.3	2.9	3.6	4.5	5.6	8.4
90	2.2	2.7	2.8	3.5	4.3	5.4	6.7	10.1

Nominal outside diameter dn	pipe series S, SDR series and nominal pressure PN equivalents S 16 SDR33 PN8	S 10 SDR21 PN12.5	S 6.3 SDR13.6 PN20	S 5 SDR11 PN25
	Nominal wall thickness			
110	3.4	5.3	8.1	10
125	3.9	6	9.2	11.4
140	4.3	6.7	10.3	12.7
160	4.9	7.7	11.8	14.6
180	5.5	8.6	13.3	16.4
200	6.2	9.6	14.7	18.2
225	6.9	10.8	16.6	-
250	7.7	11.9	18.4	-
280	8.6	13.4	20.6	-
315	9.7	15	23.2	-
355	10.9	16.9	26.1	-
400	12.3	19.1	29.4	-
450	13.8	21.5	33.1	-
500	15.3	23.9	36.8	-
560	17.2	26.7	-	-
630	19.3	-	-	-
710	21.8	-	-	-

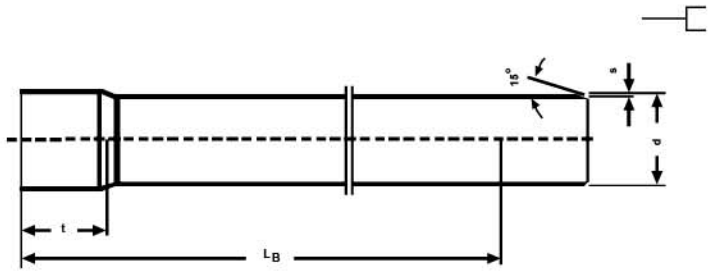
RUBBER SOCKET BENDS



d	r	kt	L				L
			11°	22°	30°	45°	90°
63	221	100	165	187	203	235	364
75	263	110	177	204	222	260	414
90	315	110	192	224	246	292	476
110	385	115	212	251	278	334	559
125	438	120	227	271	301	365	622
140	490	125	243	292	326	397	684
160	560	132	264	320	358	440	768
200	729	145	303	373	422	524	934
225	788	152	329	408	462	578	1039
250	852	160	350	435	480	595	1240
280	980	170	385	483	551	694	1268
315	1103	180	420	531	607	768	1414
355	1243	180	461	585	671	853	1581
400	1400	200	504	644	740	945	1765

PRESSURE PIPE WITH SOLVENT CEMENT SOCKET JOINT

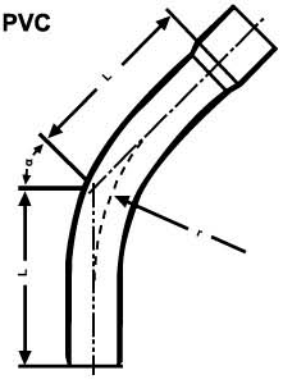
OF UNPLASTICIZED PVC



d	63	75	90	110	140	160
s	3.0	3.6	4.3	5.3	6.7	7.7
t	68	76	86	99	119	152

SOLVENT CEMENT SOCKET BENDS

OF UNPLASTICIZED PVC

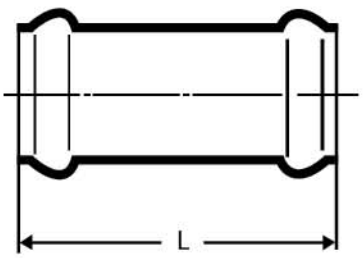


d	r	L				L
		11°	22	30°	45°	90°
63	221	165	187	203	235	364
75	263	177	204	222	260	414
90	315	192	224	246	292	476
110	385	212	251	278	334	559
125	438	227	271	301	365	622
140	490	243	292	326	397	684
160	560	264	320	358	440	768

COUPLING

SLEEVE JOINTS (REPAIR COUPLING)

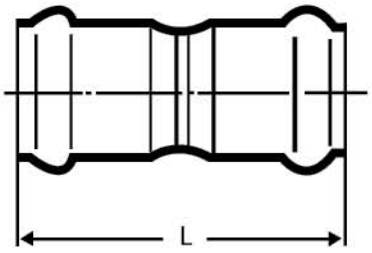
OF UNPLASTICIZED PVC



No. Size	63	75	90	110	140	160	200	225	250	280	315	355	400
L	250	270	270	270	365	365	430	430	430	500	1000	1000	1000

DOUBLE SOCKET

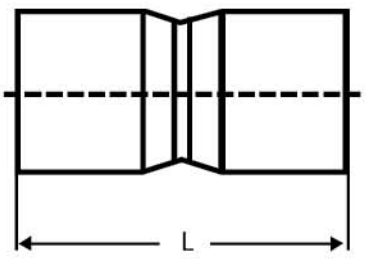
OF UNPLASTICIZED PVC



No. Size	63	75	90	110	140	160	200	225	250	280	315	355	400
L	250	270	270	270	365	365	430	430	430	500	1000	1000	1000

DOUBLE SOCKET (CEMENT)

OF UNPLASTICIZED PVC



No. Size	63	75	90	110	140	160
L	159	180	206	240	292	326

PIPE FOR UNDERGROUND DRAINAGE AND SEWAGE SYSTEMS

UPVC pipes for below ground gravity drainage and sewage systems.

Dimensions :

According to DIN 19534

Nominal outside diameter mm	110	125	160	200	250	315	400	500	630
Nominal wall thickness mm	3.0	3.0	3.6	4.5	6.1	7.7	9.8	12.2	15.4

PIPE FOR SOIL, WASTE AND VENTING INSIDE BUILDING

The range of UPVC pipes for soil, waste and vent. Inside the buildings.

Dimensions :

According to DIN 19531

Nominal outside diameter mm	40	50	75	110	125	160
Nominal wall thickness mm	1.8	1.8	1.8	2.2	2.5	3.2

UPVC PRESSURE THREADED PIPES

Dimensions :

D	O.D (mm)	I-D (mm)	S (mm)
½"	21.2	16	2.6
¾"	26.6	20.6	3
1"	33.4	26.4	3.5
1 ¼"	42.1	34.6	3.75
1 ½"	48	39.4	4.3
2"	60	49.4	5.3

PIPE FOR UNDERGROUND DRAINAGE AND SEWAGE SYSTEMS

UPVC pipes for below ground gravity drainge and sewage systems

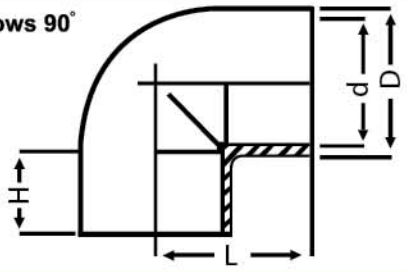
According to ES 1717

Measuring name DN/OD	Nominal diameter dn	SN2 SDR51		SN4 SDR41		SN8 SDR34	
		e min	e max	e min	e max	e min	e max
110	110	-	-	3.2	3.8	3.2	3.8
125	125	-	-	3.2	3.8	3.7	4.3
160	160	3.2	3.8	4.0	4.6	4.7	5.4
200	200	3.9	4.5	4.9	5.6	5.9	6.7
250	250	4.9	5.6	6.2	7.1	7.3	8.3
315	315	6.2	7.1	7.7	8.7	9.2	10.4
355	355	7.0	7.9	8.7	9.8	10.4	11.7
400	400	7.9	8.9	9.8	11.0	11.7	13.1
450	450	8.8	9.9	11.0	12.3	13.2	14.8
500	500	9.8	11.0	12.3	13.8	14.6	16.3
630	630	12.3	13.8	15.4	17.2	18.4	20.5
710	710	13.9	15.5	17.4	19.4	-	-

PIPE FITTINGS FOR SOLVENT CEMENT JOINTING

Fiitings According to DIN 8063

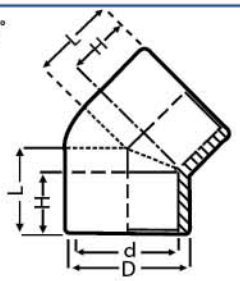
ELbows 90°



FPS X FPS

d	D	H	L
16	23	14	23
20	27	16	27
25	33	19	33
32	42.7	30	48
40	52.1	33	56
50	63.3	37	65
63	79.7	42	77
75	91.5	44	83
90	109	51	97
110	131	61	117
160	187	86	167

ELbows 45°

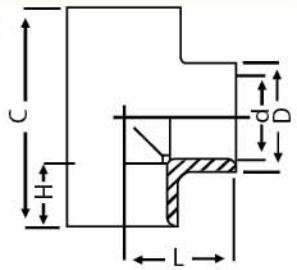


FPS X FPS

d	D	H	L
20	29	22	32
25	35	26	35
32	44	22	40
40	52	26	43
50	60	31	43
63	75	39	56
75	89	44	62
90	105	51	72
110	127	61	87
160	186	86	120

Tees 90°equal

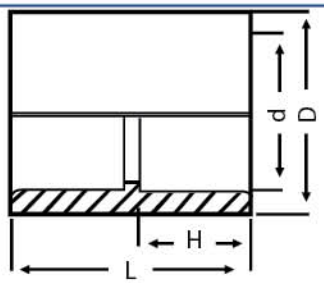
FPS X FPS X FPS



d	D	H	L	C
20	27	16	27	54
25	33	19	33	65
32	42.7	30	48	96
40	52.1	33	56	112
50	63.3	37	65	130
63	79.7	42	77	154
75	91.5	44	83	165
90	109	51	97	197
110	131.5	61	117	237
160	188	86	167	335

