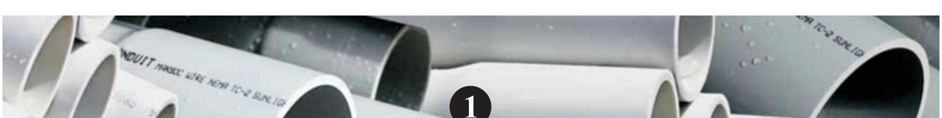
MASTER

uPVC Pipes and Fittings

Technical Book



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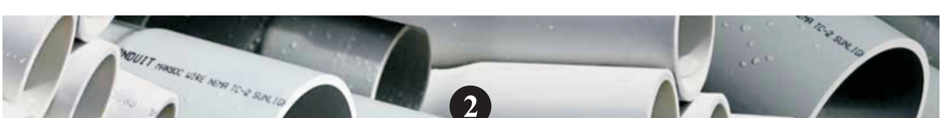


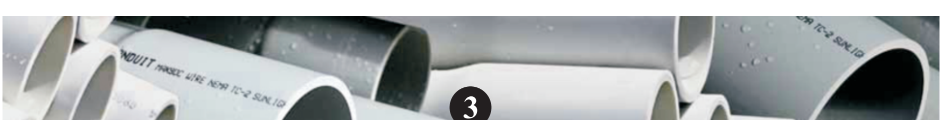
A View of our Production Plant

1. COMPANY PROFILE

Master Pipe Industries (Pvt) Limited is entered into the manufacturing field of uPVC Pipes & Fittings , PPRC Pipes & Fittings with the determination to serve the nation by providing quality products in mega projects as well as small consumers. The Company had established its manufacturing facility in the great Textile City of Pakistan, named as Faisalabad, famous for its Textile Products.

The Manufacturing plant is situated at 3.5 K.M, Makkuana Khanuana, Main By Pass Road, Faisalabad.

We aim to set standards in every field of our entrance. Customer focus, quality and innovation are reflected in every aspect of our business. We are offering customized solutions to a cross section of market for over a decade. Master today is a hallmark of trust and reliability. We believe that our strength lies in delighting our customers. That is why, providing quality products is backed by superior technical support services, which is the Master promise to all valued customers.



Master Pipe Industries (Pvt) Ltd. is a quality conscious company, and having the honor to obtain quality & control certifications from ISO 9001: 2008, ISO 14001: 2004, PSQCA (Pakistan Standard & Quality Control Authority), HUD & PHED, Punjab Building Department etc. In addition, Master Pipe Industries (Pvt) Ltd. is the first company in Pakistan which is exporting Pipes & Fittings to African region and maintaining SONCAP certification.

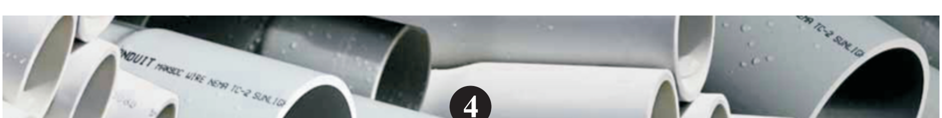
Our company is specialized to producing u-PVC Pressure Pipes & Fittings in B, C, D, E(Classes) for supply lines, u-PVC Electrical Conduit Pipes & Fittings for building electrification system, u-PVC Sewerage Disposal Pipes & Fittings for soil, waste, and vent system, PPR-C Pipes & Fittings for Hot & Cold water supply system, HDPE Pipes & Fittings for gas distribution system. Our products can be used for deep well pumps, sanitary plumbing, drainage, sewerage, agriculture, horticulture, air condition and chilled or hot water supplies system.

Our Vision

To become one of the leading brand in Plastic Piping System in domestic and global markets by continuous development and innovation.

Our Mission

Our business activities are focused on the development, manufacturing and distribution of Plastic Pipe System. We provide solutions for the complete water cycle and industrial application.



2. INTRODUCTION

This is a technical hand book for the engineers who design and install water pipe lines in urban and far flung areas. It contains the latest information now available based on the specialized experience of our company meeting the specific demands of various areas with almost all types of geo physical terrains and our technical department can take care of all normal and abnormal problems.

Material

The material from which uPVC pipes are produced mainly consist of polyvinyl chloride with additives not more than 5% and which are necessary for the manufacturing of pipe according to BS-3505 and PS -3051/91 and also Schedule 40, Schedule 80 with specific gravity 1.42 - 1.46.

3. MASTER PRESSURE PIPES RANGE

Master uPVC pressure pipes are manufactured in the following range and are classified by their maximum sustained working pressures, based on water at a temperature of 20^{o}C.

Class B	6.0 bar	(60m head of water)
Class C	9.0 bar	(90m head of water)
Class D	12.0 bar	(120m head of water)
Class E	15.0 bar	(150m head of water)

Master uPVC pressure pipes conform to BS-3505 and PS -3051/91 and also Schedule 40, Schedule 80 as specified in Tables 3, two 5.

The pipe dimensions, as expressed in Table 3 are in metric units. However, the given nominal (diameter) size of pipes is in inches and are nearest equivalent to metric values.

Master uPVC pressure pipes are available in various lengths having plain ends, socketted ends with or without provision of rubber rings.

Rubber Rings

Master Rubber Rings are manufactured at Master own Rubber Plant using best quality rubber. These Rings conform to PS.1915: 1987 and also meet the relevant British and International Standards.

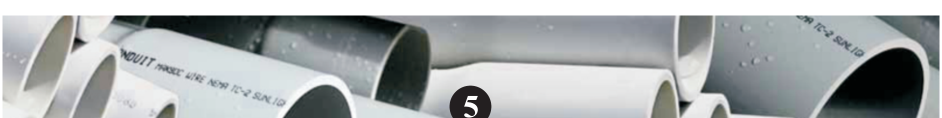


Table - 1

Maximum Sustained Working & Field Test Pressures

	Working Pressure			Test Pressure		
Class	bar	Kgf/cm^2	Lbf/in^2	Bar	Kgf/cm^2	Lbf/in^2
B	6	6.12	87	9	9.18	130
C	9	9.18	130	14	13.77	195
D	12	12.25	173	18	18.38	259
E	15	15.30	217	23	22.95	325

The maximum admissible service pressures are calculated from known data on the basis of a life of at least 50 years of continuous operation and a safety factor greater than 2.

Table - 2

Short-term Hydrostatic Pressure Resistance at 20°c

Maximum 1 h Failure Pressure

Class of Pipe	Maximum 1 h Failure Pressure
6 bar class - B	21.6 bar
9 bar class - C	32.4 bar
12 bar class - D	43.2 bar
15 bar class - E	54. 0 bar

