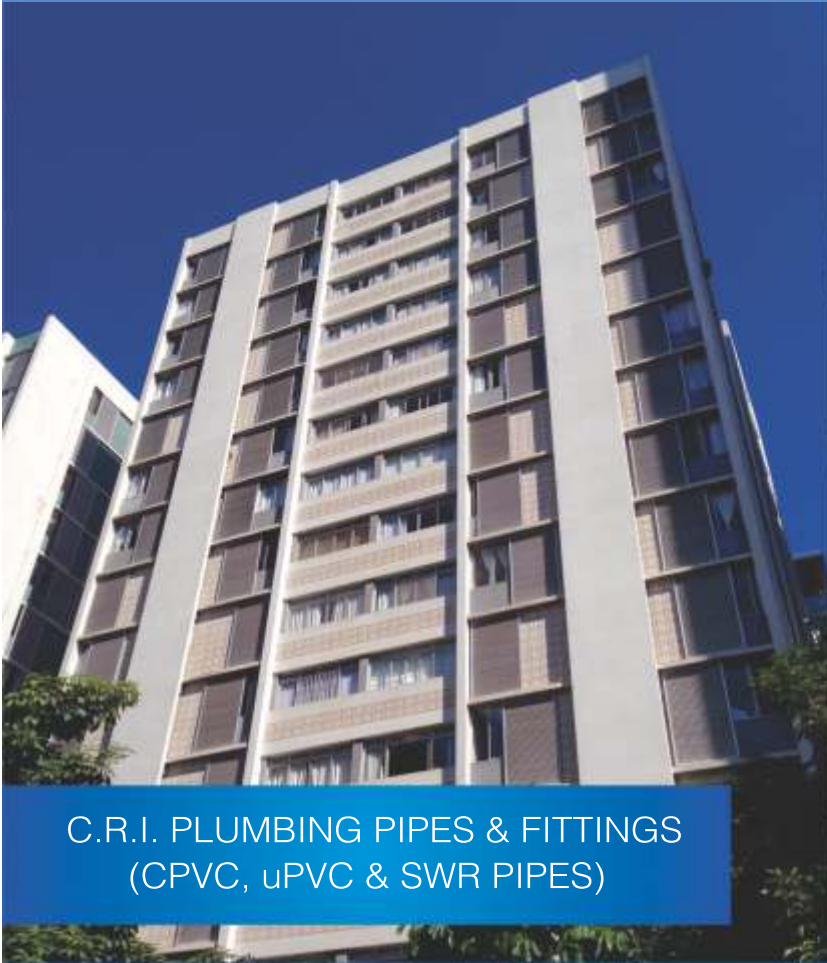




C.R.I. PIPES



C.R.I. PLUMBING PIPES & FITTINGS  
(CPVC, uPVC & SWR PIPES)



An ISO 9001 Company

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## ABOUT C.R.I.

The beginning of C.R.I. was in the year 1961, with the production of a few irrigation equipment at an in-house foundry, with very limited facilities. Now, after five eventful decades, C.R.I. is one the leading global brands, a complete solution provider for all your fluid management needs, producing more than 6,000 varieties of engineered pumps, motors and various other products, catering to diverse customer profiles.

With advanced technology adoptions, adhering to strict safety standards, complementing with a solid production capacity with state of art machinery we strive to provide our customers an eminent product, worthy of our brand name. The production environment is accredited with ISO 9001, ISO 14001 and OHSAS 18001 certifications and the products are CE, UR/UL, IEC, TSE and ISI certified.



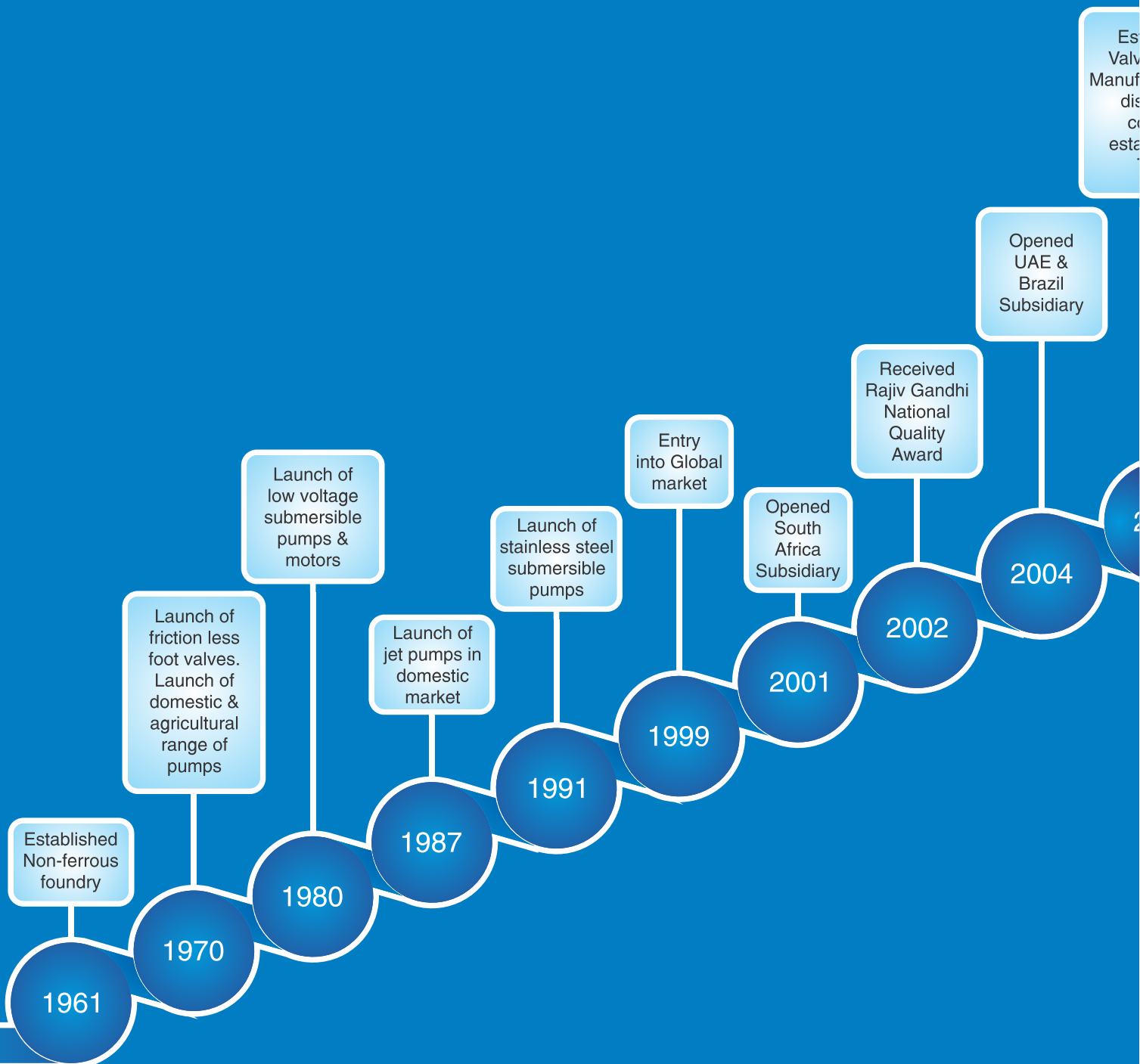
To support our interests among various products, we have incorporated, Fludyn Advanced Technology Center, an in-house R & D wing, equipped with world class Research and Development facilities, softwares, systems, prototyping and testing facilities, and is manned by 150+ Engineering graduates. It is recognized by The Ministry of Science & Technology, Government Of India.

The production area (in C.R.I.) is spanned across 300,000 square meters covered area and is supported by 20,000 plus channel partners and more than 1500 authorized service centers and 39 sales offices across the globe. To abut our customres, spread among 120+ countries, we have strategically rooted out own subsidiaries in 12 countries.

Needless to say, behind this stupendous growth, lies the relentless, innovative, enthusiastic and dedicated team work from our employees, amalgamated with a flawless value system, taught and maintained throughout the organization.