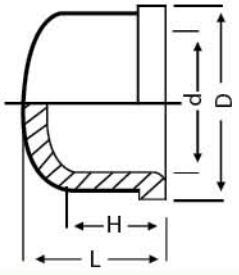
Sockets

FPS X FPS



d	D	H	L
16	22	14	31
20	27	16	35
25	33	19	41
32	42.7	30	62.5
40	52.1	33	68.5
50	63.3	37	77
63	79.7	42	87.5
75	91	44	95
90	106	51	107
110	131.5	61	128
160	191	86	178

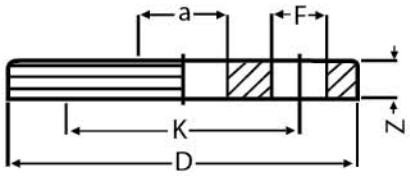
Caps



FPS

d	D	H	L
16	24.5	14	21
20	29.5	16	24
25	35.5	19	28
32	44	22	32
40	54	26	38
50	66	31	45
63	80	38	56
75	96	44	64
90	115	51	77
110	132	61	92
160	188	86	114

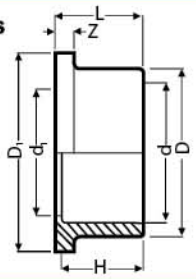
Backing Flanges



d	D	K	a	Z	F	No. of holes
20	95	63	28	11	14	4
25	105	73	34	12	14	4
32	115	83	42	14	14	4
40	140	100	51	15	18	4
50	150	110	62	16	18	4
63	165	125	78	18	18	4
75	185	145	92	19	18	4
90	200	160	110	20	18	8
110	220	180	133	22	18	8
160	285	240	190	28	22	8

Flanges Adaptors (Female)

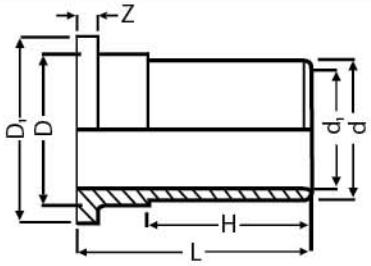
FPS



d	D	d_1	D_1	Z	H	L
20	27	14	34	6	16	19
25	33	19	41	7	19	22
32	41	26	50	7	22	25
40	50	34	60	8	26	29
50	61	42	73	8	36	40
63	77	57	90	9	38	41
75	91	69	106	10	44	47
90	108	82	125	11	51	57
110	131	102	150	12	61	66
160	188	152	213	16	86	91

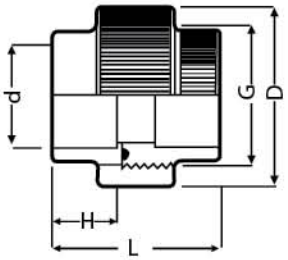
Flanges Adaptors (Male)

MPS



d	d_1	D	D_1	Z	H	L
63	54.5	76	90	9	97	133
75	65	90	106	10	102	139
90	78	108	125	11	108	146
110	95	131	150	12	116	156

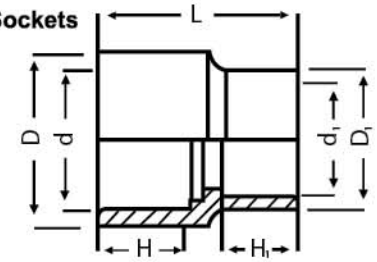
Unions



FPS X FPS

d	G	H	L	D
20	29.7	22	58	49
25	35.7	26	66	58
32	42.7	30	70	58
40	52.5	33	75.5	69
50	65.5	39	96	88
63	82.7	42	113	108

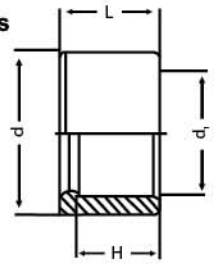
Reducing Sockets



FPS X FPS

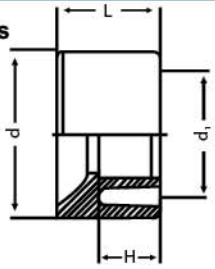
$d-d_1$	D	D_1	H	H_1	L
20/16	27	22	16	14	37
25/20	33	27	19	16	41
32/20	41	27	22	16	46
32/25	41	33	22	16	49
40/25	50	33	26	19	52
40/32	50	41	26	22	55
50/25	61.5	33	31	19	60
50/32	61.5	41	31	22	60
50/40	61.5	50	31	26	64
63/32	76	41	38	22	76
63/40	76	50	38	26	80
63/50	76	61.5	38	31	76
75/63	90	76	44	38	102
90/50	106	61.5	51	31	105
90/63	106	79	51	38	106
90/75	106	91	51	44	107
110/90	131	106	61	51	127

Reducing Bushes



FPS
Form R_2

Reducing Bushes



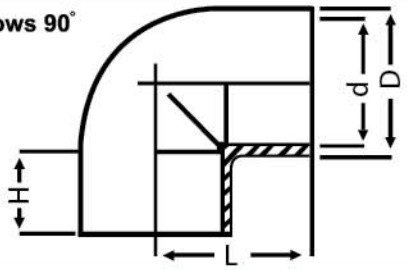
FPS
Form R_3

$d-d_1$	H	L	Form
25/20	16	19	R_2
32/20	16	22	R_2
32/25	19	22	R_2
40/20	16	26	R_2
40/25	19	26	R_2
40/32	22	26	R_2
50/32	22	31	R_2
50/40	26	31	R_2
63/40	26	38	R_2
63/50	31	38	R_2
75/50	31	44	R_2
75/63	38	44	R_2
90/50	31	51	R_3
90/63	37	51	R_3
90/75	44	51	R_2
110/50	31	61	R_3
110/63	37	61	R_3
110/75	44	61	R_3
110/90	51	61	R_2
160/110	61	86	R_3

PIPE FITTINGS FOR SOLVENT CEMENT JOINTING

Fiitings According to ASTM 2467 SCH80

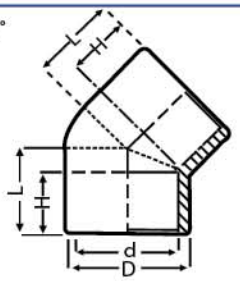
ELbows 90°



FPS X FPS

d	D	H	L
1/2"	29	22	36
3/4"	35	26	41
1"	42.7	30	48
1 ¼"	52.1	33	56
1 ½"	63.3	37	65
2"	97.7	42	77
2 ½"	91.5	44	83
3"	109	51	97
4"	131	61	117

ELbows 45°

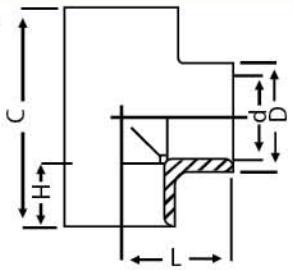


FPS X FPS

d	D	H	L
1/2"	29	22	32
3/4"	35	26	35
1"	44	30	40
1 ¼"	52.1	26	43
1 ½"	60.3	31	43
2"	75	39	56
2 ½"	91	44	62
3"	105	51	72
4"	127	61	87

Tees 90˚equal

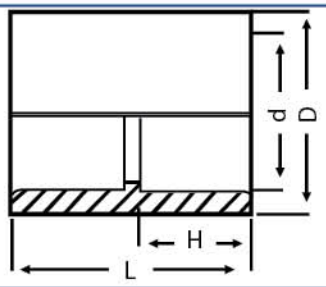
FPS X FPS X FPS



d	D	H	L	C
1/2"	28	16	27	54
3/4"	34	19	33	65
1"	42.7	30	48	96
1 ¼"	52.1	33	56	112
1 ½"	63.3	37	65	130
2"	79.7	42	77	154
2 ½"	91.5	44	83	165
3"	109	51	97	197
4"	131.5	61	117	237

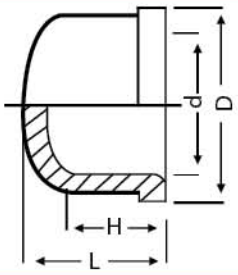
Sockets

FPS X FPS



d	D	H	L
1/2"	27	16	35
3/4"	33	19	41
1"	41	22	47
1 ¼"	50	26	55
1 ½"	61	31	65
2"	77	38	79
2 ½"	91	44	95
3"	106	51	107
4"	131.5	61	128
6"	191	86	178

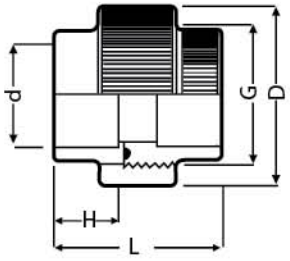
Caps



FPS

d	D	H	L
1/2"	29.5	16	24
3/4"	35.5	19	28
1"	44	22	32
1 ¼"	54	26	38
1 ½"	66	31	45
2"	80	38	56
2 ½"	96	44	64
3"	115	51	77
4"	132	61	92

Unions

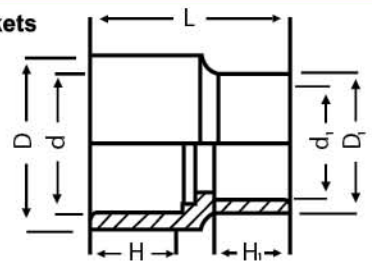


FPS X FPS

d	G	H	L	D
1/2"	29.7	22	58	49
3/4"	35.7	26	66	58
1"	42.7	30	70	58
1 ¼"	52.5	33	75.5	69
1 ½"	65.5	39	96	88
2"	82.7	42	113	108