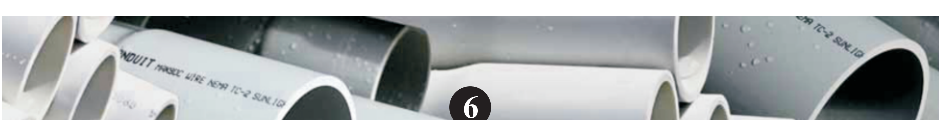


Table 3. Pipe Dimensions For Classe B, C, D And E, Bs-3505 & Ps-3051/91

Nominal Size	Mean Outside Diameter		Wall Thickness											
			Class B 6-0 bar			Class C 9-0 bar			Class D 12-0 bar			Class E 15-0 bar		
			Averaged Value	Individual Value		Averaged Value	Individual Value		Averaged Value	Individual Value		Averaged Value	Individual Value	
Inch	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
3/8	17.0	17.3	-	-	-	-	-	-	-	-	-	1.9	1.5	1.9
1/2	21.2	21.5	-	-	-	-	-	-	-	-	-	2.1	1.7	2.1
3/4	26.6	26.9	-	-	-	-	-	-	-	-	-	2.5	1.9	2.5
1	33.4	33.7	-	-	-	-	-	-	-	-	-	2.7	2.2	2.7
1 1/4	42.1	42.4	-	-	-	-	-	-	2.7	2.2	2.7	3.2	2.7	3.2
1 1/2	48.1	48.4	-	-	-	-	-	-	3.0	2.5	3.0	3.7	3.1	3.7
2	60.2	60.5	-	-	-	3.0	2.5	3.0	3.7	3.1	3.7	4.5	3.9	4.5
2 1/2	75.0	75.3	-	-	-	3.5	3.0	3.5	4.5	3.9	4.5	5.5	4.8	5.5
3	88.7	89.1	3.4	2.9	3.4	4.1	3.5	4.1	5.3	4.6	5.3	6.5	5.7	6.6
4	114.1	114.5	4.0	3.4	4.0	5.2	4.5	5.2	6.8	6.0	6.9	8.3	7.3	8.4
5	140.0	140.4	4.4	3.8	4.4	6.3	5.5	6.4	8.3	7.3	8.4	10.1	9.0	10.4
6	168.0	168.5	5.2	4.5	5.2	7.5	6.6	7.6	9.9	8.8	10.2	12.1	10.8	12.5
7	193.5	194.0	6.0	5.2	6.0	8.7	7.7	8.9	11.4	10.1	11.7	13.9	12.4	14.3
8	218.8	219.4	6.1	5.3	6.1	8.8	7.8	9.0	11.6	10.3	11.9	14.1	12.6	14.5
9	244.1	244.8	6.7	5.9	6.8	9.8	8.7	10.0	12.9	11.5	13.3	15.8	14.1	16.3
10	272.6	273.4	7.5	6.6	7.6	10.9	9.7	11.2	14.3	12.8	14.8	17.5	15.7	18.1
12	323.4	324.3	8.8	7.8	9.0	12.9	11.5	13.3	17.0	15.2	17.5	20.8	18.7	21.6
14	355.0	356.0	9.6	8.5	9.8	14.1	12.6	14.5	18.6	16.7	19.2	22.8	20.5	23.6
16	405.9	406.9	10.9	9.7	11.2	16.2	14.5	16.7	21.1	19.0	21.9	26.0	23.4	27.0
18	456.7	457.7	12.3	11.0	12.7	18.2	16.3	18.8	23.8	21.4	24.6	-	-	-
20	507.5	508.5	13.7	12.2	14.1	20.2	18.1	20.9	-	-	-	-	-	-
22	558.3	559.3	15.0	13.4	15.5	22.1	19.9	22.9	-	-	-	-	-	-
24	609.1	610.1	16.3	14.6	16.8	24.1	21.7	25.0	-	-	-	-	-	-

Table 4

uPVC & cPVC Pipes -Schedule 40

Nominal Pipe Size (inches)	AveOutside Dia (d) (mm)	Wall Thickness (s) MIN (mm)	MIX (mm)	Nominal Weight kg/m	Water Presure Rating at 73^{o}F (23^{o}C) Psi
1/2	21.34	2.77	3.28	0.24	600
3/4	26.67	2.87	3.38	0.33	480
1	33.40	3.38	3.89	0.48	450
$1^{1/4}$	42.16	3.56	4.07	0.65	370
$1^{1/2}$	48.26	3.68	4.19	0.77	330
2	60.32	3.91	4.42	1.04	280
$2^{1/2}$	73.12	5.16	5.77	1.62	300
3	88.90	5.49	6.15	2.14	260
4	114.30	6.02	6.73	3.05	220
6	168.28	7.11	7.97	5.30	180
8	219.08	8.18	9.17	8.11	160

1 BAR = 14.5 PSI

Pressure rating apply to unthreaded pipes at 23^{o} Centigrade. Threading of schedule 40 pipes is not recommended. The standard lengths (L) 6 meters.

Table 5

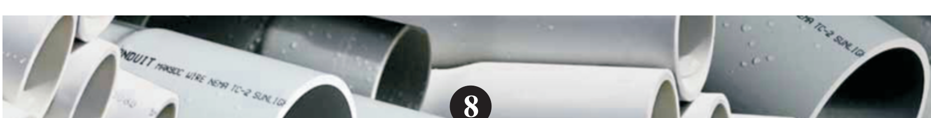
uPVC & cPVC Pipes -Schedule 80

Nominal Pipe Size (inches)	AveOutside Dia (d) (mm)	Wall Thickness (s) MIN (mm)	MIX (mm)	Nominal Weight kg/m	Water Presure Rating at 73^{o}F (23^{o}C) Psi
1/2	21.34	3.73	4.24	0.31	850
3/4	26.67	3.91	4.42	0.41	690
1	33.40	4.55	5.08	0.60	630
$1^{1/4}$	42.16	4.85	5.43	0.84	520
$1^{1/2}$	48.26	5.08	5.69	1.03	470
2	60.32	5.54	6.20	1.41	400
$2^{1/2}$	73.12	7.01	7.85	2.15	420
3	88.90	7.62	8.53	2.88	370
4	114.30	8.56	9.58	4.22	320
6	168.28	10.97	12.29	8.05	280
8	219.08	12.70	14.22	12.23	250

1 BAR = 14.5 PSI

Pressure rating apply to water services at 23^{o} Centigrade. For more sever service an additional correction factor may be required. Threading of schedule 80 PVC pipe above 4” nominal size in not recommended .

The standard length is 6 meters.

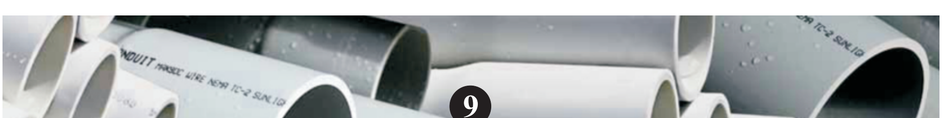


Weights of Master uPVC Pipe

BS-3505 and PS -3051/91 and also Schedule 40, Schedule 80 Pipe does not spell out any figures for weights. The pipe weights are dependent on the formulation, density and tolerances. Approximate weights for Master uPVC Pipes for transportation and other estimation purposes are given in the table below.

Approximate Weights of uPVC Pipe Per Metre

Normal Size (inch)	Class-B kg/m	Class-C kg/m	Class-D kg/m	Class-E kg/m
3/8	-	-	-	0.11
1/2	-	-	-	0.15
3/4	-	-	-	0.22
1	-	-	-	0.32
1-1/4	-	-	0.41	0.50
1-1/2	-	-	0.54	0.65
2	-	0.68	0.82	1.03
2-1/2	-	1.01	1.20	1.58
3	1.17	1.41	1.82	2.22
4	1.78	3.32	3.03	3.65
5	2.44	3.49	4.55	5.51
6	3.46	5.01	6.57	7.95
8	5.30	7.72	10.05	12.17
10	8.26	11.97	15.59	18.89
12	11.55	16.85	21.91	26.68
14	13.87	20.27	26.49	32.16



4. ADVANTAGES OF MASTER uPVC PIPES

The utility of the uPVC pressure pipes for the conveyance and distribution of portable water has been proven beyond doubt for the past 30 years.
Master uPVC pressure pipes provide the following distinct advantages:

- Total resistance to corrosion, abrasion, growth of bacteria, algae and fungi.
- Light in weight, durable and economical.
- Simple to join and quick to install.
- Flexible and resistant to breakage.
- Easy to transport.
- Non-toxic and non-conductive.
- Smooth bore with excellent hydraulic characteristics, low frictional losses and high flow capabilities.
- Non-flammable/self-extinguishing. Does not support combustion.
- Exceptional chemical resistance to most acids, alkalis and halogens.
- Maintenance free.