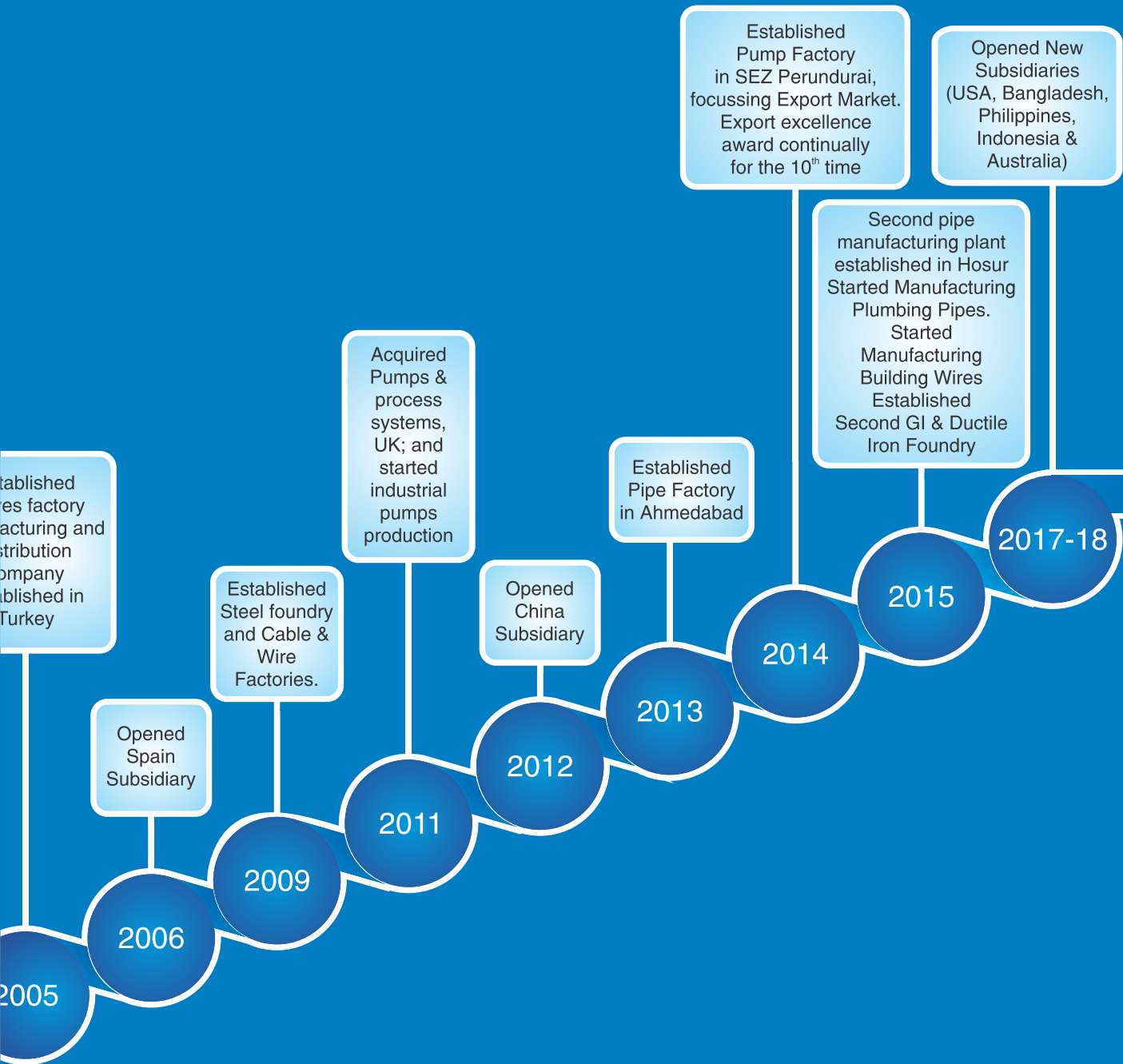
The name C.R.I. itself encapsulates the company's ethos: "Commitment, Reliability, Innovation."





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 Manufacturing Unit

 Subsidiaries

 Distributors

To support our customers, who are spread across 120 countries, we have established our own subsidiaries in 12 countries. It is truly '*Vasudhaiva Kutumbakam*', which means 'the world is one family'







## RECOGNITIONS OF MERIT

C.R.I.'s dream never ends with laurels and adulations. We are on an unending mission to upgrade and innovate concepts and solutions for a much better living, where sophistication, quality and reliability reach higher altitudes. Our each action is inspired by truly good intentions. No wonder why several prestigious awards decorate our shelves.



# C.R.I. CPVC, uPVC, SWR Pipes & Fittings



C.R.I.'s vast experience & successful track record in pump industry spanning over 5 decades facilitate, not only to enhance the range of pumps & motors, but also to produce and supply quality ancillary products. These plumbing pipes are a good example showcasing specially designed formulation under integrated quality control system, right from sourcing of the raw materials. Adequate safety factors have been considered in designing the pipes enabling them to have maximum weight carrying capacity.

C.R.I. has two pipe production plants in Ahmedabad and Hosur, with production capacity in excess of 40,000 M.T. per annum. We are constantly expanding and upgrading our facilities to meet the market requirements.







## CPVC Plumbing pipes & Fittings :

C.R.I. CPVC pipes and fittings are the choice for the quality plumbing systems for carrying hot and cold water. C.R.I. CPVC pipes & fittings are manufactured according to

- a) IS 15778 and ASTM D-2846 standards for ½” to 2” pipes
- b) ASTM F 441 standards for higher diameter i.e. 2½” to 4” pipes
- c) ASTM F 439 standards for Schedule 80 fittings

CPVC (Chlorinated Poly Vinyl Chloride) is a thermoplastic Poly Vinyl Chloride (PVC) resin and is used for hot and cold-water lines. CPVC is the first choice of material for potable water supply across the world and is in use for more than 50 years. It is ideal for use in hot and cold-water applications in villas and individual homes, residential apartments, office complexes, commercial buildings, hotels and hospitals. It has the Lowest bacterial growth amongst its supplements. It offers no corrosion, no leakage, no scaling and pitting and is fire retardant.

The union of PVC and chlorine, results in a compound, which can carry hot water at a maximum temperature of 82°C and is maintenance free for life.

Features	C.R.I. CPVC	Copper Tubes	GI Pipes
Bacterial growth	Negligible	More than C.R.I. CPVC pipes.	More than copper tubes
Corrosion	No corrosion	Will corrode over a period of time	Corrodes and deteriorates at a faster pace
Scaling & Water flow	No scaling; Hence full-bore flow	Scaling occurs over a period of time thus reducing the flow of water	Severe scaling leading to reduced bore flow
Installation	Simple. No additional heat/electric source required.	Skilled man power required with additional heat / electric source and special equipment.	Skilled man power required and the installation time is higher.
Leakage	Leak proof joints	Depends on the workmanship of the personnel.	Highly susceptible to leakage.
Thermal Expansion	Less. But care and provision to be given at regular intervals.	Less.	Less.
Thermal conductivity	Low. No need for additional insulation.	High. Insulators are essential.	Medium. Installation is recommended with insulation.
Fittings range	Wide range of fittings are available. Highly recommended by Architects, End users, Plumbers, Builders & Consultants.	Limited. Additional man hours are essential to achieve desired layout.	Limited. Additional man hours are essential to achieve desired layout.
Fire resistance	High. Since LOI of CPVC is 60, it doesn't support burning.	Being metallic, better fire resistant.	Being metallic, better fire resistant.