Reducing Sockets

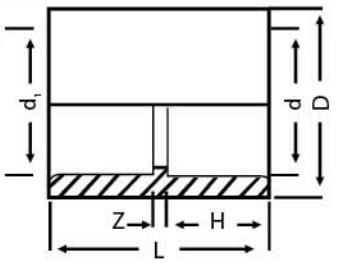
FPS X FPS



d-d_1	D	D_1	H	H_1	L
¾"-½"	33	27	19	16	41
1"-½"	41	27	22	16	46
1"-¾"	41	33	22	19	49
1 ¼"-½"	50	27	26	16	52
1 ¼"-¾"	50	33	26	19	52
1 ¼"-1"	50	41	26	22	55
1 ½"-½"	61	33	31	16	60
1 ½"-¾"	61	33	31	19	60
1 ½"-1"	61	41	31	22	60
1 ½"-1 ¼"	61	50	31	26	64
2"-½"	77	33.5	38	16	76
2"-¾"	77	33.5	38	19	76
2"-1"	77	49.5	38	22	76
2"-1 ¼"	77	50	38	26	77
2"-1 ½"	77	61	38	31	77
2 ½"-2"	91	77	44	38	98
3"-2 ½"	106	91	51	44	107
4"-3"	131	106	61	51	127

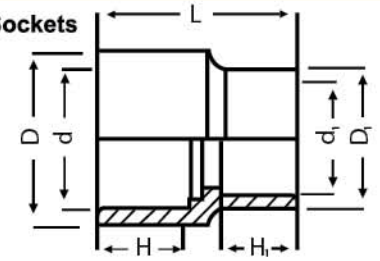
Adaptor Sockets

FPS X FPS



d-d_1	D	H	Z	L
20"-½"	27	16	3	35
25"-¾"	33	19	3	41
32"-1"	41	22	3	47
40"-1 ¼"	50	26	3	55
50"-1 ½"	61	31	3	65
63"-2"	77	38	3	79
75"-2 ½"	91	44	5	95

Reducing Sockets

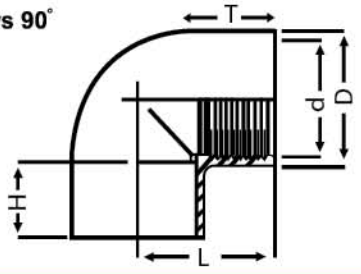


FPS X FPS

d-d_1	D	D_1	H	H_1	L
25-½"	33	27	19	16	41
32-½"	41	27	22	16	46
32-¾"	41	33	22	19	49
40-½"	50	27	26	16	52
40-¾"	50	33	26	19	52
40-1"	50	41	26	22	55
50-½"	61	41	31	16	60
50-¾"	61	41	31	19	60
50-1"	61	41	31	22	60
50-1 ¼"	61	50	31	26	64
63-½"	77	33.5	38	16	76
63-¾"	77	33.5	38	19	76
63-1"	77	41	38	22	76
63-1 ¼"	77	50	38	26	77
63-1 ½"	77	61	38	31	77
75-2"	91	75	44	38	98
90-2"	106	77	51	38	107
90-2 ½"	106	91	51	44	109
110-2"	131	77	61	38	128
110-2 ½"	131	91	61	44	128
110-3"	131	106	61	51	128

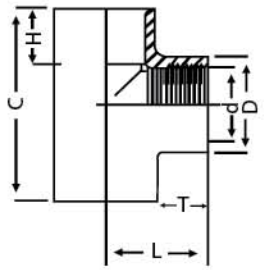
ADAPTOR PIPE FITTINGS

ELbows 90° — **FPT X FPS**



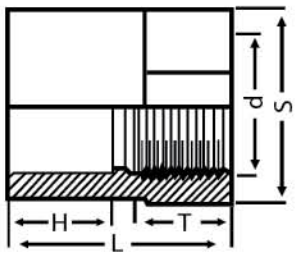
d	D	H	L	T
1/2"	27	16	36	17
3/4"	33	19	41	20
1"	42.7	30	48	22
1 ¼"	52.1	33	56	23
1 ½"	63.3	37	65	27
2"	19.7	42	77	31
2 ½"	91.5	44	83	41
3"	109	51	97	42
4"	131.5	61	117	51

Tees 90° equal — **FPS X FPT X FPS**



d	D	H	L	T	C
1/2"	28	16	27	17	54
3/4"	34	19	33	20	65
1"	42.7	30	48	22	96
1 ¼"	52.1	33	56	29	112
1 ½"	63.3	37	65	33	130
2"	79.7	42	77	35	154
2 ½"	91.5	44	83	41	165
3"	109	51	97	42	197
4"	131.5	61	117	51	237

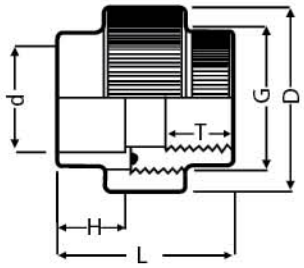
Sockets



FPT X FPS

d	S	H	L	T
1/2"	32	16	38	17
3/4"	36	19	41	20
1"	46	22	47	22
1 ¼"	55	26	55	23
1 ½"	65	31	65	27
2"	80	38	69	31
2 ½"	91	44	95	40
3"	106	51	107	42
4"	131	61	128	51

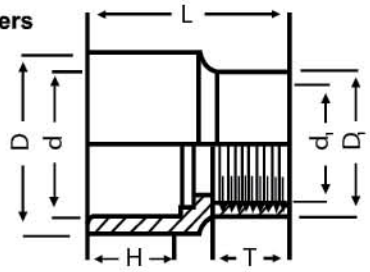
Unions



FPT X FPS

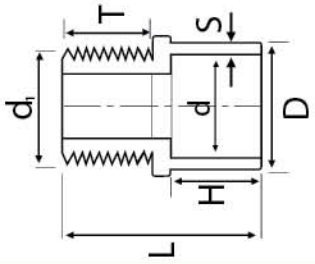
d	G	H	L	D	T
1/2"	29.7	22	58	49	18
3/4"	35.7	26	66	58	22
1"	42.7	30	69	58	26
1 ¼"	52.5	33	76	69	29
1 ½"	65.5	38.5	97	88	35
2"	82.7	42	116	108	38

Reducers **FPS X FPT**



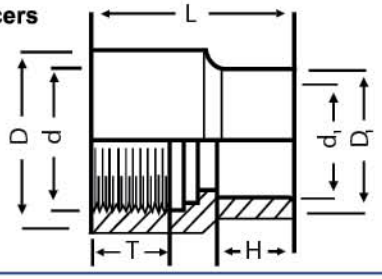
d-d1	D	D1	H	T	L
¾"-½"	33	27	19	16	41
1"-½"	41	27	22	16	46
1"-¾"	41	33	22	18	49
1 ¼"-½"	50	27	26	16	52
1 ¼"-¾"	50	33	26	18	52
1 ¼"-1"	50	41	26	20	54
1 ½"-½"	61	41	31	16	60
1 ½"-¾"	61	41	31	18	60
1 ½"-1"	61	41	31	20	60
1 ½"-1 ¼"	61	50	31	23	64
2"-½"	77	33.5	38	16	76
2"-¾"	77	33.5	38	18	76
2"-1"	77	49.5	38	20	76
2"-1 ¼"	77	49.5	38	23	77
2"-1 ½"	77	61	38	27	77
2 ½"-2"	91	77	44	31	102
3"-2 ½"	106	91	51	44	107
4"-3"	131	106	61	51	127

Reducers **MPT X FPS**



d-d1	D	T	H	L
¾"-½"	33	13	18	46
1"-½"	41	13	22	46
1"-¾"	41	15	22	49
1 ¼"-½"	50	13	26	52
1 ¼"-¾"	50	15	26	52
1 ¼"-1"	50	20	26	52
1 ½"-½"	61	13	31	60
1 ½"-¾"	61	15	31	60
1 ½"-1"	61	20	31	60
1 ½"-1 ¼"	61	23	31	64
2"-½"	77	13	37	76
2"-¾"	77	15	37	76
2"-1"	77	20	37	76
2"-1 ¼"	77	23	37	77
2"-1 ½"	77	27	37	77
2 ½"-2"	91	31	43	102
3"-2 ½"	106	39	51	107
4"-3"	131	40	61	127

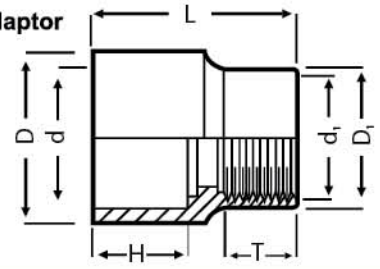
Reducers



FPT X FPS

d-d1	D	D1	H	T	L
¾"-½"	33	27	16	18	42
1"-½"	41	27	16	20	46
1"-¾"	41	33	18	20	49
1 ¼"-½"	50	27	16	23	52
1 ¼"-¾"	50	33	18	23	54
1 ¼"-1"	50	41	22	23	60
1 ½"-½"	61	41	16	27	60
1 ½"-¾"	61	41	18	27	60
1 ½"-1"	61	41	22	27	64
1 ½"-1 ¼"	61	50	16	27	64
2"-½"	77	33.5	18	31	76
2"-¾"	77	33.5	22	31	76
2"-1"	77	49.5	26	31	76
2"-1 ¼"	77	49.5	31	31	77
2"-1 ½"	77	61	38	31	77
2 ½"-2"	91	77	31	38	102
3"-2 ½"	106	91	44	42	107
4"-3"	131	106	51	61	127

