



PPRC Type 3 Sanitary Pipes and Fittings Technical Book

	Innovation		Leader of Sector		
	Master Means Quality		Customer's Believe		Quality Assurance

BUILDING TRUST TO YOUR SUCCESS

Master Pipe Industries (Pvt) Ltd.



MASTER

PPRC TYPE 3 SANITARY
PIPES AND FITTINGS
TECHNICAL BOOK

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A View of our Production Plant

1. Introduction:

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, Makuana 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 Industry is a quality conscious company, and have honor to obtain quality control certifications from ISO 9001 – 2008, ISO 9000 – 1400, PSQCA (Pakistan Standard & Quality Control Authority), HUD & PHED, Punjab Building Department etc. In addition, Master Pipe Industry is the first company in Pakistan which exporting Pipes & Fittings to African & Gulf regions and maintaining SONCAP certification.

Master Pipe Industry 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. GENERAL INFORMATION

2.1. Raw Material

The raw material for Master Sanitary Pipes and Fittings is Random Copolymer Type-3 Polypropylene, which is the most resistant to heat, pressure and chemical materials and having the longest life span.

There are three types of Polypropylene, Type-1, Type-2 and Type-3.

Type-1 (HOMOPOLYMER) : Polymer type obtained as a result of only the polymerization of propylene.

Type-2 (BLOCK COPOLYMER) : Polypropylene type obtained by the Polymerization of a mixture of Propylene and Ethylene at certain proportions. Due to the fact that Propylene and Master molecules are present in blocks within the polymer chain, they show an intermediary property between Polyethylene and Polypropylene.

Type-3 (RANDOM COPOLYMER) : Obtained by the Polymerization of a mixture of Propylene and Ethylene at certain ratios. Propylene and Ethylene molecules are found to be mixed randomly. For this reason they have better properties than Polyethylene and Polypropylene.

Their physical properties, thermal effect and pressure resistance increases from Type-1 towards Type-3. Hence from Type-1 there is no application for pipes, from Type-2 application only for cold water pipes, where as from Type-3 both cold and hot water pipe production is possible.

The structure of Polypropylene Random Copolymer Type-3, raw material for Master pipes and fittings, the superior resistance properties against pressure and chemical substances have been increased giving them a longer life span.

2.2. PROPERTIES

Found as a result of extremely careful research in the installation technology, Polypropylene Random Copolymer Type-3 is a hygienic, long lasting and a quality product and is used for all kinds of pressurized liquid and gas installations in modern installation times.

Properties of Polypropylene Random Copolymer Type-3 are as follows:

- High molecular weight, good elasticity and low melting values.
- Long time resistance against heat.
- Ability to retain its shape and chemical structure under extreme heat.
- Resistant to chemical substances, won't be effected by acids, bases and salts, won't rust, melt or rot. Liquids passing through won't smell or change taste.
- Very even surfaces, low coefficient of friction, formation of bacteria, moss or lime cannot be seen, therefore no tightening of diameter.
- Won't be effected from outside temperatures between -5°C and $+95^{\circ}\text{C}$ and won't need insulation.
- Operational pressure according to 50 years is 25 Bar at 20°C , 8.5 Bars at 70°C .
- At normal outside effects, long term installation use temperatures are $70^{\circ}\sim 95^{\circ}\text{C}$.
- Dilatation is much more than metals and is Linear.
- With the fusiotherm welding technique complete joining is made easily, without any diameter tightening.

3. CHARACTERISTICS OF POLYPROPYLENE RANDOM COPOLYMER TYPE-3

TABLE.1

PROPERTIES	VALUE	UNIT	TEST METHOD
MELT FLOW INDEX (MFR) 230°C, 2,16 Kg	0,3	g/10 Min.	ISO 1133
MELT FLOW INDEX (MFR) 190°C, 5,0 Kg	0,5	g/10 Min.	ISO 1133
DENSITY	900,0	Kg/m ³	ISO 1872 D ISO 1872
BREAK STRENGTH	25	MPa	ISO 6259
ELONGATION AT YIELD	10	%	ISO 6259
ELONGATION AT BREAK	>500	%	ISO 6259
BEND MODULUS (% SECANT)	900	MPa	ASTM D 790
NOTCHED IMPACT RESISTANCE TEST 23°C 0°C	15 5	kJ / m ² kJ / m ²	DIN 53453 ISO R 179
SPECIFIC HEAT	1	J/g	DSC
COEFFICIENT OF LINEAR DILATION	2,0	°K ⁻¹	DILATOMETER
MELTING TEMPERATURE	140~150	°C	
HEAT PERMEABILITY (23°C)	0,24	w/mk	
COEFFICIENT OF DILATION (25°~80°C)	1,5	10 ⁻⁴ °C ⁻¹	ASTM 0696
VOLUME RESISTANCE	>10 ¹⁶	Ωcm	DIN 53 482
SURFACE RESISTANCE	>10 ¹²	Ω	DIN 53 482

4. MASTER PIPE AND FITTING DIMENSIONS

4.1 MASTER PIPE DIMENSIONS

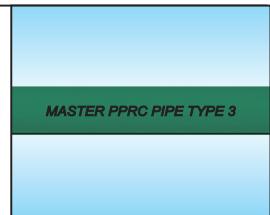
TABLE. 2

OUTSIDE DIAMETER d(mm)	OUTSIDE DIAMETER TOLERANCE (mm)	WALL THICKNESS (mm)	WALL THICKNESS TOLERANCE (mm)	UNIT WEIGHT (Kg/m)	
				MASTER PIPE (Kg/m)	MASTER PIPE WITH ALUMINIUM FOIL (Kg/m)
20	+ 0.3	3.4	+ 0.6	0.172	0.240
25	+ 0.3	4.2	+ 0.7	0.266	0.350
32	+ 0.3	5.4	+ 0.8	0.434	0.545
40	+ 0.4	6.7	+ 0.9	0.671	0.794
50	+ 0.5	8.4	+ 1.1	1.050	1.185
63	+ 0.6	10.5	+ 1.3	1.650	
75	+ 0.7	12.5	+ 1.5	2.340	

4.2. MASTER PPRC TYPE 3 SANITARY PIPES AND FITTINGS

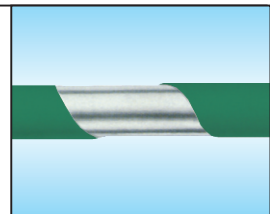
PIPE(PN 20)

ITEM CODE	ød(mm)	s(mm)	PCS/PKG
012120	20	3.40	50
012125	25	4.20	25
012132	32	5.40	15
012140	40	6.70	10
012150	50	8.40	5
012163	63	10.50	3
012175	75	12.50	3



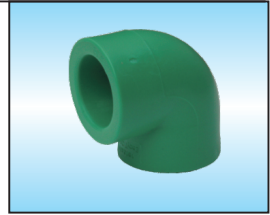
PIPE WITH ALUMINIUM FOIL (PN 20)

ITEM CODE	ød(mm)	s(mm)	PCS/PKG
012520	20	3.40	50
012525	25	4.20	25
012532	32	5.40	15
012540	40	6.70	10
012550	50	8.40	5



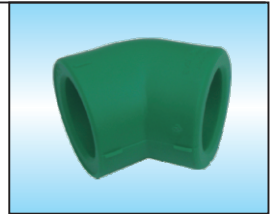
EBLBOW 90°

ITEM CODE	φd	L	PCS/BOX
130220	20	39	250
130225	25	46	250
130232	32	55	150
130240	40	67	80
130250	50	80	40
130263	63	100	24
130275	75	119	