## Basic Properties of CPVC:

Sl.No.	Property	Test	Condition	English Units	S.I. Units
	General				
1.	Specific Gravity	ASTM D792	73°F/23°C	1.52	1.52
2	Specific Volume	-	73°F/23°C	0.645 cm <sup>3</sup> /g	0.645 cm <sup>3</sup> /g
3	Water Absorption	ASTM D570	73°F/23°C	0.03%	0.03%
			212°F/100°C	0.55%	0.55%
4	Rockwell Hardness	ASTM D785	73°F/23°C	119	-
5	Cell Classification	ASTM D1784	-	23447	-
	Mechanical				
1	Izod impact	ASTM D256	73°F/23°C	1.5 ft lbs/in. o.n	80 J/m o.n
2	Tensile Strength	ASTM D638	73°F/23°C	8000 psi	55 N/mm <sup>2</sup>
3	Tensile Modulus	ASTM D638	73°F/23°C	360,000 psi	2500 N/mm <sup>2</sup>
4	Flexural strength	ASTM D790	73°F/23°C	15,100 psi	104 N/mm <sup>2</sup>
5	Flexural modulus	ASTM D790	73°F/23°C	415,000 psi	2860 N/mm <sup>2</sup>
6	Compressive strength	ASTM D695	73°F/23°C	10,100 psi	70 N/mm <sup>2</sup>
7	Compressive Modulus	ASTM D695	73°F/23°C	196,000 psi	1350 N/mm <sup>2</sup>
	Thermal Properties				
1	Expansion	ASTM D696	-	3.4x10 <sup>-5</sup> in/in/°F	6.1x10 <sup>-2</sup> m/m/K
2	Thermal Conductivity	ASTM C177	-	0.95 BTU in/hr/ft <sup>2</sup> /°F	0.14Wm/K/m <sup>2</sup>
3	Heat Distortion Temperature	ASTM D648	-	217°F	103°C
4	Heat capacity	DSC	73°F/23°C	0.21 BTU/lb°F	0.90 J/gK
			212°F/100°C	0.26 BTU/lb°F	1.10 J/gK
	Flammability				
1	Flammability rating	UL94	-	0.062 in/0.157cm	V-0, 5VB, 5VA
2	Flame spread	ASTM E84	-	15	
3	Smoke developed	ASTM E84	-	70-125	-
4	Limiting oxygen index	ASTM D2863	-	60%	-
	Electrical				
1	Dielectric Strength	ASTM D147	-	1250 V/mil	492,000 V/cm
2	Dielectric Constant	ASTM D150	60 Hz, 30°F/-1°C	3.7	3.7
3	Power Factor	ASTM D150	1000 Hz	7e-005	7e-005
4	Volume Resistivity	ASTM D257	73°F/23°C	3.4x10 <sup>15</sup> ohm/cm	3.4x10 <sup>15</sup> ohm/cm

## Features of C.R.I. CPVC Plumbing pipes :

- a) Lead free: C.R.I. CPVC pipes & fittings are lead free and highly recommended for potable water supply requirements.
- b) Corrosion & Chemical Resistant: These pipes and fittings have excellent chemical resistance properties to with stand salty and chlorinated water conditions.
- c) Fire Resistant: These pipes and fittings are fire resistant and self-extinguishing because of high degree of LOI.
- d) Maintenance Free: These pipes and fittings are free from corrosion, rust, weathering and leakage and ensures years of trouble free performance.
- e) Easy to Install: No special tools required for installing. These pipes and fittings can be easily joined using a solvent cement.
- f) Low Thermal Expansion & Contraction: These pipes and fittings have lower thermal expansion and contraction compared to other thermoplastics and metal pipes. Therefore, distortion of pipelines due to flow of hot water leading to looping is reduced.

**Pipes**

Class	Standard	Sizes Available
SDR 11 Pipe	IS 15778 & ASTM D 2846	½" - 2"
SDR 13.5 Pipe	IS 15778 & ASTM D 2846	½" - 2"
SCH 40 Pipe	ASTM F 441	2½" - 4"
SCH 80 Pipe	ASTM F 441	2½" - 4"

**Fittings**

Class	Standard	Sizes Available
SDR 11 Fittings	ASTM D 2846	½" - 2"
SDR 13.5 Fittings	ASTM D 2846	½" - 2"
SCH 80 Fittings	ASTM F 439	2½" - 4"

**Dimensional details and Pressure Ratings of SDR 11 (Class 1) CPVC Pipes**

As per IS 15778

Nominal size		Mean outside diameter (mm)		Wall thickness		Pressure rating			
						at 27°C		at 82°C	
inch	mm	Average	Tolerance	mm	Tolerance	kg/cm <sup>2</sup>	MPA	kg/cm <sup>2</sup>	MPA
½	15	15.90	±0.1	1.95	±0.25	28.14	2.76	6.93	0.68
¾	20	22.20	±0.1	2.25	±0.25	28.14	2.76	6.93	0.68
1	25	28.60	±0.1	2.85	±0.25	28.14	2.76	6.93	0.68
1¼	32	34.90	±0.1	3.45	±0.25	28.14	2.76	6.93	0.68
1½	40	41.30	±0.1	4.05	±0.25	28.14	2.76	6.93	0.68
2	50	54.00	±0.1	5.20	±0.30	28.14	2.76	6.93	0.68

**Dimensional details and Pressure Ratings of SDR 13.5 (Class 1) CPVC Pipes**

As per IS 15778

Nominal size		Mean outside diameter (mm)		Wall thickness		Pressure rating			
						at 27°C		at 82°C	
inch	mm	Average	Tolerance	mm	Tolerance	kg/cm <sup>2</sup>	MPA	kg/cm <sup>2</sup>	MPA
½	15	15.9	±0.1	1.65	±0.25	22.23	2.18	5.61	0.55
¾	20	22.2	±0.1	1.95	±0.25	22.23	2.18	5.61	0.55
1	25	28.6	±0.1	2.35	±0.25	22.23	2.18	5.61	0.55
1¼	32	34.9	±0.1	2.85	±0.25	22.23	2.18	5.61	0.55
1½	40	41.3	±0.1	3.35	±0.25	22.23	2.18	5.61	0.55
2	50	54.0	±0.1	4.25	±0.30	22.23	2.18	5.61	0.55

Dimensions and water pressure Rating as per ASTM F 441											
Nominal size		Outer diameter (D) in mm		SCH 40				SCH 40			
				Wall Thickness (t) in mm		Working Pressure at (kg/cm <sup>2</sup> )		Wall Thickness (t) in mm		Working Pressure at (kg/cm <sup>2</sup> )	
mm	inch	Min	Max	Min	Max	27°C	82°C	Min	Max	27°C	82°C
65	2½"	72.84	73.20	5.16	5.77	21.00	5.30	7.01	7.85	29.50	7.30
80	3"	88.7	89.10	5.49	6.15	18.20	4.60	7.62	8.53	25.90	6.30
100	4"	114.07	114.53	6.02	6.73	15.50	3.90	8.56	9.58	22.50	6.60

Frictional head loss characteristics of C.R.I. CPVC pipes :

Frictional Losses Table of SDR-11 Pipes						
Frictional Head loss (Milli bar per meter pipe) for SDR 11 pipe						
Pipe ID - di (mm)	1/2" (15 mm) SDR 11		3/4" (20 mm) SDR 11		3/4" (20 mm) SDR 11	
	12.0		17.7		22.9	
Flow Rate - Q (Litre/min)	Velocity (m/sec)	Flow rate (millibar/mt)	Velocity (m/sec)	Flow rate (millibar/mt)	Velocity (m/sec)	Flow rate (millibar/mt)
1	0.15	0.32	0.07	0.05	0.04	0.01
2	0.29	1.14	0.14	0.17	0.08	0.05
3	0.44	2.42	0.20	0.36	0.12	0.10
4	0.59	4.11	0.27	0.62	0.16	0.18
5	0.74	6.22	0.34	0.94	0.20	0.27
6	0.88	8.71	0.41	1.31	0.24	0.37
7	1.03	11.58	0.47	1.74	0.28	0.50
8	1.18	14.83	0.54	2.23	0.32	0.64
9	1.33	18.44	0.61	2.78	0.36	0.79
10	1.47	22.41	0.68	3.38	0.40	96.00