Reducers Adaptor

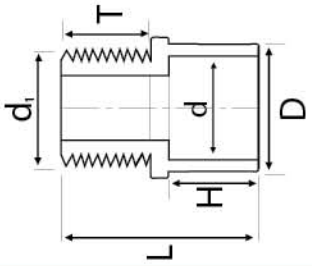


FPS X FPT

d-d1	D	D1	H	T	L
25-½"	33	27	18	16	41
32-½"	41	27	22	16	46
32-¾"	41	33	22	18	49
40-½"	50	27	26	16	52
40-¾"	50	33	26	18	52
40-1"	50	41	26	20	56
50-½"	61	41	31	16	60
50-¾"	61	41	31	18	60
50-1"	61	41	31	20	60
50-1 ¼"	61	50	31	23	64
63-½"	77	33.5	38	16	76
63-¾"	77	33.5	38	18	76
63-1"	77	50	38	20	76
63-1 ¼"	77	50	38	23	74
63-1 ½"	77	61	38	27	74
75-2"	91	77	43	31	102
90-2"	106	77	51	31	107
90-2 ½"	106	90	51	38	107
110-2"	131	77	61	31	131
110-2 ½"	131	90	61	38	131
110-3"	131	106	61	41	131

Reducers Adaptor

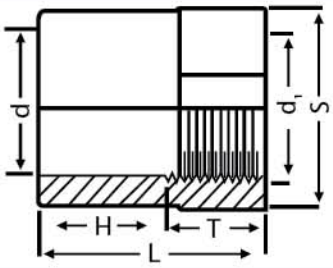
MPT X FPS



d-d1	D	H	T	L
25-½"	33	18	16	41
32-½"	41	22	16	46
32-¾"	41	22	18	49
40-½"	50	26	16	52
40-¾"	50	26	18	52
40-1"	50	26	20	52
50-½"	61	31	16	60
50-¾"	61	31	18	60
50-1"	61	31	20	60
50-1 ¼"	61	31	23	64
63-¾"	77	38	18	76
63-1"	77	38	20	76
63-1 ¼"	77	38	23	74
63-1 ½"	77	38	27	74
75-2"	91	43	30	102
90-2"	106	51	30	107
90-2 ½"	106	51	38	107
110-2"	131	61	30	131
110-2 ½"	131	61	38	131
110-3"	131	61	40	131

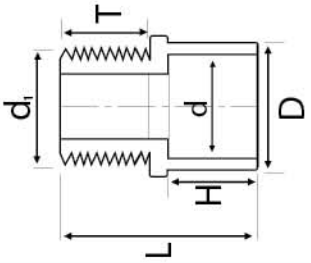
Adaptor Sockets

FPT X FPS



d-d1	S	H	T	L
16-⅜"	27	14	15	31
20-½"	32	16	17	35
25-¾"	36	19	20	41
32-1"	46	22	22	47
40-1 ¼"	55	26	23	55
50-1 ½"	65	31	27	65
63-2"	80	38	31	79
75-2 ½"	91	44	35	95
90-3"	106	51	42	107
110-4"	131.5	61	51	128

Male Adaptor

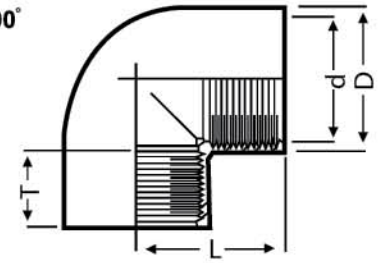


MPT X FPS

$d\text{-}d_1$	D	H	T	L
16-3/8"	22	14	15	34
20-½"	27	16	17	36
25-¾"	32	19	19	42
32-1"	41	22	21	47
40-1 ¼"	51	26	23	56
50-1 ½"	61	31	23	65
63-2"	77	38	27	76
75 - 2 ½"	91	43	30	102
90 - 3"	106	51	38	107
110 - 4"	131	61	40	131

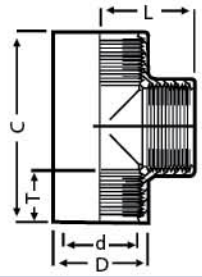
PIPE FITTINGS THREADAD

ELbows 90° **FPT X FPT**



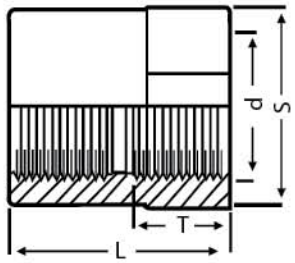
d	D	T	L
1/2"	27	17	36
3/4"	33	20	41
1"	42.7	30	48
1 ¼"	52.1	33	56
1 ½"	63.3	37	65
2"	79.7	42	77
2 ½"	91.5	40	83
3"	109	42	97
4"	131.5	51	117

Tees 90° equal **FPT X FPT X FPT**



d	D	T	L	C
1/2"	28	17	27	54
3/4"	34	20	33	65
1"	42.7	30	48	96
1 ¼"	52.1	33	56	112
1 ½"	63.3	37	65	130
2"	79.7	42	77	154
2 ½"	91.5	40	83	165
3"	109	42	97	197
4"	131.5	51	117	237

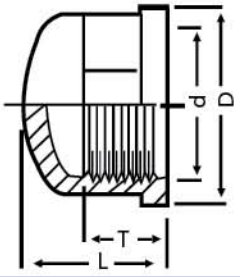
Sockets



FPT X FPT

d	S	T	L
1/2"	32	17	35
3/4"	36	20	41
1"	42.7	30	62.5
1 ¼"	52.1	33	68.5
1 ½"	63.3	37	77
2"	79.7	42	87.5
2 ½"	91	40	95
3"	106	42	107
4"	131.5	51	128

Caps

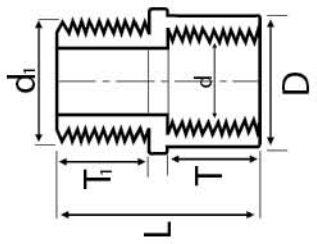


FPT

d	D	T	L
1/2"	37.5	15	21.5
3/4"	42	17	24.5
1"	49.5	18	26.5
1 ¼"	59.5	19	30
1 ½"	64.5	22	33.5
2"	81	26	40
2½"	91	40	64
3"	106	42	77
4"	132	51	92

Reducers

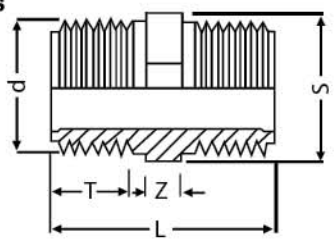
MPT X FPT



d-d$_1$	D	T	T$_1$	L
¾"-½"	33	20	13	41
1"-½"	41	22	13	46
1"-¾"	41	22	15	46
1 ¼"-½"	50	23	13	52
1 ¼"-¾"	50	23	15	52
1 ¼"-1"	50	23	19	52
1 ½"-½"	61	27	13	60
1 ½"-¾"	61	27	15	60
1 ½"-1"	61	27	19	60
1 ½"-1 ¼"	61	27	20	60
2"-½"	77	31	13	76
2"-¾"	77	31	15	76
2"-1"	77	31	19	76
2"-1 ¼"	77	31	20	76
2"-1 ½"	77	31	23	76
2 ½"-2"	90	33	27	102

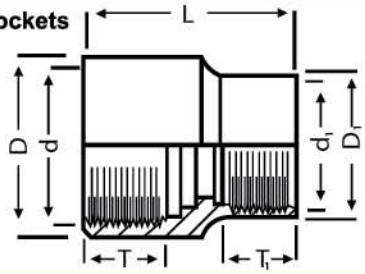
Nipples

MPT X MPT



d	S	Z	L	T
1/2"	24	8	45	17
3/4"	29	8	49	19
1"	38	10	57	21
1 ¼"	46	12	62	23
1 ½"	49	14	67	23
2"	62	14	76	27

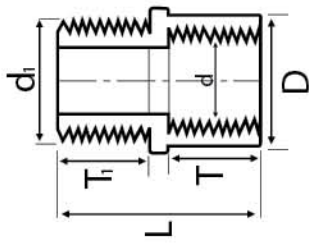
Reducing Sockets



FPT X FPT

d-d_1	D	D_1	T	T_1	L
¾"-½"	33	27	18	16	41
1"-½"	41	27	20	16	46
1"-¾"	41	33	20	20	49
1 ¼"-½"	50	27	23	17	52
1 ¼"-¾"	50	33	23	20	52
1 ¼"-1"	61	41	27	22	54
1 ½"-½"	61	41	27	17	60
1 ½"-¾"	61	41	27	20	60
1 ½"-1"	61	41	27	22	60
1 ½"-1 ¼"	77	50	31	23	64
2"-½"	77	33.5	31	17	76
2"-¾"	77	33.5	31	20	76
2"-1"	77	49.5	31	22	76
2"-1 ¼"	77	49.5	31	23	77
2"-1 ½"	77	61	31	27	77
2 ½"-2"	91	77	38	31	102

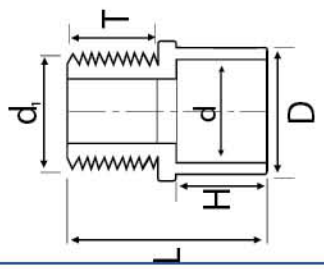
Reducers



MPT X FPT

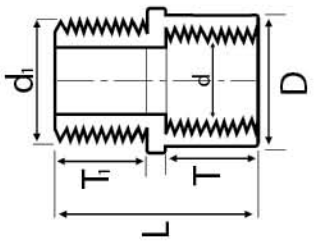
d-d_1	D	T	T_1	L
¾"-½"	33	20	13	46
1"-½"	41	22	13	46
1"-¾"	41	22	15	46
1 ¼"-½"	50	23	13	52
1 ¼"-¾"	50	23	15	52
1 ¼"-1"	50	23	19	52
1 ½"-½"	61	27	13	60
1 ½"-¾"	61	27	15	60
1 ½"-1"	61	27	19	60
1 ½"-1 ¼"	61	27	20	64
2"-½"	77	31	13	76
2"-¾"	77	31	15	76
2"-1"	77	31	19	76
2"-1 ¼"	77	31	20	77
2"-1 ½"	77	31	23	77
2 ½"-2"	90	33	27	102