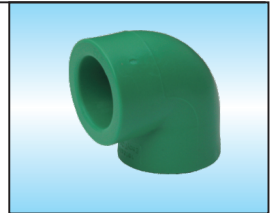
BLBOW 45°

ITEM CODE	φd	L	H	PCS/BOX
130120	20	35	46	320
130125	25	41	53	320
130132	32	49	63	200
130140	40	60	76	100
130150	50			
130163	63			
130175	75			



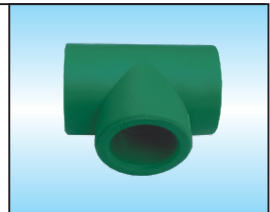
REDUCING ELBOW

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13032532	32	25			150



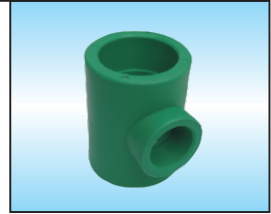
EQUAL TEE

ITEM CODE	φd	L	H	PCS/BOX
131020	20	52	40	180
131025	25	59	46	180
131032	32	69	55	100
131040	40	82	67	60
131050	50	100	82	30
131063	63	119	101	15
131075	75	138	119	



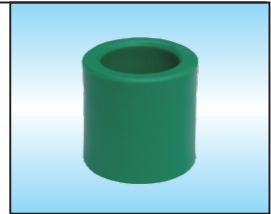
REDUCING TEE

ITEM CODE	ød1	ød2	ød3	L	H	PCS/BOX
13122025	25	20	25	62	54	120
13122032	32	20	32	62	54	120
13122532	32	25	32	62	54	120
13122540	40	25	40	68	64	70
13123240	40	32	40	74	64	70
13123250	50	32	50			60
13123263	63	32	63			50



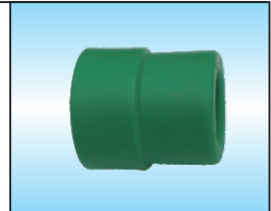
SOCKET

ITEM CODE	ød(mm)	L	h	PCS/BOX
131820	20	32	29	400
131825	25	35	37	400
131832	32	40	43	250
131840	40	45	53	140
131850	50	50	67	80
131863	63	54	83	40
131875	75	64	100	



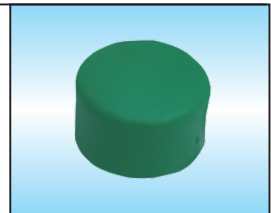
REDUCING SOCKET

ITEM CODE	ød1	ød2	L	PCS/BOX
13212025	25	20	39	400
13212032	32	20	39	400
13212532	32	25	39	400
13212540	40	25	40	300
13213240	40	32	42	250
13212550	50	25	45	180
13213250	50	32	47	160
13214050	50	40	50	120
13212563	63	25	56	150
13213263	63	32	57	150
13214063	63	40	60	140
13215063	63	50	63	120
13215075	75	50	67	
13216375	75	63	71	



END CAP

ITEM CODE	ød	L	PCS/BOX
132820	20	22	800
132825	25	24	700
132832	32	26	400
132840	40	32	250
132850	50	37	120
132863	63		
132875	75		



THREADED END PLUG

ITEM CODE	ød	R"	L	PCS/BOX
133720	20	1/2	47	560
133725	20	3/4	47	400



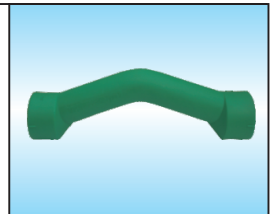
CLUMP

ITEM CODE	ød	L	H	PCS/BOX
137120	20	30	33	
137125	25	36	39	
137132	32	45	44	



CROSS OVER

ITEM CODE	ød	L	H	PCS/BOX
132520	20	160	46	90
132525	25	163	55	90
132532	32	195	68	48
132540	40	280	93	24



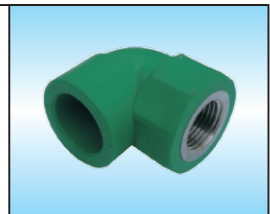
UNION

ITEM CODE	ød	L	H	PCS/BOX
133020	20	52	54	90
133025	25	52	60	90
133032	32	56	74	70



ELBOW FEMALE THREADED

ITEM CODE	ød	R"	L	H	PCS/BOX
13062020-1	20	1/2	49	52	200
13062520-1	25	1/2	49	52	200
13062525-1	25	3/4	52	56	160
13063220-1	32	1/2	55	61	140
13063225-1	32	3/4	73	61	140
13063232-1	32	1	65	65	100
13064032-1	40	1	67	67	70
13064040-1	40	1 1/4	85	75	48



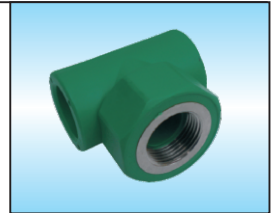
ELBOW MALE THREADED

ITEM CODE	φd	R"	L	H	PCS/BOX
13042020-1	20	½	45	63	230
13042520-1	25	½	54	68	230
13042525-1	25	¾	54	68	190
13043220-1	32	½	73	77	190
13043225-1	32	¾	73	78	190
13043232-1	32	1	73	80	110
13044040-1	40	1 ¼	90	112	35



TEE FEMALE THREADED

ITEM CODE	φd	R"	L	H	PCS/BOX
13112020-1	20	½	61	51	160
13112520-1	25	½	61	51	160
13112525-1	25	¾	61	56	120
13113220-1	32	½	68	61	105
13113225-1	32	¾	92	66	105
13113232-1	32	1	76	65	70
13114032-1	40	1	83	67	48
13114040-1	40	1 ¼	96	74	35



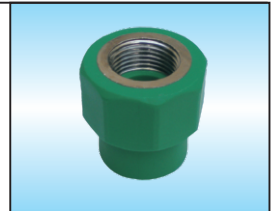
TEE MALE THREADED

ITEM CODE	φd	R"	L	H	PCS/BOX
13092020-1	20	½	54	54	150
13092520-1	25	½	75	68	150
13092525-1	25	¾	75	72	110
13093220-1	32	½	92	77	110
13093225-1	32	¾	92	79	110
13093232-1	32	1	92	79	70
13094032-1	40	1			
13094040-1	40	1 ¼	107	101	30



SOCKET FEMALE THREADED

ITEM CODE	φd	R"	L	H	PCS/BOX
13202020-1	20	½	40	37	240
13202520-1	25	½	40	37	300
13202525-1	25	¾	41	44	225
13203220-1	32	½	42	37	250
13203225-1	32	¾	41	44	200
13203232-1	32	1	48	55	150
13204040-1	40	1 ¼	52	75	72
13205040-1	50	1 ¼	66	75	
13205050-1	50	1 ½	68	82	
13206350-1	63	1 ½	72	84	
13206363-1	63	2	79	100	
13207575-1	75	2 ½			



SOCKET MALE THREADED

ITEM CODE	ød	R"	L	H	PCS/BOX
13192020-1	20	½	37	39	240
13192520-1	25	½	55	37	240
13192525-1	25	¾	55	44	175
13193220-1	32	½	60	54	100
13193225-1	32	¾	62	54	100
13193232-1	32	1	64	55	100
13194040-1	40	1 ¼	86	76	60
13195040-1	50	1 ¼	87	75	
13195050-1	50	1 ½	89	77	
13196350-1	63	1 ½	93	84	
13196363-1	63	2	104	86	
13197575-1	75	2 ½			