5. LABORATORY TESTING OF MASTER uPVC PIPES

To maintain & assure the quality, Master Pipes haso their own most modern, very well equipped pipe testing laboratory. The test are regularly conducted in quality control laboratory as PS-3051/91 Equivalent to BS-3505.

This latest laboratory is for quality testing and research development purposes. Pure Master uPVC Pipes are inspected on line &tested in calibrated laboratory by its trained QC Engineers for conformance to the specifications of standards as well as for valued

customers.

The following test are conducted regularly in the laboratory for the conformance of BS-3505 and PS -3051/91 and also Schedule 40, Schedule 80.

1- Impact Resistance Test at20° c

2- Longitudinal Reversion at 15° c

3- Delamination Resistance 150° c

4- Superficial Appearance

5- Dimension as per Table 3

6- Long Term Hydrostatic Pressure Resistance Test AT 20° c

7- Long Term Hydrostatic Pressure Resistance Test AT 60° c

8- Short Term Hydrostatic Pressure Resistance Test AT 20° c

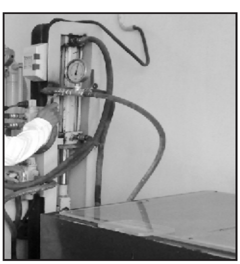
9- Specific Gravity Test (1.42-1.46)

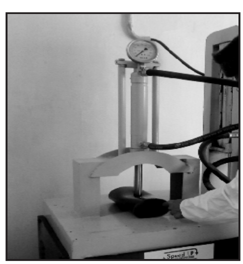
10- Fracture Toughness.

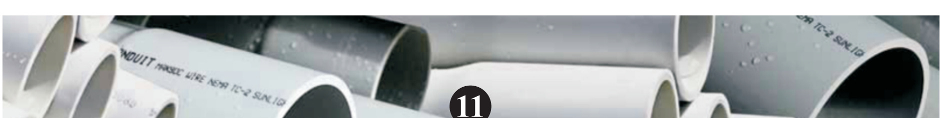
11- Opacity Test (0.2 % Max)

12- Compression Test, Flattening Test (as per ASTM)

13- Methylene Chloride Test (For Controlling Proper Gelation)

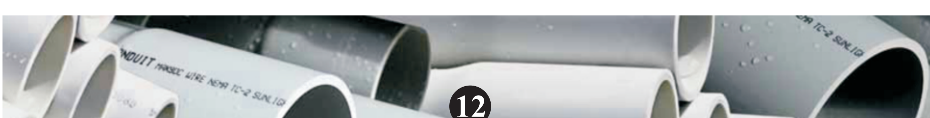






6. PHYSICAL PROPERTIES

Sr.#	Property	Value	Unit
1.	Specific Gravity	1.42 - 1.46	—
	Mechanical:		
1	Tensile Strength At 23^{o}C	450 - 600	Kgf/cm2
2.	Modulus of Elasticity at 20^{o} C	30,000	kgf/cm2
3.	Elongation at Break	> 80%	
4.	Impact Strength at 0^{o} C	0.5 - 1	ft lb/in of Notch
5.	At 20^{o} C	1 - 2	ft lb/in of Notch
6.	Compressive Strength	600 - 700	kgf/cm2
7.	Bending Strength	1000	kgf/cm2
	Thermal:		
1.	Specific Heat at 20^{o}C	0.24	Cal/gm/^{o}C
2.	Vicat Softening Point	85	^{o}C
	Heat Distortion		
3.	Temperature at 18.5 kgf/cm2	75	^{o}C
4.	Thermal Conductivity	0.12-0.14	cal m/m2h^{o}C
5.	Coeficient of linear expansion	7-8x10-5	m/m/^{o}C
	Electrical:		
1.	Dielectric constant (800 Cycle)	30	—
2.	Dielectric Strength	425	Volts/mil
3.	Inflammability	Will not support	combustion
4.	Water Absorption (24 Hours at Ambient Temperature)	0.07	%



7. CHEMICAL RESISTANCE

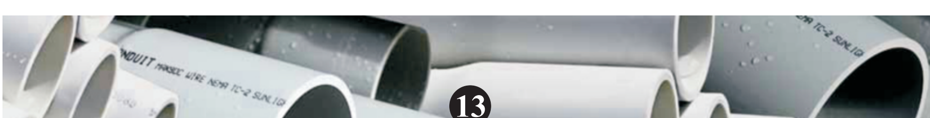
uPVC pipes are highly resistant to acqueous salt solutions, mineral acids and alkalis. Some hydro-carbons are absorbed by PVC and cause swelling and loss of strength. These changes are, however, largely restored when the hydro-carbons are allowed to evaporate from the pipe. PVC is virtually unaffected by water.

PVC piping is not recommended for use with organic esters, ketones, chlorinated solvent aromatic hydro-carbons and reagents and low molecular weight alcohols.

Resistance of Master Pipes to Common Chemicals Under Use Conditions

Mineral Acids	Hydrochloric (Muriatic) Acid-30%	+
	Sulphuric Acid 50%	+
	Sulphamic Acid 30%	+
Alkalies	Ammonium Hydroxide	+
	Calcium Hydroxide	+
	Sodium Hydroxide	+
Salts	Calcium Chloride	+
	Potassium Chloride	+
	Sodium Bicarbonate	+
	Sodium Chloride	+
	Sodium Phosphate	+
	Sodium Sulphate	+
Oxidising Agents/ Disinfectants	Sodium Hydrochloride (Bleach Solu)	+
	Chlorine Water	+
	Calcium Hypochlorite-Soln. 18%	+
Organic Acids	Acetic-Acid-10%	+
	Stearic Acid	
	Hydroxy Acetic Acid	+
Oils & Derived Product	Crude Oil Sour	+
	Diesel Fuel	+
	Gasoline	+
	Lubricating & Thread Cutting Oils	+
	Motor Oil	+
Solvents	Acetone	-
	Methyl Ethyl Ketone	-
	Toluene	-
	Trichloroethylene	-
	Turpentine	+
	Xylene	-
	Soaps & Detergents	+
Gases	Ammonia	+
	Carbon dioxide	+
	Hydrogen Sulfide	+
	Natural Gas	+
	Oxygen	+

Key——+denotes resistant
-not resistant



8. WEATHERING

uPVC pipe owes much of its acceptance and operating success to its exceptional resistance to aggressive environment compared to steel and cast-iron pipes. Buried uPVC pipelines are well - shielded from sunlight. Long exposure of uPVC pipes to sun hardly affects the tensile strength but can result in colour fading, reduction in impact strength and slight decrease in elongation property. However, considering uPVC pipe's high inital impact strength, the reductions are not significant enough to warrant concern.

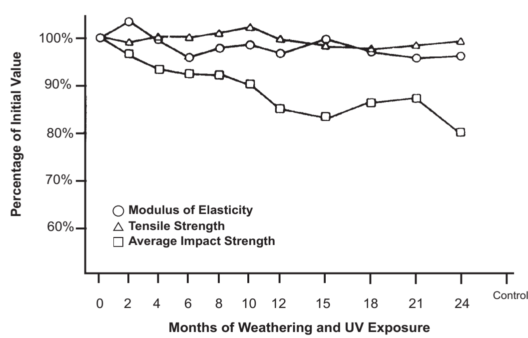
8.1 Thermal Expansion

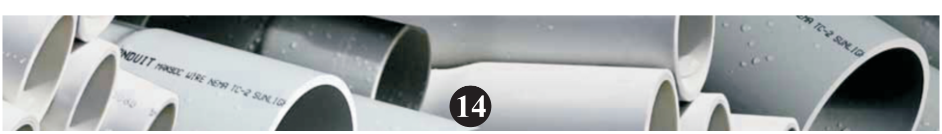
A 6 metre Master uPVC pipe will expand approximately 1.6mm for a temperature rise of 10^{o} C. The use or rubber ring joints accommodates any thermal movement that may develop in a buried uPVC water-main.