Male Adaptor **MPT X FPS**



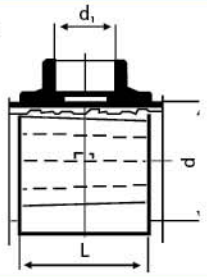
$d\text{-}d_1$	D	T	H	L
1/2"	30	17	22	47
3/4"	35.5	19	25.5	52
1"	44.5	22.5	30	60
1 ¼"	50	23	26	56
1 ½"	61	27	31	64
2"	77	31	37	77

Male Adaptor **MPT X FPT**



$d\text{-}d_1$	D	T	T_1	L
1/2"	30	15	17	47
3/4"	35.5	19	19	52
1"	44.5	20	22.5	60
1 ¼"	50	23	20	56
1 ½"	61	27	23	64
2"	77	31	27	77

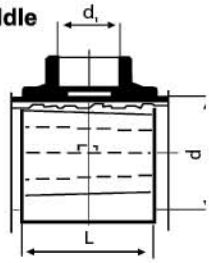
Branch Saddle



d	d_1	L
110	20	105.5
110	25	105.5
110	32	105.5
110	40	105.5
110	50	105.5
110	63	105.5
160	20	105.5
160	25	105.5
160	32	105.5
160	40	105.5
160	50	105.5
160	63	105.5

For UPVC Pipes
Top Saddles With rubber Seal
And outlet With Socket for Solvent Cement Jointing

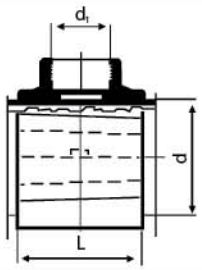
Branch Saddle



d	d_1	L
110	1/2"	105.5
110	3/4"	105.5
110	1"	105.5
110	1 ¼"	105.5
110	1 ½"	105.5
110	2"	105.5
160	1/2"	105.5
160	3/4"	105.5
160	1"	105.5
160	1 ¼"	105.5
160	1 ½"	105.5
160	2"	105.5

For UPVC Pipes
Top Saddles With rubber Seal
And outlet With Socket for Solvent Cement Jointing

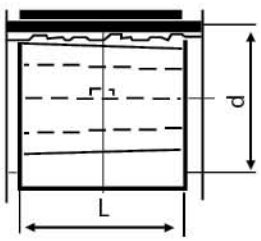
Branch Saddle



d	d_1	L
110	1/2"	105.5
110	3/4"	105.5
110	1"	105.5
110	1 ¼"	105.5
110	1 ½"	105.5
110	2"	105.5
160	1/2"	105.5
160	3/4"	105.5
160	1"	105.5
160	1 ¼"	105.5
160	1 ½"	105.5
160	2"	105.5

For UPVC Pipes
Top Saddles With rubber Seal
And outlet With Socket for female Threaded

Repair Saddle



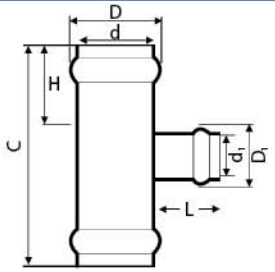
T	L
110	105.5
160	105.5

For UPVC Pipes
Top mains repair work
Saddle halves with Rubber joint
(Cementing only possible on dry mains)

RUBBER RING JOINT FITTINGS FOR DRINKING WATER

All Rubber Ring Socket

Tee 90°

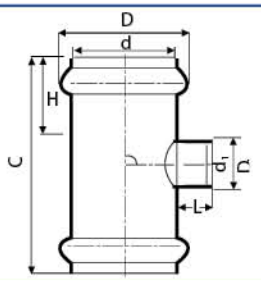


MMB - KS

d-d1	D	D1	C	L	H
110/63	150.6	91	329	159	117
110/75	150.6	106.7	329	165	117
110/90	150.6	125.6	364	172	117
110/110	150.6	150.6	364	182	117
160/110	212	151	456	207	134
160/160	212	212	456	228	134

Double Rubber Socket With Solvent Weld Socket Branch

Tee 90°

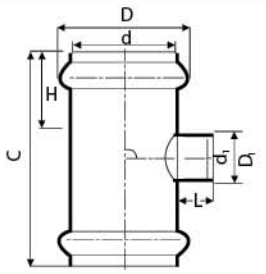


MMI - KS

d-d1	D	D1	C	L	H
110/63	150.6	76	329	97	117
110/75	150.6	91.5	329	97	117
110/90	150.6	109	364	102	117
110/110	150.6	132	364	110.75	117
160/110	212	132	456	140	134
160/160	212	188	456	143	134

Double Rubber Socket With Solvent Weld Socket Branch

Tee 90°

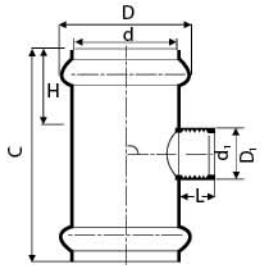


MMB - KS

d-d1	D	D1	C	L	H
110/2"	150.6	76	329	97	117
110/2½"	150.6	91.5	329	97	117
110/3"	150.6	109	364	102	117
110/4"	150.6	132	364	110.75	117
160/4"	212	132	456	140	134
160/6"	212	188	456	143	134

Double Rubber Socket With Threaded Socket Branch

Tee 90°

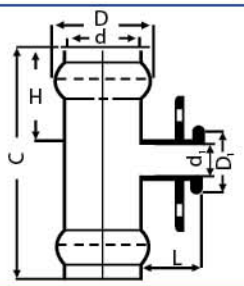


MMI - KS

d-d1	D	D1	C	L	H
110/2"	150.6	76	329	97	117
110/2½"	150.6	91.5	329	97	117
110/3"	150.6	109	364	102	117
110/4"	150.6	132	364	110.75	117
160/4"	212	132	456	140	134
160/6"	212	188	456	143	134

Double Rubber Socket With Flange Adaptor Branch

Tee 90°

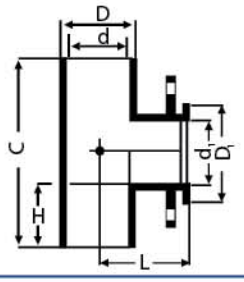


MMA - KS

d-d1	D	D1	C	L	H
110/63	150.6	90	329	134	117
110/75	150.6	106	329	134	117
110/90	150.6	125	364	141	117
110/110	150.6	150	364	151	117
160/110	212	150	456	180	134
160/160	212	213	456	188	134

Double Solvent Socket With Flange Adaptor Branch

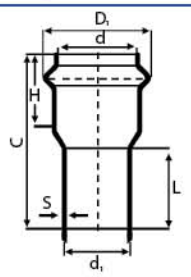
Tee 90°



MMA - KS

d-d1	D	D1	C	L	H
63/63	77	90	141	108	38
75/75	91.5	106	165	121	44
90/90	109	125	197	137	51
110/110	131.5	150	237	158	61
160/160	188	213	335	212	86

Reducer Rubber Ring Socket With Solvent Weld Spigot

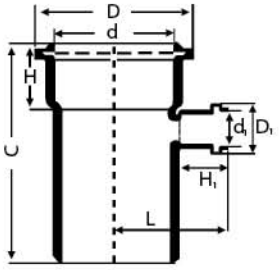


MR - KS

d-d1	S	D1	C	L	H
110/63	6.1	150.6	286	101	117
110/75	7.0	150.6	280	105	117
110/90	8.6	150.6	272	110.2	117
160/110	10.5	212	334	117	134

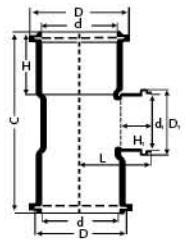
Double Rubber Socket With (Male) Adaptors 6 Bar

Tee 90°



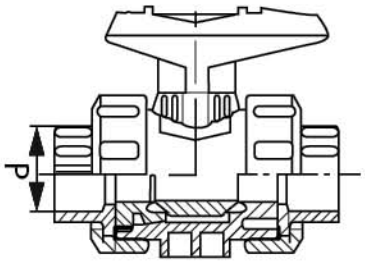
d-d1	D	D1	C	H	H1	L
250/110	292	129	422	121	51	200

Triple Rubber Socket 6 Bar



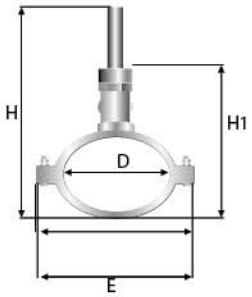
d-d1	D	D1	C	H	H1	L
250/110	292	129	392	122	52	200

Ball Valve (metric), (inch)



d"mm"	20	25	32	40	50	63
d"inch"	½"	¾"	1"	1 ¼"	1 ½"	2"

Tapping Saddle



A

B

	H		H1		E		L		WT.gm	
D/R	A	B	A	B	A	B	A	B	A	B
110mm/2"	432	454	325	334	174	163	105	105	1380	1553
160mm/2"	483	506	375	386	224	225	105	105	1600	1927
225mm/2"	570	---	441	---	337	---	126	---	1800	---

PARTS OF TAPPING SADDLE

(BRASS VALVE) (AVAILABLE WITH 110 - 160 - 225 MM SIZE)

Cap with internal seal

Cutter used for cutting main pipe line also used a valve can be delivered up on client requirement

Threaded Tee installed at the upper part of the saddle with inner thread output(union)

Saddle consists of upper and lower parts. upper part has a seal to prevent leakage

4 galvanized bolts with fixation rings

2 locks for fixing the saddle onto the pipe

PARTS OF TAPPING SADDLE

(PLASTIC VALVE) (AVAILABLE WITH 110 - 160 - 225 MM SIZE)

Cap with internal seal

UPVC threaded valve

Seal to prevent the leakage

Cutter used for cutting main pipe line can be delivered up on client requirement

Threaded Tee installed at the upper part of the saddle with inner thread output(union)