Frictional Losses Table of SDR-13.5 Pipes						
Frictional Head loss (Milli bar per meter pipe) for SDR 13.5 pipe						
Pipe ID - di (mm)	1/2" (15 mm) SDR 11		3/4" (20 mm) SDR 13.5		1" (25 mm) SDR 13.5	
	12.6		18.3		23.9	
Flow Rate - Q (Litre/min)	Velocity (m/sec)	Flow rate (millibar/mt)	Velocity (m/sec)	Flow rate (millibar/mt)	Velocity (m/sec)	Flow rate (millibar/mt)
1	0.13	0.25	0.06	0.04	0.04	0.01
2	0.27	0.9	0.13	0.15	0.07	0.04
3	0.4	1.9	0.19	0.31	0.11	0.08
4	0.53	3.24	0.25	0.53	0.15	0.14
5	0.67	4.9	0.32	0.8	0.19	0.22
6	0.8	6.87	0.38	1.12	0.22	0.3
7	0.94	9.13	0.44	1.48	0.26	0.4
8	1.07	11.69	0.51	1.9	0.3	0.52
9	1.2	14.54	0.57	2.36	0.33	0.64
10	1.34	17.67	0.63	2.87	0.37	0.78



**Thermal expansion and contraction :**

For CPVC pipes which are not embedded inside the wall but are carrying hot water from Boiler/Solar water heater etc., it is important to use readymade expansion loops supplied by C.R.I Pipes. Use one C.R.I expansion loop for every 12 feet run of the pipe, between two fixed joints. For longer lines and longer distances between the fixed joints expansion loops can be made at site with calculations as per the guidance of C.R.I. executives. It is not recommended to directly connect CPVC pipes to the water heater outlet. Instead, one-meter long metal nipple should be connected directly to the heater so that the CPVC pipe is not damaged by the buildup of excessive radiant heat from the flue.





**Horizontal and vertical support :**



A typical Hot and Cold-water distribution system operating at 60° - 70°C requires support for horizontal lines every 90 cm for pipes whose diameter is below 1 ¼ inch (32 mm) and for every 120 cm on pipes of larger sizes.









Vertical spacing supports are to be provided at the distances mentioned based on water temperatures indicated below.

Nominal size		Temperature range and vertical support distance							
		Range 1		Range 2		Range 3		Range 4	
		20°C	68°F	50°C	122°F	70°C	158°F	80°C	176°F
inch	mm	feet	mtr	feet	mtr	feet	mtr	feet	mtr
1/2	12.70	5.5	1.7	4.5	1.4	3.0	0.9	2.5	0.8
3/4	19.05	5.5	1.7	5.0	1.5	3.0	0.9	2.5	0.8
1	25.40	6.0	1.8	5.5	1.7	3.5	1.1	3.0	0.9
1 1/4	31.75	6.5	2.0	6.0	1.8	3.5	1.1	3.0	0.9
1 1/2	38.10	7.0	2.1	6.0	2.0	3.5	1.1	3.5	1.1
2	50.80	7.0	2.1	6.5	2.0	4.0	1.2	5.5	1.1








**C.R.I. CPVC Fittings**

CPVC Plumbing Fittings					
Sl. No.	Description	Images	Sizes available		Item code
			in mm	in inches	
1.	Male Threaded adapter (MTA) - Plastic thread		15mm	1/2"	RP3ADAP3071
			20mm	3/4"	RP3ADAP1671
			25mm	1"	RP3ADAP1681
			32mm	1 1/4"	RP3ADAP3081
			40mm	1 1/2"	RP3ADAP3091
			50mm	2"	RP3ADAP3101
2.	Reducer - Male Threaded adapter (MTA) - Plastic thread		20mm x 15mm	3/4" x 1/2"	RP3ADAP1171
3.	Male Adapter Brass Threaded - MABT		15mm	1/2"	RP3ADAP1101
			20mm	3/4"	RP3ADAP1111
			25mm	1"	RP3ADAP1121
			32mm	1 1/4"	RP3ADAP3001
			40mm	1 1/2"	RP3ADAP3011
			50mm	2"	RP3ADAP3021
4.	Reducer - Male Adapter Brass Threaded - MABT		20mm x 15mm	3/4" x 1/2"	RP3ADAP1711

CPVC Plumbing Fittings					
Sl. No.	Description	Images	Sizes available		Item code
			in mm	in inches	
5.	Female Threaded adapter (FTA) - Plastic thread		15mm	1/2"	RP3ADAP3031
			20mm	3/4"	RP3ADAP1651
			25mm	1"	RP3ADAP1661
			32mm	1 1/4"	RP3ADAP3041
			40mm	1 1/2"	RP3ADAP3051
			50mm	2"	RP3ADAP3061
6.	Female Adapter Brass Threaded - FABT		15mm	1/2"	RP3ADAP1071
			20mm	3/4"	RP3ADAP1081
			25mm	1"	RP3ADAP1091
			32mm	1 1/4"	RP3ADAP2971
			40mm	1 1/2"	RP3ADAP2981
			50mm	2"	RP3ADAP2991
7.	Reducer - Female Adapter Brass Threaded - FABT		20mm x 15mm	3/4" x 1/2"	RP3ADAP1691
			25mm x 15mm	1" x 1/2"	RP3ADAP1701
			25mm x 20mm	1" x 3/4"	RP3ADAP3111
8.	Coupler		15mm	1/2"	RP3COUP0291
			20mm	3/4"	RP3COUP0301
			25mm	1"	RP3COUP0311
			32mm	1 1/4"	RP3COUP0481
9.	Reducer - Coupler		20mm x 15mm	3/4" x 1/2"	RP3COUP0321
			25mm x 15mm	1" x 1/2"	RP3COUP0331
			25mm x 20mm	1" x 3/4"	RP3COUP0341
10.	Reducing Coupler Socket		40mm	1 1/2"	RP3COUP0711
			50mm	2"	RP3COUP0721
			32mm x 15mm	1 1/4" x 1/2"	RP3COUP0731
			32mm x 20mm	1 1/4" x 3/4"	RP3COUP0741
			32mm x 25mm	1 1/4" x 1"	RP3COUP0751
			40mm x 15mm	1 1/2" x 1/2"	RP3COUP0761
			40mm x 20mm	1 1/2" x 3/4"	RP3COUP0771
			40mm x 25mm	1 1/2" x 1"	RP3COUP0781
			40mm x 32mm	1 1/2" x 1 1/4"	RP3COUP0791
			50mm x 20mm	2" x 3/4"	RP3COUP0801
			50mm x 25mm	2" x 1"	RP3COUP0811
			50mm x 32mm	2" x 1 1/4"	RP3COUP0821
			50mm x 40mm	2" x 1 1/2"	RP3COUP0831
11.	Elbow 45°		15mm	1/2"	RP3ELBO341
			20mm	3/4"	RP3ELBO351
			25mm	1"	RP3ELBO361
			32mm	1 1/4"	RP3ELBO0661
			40mm	1 1/2"	RP3ELBO0671
			50mm	2"	RP3ELBO0681