8.2 Impact Of High And Low Temperatures

Though the softening point of Master uPVC pipes is between 75^{o} C to 85^{o} C, it is recommended not to use these pipes for hot water beyond 55^{o} C. In an open uPVC pipe, the water will freeze below 0^{o}C causing increase in volume inside the pipe. However, it will not crack or burst due to its resilience but cause it to become brittle and liable to break due to any impact.

Graphical Representation of Mechanical Property Changes over the 24-months Evaluation Period

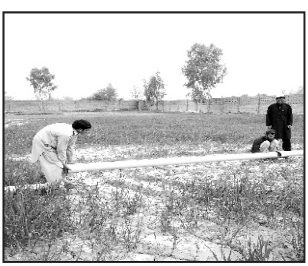


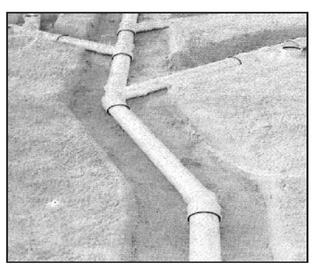


9. APPLICATIONS

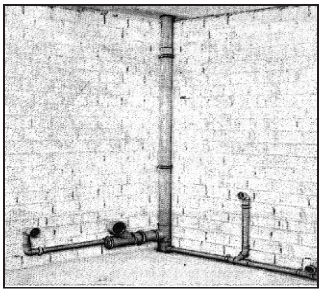
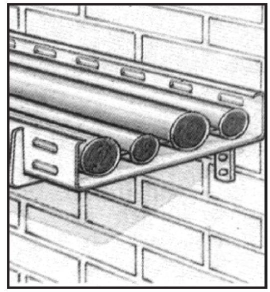
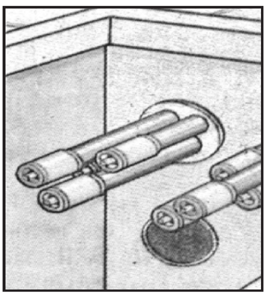
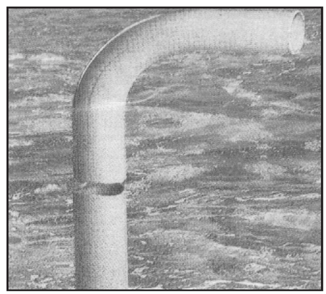
Master uPVC pipes have diverse applications and some of them are listed here:

* Water supply schemes - for pressure mains and portable water distribution networks.
* Cold water services.
* Fire-Ring Mains.
* Sewage mains - pumped or gravity flow.
* Drainage Installations - domestic and industrial.
* Factory supply lines.
* Slurry lines.
* Effluent lines.
* Corrosive fluid pipe lines - Dye houses, Chrome and Zinc planting plant, etc.
* Chemical plant installation.
* Non-explosive dry materials handling - sand, cement, rock salt, plastics, compounds.
* Pulverized fuel-ash lines.
* Brinelines - Tanning plant, Ice rings.
* Livestock whey feed pipes.
* Paper Mill installation - Alum and Pulp carrying.
* Coal Washing plant.
* Power station screening plant pipelines.
* Power station chlorination plant.
* Fume extraction ducts.
* Chilled water lines for refrigeration and air conditioning plant/cooling towers.
* Salt water pipes for small boat engines cooling and ballast tanks.
* Water aeration plant.
* Horticulture and Greenhouse irrigation system.
* Land drainage.





* Tube wells.
* Industrial and Laboratory piping system for chemical waste drainage.
* Electrical conduits and cable ducting.
* Sanitary plumbing (soil, waste and vent).

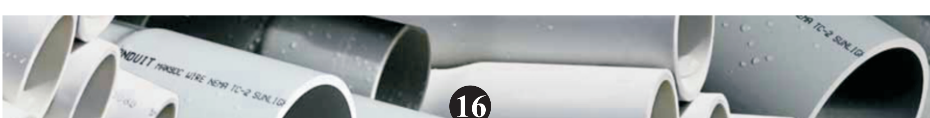
10. DESIGN DATA

The tensile strength of the uPVC pipe is directly related to its ability to withstand internal pressures. The rating or pressure class of pipe is dependent upon the wall thickness and tensile strength of the pipe material. Pipe stiffness is a function of its diameter, wall thickness and modulus of tensile elasticity of the pipe material.

The permissible working pressure of the pipe is calculated on the basis of water at 20^{O}C. At other temperatures the permissible working pressure changes according to graph 1.

10.1 Water Flow Velocity

The maximum safe water velocity in a thermoplastic piping system depends on the specific details of the system and the operating conditions. In general, 5 feet per second (1.5m/sec) is considered to be safe. Higher velocities may be used in cases where the



operating flow velocity can be controlled. The total pressure in the system at any time (operating plus surge of water hammer) should not be more than 1.5 times of the pressure rating of the system.

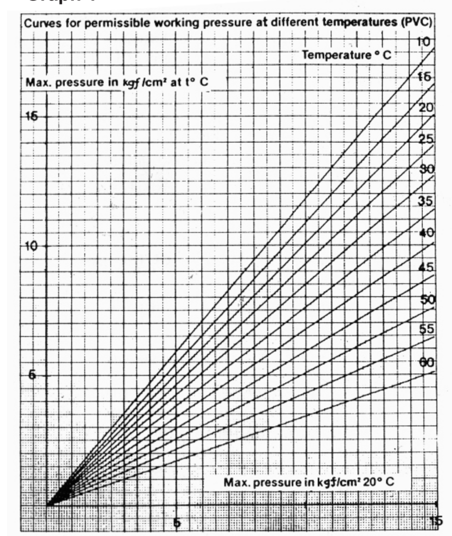
10.2 Hydraulic Claculations

The formula recommended for calculations of velocity and discharge is the Colebrooke - White formula.

$$V = -2\sqrt{2gdj}\ \log\left[\left(\frac{K}{3.71d}\right)+\left(\frac{2.51\phi}{d\sqrt{2gdj}}\right)\right]$$

$$Q = 6.95\ \log\left(\frac{0.74}{d\sqrt{dxI\ x10^{o}}}+\frac{K}{3.71d}\right)\times d^{2}x\sqrt{dx1}$$

Graph 1



Where,

v = Velocity (m/sec)

g = 9.81 (m/sec^2-gravity)

d = Internal pipe diameter (mm)

j = Hydraulic gradient

k = Frictional resistence in meters for diameter $\leqslant$ 200mm

k = 0.00001m for diameter > 200 mm

k = 0.00005 m

ϕ = kinematic viscosity of water (at18^{o}C) = 1.01 x 10^{-6} m^2/sec.

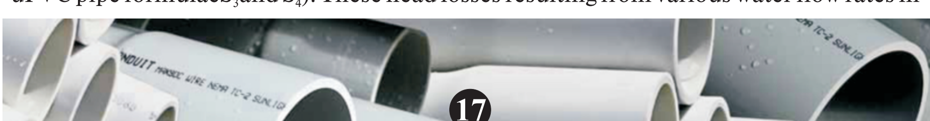
I = Frictional loss (mm-Number)

q= Water discharge (m^3/sec.)