Saddle consists of upper and lower parts. upper part has a seal to prevent leakage

4 galvanized bolts with fixation rings

2 locks for fixing the saddle onto the pipe

INSTALLATION PROCEDURE

BOLTS TAPPING SADDLE

Clean outer surface of the pipe

Make sure that the O-ring at the bottom of the upper part of the saddle

Put the 2 parts of the saddle arround the pipe at the required region

Place the 4 fixation bolts at the specified holes with the fixation rings

Install the Tee upon the saddle and tight it well to prevent leakage

Install the brass cutter into the saddle Tee and cut the pipe using the spacific key of the saddle by turning clock wise direction

Take off the brass cutter form the saddle by turning it anti clock wise direction and we can observe the cutted part of the pipe into the cutter

Install the UPVC valve column into the saddle Tee to manage the water entry

Install the thread end cap at the column by using cleaning soap for easily enterance the end cap onto the column with make sure the O-ring at the end cap to prevent water leakage

INSTALLATION PROCEDURE

LOCK TAPPING SADDLE

Clean outer surface of the pipe

Make sure that the O-ring at the bottom of the upper part of the saddle

Put the 2 parts of the saddle arround the pipe at the required region

Install the 2 locks at the direcion of arrow and with the same number written at the lock by using a wood or plastic hummer with a suitable way at to locks

Install the Tee upon the saddle and tight it well to prevent leakage

Install the brass cutter into the saddle Tee and cut the pipe using the spacific key of the saddle by turning clock wise direction

Use the Brass cutter as a valve into the saddle to manage the water entery

Install the end cap at the upper part of the Tee to prevent leakage of water and make sure the presence of the O-ring at the end cap

WATER WELLS PRODUCTS

TECHNICAL DATA

PIPES DIMENSIONS

CHAPTER 2

WATER WELLS PRODUCTS

AL-AMAL – (AL SHARIF)CASING AND SCREEN

Steel Casing and screen are vulnerable ot aggerssive water especially if it is for direct human consumption. UPVC is a thermoplastic material and there chemically inert to ground water. it is hygienic, rust free non toxic and does not is any way contaminate nor affect the quality of extracted well water.

AL-AMAL Company for Plastic Pipes and Fittings obsession UPVC pipes quality since 1964. it is a populaer and trusted choice of water Authorities of more than 18 countries arounds, ground water consultants, water well contractors, professional Internatonal Organzation developing institutions and Aid Agencies.

To keep the sustainability of running operation and lifetime of water wells a highly specifications standard are required, to UPVC casings and screen pipes products in addition to supply of our products we are closely involved with clients word wide in providing reliable services and on site technical assistance.

UPVC GENERAL ADVANTAGES

NON – CORROSION
UPVC pipes & fittings resist corrosion caused by acid, alkalis, oils, salts, moisture and the media inside and outside the pipe.

NON TOXIC
It neither affects the taste, smell or color of water or liquid nor react with any liquid to cause a precipitant.

LOW FLOW LOSS
It has a mirror –Smooth surface that minimizes resistance and impedes the build-up of Deposits and corrosive scales.

LIGHT WEIGHT
UPVC pipe & fittings are lighter in weight than traditional cast iron this gives savings in manpower handling and installation costs.

EASE OF INSTALLATION AND MAINTENANCE
It is quick and easy to install by using solvent cement, by threading or by rubber joints.
UPVC pipe can be cut easily for installation.
Also can be quickly repaired with a minimum of complication or cost.

FIRE PROOF
UPVC pipes & fittings will not support combustion. In the event of fire, flames are unable To travel along the pipe and fitting, It is self-extinguishing.

INSULATOR
UPVC pipes & fittings are ideal for electric conduits, as UPVC is an integral insulator, It eliminates the possibility of electrolytic corrosion that so often destroys underground piping systems.

HIGH CHEMICAL RESISTANCE
AL-AMAL UPVC (DWV) systems are resistant to a great number of chemical agents.

OTHER ADVANTAGES OF UPVC PIPES SYSTEMS
SEE PAGE 6 - 7 - 8 AT PART 1

MATERIAL PROPERTIES SEE PAGE 11 AT PART 1

UPVC CASING AND SCREEN STANDARD

ALAMAL (ALSHARIF) produces a high quality range of UPVC well casing and screen strictly in accordance with the standard DIN 4925, in two basic ranges a standard range for shallow and medium well depths and a heavy duty, thick walled range for greater well depths.

Casing and screens are made from 100% virgin Unplasticized Poly Vinyl Chloride Comp with different colors, with required accessories. According to the standard.

MATERIAL
UPVC according to DIN 4925

PIPE LENGTHS
Normal supplied in 3 m and 6 m overall lengths to fit inside standard containers and Sea transport, others supplies with required lengths available.

PIPE SCREEN SLOTS
Normally in size and widths ranging with dia 1.0 mm – 1.5 mm – 2.0 mm.

PIPE THREAD METHODS
According to DIN 4925 standard threaded connection are mechanically Jointed for the greater range supplied above 125 mm, which is produced the pipes casing and screen with sockets, Other small products supplies with flushed threaded joints.

PIPE JOINTS
Greater sizes supplied with male/female sockets joint as standard; small sizes supplied with flushed joint on thick walled pipe.

PIPE MARKING
standard marking for pipes casing and screen includes OD, S, is applied in all products.

USE AND INSTALLATION

CASING

According to UPVC pipe standard casing wall thickness is collapse resistance rate of approximately 6 – 10 Bars for mechanical properties of casing permit installation in water well approximately up 100 m (328 feet).

Respectively 153 m (500 ft) * depending on local site of water well installation conditions. Under special installation conditions with some methods even greater depths are possible.

The thick – walled casing has collapse resistance rate of approximately 14 – 16 Bars which is mechanically permit installation up to a depth 300 m (1000 ft), and under special installation condition can be possible for more depth * see the table no. (2)

The Threads on both types of casing are conducted as in the drawing attached No(1), depending on the normal diameter and the tensile strength of these Joints permit freely suspended installation load and soil movements resistance.

SCREEN

Accirdubg ti a standerd DIN 4295 UPVC Screen pipes can be supplied either plain or with ribs up to 200 mm (8) ø. Above ND 200 are supplied plain or can be requested according to client design.

The threaded Joints of AL-AMAL (ALSHARIF) UPVC screen pipe are identical with our easing,guarantee coupling Joints with differents of the same diameter.z

See Drawing No (2)

Screen are available in range of slots sizes and when selecting the type and dimensions of the screen to be used, we should consider the conditions bellows:

(A) The permeability of the sand or gravel back the screen should be higher than two slots or two screen.

(B) The slot width should be selected as to resist the water well back washing and development of two boreholes.

(C) The screen does not corrode and that it can be regenerated by mechanical or chemical means without damage.

For more details and recommendations see table No (1)

RECOMMENDED SELECTION FOR CASING AND SCREEN INSTALLATION TABLE

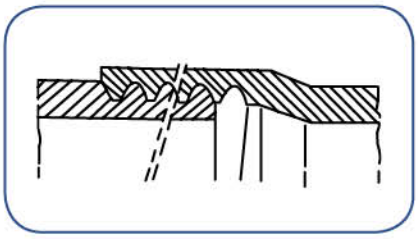
TABLE NO (1)

NO.	Borehole Conditions Soil Formation, water well Depth and Aquifer	Recommended Selection for Casing / Screen Installation				
		Casing pipe selection	Screen pipe. Recomm.			Backwash.Air-develop.R
			Slot WID (mm)	Strength (bars)	Length (m)	
1	(A)Shallow Water wells (SHW) Soil formation: Basement and Stable Formation Borehole depth: Small "Dia up"6 Ø (160 mm) Depth up to (60m) Water well Aquifer: poor - Semi poor	Flush Joint UPVC Casing Up 4 Ø (110mm) 6-10 Bars	1.0 mm slots flush screen pipe	6 To 10 bars	3m	Not Exceed 12 bars
2	Soil formation: Lose Soil & Unstable formations Borehole depth: Small Dia up 6 Ø (160mm) Depth up to(60m) Water well Aquifer: Semi - Rich - Rich	Flush Joint UPVC Casing Up 4 Ø (110mm) 6-10 Bars	1.0 - 1.5mm flush screen pipe	10 To 16 bars	3m	Not Exceed 16bars
3	Soil formation: Basement and Stable Formation Borehole depth: Med-Large dia 7 Ø (180mm) up to 12 ¼ Ø (315mm)Depth up to (152m) Water well Aquifer: poor - Semi poor	Socket Joint UPVC Casing Up 8 Ø (200mm) 10 Bars	1.00 socket screen pipe	16 bars	6m	Not Exceed 20 bars
4	Soil formation: Lose Soil & Unstable formations Borehole depth: Med-Large dia 7 Ø (180mm) up to 12 ¼ Ø (315mm)Depth up to (152m) Water well Aquifer: Semi Rich - Rich	Socket Joint UPVC Casing Up 8 Ø (200mm) 10 Bars	1.00-1.5mm socket screen pipe	16 bars	6m	Not Exceed 20 bars
5	(B)Deep water well (D.W) Soil formation: Basement and Stable Formation Borehole depth: Small Dia up 6 Ø (160mm) Depth up to (182m) Water well Aquifer: poor - Semi poor	Socket Joint UPVC Casing Up 4 Ø (110mm) 10 Bars	1.00mm socket UPVC screen pipe	10 bars	3m or 6m	Not Exceed 12 bars
6	Soil formation: Lose Soil & Unstable formations Borehole depth: Small Dia up 6 (160mm) Ø Depth up to (182m) Water well Aquifer: Semi Rich - Rich	Socket Joint UPVC Casing Up 4 Ø (110mm) 10 Bars	1.5mm socket UPVC screen pipe	16 bars	3m or 6m	Not Exceed 20 bars
7	Soil formation: All Soil formations Borehole depth: Deep water well Up to(300m) Med-Large dia 7 Ø (180mm) up to 12 ¼ Ø (315mm) Water well Aquifer: Semi poor to Rich aquifer	Socket Joint UPVC Casing Up 10 Ø (250mm) 16 Bars	1.00-1.5mm socket UPVC screen pipe	16 bars	6m	Not Exceed 20 bars
8	Soil formation: All Soil formations Borehole depth: Deep water well Depth Up to(500m) Med-Large dia 12 ¼ Ø (315mm) up to17 ¼ Ø (450mm) Water well Aquifer: Rich-Very Rich aquifer	Socket Joint UPVC Casing Up 12 Ø (315mm) 16 Bars	1.5mm socket UPVC screen pipe	16 - 25 bars	6m	Not Exceed 22 bars