UNION FEMALE THREADED

ITEM CODE	ød	R"	L	H	PCS/BOX
13312020-1	20	½	38	36	
13312525-1	25	¾	44	47	100
13313232-1	32	1	47	52	
13314040-1	40	1 ¼			



UNION MALE THREADED

ITEM CODE	ød	R"	L	H	PCS/BOX
13322020-1	20	½	50	36	
13322525-1	25	¾	56	47	80
13323232-1	32	1	62	52	
13324040-1	40	1 ¼			



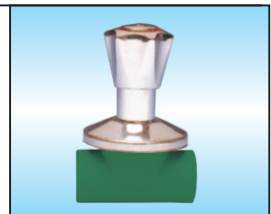
STOP VALVE

ITEM CODE	ød	L	H	PCS/BOX
13342025-1	20	55	110	56
13342525-1	25	79	113	56
13343232-1	32	90	130	40



STOP VALVE WITH CHROME COVER

ITEM CODE	ød1	L	H	PCS/BOX
137920-1	20	55	110	56
137925-1	25	79	113	56
137932-1	32			40



5. TECHNICAL INFORMATION

Resistance of a pipe against time, which means, service life, is very important.

Figure-1 below gives comparison of pressure resistances against time of Polypropylene classes at 20°C and 60°C temperatures.

In Table-1 service life of Polypropylene Random Copolymer Type-3 based on pressure and temperature is given

The equality between the hydrostatic pressure and tension applied to pipes is as follows:

$$P = 2 \times s \times G / d-s$$

Where;

- G** : Circumferential stress of material, MPa
- P** : Inside Pressure, Mpa [1MPa=10Bar]
- s** : Wall thickness, mm
- d** : Outside Diameter, mm

BURSTING PERIOD (h) AND CIRCUMFERENTIAL STRESS (Mpa) OF POLYPROPYLENE PRESSURE PIPES BETWEEN TEMPERATURES 20°C - 60°C, IN ACCORDANCE WITH DIN 8078

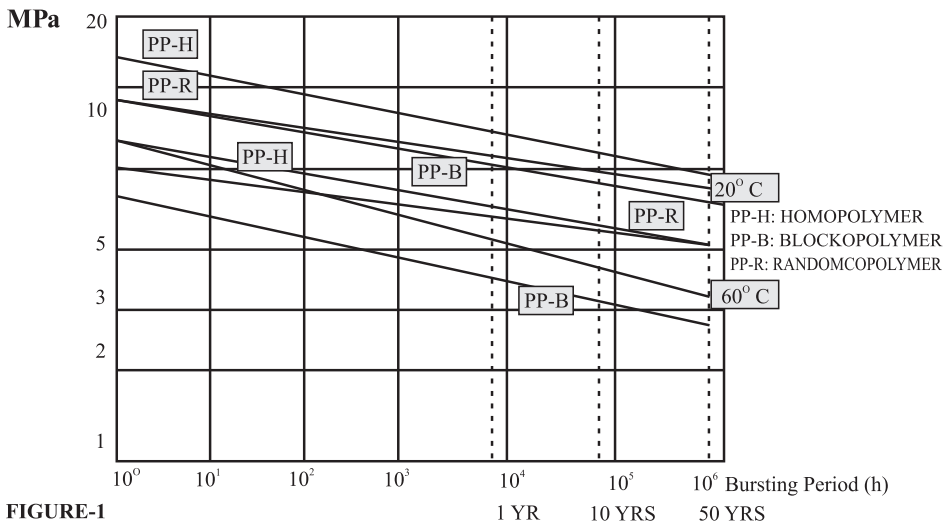


FIGURE-1

Service Life Periods of PPRC Pipes Depending on Pressure and Temperature

TABLE-3

Temp. C°	Service Life (yrs)	PIPE SERIES			
		4	5	6	
		Nominal Pressure, Bar			
		PN10	PN16	PN20	
		Operation Pressure, Bar			
10	1	17.6	28.2	35.2	
	5	16.5	26.5	33.1	
	10	16.1	25.8	32.3	
	25	15.6	25.0	31.2	
	50	15.2	24.3	30.4	
	100	14.8	23.7	29.6	
20	1	14.9	23.9	29.9	
	5	14.1	22.6	28.3	
	10	13.7	22.0	27.5	
	25	13.3	21.3	26.7	
	50	12.9	20.7	25.9	
	100	12.5	19.5	25.1	
30	1	12.8	20.5	25.6	
	5	12.0	19.2	24.0	
	10	11.6	18.6	23.2	
	25	11.2	17.9	22.4	
	50	10.9	17.5	21.9	
	40	1	10.8	17.3	21.6
5		10.1	16.2	20.3	
10		9.9	15.8	19.7	
25		9.5	15.2	18.9	
50		9.2	14.7	18.4	
50		1	9.1	14.6	18.3
	5	8.5	13.7	17.1	
	10	8.3	13.2	16.5	
	25	8.0	12.8	16.0	
	50	7.7	12.4	15.5	
	60	1	7.7	12.4	15.5
5		7.2	11.5	14.4	
10		6.9	11.1	13.9	
25		6.7	10.7	13.3	
50		6.5	10.4	12.9	
70		1	6.5	10.5	13.1
	5	6.0	9.6	12.0	
	10	5.8	9.3	11.6	
	25	4.9	7.9	9.9	
	50	4.3	6.8	8.5	
	80	1	5.5	8.8	10.9
5		4.8	7.7	9.6	
10		4.0	6.4	8.0	
25		3.2	5.1	6.4	
95		1	3.9	6.2	7.7
		5	2.6	4.1	5.2
	10	2.2	3.5	4.3	

Master Pipes are manufactured in 20bar class.
PN10 and PN16 values are given for information.

6. PRESSURE LOSSES

6.1.PIPES

In the figure below the relation between water flowrate, pipe diameter and velocity of water is given. Pressure loss occurred in 1 meter pipe (R) is read on the horizontal line at the bottom of the graph by means of Pa ($10^5 \text{Pa} = 1 \text{Bar}$)