CPVC Plumbing Fittings					
Sl. No.	Description	Images	Sizes available		Item code
			in mm	in inches	
12.	Elbow 90°		15mm	1/2"	RP3ELBO371
			20mm	3/4"	RP3ELBO381
			25mm	1"	RP3ELBO391
			32mm	1 1/4"	RP3ELBO0691
			40mm	1 1/2"	RP3ELBO0701
			50mm	2"	RP3ELBO0711
13.	Reducing Elbow 90°		20mm x 15mm	3/4" x 1/2"	RP3ELBO331
			25mm x 15mm	1" x 1/2"	RP3ELBO0721
			25mm x 20mm	1" x 3/4"	RP3ELBO0731
14.	Brass Elbow		15mm	1/2"	RP3ELBO291
			20mm	3/4"	RP3ELBO301
			25mm	1"	RP3ELBO0611
			32mm	1 1/4"	RP3ELBO0621
15.	Reducing Brass Elbow		20mm x 15mm	3/4" x 1/2"	RP3ELBO311
			25mm x 15mm	1" x 1/2"	RP3ELBO321
			25mm x 20mm	1" x 3/4"	RP3ELBO0601
16.	Tee		15mm	1/2"	RP3TEEX0541
			20mm	3/4"	RP3TEEX0551
			25mm	1"	RP3TEEX0561
			32mm	1 1/4"	RP3TEEX0761
			40mm	1 1/2"	RP3TEEX1071
			50mm	2"	RP3TEEX0771
17.	Reducing Tee		20mm x 15mm	3/4" x 1/2"	RP3TEEX0571
			25mm x 15mm	1" x 1/2"	RP3TEEX0581
			25mm x 20mm	1" x 3/4"	RP3TEEX0591
			32mm x 15mm	1 1/4" x 1/2"	RP3TEEX0961
			32mm x 20mm	1 1/4" x 3/4"	RP3TEEX0971
			32mm x 25mm	1 1/4" x 1"	RP3TEEX0981
			40mm x 15mm	1 1/2" x 1/2"	RP3TEEX0991
			40mm x 20mm	1 1/2" x 3/4"	RP3TEEX1001
			40mm x 25mm	1 1/2" x 1"	RP3TEEX1011
			40mm x 32mm	1 1/2" x 1 1/4"	RP3TEEX1021
			50mm x 20mm	2" x 3/4"	RP3TEEX1031
			50mm x 25mm	2" x 1"	RP3TEEX1041
			50mm x 32mm	2" x 1 1/4"	RP3TEEX1051
50mm x 40mm	2" x 1 1/2"	RP3TEEX1061			
18.	Tee Holder		15mm x 15mm x 15mm	1/2" x 1/2" x 1/2"	RP3TEEX0601
			20mm x 20mm x 15mm	3/4" x 3/4" x 1/2"	RP3TEEX0611
19.	Brass Tee		15mm	1/2"	RP3TEEX0511
			20mm	3/4"	RP3ELBO0631

CPVC Plumbing Fittings					
Sl. No.	Description	Images	Sizes available		Item code
			in mm	in inches	
20.	Reducing Brass Tee		20mm x 15mm	3/4" x 1/2"	RP3TEEX0521
			25mm x 15mm	1" x 1/2"	RP3TEEX0531
			25mm x 20mm	1" x 3/4"	RP3ELBO0641
			32mm x 15mm	1 1/4" x 1/2"	RP3ELBO0651
21.	Cross Tee		15mm	1/2"	RP3TEEX1081
			20mm	3/4"	RP3TEEX1091
			25mm	1"	RP3TEEX1101
22.	Tank Nipple		15mm	1/2"	RP3NIPP0071
			20mm	3/4"	RP3NIPP0081
			25mm	1"	RP3NIPP0091
			32mm	1 1/4"	RP3NIPP0101
			40mm	1 1/2"	RP3NIPP0111
			50mm	2"	RP3NIPP0121
23.	Union		15mm	1/2"	RP3UNIO0051
			20mm	3/4"	RP3UNIO0061
			25mm	1"	RP3UNIO0071
			32mm	1 1/4"	RP3UNIO0081
			40mm	1 1/2"	RP3UNIO0091
			50mm	2"	RP3UNIO0101
24.	End Cap		15mm	1/2"	RP3ECAP0101
			20mm	3/4"	RP3ECAP0111
			25mm	1"	RP3ECAP0121
			32mm	1 1/4"	RP3ECAP0131
			40mm	1 1/2"	RP3ECAP0141
			50mm	2"	RP3ECAP0151
25.	Reducer Bushing		20mm x 15mm	3/4" x 1/2"	RP3BUSH0511
			25mm x 15mm	1" x 1/2"	RP3BUSH0521
			25mm x 20mm	1" x 3/4"	RP3BUSH0531
			32mm x 15mm	1 1/4" x 1/2"	RP3BUSH0541
			32mm x 20mm	1 1/4" x 3/4"	RP3BUSH0551
			32mm x 25mm	1 1/4" x 1"	RP3BUSH0561
			40mm x 15mm	1 1/2" x 1/2"	RP3BUSH0571
			40mm x 20mm	1 1/2" x 3/4"	RP3BUSH0581
			40mm x 25mm	1 1/2" x 1"	RP3BUSH0591
			40mm x 32mm	1 1/2" x 1 1/4"	RP3BUSH0601
			50mm x 25mm	2" x 1"	RP3BUSH0631
			50mm x 32mm	2" x 1 1/4"	RP3BUSH0641
			50mm x 40mm	2" x 1 1/2"	RP3BUSH0651
			50mm x 15mm	2" x 1/2"	RP3BUSH0611
50mm x 20mm	2" x 3/4"	RP3BUSH0621			

CPVC Plumbing Fittings					
Sl. No.	Description	Images	Sizes available		Item code
			in mm	in inches	
26.	Expander Brass Tee				
27.	Cross Tee				
28.	Converter Bushing		15mm	1/2"	RP3BUSH0661
			20mm	3/4"	RP3BUSH0671
			25mm	1"	RP3BUSH0681
			32mm	1 1/4"	RP3BUSH0691
			40mm	1 1/2"	RP3BUSH0701
			50mm	2"	RP3BUSH0711
29.	Ball Valve		15mm	1/2"	RP3VALV0091
			20mm	3/4"	RP3VALV0011
			25mm	1"	RP3VALV0021
			32mm	1 1/4"	RP3VALV0101
			40mm	1 1/2"	RP3VALV0111
			50mm	2"	RP3VALV0121
30.	Threaded End Plug		15mm	1/2"	RP3PLUG0201
			20mm	3/4"	RP3PLUG0211
			25mm	1"	RP3PLUG0221
31.	Step over bend		15mm	1/2"	RP3BUSH0721
			20mm	3/4"	RP3BUSH0731
			25mm	1"	RP3BUSH0741
32.	CPVC clamp		15mm	1/2"	RP3CLAM0181
			20mm	3/4"	RP3CLAM0191
			25mm	1"	RP3CLAM0201
			32mm	1 1/4"	RP3CLAM0211
			40mm	1 1/2"	RP3CLAM0221
			50mm	2"	RP3CLAM0231

## Installation Procedure :

### Step 1: Cutting

For making a proper and neat joint, measure the required pipe length accurately and make a visible marking for a cut. Also, ensure that both the pipe and fittings are of same size and standard. Then make the cut using a hacksaw blade or a wheel cutter. Kindly note that, making the cut as square as possible, provides optimal bonding area within a joint. If you observe any cracks or splinters on the ends of the pipe, cutoff a minimum of 30 mm beyond the visible crack before proceeding further.

### Step 2: Deburring/Beveling

Burrs and Filings, which occur during the cutting of the pipe, can obstruct and prevent proper contact between the pipe and fitting during assembly and should be removed both from inside and outside of the pipe. A file or a pocket knife or a deburring tool can be used for this purpose. A slight bevel at the end of the pipe will ease the entry of the same into the fitting.

**Step 3: Fitting Preparation**

Clean both the pipe and fitting using a clean and dry cloth. Dry fit the pipe and fitting such that the pipe is at least 2/3<sup>rd</sup> of the way into the fitting and make a visible mark.

**Step 4: Solvent Cementing Procedure**

Usage of only C.R.I. CPVC Cement conforming to ASTM F-493 standards is recommended to ensure a perfect solvent weld joint. To make a joint, apply an even coating of solvent cement on the inside of the fitting and on the outside of the pipe till the visible mark. A smooth flowing solvent cement with the consistency of a paint is to be used. Do not use thickened or lumpy solvent cement.

**Step 5: Assembly**

Immediately after the application of the solvent cement, insert the pipe into the fitting. While inserting, rotate the pipe to 90° and 180°, so that there is an even distribution of the solvent cement. Properly align the fittings. Hold the assembly for approximately 20 seconds, to allow the joint to setup and to avoid pushout.

**Step 6: Setting and Curing times**

Solvent cement set and cure timings depend on the pipe size, temperature and relative humidity. The same are mentioned in the below tables. It takes approximately 10 to 20 minutes depending on the above mentioned factors, to make a perfect joint. After the specified time, kindly check the assembly by filling it with water and ensure that there are no leakages.