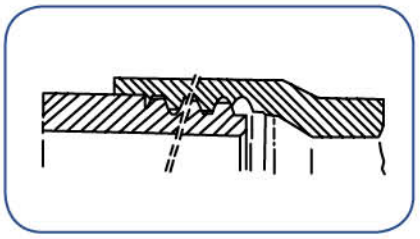
SCREW THREADS

DRAWING NO (1)

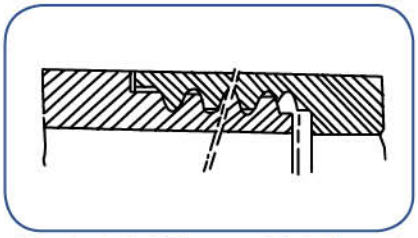
All Well casing and screens are provided with a male thread at the spigot end and female thread at the socket end.
A range of thread types are available :



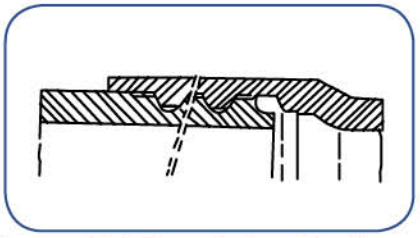
Whiteworth Pipe thread
According to DIN 2999 from sizes 35/1.25" to 100/4"
And Rising main 1 ¼ , 1 ½ , 2" Ø
For 4 Ø deep wells
(R)



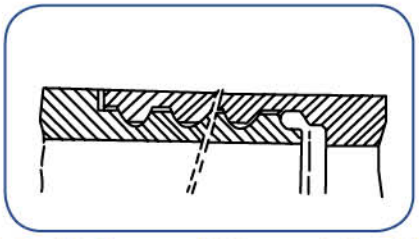
Trapezoidal thread DIN 4925
6 mm Pitch on 100/4" to200/8"
12 mm Pitch on 250/10" to 400/16"
For Meduim and Deep wells
(TR)



Flush Joint Trapezoidal thread
Only to be used on extra thick walled pipe as thread is machined into pipe wall

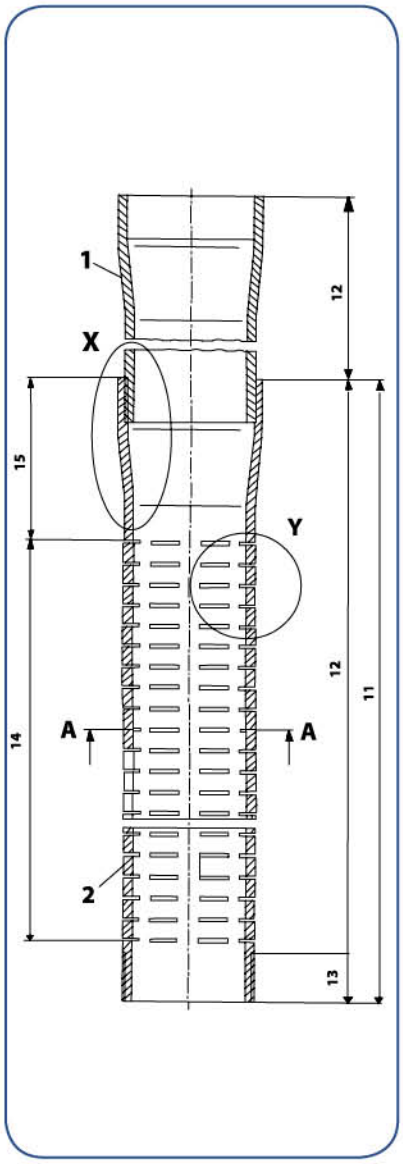


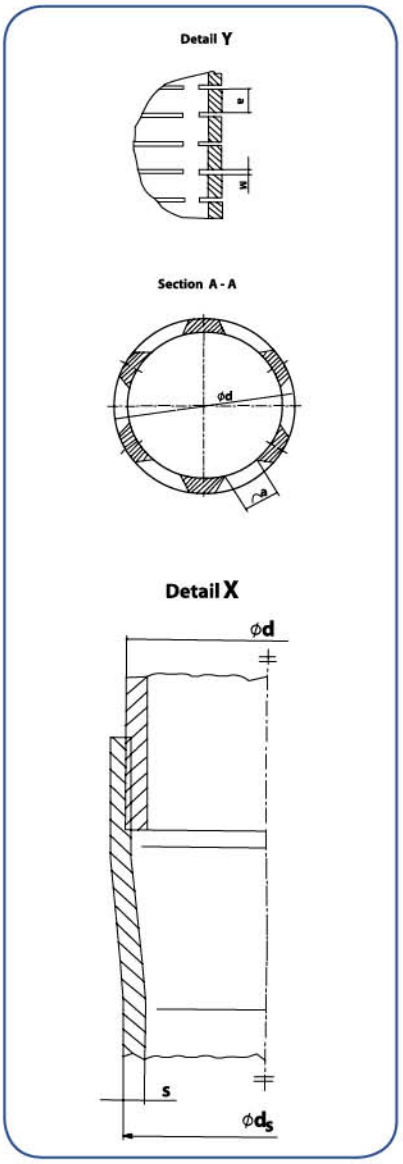
Trapezoidal Round shoulder thread
For use on heavy duty large diameter screens sizes 250/10" and above



Flush Joint with Trapezoidal round shoulder thread
Only For Shallow and Meduim
4 Ø U.P.V.C Casing and Screen pipes

DRAWING NO (2)

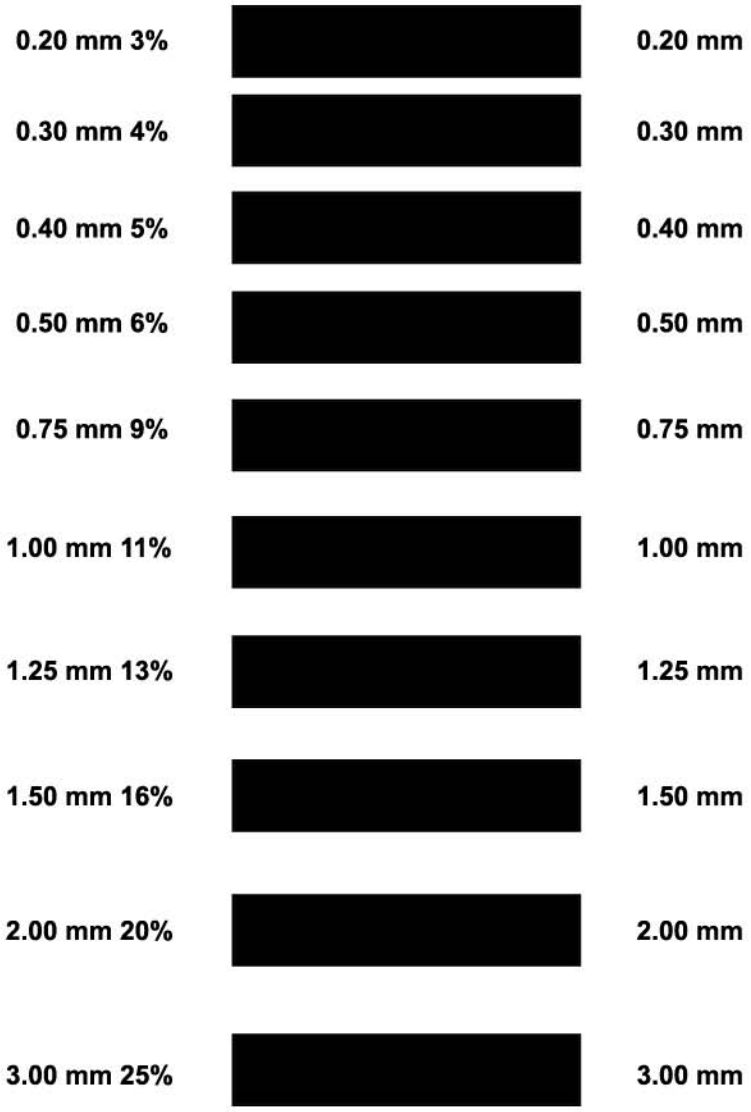




Casing and Filter Pipe Assembly

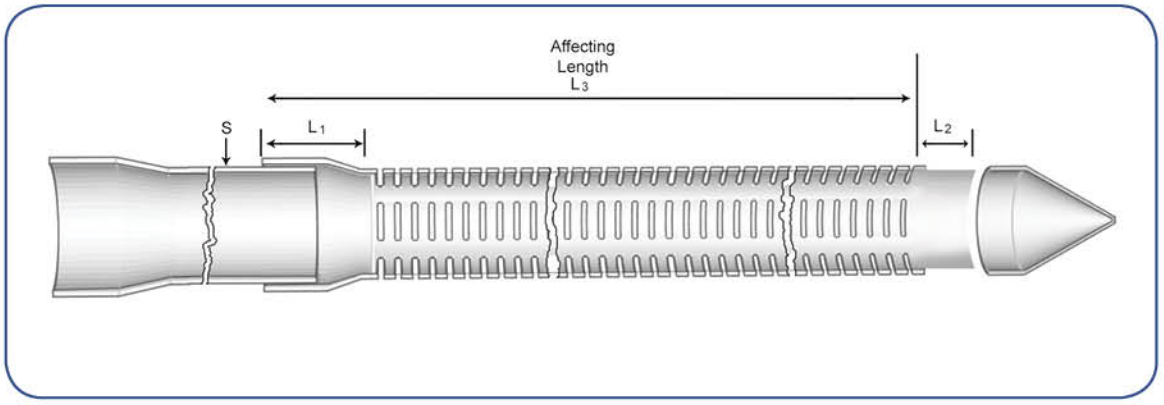
Fundamentals of Adjusting for Expansion and Contraction of Vertical Pipe