10.3 Flow or Friction Losses

The head losses that occur because of fluids flowing in PVC piping systems are calculated in a similar manner as for other conventional piping systems. These losses exist on both the suction and discharge sides of the pump and at the entrance and exit of the systems. The entrance and exit losses are usually compensated by slightly enlarging the diameter at the entrance or exit (i.e.a bell-mouthed fitting is commonly used on a suction line. The following factors also contribute significantly towards the loss of head in uPVC pipe systems:

* Flow velocity of the fluid.
*The type of fluid being transmitted, especially its viscosity.
*Diameter of the pipe.
* Surface roughness of interior of the pipe.
* The length of the pipe line. (Refer to attached flow diagram based on Lamont's Smooth uPVC pipe formulaeS$_3$and S$_4$). These head losses resulting from various water flow rates in



PVC piping may also be calculated by means of the Hazen-Williams equation:

$$H_f = \frac{10{,}520}{D^{4.87}} \left(\frac{Q}{Cw}\right)^{1.852}$$

Also, $V = 0.3544 \text{ x } CwD^{0.63} xS^{0.54}$

or, $Q = 0.00668 \; CwD^{2.63} xH_f^{\;0.54}$

Where,

V = Velocity (m/sec.)

D = Internal diameter of pipe (m.)

S = Hydraulic gradient

Cw Constant (150) for inside roughness

Q = Discharge (m^3/sec.)

Hf = Loss of head m per 1000m.

10.4 Surge And Water Hammer

The pressure ratings make some allowance for surge and water hammer. However, when excessive surge and water hammer are likely to be encountered, extra allowance should be made or protective devices installed. The surge or water may be calculated by means of the following equation:

$$P = v\sqrt{\frac{3960}{\frac{1 + 300{,}000\ d}{Et}}}$$

P = Peak water surge pressure (psi)
E = modulus of elasticity of the pipe material (psi)
D = Inside diameter of the pipe (inch)
T = Wall thickness (inch)
V = Water velocity (feet per second.)

It may be necessary to use pressure ratings lower than the prescribed once when the following situations are likely to be encountered:

1. Water hammer or surges
2. Cyclic hammer oscillations
3. Air-pockets
4. Quick closing valves
5. Pumps with more capacity then the lines can deliver or their faulty operation or failure.
6. Flow velocities more then 5 ft/sec
7. Sudden shut down of electricity.

Operators Should be trained to prevent possible occurance of water hammer in situations 4 and 5. In such cases, the following procedure should be observed for centrifugal pumps (which can work against the closed valves):

a) The suction line should be fully primed. The supply line gate valve should be fully closed before switching on the motor or starting the engine.

b) As soon as full pressure is developed the supply line valve should be slowly opened.

In Order To Shut Down The Operation:

c) The supply line gate valve should be shut gradually before stopping the engine or switching off the motor.

Note:

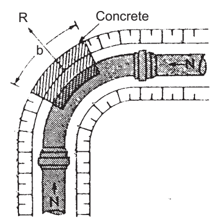
A Rotary or Reciprocating pump, unlike a centrifugal pump should never be operated against a closed valve.

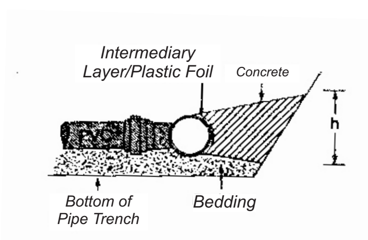
10.5 Barring Of Fittings

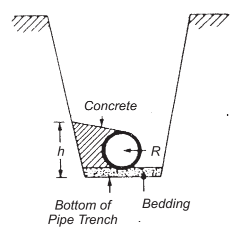
Fitting such as bends, tees and sockets, reducers and valves exposed to sheer strain due to internal water pressure, need to be barred/anchored.
For project with much higher water velocity or project for which detailed calculations of different individual resistances is desirable then

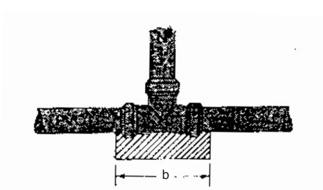
$$\triangle H = \frac{ZV^2}{2\,g}$$

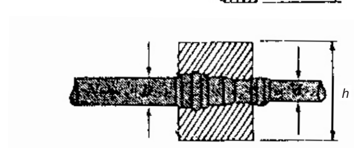
Where, $\triangle$ H = pressure head loss (m)
V = Velocity (m/sec)
Z = Resistance (number)
G = 9.81 (m/sec^2-gravity)

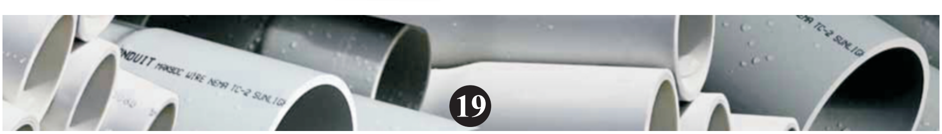










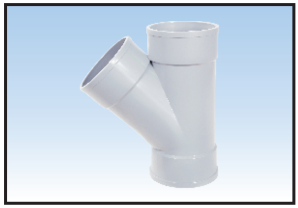


11. PRESSURE FITTINGS

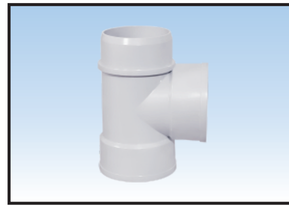
A wide range of moulded fittings available with Master, are designed to make service pipe connections economical, durable, leak proof, easy and quick.

Tee

Wye



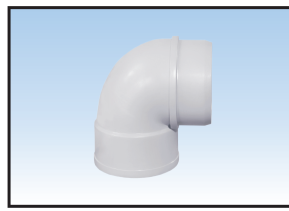
Male Female Tee



Plug Tee

Plug Elbow

Male Female Elbow 90°



Elbow 90°

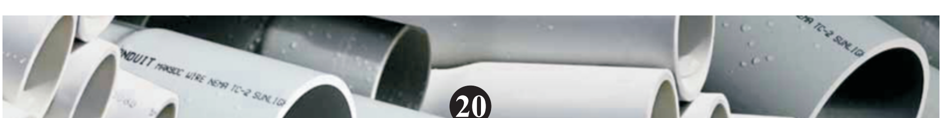
Elbow 45°

Reducing Tee

Floor Trap

P-Trap

Reducing Wye



12. PRESSURE JOINTING SYSTEMS

The following system are available.
* Solvent Cement Joint.
* Z-Joint

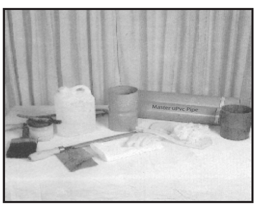
12.1 Solvent Cement Jointing System

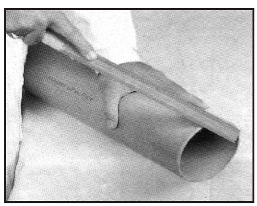
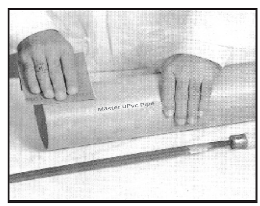
Procedure - Typical

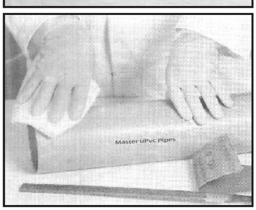
* Chamfer the pipe end at an angle of 15° to20° to an extent of 0.75mm length.
* Remove the dust and burr from the pipe ends and fittings using dry rag and thoroughly clean with the cleaner.
* Spread Solvent cement thinly and evenly over spigot end and inside of socket.
* Assemble within 40 seconds.
* Hold together for 3-5 minutes.
* Wipe all excessive adhesive.
* Leave for 24 hours before pressure testing.