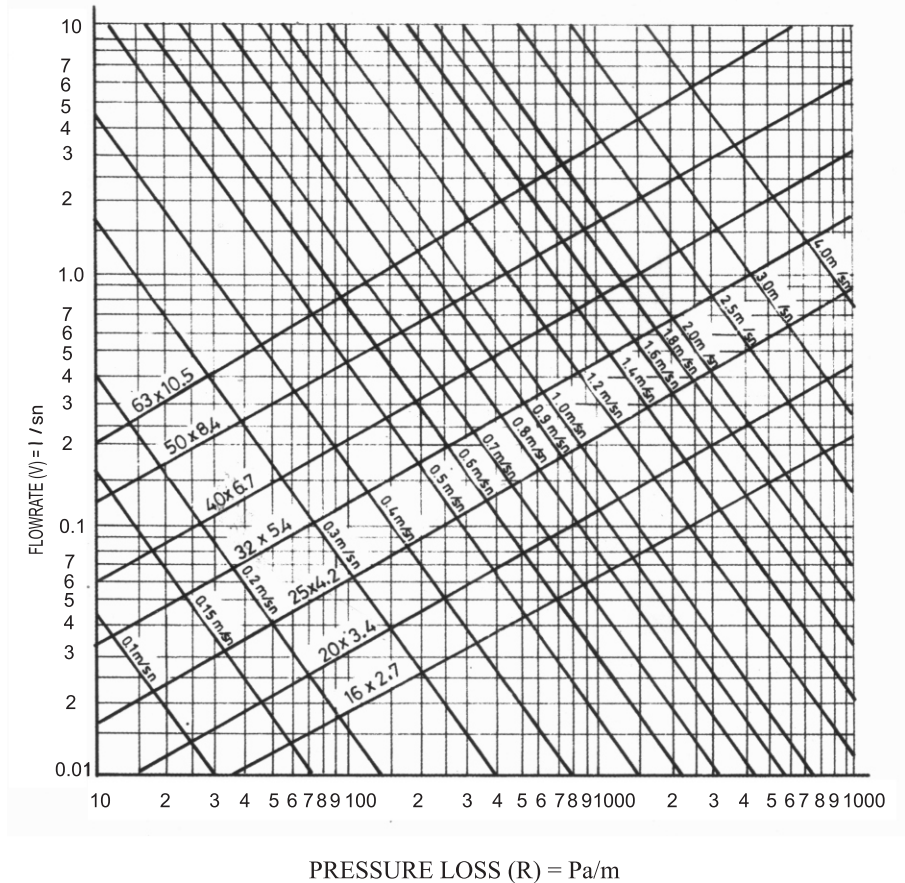


FIGURE-2 DETERMINING PIPE DIAMETER






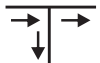
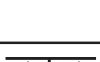
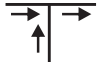
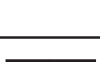
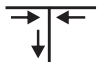

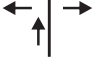


6.2 FITTINGS

Pressure loss of Master fittings is calculated with the formula $R = 5 \times V^2 \times f$ where;
 R =Pressure loss of fitting, mBar (10^3 mBar= 1Bar)

V =Velocity, m/sec

f =Correction factor, see table 4.

TABLE-4 CORRECTION FACTORS OF MASTER FITTINGS

NO	FITTING TYPE	SYMBOL	CORRECTION FACTOR (f)
1	SOCKET		0.25
2	DECREASE TO 2 DIMENSION		0.55
2a	DECREASE TO 3 DIMENSION		0.85
3	ELBOW 90°		2.0
4	ELBOW 45°		0.6
5	T- PIECE (DISTRIBUTOR)		1.8
5a	T- PIECE (REDUCER)		3.6
6	T- PIECE (COUPLING)		1.3
6a	T- PIECE (REDUCER)		2.6
7	T- PIECE (AT SAME DIRECTION)		4.2
7a	T- REDUCER		9.0
8	T- PIECE (AT SAME DIRECTION)		2.2
8a	T- REDUCER		5.0
9	JOINING WITH T-PIECE		0.8

Note: In determining pipe diameters; practically adding 3-5% to the total loss for the friction losses arising from the fittings is sufficient.

6.3. TOTAL PRESSURE LOSS: Is the total of pressure losses of pipes and fittings.

7.DILATION

Common characteristic of polypropylene pipes is that they dilate, i.e. extend/contract a bit more especially by heat effects when compared with metals. This extension/contraction lengths are calculated by considering pipe length and temperature differences, ΔT . In practice, for potable water and cold water installations, extension/contraction of pipes under normal environmental temperatures are minimum enough to be neglected.

In Master aluminum foiled pipes, these dilation values become very close to those steel pipes thanks to aluminum foil wrapped around the outer surface.

Calculation of dilation during installation:

$$\Delta L: a \times L \times \Delta T$$

ΔL : Amount of elongation of pipes, mm

a : Coefficient of dilation (extension/contraction), can be taken as
0,18 mm/M°C between 30C-90C.

L : Pipe length (m)

ΔT : Temperature Difference (°C) (difference between temperatures
during pipe laying and utilization

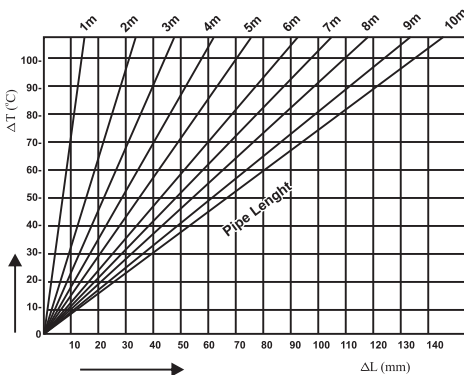


FIGURE-3: Dilation of Master monolayer pipes

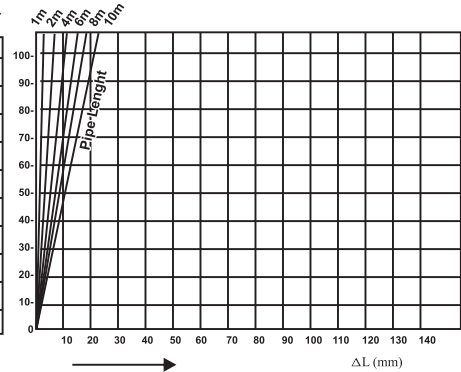


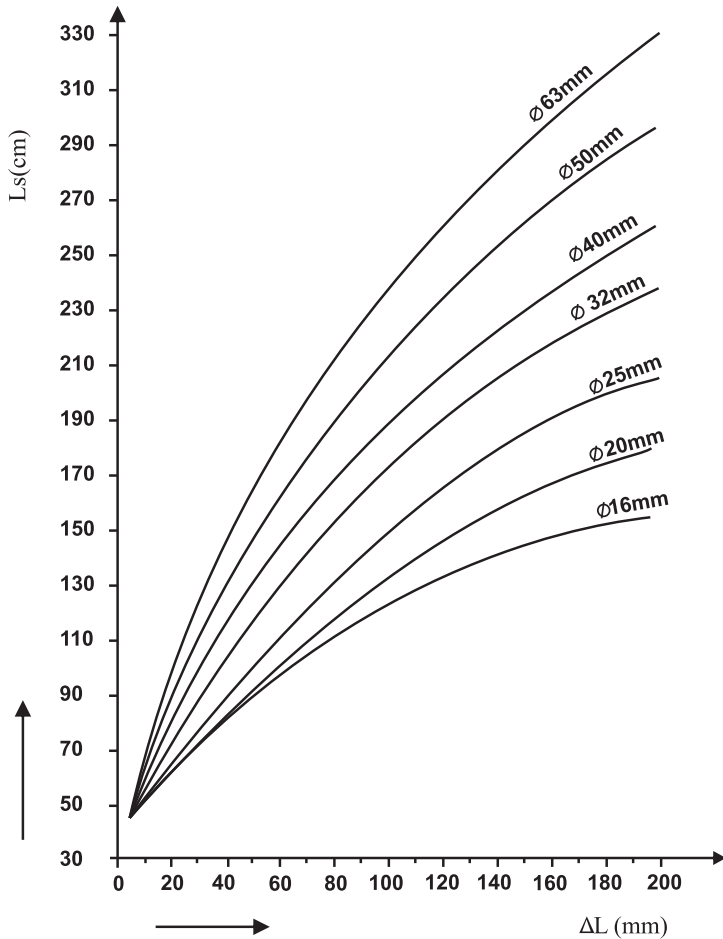
FIGURE-4: Dilation of Master aluminium foiled pipes

In many cases dilations (extension/contraction) can be diminished by using free bending pieces called Bow Knot. This way system compensates these extension and contraction in length within itself. For the calculation of the free bending piece, the following formula is used:

$$L_s = K \times D_o \times \Delta L \text{ where,}$$

- L_s** : Free Bending Piece (Min) Length, mm
- K** : Material Constant (For Polypropylene K=30)
- Ød** : Diameter of Pipe, mm
- ΔL** : Elongation, mm

FIGURE-5



NOTE: Width of the Free Bending Piece should not be less than 10 times that of the pipe diameter.