Solvent Cement Cure Times		
Average initial set schedule for CPVC solvent cements		
Temperature Range	Pipe Sizes ½ - 1¼"	Pipe Sizes 1½ - 2"
60° - 100°F / 16° - 38°C	2 minutes	5 minutes
40° - 60°F / 5° - 16°C	5 minutes	10 minutes
0° - 40°F / -18° - 5°	10 minutes	15 minutes

Average joint cure schedule for CPVC solvent cements				
Relative Humidity	Pipe Sizes ½-1¼"		Pipe Sizes 1½-2"	
60% or Less	20 - 40 mm		50 - 63 mm	
Temperature range during assembly and cure periods	psi (Bar)		psi (Bar)	
	up to 160	160 to 370	up to 160	160 to 370
	(up to 11)	(11 to 26)	(up to 11)	(11 to 26)
60° - 100°F / 16° - 38°C	15 minutes	6 hours	30 minutes	12 hours
40° - 60°F / 5° - 16°C	20 minutes	12 hours	45 minutes	24 hours
0o - 40oF / -18o - 5o	30 minutes	48 hours	1 hours	96 hours

**Limited Warranty:**

C.R.I. CPVC Pipes limited warranty, warrants to the original owner that the product will be free from manufacturing defects and conform to current applicable ASTM standards, under normal use. Buyers' remedy for breach of this warranty is limited to replacement of, or credit for, the defective product. This warranty excludes any expense for removal or reinstallation of any defective product and any other incidental, consequential or punitive damages.

The limited warranty will not apply if

1. C.R.I. products are used in combination with any other brand / make of pipes, fittings and solvent cement.
2. The product is used for purposes other than distribution of domestic water.
3. The product fails due to defects or deficiencies in design, engineering or installation.
4. The joints are not pressure tested before plastering of the casings.

5. The Installation manual for the use of the product is not followed.
6. The temperature exceeds 93°C for short term use and 82°C for continuous use.
7. The pipe is not warranted against any mechanical damage by nails, drilling, chiselling, etc.
8. The warranty will not apply in case of geyser short circuit or temperature control system failure.
9. For open hot water line, the expansion loop is not used as per instruction. For pipes under severe sunlight condition, coating of recommended paint to be done on pipes and fittings.

#### **Quality Control Procedures at C.R.I.:**

Pipes and fittings manufactured at C.R.I. follow a stringent quality control process before being rolled out into the market, in order to supply a defect free system to its users.

#### **Tests for Pipes:**

**Effect on Water:** To ensure the quality of water passing through the pipes.

**Heat Reversion Test:** How much the pipe changes in length when heated in an oven and left to cool. This is a measure of residual stresses left in the pipe during production process.

#### **Hydrostatic Pressure Test at 20°C and 95°C**

**Short term (Acceptance Test) at 20°C:** When subjected to internal hydrostatic pressure the pipe should not burst or crack at the given test pressure for minimum of 1 hour. This pressure must be over 3 times the normal pressure rating.

**Long term (Type Test) at 95°C:** The pipe should not crack or burst at the given test pressure for a period of 1000 hours.

**Thermal Stability:** When subjected to this test at 95°C the pipe shall not fail at the prescribed test pressure for a period of 8760 hours (1 year).

**Drop Impact Test:** Weights are dropped on the pipe to observe for any cracks or failures.

**Flattening Test:** Samples are compressed so that opposite walls are brought together without the pipe cracking, which is a good measure of correct extrusion techniques during production.

**Tensile Strength:** The maximum stress that a pipe can withstand while being stretched or pulled.

#### **Tests for fittings:**

**Stress Relief Test:** To determine the level of internal stress by heating the fitting in an air circulated oven @ 150°C. There should not be any blisters, weld line splitting or any cracking.

**Burst Pressure Check:** Maximum pressure before the fittings burst. This must be over three times the normal pressure rating.

#### **Tests for both Pipes & Fittings:**

**Visual Appearance:** To ensure that all pipes and fittings are uniform in colour and free visual effects such as black dots, scratches, burn marks, etc.

**Dimensions:** To ensure that all pipes and fittings conform to the appropriate standards.

**Opacity:** To measure the percentage of light flux passing through the wall and to ensure it is below 0.2%.

**Vicat Softening Temperature:** The temperature at which 1 mm<sup>2</sup> needle penetrates 1 mm through the wall of the pipe.

**Density:** Density of pipes and fittings is to be determined.

**Malfunction Temperature Test at 95°C:** An assembly of pipes and fittings should not leak or burst at 10 kg/cm<sup>2</sup> internal pressure at a temperature of 95°C for 1000 hours.



## uPVC Plumbing Pipes & Fittings

C.R.I. is privileged to introduce lead free ASTM standard uPVC solvent weld plumbing system. C.R.I. uPVC pipes & fittings are lead free and hence non-toxic, easy to install and are made for trouble free lifetime service. These pipes and fittings are manufactured under ASTM D 1785 and ASTM D 2467 standards, respectively and are available from ½” to 6”. These pipes can be used up to a maximum temperature of 60°C.

uPVC (un-plasticised poly vinyl chloride) is a derivative of PVC compound. These are some of the properties of the uPVC raw material.

SI. No.	Property	Condition	Test	SI Units
<b>General</b>				
1	Specific Gravity	ASTM D 792	1.42	g/cc
2	Shore Durometer	ASTM D 2240	89	D
3	Water absorption	ASTM D 570	0.06	%
4	Rockwell Hardness	ASTM D 785	115	R Scale
<b>Mechanical</b>				
5	Izod impact	ASTM D 256	1	ft-lb/in
6	Tensile strength	ASTM D 638	52	MPa
7	Tensile Modulus	ASTM D 638	411	psi
8	Flexural modulus	ASTM D 790	481	psi
<b>Thermal properties</b>				
9	Linear Coefficient of Expansion	**	3.2 x 10 <sup>-5</sup>	in/in/°F
10	Thermal Conductivity	0-50°C PE 0.4	0.16	W/(m.k)
11	Heat Deflection Temperature	ASTM D 648	179	°F
12	Vicat Softening Point	ASTM D 1525	181	°F
<b>Flamability</b>				
13	Flammability rating	ASTM D 635	Self-Extinguishing	**
14	Flame spread	E-84	15	**
15	Smoke developed	UL 94	V-0	0
<b>Electrical</b>				
16	Dielectric strength	ASTM D 149	544	V/mil
17	Dielectric constant	ASTM D 150	3.19	60 Hz
18	Power factor	AS 1255.4	0.01 (0.02)	51 Hz
19	Dissipation Factor	ASTM D 150	0.0096	60 Hz
20	Loss Index	ASTM D 150	0.03	60 Hz
21	Volume resistivity	ASTM D 256	5.4 x 10 <sup>15</sup>	ohm/cm
<b>Chemical</b>				
22	Chemical Resistance	ASTM D 1784	Class B	**



**Features of C.R.I. uPVC plumbing pipes & fittings:**

- a) UV Resistant - C.R.I. uPVC pipes and fittings are resistant to Ultraviolet sun rays and offers better resistance to Ultra violet degradation.
- b) Maximum flow rate – Since the internal surface of the pipe is smooth, it ensures high flow rate and low frictional losses. The system is leach and scale free.
- c) Lead Free - These pipes and fittings are lead free and are safer for drinking water transportation. These pipes are also ideal for potable water distribution.
- d) Strong & Light Weight - The pipes and fittings are light in weight for easy handling and have good mechanical strength & toughness. The system is free from weaknesses caused by rusting, weathering and chemical action, and hence lasts for a lifetime.
- e) Fire Resistant - C.R.I. uPVC pipes & fittings are fire resistant and are self-extinguishing.
- f) Maintenance Free - C.R.I. uPVC pipes & fittings are free from corrosion, rust, weathering & leakage and ensures years of trouble free performance.
- g) Easy to Install - No special tools required for installing. The pipes and fittings are easily joined using solvent cements.
- h) Cost Effective - Light weight and easy installation helps to reduce the cost.
- l) Water quality – C.R.I. pipes and fittings are non-toxic, imparts no taste or smell into the water. Hence, there will be no change in the quality of the water that is being transported.