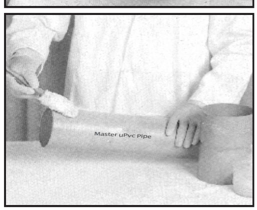
Note:

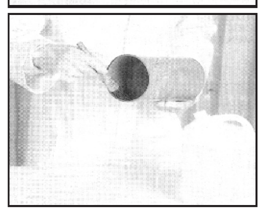
Excessive use of Solvent cement could lead to weakening the pipe wall by solvent action.
The tools required for Solvent cement jointing comprise of: cutting tool, rags, knife or half round coarse file, natural bristle, primer, application can, lubricant, Solvent cement and tool tray.

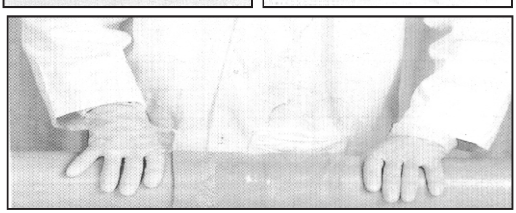


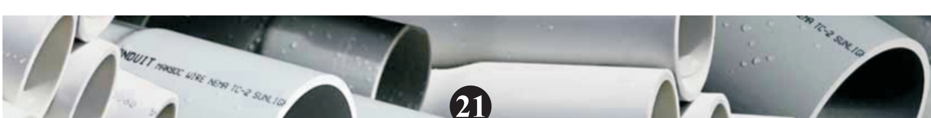













Consumption for Single joint of Pipes and its Respective Fitting

Size	1.5"-2"	2.5"-3"	4"	4"-6"	7"-8"
Cleaner	6	10	30	65	100
(ml)	10	20	50	90	120
Lubricant	20	35	40	50	70
(gm)	23	40	50	65	80
Solvent Cement	14	20	60	125	180
(ml)	20	40	100	175	220

Setting Time

Ambient Temperature °C	Pipe Diameter de (mm)	Waiting Time Before Installation Minute	Time During Which the Joint Should not be Moved Seconds
> 20	< 63	10	40 Sec
	> 75	15	70 Sec (1.10 Minutes)
10....20	< 63	20	200 Sec (3.20 Minutes)
	> 75	30	360 Sec (6 Minutes)

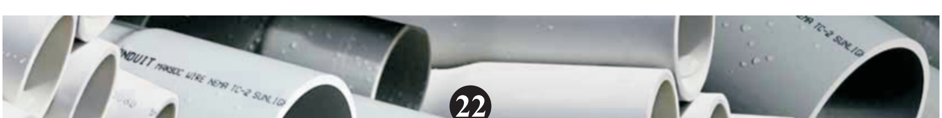
12.2 Z-Jointing System

Z-joint was developed by Master and since its inception has become one of the well-known integral joints for uPVC pressure pipes in the world. The Z-joint possesses the following sealing mechanism and is presently manufactured by Master:

* Due to he cavity between the lip and the body of the sealing element, the internal water pressure pushes the body of the ring into the groove and the lip to the inside diameter of the pipe thus giving an excellent sealing.

* The gap between the groove and the body of the rubber ring is small because their profiles match.

* The contact surface between the ring and the inside of the pipe diameter is relatively large because of the lip's Length. (Z-joints and other lip sealing rings are normally loose components of the joint.)



Procedure for Z-joint installations:

* Carefully clean the socket, groove, rubber ring and bevelled spigot end until they are completely dry and free of dirt.

This is extremely important for the correct positioning of the rubber ring during assembly.

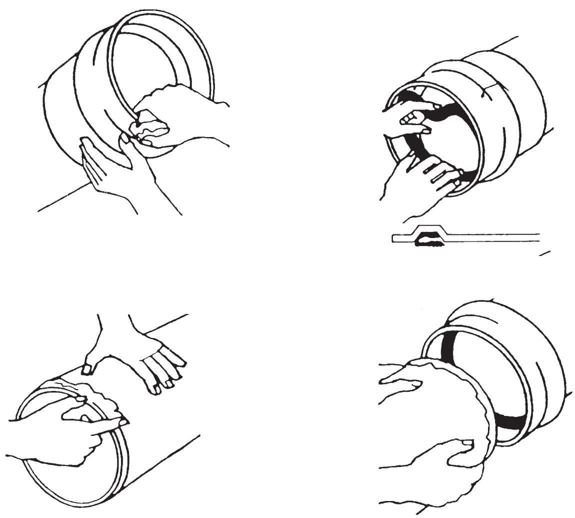
* Press the rubber ring into a heart shape and fit carefully into the groove, pushing it firmly in as far as it goes all the way round. The opening in the rubber ring must face backwards (see illustration).

* Apply lubricant generously to the bevelled spigot end and a little to the front edge of the rubber ring. Ensure that no lubricant penetrates behind the rubber ring.

* Press the spigot end into the socket, rotating it gently to align the chamfer with the rubber ring. Do not insert the spigot at an angle.

* Stop at the entry mark (13-25mm) from the end of the socket to cater for potential expansion and contraction.

* Make sure that the pipes to be jointed are aligned correctly against each other.

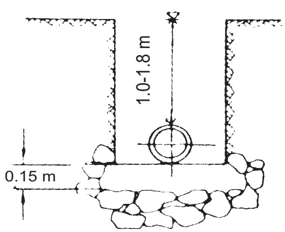


13. INSTALLATION PROCEDURE

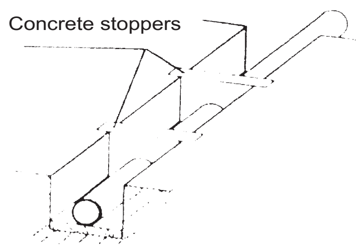
13.1 Pipe Trench

The depth of trench should be such that the pipe and fittings can be conveniently laid with a cover of 1.0-1.8m according to the design, climate and soil conditions. If the ground is rocky then the depth of trench should be increased by at least 0.15m and the excavated earth replaced by a stone-free layer. In case of descending gradients the stone-free layer must be prevented from being washed away by concrete or clay-stoppers. Drainage might also be advisable. In case of changing layers and conseqently changing soil bearing capacity of the trench bottom, provide an adequate fine gravel or sand filling (approximately 10xdia) at the points of transition. Should there be a parallel running or crossing of other pipes conveying warm fluids, then care must be taken that the uPVC pipe surface temperature does not rise above 20^{o} C.

No. 1



No. 2

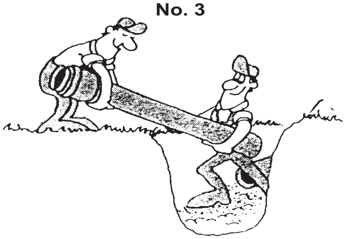


13.2 Pipe Laying/Installation

Small diameter pipes could easily be handled without use of auxillary tools. When connecting bigger diameter pipes, the use of a bar to push them into position is recommended.

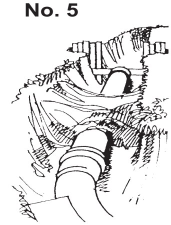
Note: When applying force to pipe ends in this way, protect with a wooden block. After installation, backfill the pipe line between the joints in order to stabilize the pipes before pressure testing is carried out. End plugs should also be anchored before pressure testing. In addition, anchoring or barring should be carried out at bends and tees, if necessary.

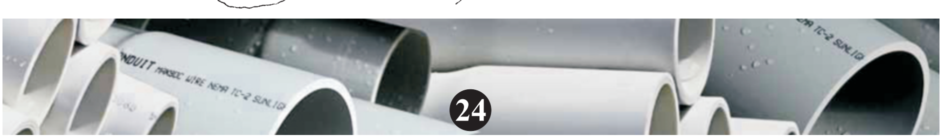
No. 3



No. 4

No. 5





13.3 Pressure Testing

It is recommended to test the pipeline in accordance with the prescribed code of practice. Normally, the leakages may occur at the rubber ring joints. As such, the backfilling of joints should only be done after testing the pipeline.