In hot water installations, considering the dilation of the pipes, effects of dilation can be avoided by considering following points about placing the sliding and fixed points along the pipe length:

FIGURE-1

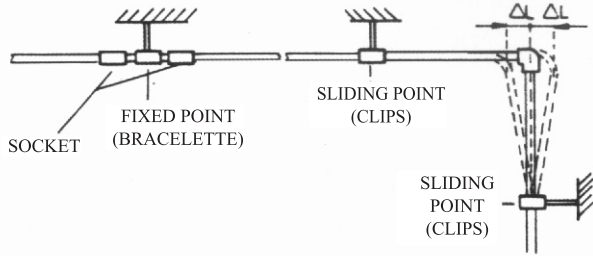
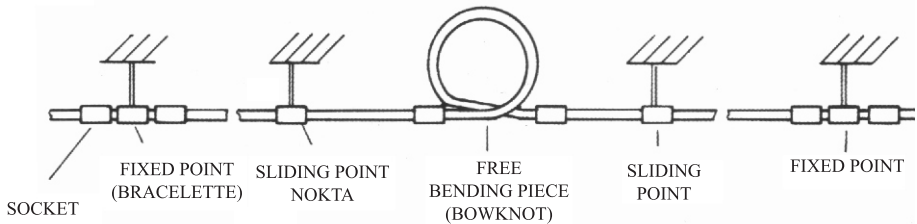


FIGURE-2



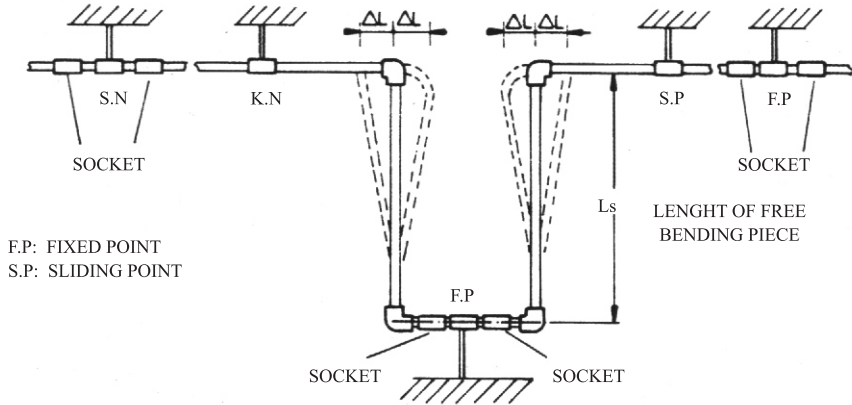
As seen in above figures, by placing the fixed points at appropriate locations taking advantage of stretching of pipes, dilation (extension/contraction) is maintained in a single section. The fixed points should be separated in sections to unavoid dilation of the system.

For hot water installations on plastering, usually connection pieces are used as fixed points. Only bends should not be fixed for turning points.

For plain pipes with lengths above 5m, dilatation should be controlled by using free bending pieces. Master system has Bowknots for this purpose.

As well as using Bowknots as free bending pieces, omega pieces can be fabricated at the construction site and used for the same purpose:

FIGURE-3



In installations, the length of free bending piece is very important in order to provide sufficient stretching.

Besides in installation laying for intersecting pipe lines Master has $\varnothing 20$, $\varnothing 25$, $\varnothing 32$ and $\varnothing 40$ mm. Cross over pieces. Using these cross overs intersecting pipes can be installed on the same platform.

8. FUSIOTHERM WELDING

Fusiotherm Welding is a technique in which the outside surface of a Master Pipe and the inside surface of its fitting are heated to 260°C , melted within inside of each other and are joined together.

8.1 WELDING SET KIT

Is a portable, easy to carry kit which contains a welding machine, welding socket, pipe cutter, pattern, welding socket key, allen key and measuring stick.

There are two heating circles of 650 W, both has separate keys and spare for each other. They can not be operated together. On the lower surface of machine there's a thermostat adjustable between between 50°C and 300°C for temperature setting which shall be set at 260°C for welding. There are 2 sets of welding sockets for $\varnothing 20$ mm pipe, 1 set for $\varnothing 32$ mm pipe and 1 set for $\varnothing 40$ mm pipe. The job of these sets in the welding process is heating the Master pipes and fittings. Their surface is teflon coated. Teflon avoids melted polypropylen to stick on the metal surface. Welding sockets must be assembled and disassembled from welding machine when it is cold.

There's a cutter to cut the pipes up to 40mm diameter. For dimensions above 40mm an iron saw can be used.

A pattern for welding deepness signing is also included in the kit. There are holes on it showing the welding length of Master pipes between Ø20-75mm that will be pushed into the welding sockets. For a good welding, welding length of the pipe shall be marked using welding stencil and the pipe shall be pushed into the welding socket until this mark.

8.2. WELDING PROCEDURE

For a good and safe weld following procedure shall be followed:

1. Proper welding sockets for pipes and fittings are to be assembled when the machine is cold.
2. Position the welding machine on the portable leg.
3. Tun on the key of one of the heating circles of machine, thermostat lamp is on, machine starts to heat-up.

4. In about 10-12 minutes, thermostat lamp is off, machine is at 260°C and ready for welding.

5. Pipes and fittings to be welded shall be clean, if not, shall be cleaned by using a clean fabric.

Welding length of pipe that will be inserted into the welding socket is marked using the pattern. Pipes and fittings are inserted together into the welding socket on the same axis. Pipe (at marked welding length) and fitting are heated until the welding time is over. Then, the pipe is to be inserted into the fitting immediately, without twisting and left to cool down. Heating joining and cooling times are given in below table.

6. As for Master Pipes with aluminium foil, aluminium foil in the outer part of pipe is peeled by peeling tool. All other steps of welding is the same as above. The point is the adjustment of the knife of the peeling tool. If the knife is not adjusted properly, then pipe surface may be over peeled or less peeled. In both cases it causes problems in welding.

Important not: Heating period of pipes and fittings inside the welding socket is very important. If heating period is short, enough melt and consequently correct weld cannot be provided. If the period is long, pipe material become fluent due to over heating, deformation occurs during welding process and this results narrowing of diameter.