**Technical Details**

**Dimensions and water pressure rating at 23°C as per ASTM D-1785**

Nominal Size		ASTM		SCH - 40				SCH - 80			
mm	inch	Outside Diameter in mm(Min)	Outside Diameter in mm(Max)	Wall Thickness in mm (Min)	Wall Thickness in mm (Max)	Working Pressure		Wall Thickness in mm (Min)	Wall Thickness in mm (Max)	Working Pressure	
						kgf/cm <sup>2</sup>	psi			kgf/cm <sup>2</sup>	psi
15	½"	21.24	21.44	2.77	3.28	42.19	600	3.73	4.24	59.76	850
20	¾"	26.57	26.77	2.87	3.38	33.75	480	3.91	4.42	48.51	690
25	1"	33.27	33.53	3.38	3.89	31.58	450	4.55	5.08	44.29	630
32	1¼"	42.03	42.29	3.56	4.07	26.01	370	4.85	5.43	36.56	520
40	1½"	48.11	48.41	3.68	4.19	23.20	330	5.08	5.69	33.04	470
50	2"	60.17	60.47	3.91	4.42	19.69	280	5.54	6.20	28.12	400
65	2½"	72.84	73.20	5.16	5.77	21.69	300	7.01	7.85	29.55	420
80	3"	88.70	89.10	5.49	6.15	18.24	260	7.62	8.53	25.98	370
100	4"	114.07	114.53	6.02	6.73	15.48	220	8.56	9.58	22.51	320
125	5"	141.05	141.55	6.55	7.34	13.34	190	9.52	10.66	20.38	290
150	6"	168.00	168.56	7.11	7.97	12.63	180	10.97	12.29	19.66	280

CLASS OF PIPE / FITTING	STANDARD	AVAILABLE SIZES
SCH 40 Pipe	ASTM D 1785	1½ - 6"
SCH 80 Pipe	ASTM D 1785	1½ - 6"
SCH 80 Fittings	ASTM D 2467	1½ - 6"

**Fields of Application:**

Plumbing applications for cold water in commercial and residential complexes and buildings, swimming pools, salt water lines, water distribution mains, coal washing and ash handling, semi aggressive / corrosive fluid transportation (kindly check with us if the chemical desired to be transported is suitable with the pipes or not), sugar, paper and distillery industry.

**Thermal expansion and contraction:**

Thermal expansion of PVC is roughly 4.5 to 5 times more than metallic pipes. As long as uPVC ASTM plumbing pipes are buried & are used for conveying cold water, thermal changes do not have any adverse effect on the durability. But in case of exposed lines & for high fluid temperatures, thermal expansion & contractions need to be considered.

The change in the length of a pipeline can be calculated as:  $\delta l = \alpha \times L \delta t$ , where

$\delta l$ : Change in length in mm

$\alpha$ : Coefficient of linear expansion of PVC

L: Length of pipe in mm (at Ambient Temperature)

$\delta t$ : Difference between ambient temperature & maximum operating temperature


It is recommended to use one C.R.I expansion loop for every 12 feet run of the pipe, between two fixed joints. For longer lines and longer distances between the fixed joints expansion loops can be made at site with calculations as per the guidance of C.R.I. executives.

**Horizontal & Vertical spacing & Support:**

To prevent the uPVC plumbing pipes from sagging, both horizontally and vertically, spacings and supports are provided at regular intervals as per the below calculations.

Recommended distances between supports in meters											
Nominal inch	Size in mm	SCH-40 -Temperature					SCH-80 -Temperature				
		23°C	30°C	40°C	50°C	60°C	23°C	30°C	40°C	50°C	60°C
1/2	21.34	1.4	1.4	1.2	0.75	0.75	1.5	1.4	1.4	0.9	0.75
3/4	26.67	1.5	1.4	1.2	0.75	0.75	1.7	1.5	1.4	0.9	0.75
1	33.40	1.7	1.5	1.4	0.9	0.75	1.8	1.7	1.5	1	0.9
1 1/4	42.16	1.7	1.7	1.5	0.9	0.9	1.8	1.8	1.7	1	0.9
1 1/2	48.26	1.8	1.7	1.5	1.0	0.9	2.0	1.7	1.0	1	1
2	60.32	1.8	1.7	1.5	1.0	2.15	2.15	2.0	1.2	1.2	1



**C.R.I. uPVC Fittings:**

uPVC plumbing fittings					
Sl. No.	Description	Images	Sizes available		Item Code
			in mm	in inches	
1	Male Threaded adapter (MTA) - Plastic thread		15 mm	1/2 "	RP3ADAP0171
			20 mm	3/4 "	RP3ADAP0801
			25 mm	1 "	RP3ADAP1161
			32 mm	1 1/4 "	RP3ADAP0201
			40 mm	1 1/2 "	RP3ADAP0211
			50 mm	2"	RP3ADAP0221

uPVC plumbing fittings					
Sl. No.	Description	Images	Sizes available		Item Code
			in mm	in inches	
2	Female Threaded adapter (FTA) - Plastic thread		15 mm	1/2 "	RP3ADAP0861
			20 mm	3/4 "	RP3ADAP0871
			25 mm	1 "	RP3ADAP1151
			32 mm	1 1/4 "	RP3ADAP0071
			40 mm	1 1/2 "	RP3ADAP0081
			50 mm	2"	RP3ADAP0091
3	Male Adapter Brass Threaded - MABT		15 mm	1/2 "	RP3ADAP0721
			20 mm	3/4 "	RP3ADAP1131
			25 mm	1 "	RP3ADAP1141
			32 mm	1 1/4 "	RP3ADAP0611
			40 mm	1 1/2 "	RP3ADAP0621
			50 mm	2"	RP3ADAP0631
4	Female Adapter Brass Threaded - FABT		15 mm	1/2 "	RP3ADAP0661
			20 mm	3/4 "	RP3ADAP0671
			25 mm	1 "	RP3ADAP0681
5	Reducer - Male Adapter Brass Threaded - MABT		20 mm x 15 mm	3/4" x 1/2"	RP3ADAP0641
			25 mm x 20 mm	1" x 3/4"	RP3ADAP3131
			20 mm x 15 mm	3/4" x 1/2"	RP3ADAP0421
6	Reducer - Female Adapter Brass Threaded - FABT		25 mm x 15 mm	1" x 1/2"	RP3ADAP0431
			25 mm x 20 mm	1" x 3/4"	RP3ADAP2961
7	Coupler		15 mm	1/2 "	RP3COUP0351
			20 mm	3/4 "	RP3COUP0361
			25 mm	1 "	RP3COUP0371
			32 mm	1 1/4 "	RP3COUP0491
			40 mm	1 1/2 "	RP3COUP0501
			50 mm	2"	RP3COUP0511
8	Reducer - Coupler		25mm x 15mm	1" x 1/2"	RP3COUP0381
			25mm x 20mm	1" x 3/4"	RP3COUP0391
			20mm x 15mm	3/4" x 1/2"	RP3COUP0551
			32mm x 15mm	1 1/4" x 1/2"	RP3COUP0561
			32mm x 20mm	1 1/4" x 3/4"	RP3COUP0571
			32mm x 25mm	1 1/4" x 1"	RP3COUP0581
			40mm x 15mm	1 1/2" x 1/2"	RP3COUP0591
			40mm x 20mm	1 1/2" x 3/4"	RP3COUP0601
			40mm X 25mm	1 1/2" x 1"	RP3COUP0611
			40mm X 32mm	1 1/2" x 1 1/4"	RP3COUP0621
			50mm X 15mm	2" x 1/2"	RP3COUP0631
			50mm X 20mm	2" x 3/4"	RP3COUP0641
			50mm X 25mm	2" x 1"	RP3COUP0651
			50mm X 32mm	2" x 1 1/4"	RP3COUP0661
50mm X 40mm	2" x 1 1/2"	RP3COUP0671			