Preparations For Testing:

After the pipeline is installed according to applicable norms.

* Air-relief valves should be provided at higher points.
* Start filling the pipeline from the lowest point.
* Open the air-relief valves during filling of water.
* Water filling speed should be 7 hours for 1 km line irrespective of the pipe diameter.
* Pressure testing to be carried out after 48 hours of backfilling.
* Prior to testing the pipeline should be filled with water for 2 hours.
* The temperature of water used for testing should be 20^{o} C.
* If the pipe system is large one, then it should be tested In sections of maximum 500m.

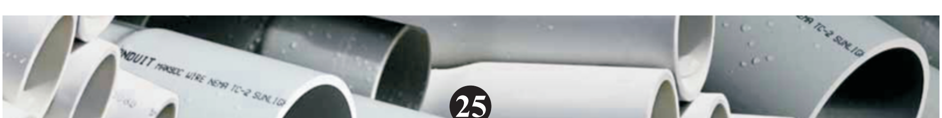
Procedure For Testing:

* The testing pressure is raised to the nominal or working pressure either by manually operated pump or a power driven pump.
* This pressure is maintained for 2 hours during which any loss of water is supplemented.
* Within 6 minutes thereafter, the pressure is increased to 1.5 times of the working pressure. This pressure is maintained for 2 hours once again by supplementing any loss of water.

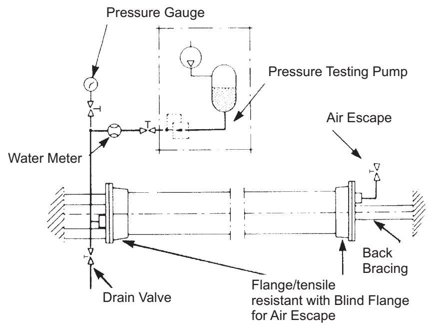
* Within 6 minutes thereafter, the pressure is reduced back to the nominal working pressure and retained for one hour.
* In case, the quantity of water added during this period is below the approximate limits as shown in Table 5 then, the pipeline is acceptable. If the quantity of water lost exceed the values given in Table 5, or the amount calculated by the following formula: 1 gallon per mile of pipe per inch of nominal bore, per 100 ft head of test pressure for 24 hours (4.5 litres/1.6 Km of pipe/25mm of nominal bore/30m head of test pressure/24 hr.) Then there is a leakage in the line that must be investigated and rectified.

Table 5

Dia (approx) mm	89	114	140	168	219	244	273	324	406	508	610
Lit/Km (approx.)	1	1.2	1.9	2.2	3.6	4.1	4.8	5.1	7.2	9.2	11.6



Please do not hesitate to contact Master Techno-Commercial Department, should you require any help or advice in connection with pressure testing.



13.4 Back-Filling

After pressure testing, filling of the trench is to be done in layers of 0.30m over the pipe, utilizing stone-free soil. The soil layer immediately over the pipe is to be compacted by the tamping bars.

The material used for upper layers can be coarser than that used for the initial backfill. These layers should be carefully rammed down one on top of the other until the backfill is completed.

14. QUALITY CERTIFICATES

Certificate of Registration

MOODY INTERNATIONAL

This is to certify that the Environmental Management System of:

MASTER PIPE INDUSTRIES PVT LTD
3.5 K.M. MANKUANA KHANUANA BYPASS ROAD, FAISALABAD, PAKISTAN

has been assessed and found compliant with the requirements of

ISO 14001:2004

Approval is hereby granted for registration on the proviso that the Certification rules and conditions are observed at all times.

Certification Scope:

MANUFACTURER AND EXPORTER OF UPVC, PPRC & PIPE FITTINGS

Certificate No. 16121112002

Issue Date: January 04, 2012

Expiry Date: January 03, 2015

Authorised Signature

Moody International Certification Ltd.

Certificate of Registration

MOODY INTERNATIONAL

This is to certify that the Quality Management System of:

MASTER PIPE INDUSTRIES (PVT) LTD.
3.5 KM, MAKKUANA, KHANUANA BY PASS ROAD, FAISALABAD – PAKISTAN

has been assessed and found compliant with the requirements of

ISO 9001:2008

Approval is hereby granted for registration on the proviso that the Certification rules and conditions are observed at all times.

Certification Scope:

MANUFACTURER OF PVC, PPRC PIPES AND RELATED PIPE FITTINGS.

Certificate No. 04-A-09-QMS 0120

Original Issue Date: September 7, 2009

Issue Date: September 28, 2011

Expiry Date: August 28, 2012

NO. SO (PH) IV-352/2009
GOVERNMENT OF THE PUNJAB
HUD & PHE DEPARTMENT

Dated Lahore, the 30th Jan, 2012

RENEWAL OF REGISTRATION

In continuation of this Department's letter of even number, dated 08.08.2011 & 17.11.2011, the firm M/s Master Pipe (Pvt.) Ltd; Faisalabad is hereby provisionally renewed upto 31.03.2012 in accordance with the notified Standard PS: 3051-1991 for Pipe size 3" to 8" dia as approved manufacturer/ supplier as "MASTER BRAND" of uPVC Pipe in HUD & PHE Department as likely supplier of above mentioned store.

2. The firm will be 100% responsible for the quality of the Pipes supplied to the contractors and in case of any complaint from field regarding the quality/specifications of pipes supplied, the firm will be responsible.

3. The firm will be bound to supply a test report (alongwith other documents) of pipes supplied for each delivery to Contractors/HUD& PHE Department. Any short fall in quality will result in immediate legal action and blacklisting.

From: The Chief Engineer, Punjab Buildings Department, North Zone, Lahore.

To: Syed Bilal Shah, Director P&D, Master Pipe Industries Pvt. Ltd.

Subject: RENEWAL OF FIRM M/S MASTER PIPE INDUSTRIES PVT. LTD. AS MANUFACTURER / SUPPLIER OF UPVC & PPRC PIPE FITTINGS ETC. 3.5 KM MAKKUANA KHANUANA MAIN BY PASS ROAD FAISALABAD FOR THE YEAR 2011-12.

Book No. 001
Number. 10072

Pakistan Standards

Pakistan Standards and Quality Control Authority
Licence for the use of the Pakistan Standard Mark

Licence No. CM/L-2291/2009(R) Agreement No. 2291

M/s. Master Pipe Industries (Pvt.) Ltd.

Address: 3.5 K.M Makkuana, Khanuana, Main By Pass Road, Faisalabad.

Licence shall be valid from 01.07.2010 to 30.06.2012 and renewable as prescribed under the Rules.

THE FIRST SCHEDULE

PS Mark	Article / Process	Pakistan Standard(s)
1	2	3
	UPVC Pressure Pipes For Cold Potable Water "Master" Brand (Sizes & Classes as Annex.-A)	PSS: 3051/1991(R)

THE SECOND SCHEDULE

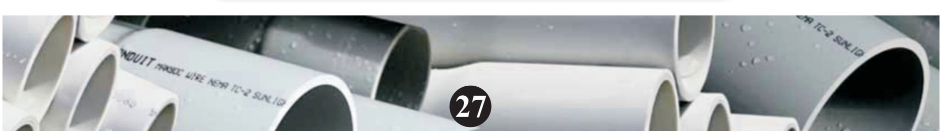
Article / Process	Unit	Marking Fee Per Unit	Mode of Payment
1	2	3	
UPVC Pressure Pipes For Cold Potable Water "Master" Brand (Sizes & Classes as Annex.-A)	Ex-Factory Price	0.1%	Through Bank Draft (Quarterly)

Signature

Director

Place: Lahore

Date: 26.09.2011




Book No. A 02697 Serial No. A 269675

MEMBERSHIP CERTIFICATE

(issued in pursuance of clause 23 of the Registration (Importers and Exporters Order, 1952)

Name & address of Chamber/Association ALL PAKISTAN PVC PIPE MANUFACTURERS ASSOCIATION

SUITE # T-23, 3RD FLOOR, BILAL CENTRE, 9-NICHOLSON ROAD, LAHORE.