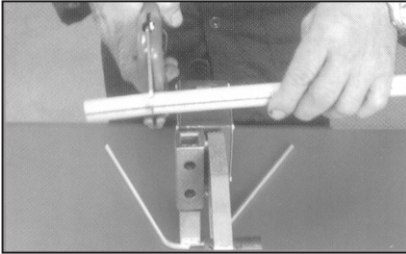
Heating, joining and cooling periods of Master pipes & fittings

TABLE-5

Outside Diameter mm.	Welding Depth mm.	Heating Period sec.	Joining Period sec.	Cooling Period sec.	
16	13	5	4	2	using hand welding machine
20	14.5	5	4	2	
25	16	7	4	2	
32	18	8	6	4	
40	20.5	12	6	4	
50	23.5	18	6	4	
63	27.5	24	8	6	Using welding work bench
75	30.0	30	10	8	

MASTER PIPE WELDING

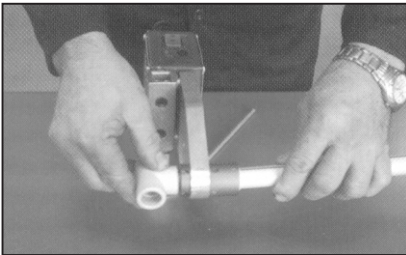
Pipe welding



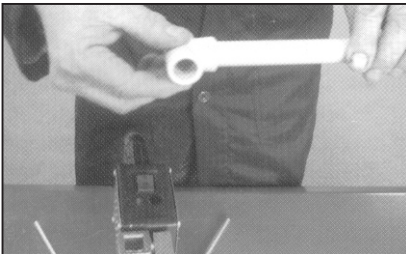
Pipe is cut



Welding Distance is fixed with pattern

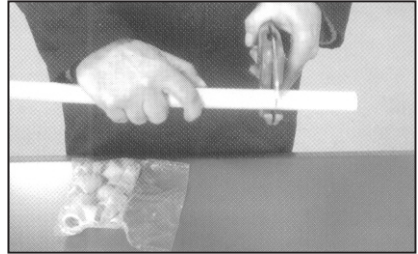


Pipe and fittings heated...($260^{\circ}\text{C} \pm 10^{\circ}$)

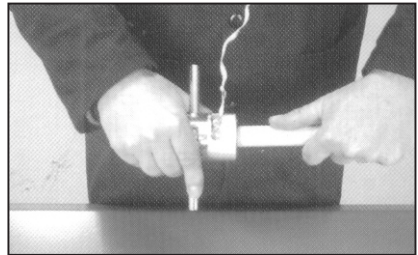


...and joined together.
Wait by cooling period without twisting.

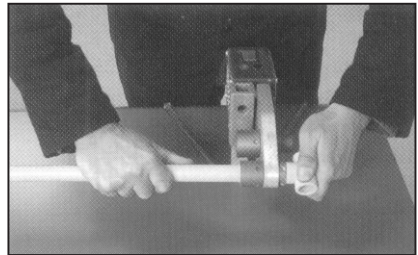
Foiled pipe welding



Pipe is cut



Aluminium foil is scraped



Pipe and fittings heated...($260^{\circ}\text{C} \pm 10^{\circ}$)



...and joined together.
Wait by cooling period without twisting.

9. INSTALLATION TECHNIQUES

Both above and below plaster the installation of Master pipes and fittings is the same with the installation of conventional galvanized metal pipes. However, in the installation of hot water systems, fix points and mobile points shall be used at specific distances since Master pipes may expand more. Best result in installation is achieved by positioning the clips properly.

Fix points splits the system into small expansion sections that avoids unrequested and uncontrolled movements. In order to determine the locations of fix points, pipe diameter, extension/contraction length, type of fluid and other effective forces (if there is) shall be considered. In general, socket, adapters, T, valve and armature connection elbows are used as fix point. Elbows shall not be used as fix point.

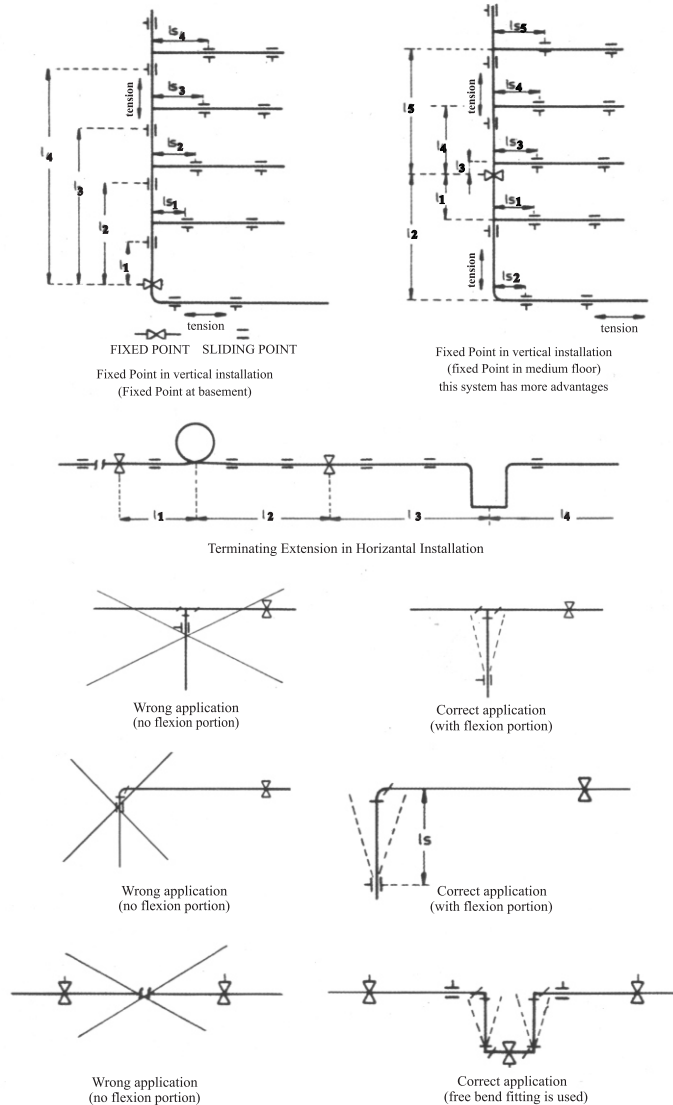
Table 6. Fixing distances of clips:

TABLE-6

	d (mm)							
	16	20	25	32	40	50	63	75
Temperature	Determining Distance (cm)							
20°C	75	80	85	100	110	125	140	160
30°C	70	75	85	95	110	120	135	155
40°C	70	70	85	95	105	115	130	150
50°C	65	70	80	90	100	110	125	145
60°C	65	65	75	85	95	105	120	140
70°C	60	60	75	80	90	100	115	135
80°C	55	60	70	75	85	90	105	125

As seen in below figure, extension shall be considered while installing pipes and fittings and fixed points shall not avoid extensions/contractions in the system

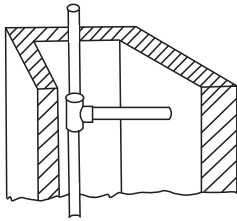
FIGURE-4



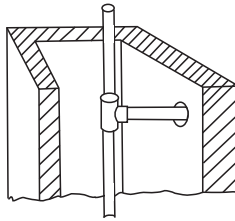
SHAFT INSTALLATION TECHNIQUES

At flat entrances, the following precautions should be taken for column pipe connections to flat at installation shafts due to extension.