DRAWING NO (3)



RANGE OF UPVC WATER WELLS CASING & SCREEN TO (DIN 4925)

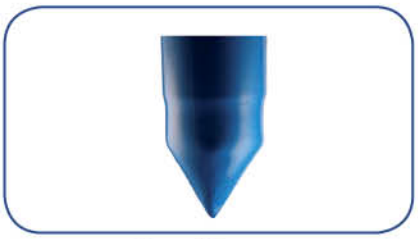
No dia (mm) OD	Wall thickness (mm) S		Threading	Head Length (L_1)	Tail Length (L_2)	L_3		No of Screen Slots N	Length of Screen Slots a	Percent of Screen Slots wedth (%)		
Standard wall	10 bars	16 bars				3 m	6 m			w (1 mm)	w (1.5 mm)	w (2 mm)
50	2.4	3.7	R	120	40	2840	5840	2	45	4	6	7
63	3.0	4.7	R	140	40	2830	5830	2	50	3.5	5.3	8
75	3.6	5.6	R	160	50	2810	5810	2	60	3.5	5.3	8
90	4.3	6.7	R	180	50	2790	5790	3	60	4.5	6.7	9
110	5.3	8.2	R	200	60	2760	5760	3	75	4.5	6.7	9
125	6.0	9.3	TR	220	60	2740	5740	3	80	4.5	6.7	9
140	6.7	10.4	TR	220	70	2740	5740	3	85	4.5	6.7	9
160	7.7	11.9	TR	240	70	2720	5720	4	85	4.7	7	9
200	9.6	14.9	TR	250	80	2710	5710	4	100	4.7	7	9
225	10.8	16.7	TR	270	90	2690	5690	5	100	5	7.5	10
250	11.9	18.6	TR	300	100	2650	5650	5	105	5	7.5	10
280	13.4	20.8	TR	310	120	2640	5640	5	110	5	7.5	10
315	15.0	23.4	TR	320	120	2630	5630	6	110	5	7.5	10



ACCESSORIES

Produces a range of high quality accessories and tools for successful installation of casing screen.

The accessories are available for the full range of sizes produced.



Sand Traps

V-shaped made of UPVC to trap sand at bottom of screen. Length to be specified at time of order

ABBREVIATIONS

MPT : Male pipe threaded.

FPT : Female pipe threaded.

FPS : Female pipe sement.

MR KS : Reduction with one socket.

MMB - KS : Double socket with socket branch.

MMA - KS : Double socket with flanged connection.

MMI - KS : Double socket with female connection.

CERTIFICATES

Registration Certificate

This is to certify that
the Environmental Management Systems of

AL-AMAL COMPANY FOR PLASTIC PIPES AND FITTINGS (AL-SHARIF)

have been assessed by AJA Registrars and registered against the requirements of

BS EN ISO 14001:2004

Certificate No. :	**AJA10/AN/1453**	Date of Original Registration :	**05/07/2010**
Date of Expiry :	**04/07/2013**	Date of Re-Registration :	**N/A**

ANAB ACCREDITED

Joint Chief Executives, AJA Registrars

ANGLO JAPANESE AMERICAN AJA REGISTRARS

This Certificate has been issued by AJA Registrars Limited, Unit 6, Gordano Court, Gordano Gate Business Park, Serbert Close, Portishead, Bristol UK BS20 7FS

This certificate is issued in respect of the locations & scope of registration detailed in the Associated Registration Schedule.
This certificate is the property of AJA Registrars and must be returned on request.

Registration Certificate

This is to certify that
The Occupational Health & Safety Management Systems of

AL-AMAL COMPANY FOR PLASTIC PIPES AND FITTINGS (AL-SHARIF)

have been assessed by AJA Registrars and registered against the requirements of

OHSAS 18001:2007

Certificate No:	AP/EG/10/HS/472	Date of Original Registration:	23:06:10
Date of Expiry:	22:06:13	Date of Re-Registration:	N/A

Timothy J Dixon
Chief Executive Officer

This Certificate is the Property of AJA Registrars and must be returned on request.

Registration Certificate

This is to certify that
the Management Systems of

AL-AMAL COMPANY FOR PLASTIC PIPES AND FITTINGS (AL-SHARIF)

have been assessed by AJA Registrars and registered against the requirements of

ISO 9001:2008

Certificate No. : **AJA01/3823**

Date of Original Registration : **01/10/2001**

Expiry Date : **03/01/2016**

Date of Re-Registration : **03/01/2013**

UKAS MANAGEMENT SYSTEMS
0059

MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT IAF

Joint Chief Executives, AJA Registrars

AJA REGISTRARS
ANGLO JAPANESE AMERICAN

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Ministry of Industry & Foreign Trade
Egyptian Organization for
Standardization & Quality

EOS

LICENCE OF QUALITY MARK

Company's Name: .... AL – Amel for Plastic Pipes & Fitting Co. (AL-SHARIF)

Address : .. 10th of Ramadan City – Industrial Zone No A3 ..

.....

product(s)Certified : Unplasticized Poly Vinyl Chloride (PVC-U) Pipes for Potable Water

.....

.....

Standard(s) : ..... ES 848-1 / 2008 .....

Date of Issue : ..... 1 / 10 / 2011 .....

Validity : ..... Two Years .....

Chairman of EOS
(Hassan Magied
02/08/2012)

Quality General Manager
(Eng. Isis Thabet)

الهيئـــة القـوميـــة

لمياه الشرب والصرف الصحى

إدارة الاختبارات والرقابة على الصناعة

National Organization

For Potable Water & Sanitary Drainage

Administration of Testing & Industry Supervision

ساري حتى ٢٠١٢/١٠/٢١

شهادة اعتماد منشاة إنتاجية

(المواسير البلاستيك UPVC)

اسم المنشاة : شركة الامل للصناعات للمواسير البلاستيك ولوازمها
عنوان الادارة : ٨ش محمد تيمور ميدان سانت فاتيما – مصر الجديدة
عنوان المصنع : المنطقة الصناعية الثالثة – مدينة العاشر من رمضان
السجل التجارى: ٦٢٣ **مكتب سجل تجارى :** الاستثمار **محافظة** : القاهرة
ب-ض رقم تسجيل ضريبي : ٨٩٨-٩٧٦-٢٠٤ **مأمورية:** الاستثمار **محافظة:** --
سجل صناعي رقم : ٢٦٦٢٧ **سنة الإصدار :** ١٩٩٨ **نوعية الصناعة :** كيماوية
رخصة : (دائمة) **ملف رقم :** ٨٣١ **(مدينة):** العاشر من رمضان**محافظة** :-الشرقية
موافقة شئون البيئة : --- **رقم القرار:** ٧٥٦ **التاريخ** ٩٩/١/١١ **الجهة :** رئاسة مجلس الوزراء

أهم المنتجات المعتمدة لدى الهيئة : -

١- المواسير البلاستيك UPVC المستخدمة في مشروعات المياه بضغوط حتي ١٦ض دجوي حتي قطر ٧١٠مم
٢- المواسير البلاستيك UPVC المستخدمة في مشروعات الصرف الصحي حتي قطر ٧١٠مم
٣- القطع الخاصة البلاستيك upvc المنتجة بالحقن بضغوط حتي ١٦ بار ض٠جوي حتي قطر ١٦٠مم
٤- البرايز المصنوعة من الحقن upvc حتى ١٦٠ض جوى ١٦ بار وقطر ٢٢٥ مم ١٠ بار
٥- المواسير البولي ايثيلين عالي الكثافة المستخدمة فى المشروعات المياه والصرف الصحي حتى قطر ١٦٠مم
٦- المواسير والقطع البولي بروبلين المستخدمة فى مشروعات المياه والصرف الصحي حتى قطر ١١٠مم
٧- محابس البلاستيك UPVC بلية لاكور حتي قطر ٦٣مم المستخدمة في مهمات مبني الكلور والكيماويات وخطوط ري الغابات الشجرية٠

- **طبقا للمواصفات القياسية المصرية و العالمية و القرار الوزاري رقم ٢٧٧ لسنة ٢٠٠٠ وتعديلاته و الإضافات بالقرار الوزاري ١٤ لسنة ٢٠٠٢**
- **يتم الالتزام بتعليمات الادارة و الموضحة خلفة وفي حاله مخالفتها يعتبر لاغي**

المشرف العام

المهندس /

" صلاح عبد العظيم دياب"

صادر في ٢٠١٢/١١/٢٠
ساري حتى ٢٠١٣/١٠/٢١

SAMAH

الهيئة العامة لشئون المطابع الأميرية ١١٣٩ س ٢٠٠٠ - ٤٠٠

Notes

Notes

Notes

2013

الهيئـــة القـــوميـــة
لمياه الشرب و الصرف الصحى

ISO 9001:2008
0059
OHSAS 18001:2007
ISO 14001:2004

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