(Affiliated with the Federation of Pakistan Chambers of Commerce & Industry)

CERTIFIED that M/S MASTER PIPE INDUSTRIES (PVT.) LTD.

MAKOOANA BY-PASS, JARANWALA ROAD, FAISALABAD.

(name and address of importer/exporter)

*Import Registration No. .... Export Registration No. ....

is a member of this Chamber/Association.

THIS CERTIFICATE shall be valid upto the 31/12/2012 (date) unless otherwise notified to the Import/Export Licensing authority/Scheduled Bank concerned.

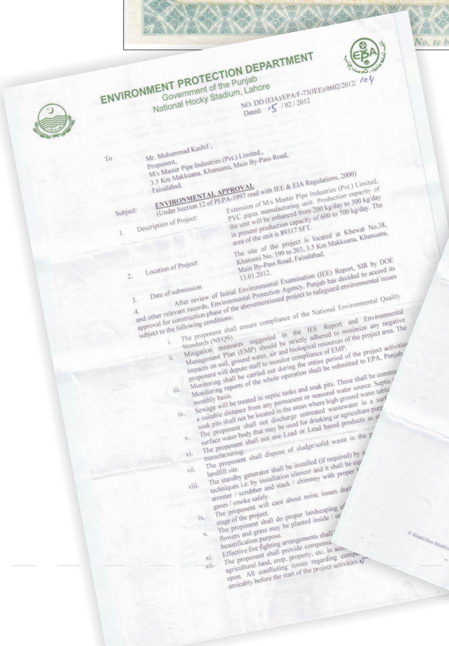
Seal of Chamber/Association

Given on this 23RD day of MAY XXX2012

Signature of Secretary

Countersigned by CH. MUHAMMAD AKRAM (name and designation) CHAIRMAN

No. to be given if registrat

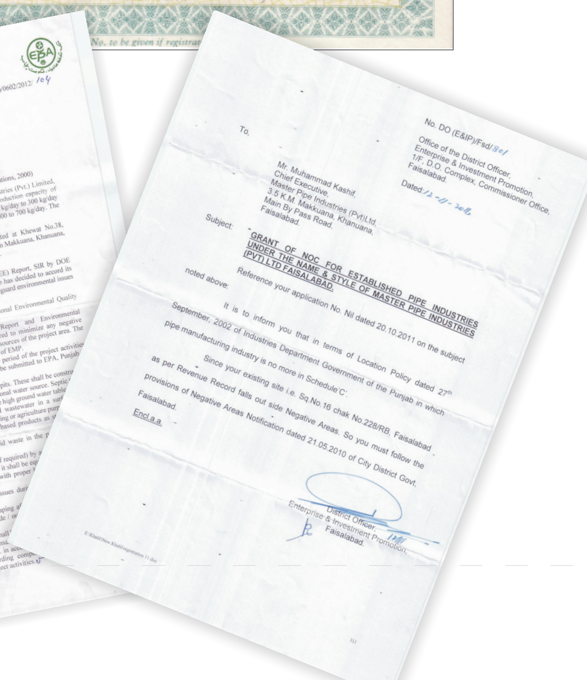

ENVIRONMENT PROTECTION DEPARTMENT
Government of the Punjab
National Hockey Stadium, Lahore

NO. DD (EIA)/EPA/F-73(IEE)/0602/2012/ 104
Dated: 15 / 02 / 2012

To Mr. Muhammad Kashif,
Proponent,
M/s Master Pipe Industries (Pvt.) Limited.,
3.5 Km Makkuana, Khanuana, Main By-Pass Road,
Faisalabad.

Subject: **ENVIRONMENTAL APPROVAL**
(Under Section 12 of PEPA-1997 read with IEE & EIA Regulations, 2000)

1. Description of Project: Extension of M/s Master Pipe Industries (Pvt.) Limited, PVC pipes manufacturing unit. Production capacity of the unit will be enhanced from 200 kg/day to 300 kg/day in present production capacity of 600 to 700 kg/day. The area of the unit is 89317 SFT.
2. Location of Project: The site of the project is located at Khewat No.38, Khatooni No. 199 to 203, 3.5 Km Makkuana, Khanuana, Main By-Pass Road, Faisalabad.
3. Date of submission 13.01.2012.
4. After review of Initial Environmental Examination (IEE) Report, SIR by DOE and other relevant records, Environmental Protection Agency, Punjab has decided to accord its approval for construction phase of the abovementioned project to safeguard environmental issues subject to the following conditions:
   i. The proponent shall ensure compliance of the National Environmental Quality Standards (NEQS).
   ii. Mitigation measures suggested in the IEE Report and Environmental Management Plan (EMP) should be strictly adhered to minimize any negative impacts on soil, ground water, air and biological resources of the project area. The proponent will depute staff to monitor compliance of EMP.
   iii. Monitoring shall be carried out during the entire period of the project activities. Monitoring reports of the whole operation shall be submitted to EPA, Punjab monthly basis.
   iv. Sewage will be treated in septic tanks and soak pits. These shall be constru a suitable distance from any permanent or seasonal water source. Septic soak pits shall not be located in the areas where high ground water table
   v. The proponent shall not discharge untreated wastewater in a surf surface water body that may be used for drinking or agriculture purp
   vi. The proponent shall not use Lead or Lead based products as st manufacturing.
   vii. The proponent shall dispose of sludge/solid waste in the p landfill site.
   viii. The standby generator shall be installed (if required) by a techniques i.e. by installation silencer and it shall be equ arrester / scrubber and stack / chimney with proper gases / smoke safely.
   ix. The proponent will care about noise issues duri stage of the project.
   x. The proponent shall do proper landscaping a flowers and grass may be planted inside / o beautification purpose.
   xi. Effective fire fighting arrangements shall
   xii. The proponent shall provide compensa agricultural land, crop, property, etc. in acc upon. All conflicting issues regarding comp amicably before the start of the project activities.


No. DO (E&IP)/Fsd/801

Office of the District Officer,
Enterprise & Investment Promotion,
1/F, D.O. Complex, Commissioner Office,
Faisalabad.

Dated: 12-11-2016

To,

Mr. Muhammad Kashif,
Chief Executive,
Master Pipe Industries (Pvt)Ltd,
3.5 K.M. Makkuana, Khanuana,
Main By Pass Road,
Faisalabad.

Subject: **GRANT OF NOC FOR ESTABLISHED PIPE INDUSTRIES UNDER THE NAME & STYLE OF MASTER PIPE INDUSTRIES (PVT) LTD FAISALABAD.**

Reference your application No. Nil dated 20.10.2011 on the subject noted above.

It is to inform you that in terms of Location Policy dated 27th September, 2002 of Industries Department Government of the Punjab in which pipe manufacturing industry is no more in Schedule'C'.

Since your existing site i.e. Sq.No.16 chak No.228/RB, Faisalabad as per Revenue Record falls out side Negative Areas. So you must follow the provisions of Negative Areas Notification dated 21.05.2010 of City District Govt, Faisalabad.

Encl.a.a.

District Officer,
Enterprise & Investment Promotion,
Faisalabad.

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