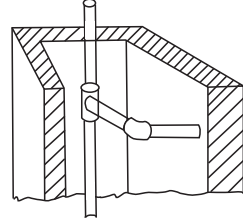
FIGURE-5



CONNECTION CAN BE MADE FROM AN APPROPRIATE DISTANCE FROM THE WALL



A BIGGER HOLE CAN BE LEFT AT FLAT ENTRANCE



AN L SHAPE ENTRANCE TO FLAT CAN BE MADE

10. ISOLATION

Raw material for Master pipes and their fittings, polypropylene random copolymer Type - 3 has a very weak heat conductivity compared to their alternative galvanized metal pipes, on the other hand due to their considerably more thickness, Master products are not effected from outside temperatures between -5°C and $+95^{\circ}\text{C}$. But the pipe lines laid in the open outside the building should be protected from impacts or various outside effects by laying them and isolating them inside ducts.

11. CONTROL OF COMPLETED INSTALLATIONS

A completed installation before closing the wall, ground and other pipes should undergo a pressure test for any leakages. This test is important for means of showing reliance for the installators workmanship and also for the user against any materialistic and moral damages he might confront later on. For this reason the system will be filled with water, after the air is taken from the peak point, a water pressuriser (a tap connection etc.) will be connected and the pressure increased to 10 Bars. One by one each welding and connection points will be controlled for any leakages. If there is any leakage, it shall be repaired and test must be repeated by repressurizing the system to observe if their's any decrease in pressure. Max test pressure is 24 hrs.

At the end of test period water inside the pipeline shall be evacuated. In some situations, the system is checked directly at working pressure. In such situations that system is kept under pressure for a long period of time and for unoperated systems water may get frozen inside the pipeline and this might cause cracks on the pipe. To avoid this water shall be antifreezed in such situations.





















12. KEY POINTS OF MASTER INSTALLATIONS

1. Use Master Yildiz welding set regardlessly. Check that the thermostat of welding machine is at 260°C, Do not use welding socket If teflon is damaged. Sticked plastic on the welding socket means the teflon is skinned and damaged.
2. Do not use damaged pipes and fittings. Surfaces of pipes and fittings to be welded and welding socket shall be clean and free from dirt.
3. In cold weathers pre-heat the pipes and fittings before welding. Capillary cracks may occur due to shock heating if cold pipes and fittings are used.
4. Pipe (at marked welding length) and fitting are heated until the welding time is over. If pipes are marked randomly, pipe may be pushed into the fitting too much and this may cause diameter reduction. Welding and cooling periods are also very important.
5. During the welding process pipe shall not be moved inside the fitting and the welding shall be in the same axis. If the axis slides, welding may occur in a lesser surface of either pipe or fitting. In this case, system may work properly at the beginning, however leakages may occur in a long term period.
6. Master aluminium foiled pipes shall be peeled using peeling tool at specified welding length. The point is the adjustment of the knife of the peeling tool. If the knife is not adjusted properly, then pipe surface may be over peeled or less peeled. In both cases it causes problems in welding.
7. Fittings with metal have plain threads. If other part is cast iron, it shall have plain threads too.
8. In threaded joints teflon tape shall be used. Linen shall be avoided. If linen is to be wrapped, then only gaps in the thread depth shall be filled with linen.
9. In threaded joints it's not necessary to squeeze very tide. Bigger spanners than necessary should not be used.

10. Pipe fix points and distances shall be handled carefully and elbows shall not be a fix point at all.
11. Pipes shall not be left uncovered, and must be isolated by covering in order to avoid external effects.
12. Master pipes and fittings extend when they are used for hot water systems. Some distance from the end of pipes shall be left to let them extend easily for under plaster installations. During plastering those distances shall not be filled.
13. A completed system shall be subjected to pressure test. For this purpose, system is filled with water, air is evacuated, pressurized between 10-20 Bar at an appropriate point. Test period is 24 hrs.
14. Water heater connections are the most critical points of hot and cold water systems. In water heater connections, metal part separation from plastics part can happen due to some trouble in operation system of the water heater. Although the water heater is closed from battery while it is in working position, water heater continues to heat water and does not turns off automatically. Some other reasons like trouble in diaphragm and trouble in tuning gas cause the same outcome; this a normal heat and pressure melts plastic part and separates metal part from plastic part. In such situations water heater shall be controlled and displayed to an authorised service.
15. **Handling:** Protect Master pipes and fittings from hard strokes, avoid pipe ends from strikes.
16. **Storage:** Pipes shall not be left in open area, shall be either stored in closed store or covered.
17. After the system is completed and checked pipes shall be covered.
18. After test mentioned above, water in the pipes shall be drained.

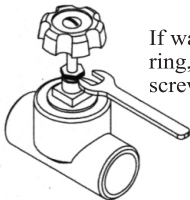
RIGHTS AND WRONGS MASTER

TABLE-7

WRONG		RIGHT	
	Avoid hard impacts and hitting of pipe tips.		Place carefully
	Don't use pipes damaged or cracked at cutting locations		Cut the pipe only with a sharp tough tools.
	Don't turn the pipe and fittings after joining.		After joining, turn only up to 5°
	Don't use conical notched pieces.		Use only plain notched armatures avoid excess tightening
	Don't subject the pipes to UV rays for a long period of time		Cover from direct sun light and rain
	Do not use metal pieces for covering purposes.		Use plastic pieces.
	Avoid hard impacts and any hard objects falling on them at construction sites.		Protect the pipes by covering them.
	In tightening don't use excess hemp.		In tightening, it is advisable to use adhesives and tapes.
	Do not heat with open flame.		Use hot air for bending. Maximum bending heat 140°
	Do not weld dirty pipe and fittings.		Use only clean material.

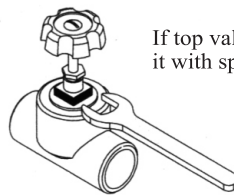
| IMPORTANT |

1



If water leaks in shaft sealing ring, tighten control bracket screw with spanner.

2



If top valve is loose, tighten it with spanner.

13. QUALITY POLICY

With the very first pipe Master set its standards high for quality product. Customers can be confident that Master has the capacity and capability to make products which not only comply with the relevant National and International Standards but also meet its own strict criteria of consistent high quality and performance. To ensure these high standards, Master follows a policy of using best quality raw material formulations. These, in combination with latest and automated controlled equipment, produce a guaranteed end-product. Master PPRC Pipes and fittings are vigorously inspected and tested in a well-equipped laboratory.

14. DIN NORMS

Our products are also conforms following DIN Standards:

- DIN 8077 Polypropylene Pipes - Dimensions
- DIN 8078 Polypropylene Pipes - General quality requirements-Test methods
- DIN 16962, section 1 to 12: Polypropylene Pipe and Fittings - Dimensions.
- DIN 16962 Section 5 : Polypropylene Pipe and Fittings -
General quality requirements - Test methods

15. FREQUENTLY ASKED QUESTIONS

Q: How is a completed installation checked?

A: An installation should be subjected to a pressure test for any leakages before closing the wall, ground and other pipes. This test is important in means of reliability of workmanship and also for the end user against any materialistic and moral damages that might arise in the future. The test is run as follows; system is filled with water, after the air is evacuated from the peak point, a water pressurizer (a tap connection etc.) is connected and the pressure is increased at least to 10 Bars and at most to 20 bars. One by one each welding and connection point shall be controlled for any leakages. If there is any leakage, it is repaired and test is repeated, test duration is 24 hrs.

Q: Are Master pipes can be used for purposes other than water systems?

A: Master products are resistant to most chemicals. However, manufacturer shall be consulted for any chemicals since the pipes don't resist some chemicals like fuel.

Q: What is the behavior of Master products under excessive hot, cold, freezing conditions?

A: Master products are not affected between $-5^{\circ}\text{C}/+95^{\circ}\text{C}$ temperatures. Operation pressure is 20 bar at 20°C and 8.5 bar at 70°C . Under cold weather conditions rigidity occurs similar to other plastics materials. As the temperature decrease pipes become more rigid, lost its plasticity and become brittle. Therefore pipes installed outside building shall be isolated in order to protect them from impacts etc.

Q: Do these material have carcinogen affect?

A: Master resin - PPRC Type 3 - is very resistant to chemicals. It's not soluble in water, therefore it's impossible for it to decompose or absorb any substance.

Q: What is Type-1, Type-2 and Type-3? Is it visually recognizable?

A: It's not possible to recognize the difference visually. These types can be described as follows;

Type-1 (homo polymer): Polymer type obtained as a result of the polymerization of propylene only.

Type-2 (block copolymer): Polypropylene type obtained by the Polymerization of a mixture of Propylene and Ethylene at certain ratios. Due to the fact that Propylene and Ethylene molecules are present in blocks within the polymer chain, they show an intermediary property between Polyethylene and Polypropylene.

Type-3 (random copolymer): Obtained by the Polymerization of mixture of Propylene and Ethylene at certain ratios. Propylene and Ethylene molecules are mixed randomly. For this reason they have better properties than Polyethylene and Polypropylene. Among their physical properties, thermal effect and pressure resistance increases from Type-1 to Type-3. Hence there is no pipe application from Type-1,2 only for cold water pipes can be produced from Type-2, where as both cold and hot water pipe production is possible from Type-3.

The structure of Polypropylene Random Copolymer Type-3, raw material for Master Pipes and Fittings, ensures the superior resistance properties against temperature, pressure and chemicals and a longer service life. Therefore Type-3 is the only alternative for cold and hot water applications.

Q: How to fix pipes drilled with a nail or auger?

A: For such cases, PP stick or pipe repair set are available.

Q: What kind of problems may occur during installations under 0°C?

A: Plastics materials become rigid and brittle as temperature decrease. Therefore pipes shall be protected from impacts while handling. If pipes stayed in cold weather is inserted to welding socket at 260°C, capillary cracks may occur at welding surface. Therefore pipes shall be pre-heated with hot air before welding.

Pipes installed over surface inside building shall be protected.

Q: What if Master pipes are subjected to direct sunlight?

A: Master pipes and fittings shall not be stored under direct sunlight. UV rays may cause cracks. Material shall be stored in a closed area.

Q: Is there an accumulated or gas welding machine for constructions without electricity?

A: In construction sites without electricity our welding machines can operate with generator. There are gas welding machines in the market.

Q: Can we twist the pipe after welding?

A: Just a little twist is allowed within 1 second right after weld. After that pipe shall not be twisted. Because while melted plastics is cooling rapidly, twisting or moving the pipe may cause crack on welding surface.

Q: Why is the threaded yellow part of welding machine that welding sockets are fixed breaking off ?

A: Socket shall be connected on and off to welding machine while it is cold. Doing it when the machine is hot may cause breaking.

Q: Why does size reduction occur in pipe while welding?

A: There may be several reasons;

- welding temperature might be above 260°C
- welding height may not be marked with pattern
- welding period might be long

Q: Why there is smoke while welding?

A: Surface of welding sockets are covered with teflon to avoid sticking. Teflon corrodes in time and plastics sticks on the socket, this plastics burns causing smoke. Socket shall be renewed immediately.

QUALITY CERTIFICATES

Certificate of Registration

This is to certify that the
Environmental Management System of:
MASTER PIPE INDUSTRIES PVT LTD
3.5 KM, 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. 1612112002

Issue Date: January 04, 2012
Expiry Date: January 03, 2015

Authorized Signatures

Certificate of Registration

This is to certify that the
Quality Management System of:
MASTER PIPE INDUSTRIES (PVT) LTD.
3.5 KM, MANKUANA, 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
Use Date: September 28, 2011
Expiry Date: August 28, 2012

Authorized Signatures

Moody International Certification Ltd
1612112002

RENEWAL OF REGISTRATION

Subject: RENEWAL OF ENVIRONMENTAL MANAGEMENT SYSTEM CERTIFICATION FOR MASTER PIPE INDUSTRIES PVT. LTD. AS MANUFACTURER & SUPPLIER OF UPVC & PPRC PIPE FITTINGS. 3.5 KM MANKUANA KHANUANA MAIN BY PASS ROAD FAISALABAD PAKISTAN

Reference: Your application No. MIP/09/011, dated 15.06.2011, on the subject RENEWAL OF ENVIRONMENTAL MANAGEMENT SYSTEM CERTIFICATION FOR MASTER PIPE INDUSTRIES PVT. LTD. AS MANUFACTURER & SUPPLIER OF UPVC & PPRC PIPE FITTINGS FOR THE YEAR 2011-12 was approved by the Ministry of Environment and Forests, Government of Punjab, Lahore. Notification No. 305/012/1/16301 dated 26.06.2011 is attached herewith for your information.

2. The firm will be 100% responsible for the quality of the pipes supplied in accordance with the specified standards (IS: 4992 for UPVC pipes and IS: 4993 for PPRC pipes) and shall be liable for any defect in the pipes supplied.

3. The firm will be bound to supply a test report (alongwith other documents) of pipes supplied for each delivery to Contractors/Builders/Engineers.

4. Any short fall in quality will result in immediate legal action and blacklisting.

5. The case of further concern will be referred to the concerned authorities for their consideration.

6. The case of further concern will be referred to the concerned authorities for their consideration.

7. The case of further concern will be referred to the concerned authorities for their consideration.

8. The case of further concern will be referred to the concerned authorities for their consideration.

9. The case of further concern will be referred to the concerned authorities for their consideration.

10. The case of further concern will be referred to the concerned authorities for their consideration.

GOVERNMENT OF PUNJAB
HUD & PIPE DEPARTMENT
Lahore, the 20th Jan, 2012.

RENEWAL OF REGISTRATION

In continuation of this Department's letter of even number, dated 08.09.2011 & 17.11.2011, the firm PPS (Pvt.) Ltd. Faisalabad is hereby provisionally renewed upto 31.03.2012 in accordance with the notified Standard (IS: 4992) for pipe size 75 to 150 mm as approved manufacturer/supplier to "MASTER BRAND" or "UPVC PIPE IN HUD & PIPE DEPARTMENT as likely supplier of above mentioned items.

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

Book No. 001
Number: 10072

Licence No. CM/L-231/2009/9
M/s. Master Pipe Industries (Pvt.) Ltd.
Address: 3.5 KM Mankuana, 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	UPVC Pressure Pipes for Cold Water	ISS: 4992/1992/9
2	UPVC Pressure Pipes for Cold Water	ISS: 4992/1992/9

THE SECOND SCHEDULE

Article / Process	Unit	Marking Fee	Mode of Payment
UPVC Pressure Pipes for Cold Water	2	0.1%	Single Shot / Draft (Quarterly)
UPVC Pressure Pipes for Cold Water	2	0.1%	Single Shot / Draft (Quarterly)

Director: Lahore
Date: 20.09.2011



Master Pipe Industries (Pvt) Ltd.

Head Office / Unit:

3.5 KM, Makkuana, Khanuana, Main By Pass Road, Faisalabad- Pakistan.

Tel: +92-41-8741931 Fax: +92-41-8741932

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