uPVC plumbing fittings					
Sl. No.	Description	Images	Sizes available		Item Code
			in mm	in inches	
9	Elbow - Plastic thread		15 mm	1/2 "	RP3ELBO011
			20 mm	3/4 "	RP3ELBO021
			25 mm	1 "	RP3ELBO031
			32 mm	1 1/4 "	RP3ELBO041
			40 mm	1 1/2 "	RP3ELBO051
			50 mm	2"	RP3ELBO061
10	Reducer - Elbow - Plastic thread		20mm x 15mm	3/4" x 1/2"	RP3ELBO071
			25mm x 15mm	1" x 1/2"	RP3ELBO081
			25mm x 20mm	1" x 3/4"	RP3ELBO091
			32mm x 25mm	1 1/4" x 1"	RP3ELBO121
11	Elbow - Brass thread		15mm	1/2"	RP3ELBO221
			20mm	3/4"	RP3ELBO231
			25mm	1"	RP3ELBO511
12	Reducer - Elbow - Brass thread		20mm x 15mm	3/4" x 1/2"	RP3ELBO411
			25mm x 15mm	1" x 1/2"	RP3ELBO531
			25mm x 20mm	1" x 3/4"	RP3ELBO521
13	Expander - Elbow - Brass thread		15mm x 20mm	1/2" x 3/4"	RP3ELBO401
14	Elbow 45°		15 mm	1/2 "	RP3ELBO421
			20 mm	3/4 "	RP3ELBO431
			25 mm	1 "	RP3ELBO441
			32 mm	1 1/4 "	RP3ELBO541
			40 mm	1 1/2 "	RP3ELBO551
			50 mm	2"	RP3ELBO561
15	Reducer Bush		25mm x 15mm	1" x 1/2"	RP3BUSH0361
			25mm x 20mm	1" x 3/4"	RP3BUSH0371
			20mm x 15mm	3/4" x 1/2"	RP3BUSH0191
			32mm x 15mm	1 1/4" x 1/2"	RP3BUSH0221
			32mm x 20mm	1 1/4" x 3/4"	RP3BUSH0231
			32mm x 25mm	1 1/4" x 1"	RP3BUSH0241
			40mm x 15mm	1 1/2" x 1/2"	RP3BUSH0251
			40mm x 20mm	1 1/2" x 3/4"	RP3BUSH0261
			40mm x 25mm	1 1/2" x 1"	RP3BUSH0271
			40mm x 32mm	1 1/2" x 1 1/4"	RP3BUSH0281
			50mm x 15mm	2" x 1/2"	RP3BUSH0291
			50mm x 20mm	2" x 3/4"	RP3BUSH0301
			50m x 25mm	2" x 1"	RP3BUSH0311
50mm x 32mm	2" x 1 1/4"	RP3BUSH0321			
50mm x 40mm	2" x 1 1/2"	RP3BUSH0331			
16	Tank Nipple - PVC		15 mm	1/2 "	RP3NIPP0011
			20 mm	3/4 "	RP3NIPP0021
			25 mm	1 "	RP3NIPP0031
			32 mm	1 1/4 "	RP3NIPP0041
			40 mm	1 1/2 "	RP3NIPP0051
			50 mm	2"	RP3NIPP0061

uPVC plumbing fittings					
Sl. No.	Description	Images	Sizes available		Item Code
			in mm	in inches	
17	Tee - PVC		15 mm	1/2 "	RP3TEEX0011
			20 mm	3/4 "	RP3TEEX0021
			25 mm	1 "	RP3TEEX0641
			32 mm	1 1/4"	RP3TEEX0831
			40 mm	1 1/2 "	RP3TEEX0841
			50 mm	2"	RP3TEEX0851
18	Reducing Tee - PVC		20mm x 15mm	1/2" x 3/4"	RP3TEEX0651
			25mm x 15mm	1" x 1/2"	RP3TEEX0661
			25mm x 20mm	1" x 3/4"	RP3TEEX0671
			32mm x 20mm	1 1/4" x 3/4"	RP3TEEX0911
			32mm x 25mm	1 1/4" x 1"	RP3TEEX0921
			40mm x 15mm	1 1/2" x 1/2"	RP3TEEX0931
			40mm x 20mm	1 1/2" x 3/4"	RP3TEEX0941
			40mm X 25mm	1 1/2" x 1"	RP3TEEX0951
			40mm x40mm x 32mm	1 1/2" x 1 1/2" x 1 1/4"	RP3TEEX0201
			50mm x 50mm x15mm	2" x 2" x 1/2"	RP3TEEX0451
			50mm x 50mm x20mm	2" x 2" x 3/4"	RP3TEEX0221
			50mm x 50mm x25mm	2" x 2" x 1"	RP3TEEX0231
			50mm x 50mm x32mm	2" x 2" x 1 1/4"	RP3TEEX0241
			50mm x 50mm x40mm	2" x 2" x 1 1/2"	RP3TEEX0251
20mm x 20mm x 15mm	3/4" x 3/4" x 1/2"	RP3TEEX0111			
19	Tee - Brass		15mm x 15mm	1/2" x 1/2"	RP3TEEX0781
			20mm x 20mm	3/4" x 3/4"	RP3TEEX0791
			25mm	1"	RP3TEEX0311
20	Reducer Tee - Brass		20mm x 15mm	3/4" x 1/2"	RP3TEEX0631
			25mm x 15mm	1" x 1/2"	RP3TEEX0811
			25mm x 20mm	1" x 3/4"	RP3TEEX0821
21	Expander Tee - Brass		15mm x 20mm	1/2" x 3/4"	RP3TEEX0621
22	Cross Tee		15mm	1/2"	RP3TEEX0261
			20mm	3/4"	RP3TEEX0271
			25mm	1"	RP3TEEX0281
23	End cap - PVC		15 mm	1/2 "	RP3ECAP0011
			20 mm	3/4 "	RP3ECAP0021
			25 mm	1 "	RP3ECAP0031
			32 mm	1 1/4"	RP3ECAP0041
			40 mm	1 1/2 "	RP3ECAP0051
			50 mm	2"	RP3ECAP0061
24	End plug plain - PVC		20 mm	3/4 "	RP3PLUG0181
			25 mm	1 "	RP3PLUG0191
25	Reducer Elbow				

uPVC plumbing fittings					
Sl. No.	Description	Images	Sizes available		Item Code
			in mm	in inches	
26	Ball valve - PVC		15 mm	1/2 "	RP3TEEX0501
			20 mm	3/4 "	RP3VALV0041
			25 mm	1 "	RP3VALV0051
			32 mm	1 1/4"	RP3VALV0061
			40 mm	1 1/2 "	RP3VALV0071
			50 mm	2"	RP3VALV0081
27	Union - PVC		15 mm	1/2 "	RP3UNIO0011
			20 mm	3/4 "	RP3UNIO021
			25 mm	1 "	RP3UNIO031
			32 mm	1 1/4"	RP3UNIO0021
			40 mm	1 1/2 "	RP3UNIO0031
			50 mm	2"	RP3UNIO0041

## Installation Procedure :

### Joining of C.R.I. uPVC Plumbing Pipe and Fittings - Threaded

1. Threading at the site should be carefully carried out. Ensure a proper square cut to the pipe end. Insert support from inside and wet the threading operation by spraying water continuously.
2. Provide adequate cushion between the jaws of the pipe wrench and pipe while holding the pipe for threading.
3. For perfect process, threads should be made in one pass. High quality Teflon tape must be used as a sealant of joints. Avoid over tightening of the joint.

### Joining of C.R.I. uPVC Plumbing Pipe and Fittings by Solvent Cement

1. CUTTING: Measure and cut the pipe length as per the requirement with the help of a plastic pipe cutter or hacksaw blade.
2. DEBURRING: Burrs and filings should be removed from pipe with the help of pocket knife or a file suitable for this. Provide slight bevel at the end of pipe for easy insertion during assembly.
3. CLEANING AND FITTING PREPARATION: Use a clean, dry rag to wipe dirt and moisture from the pipe and from inside the socket fittings
4. CHECK DRY FIT: Pipe should easily go into the socket to around 2/3 of its depth. This is commonly referred as inference fit. If the pipe goes to the bottom without any reference, check if the fitting is the correct size. If it is not correct size get another fitting. To make the task easier mark the socket depth on the pipe with the marker.
5. SOLVENT CEMENT APPLICATION: Use only C.R.I. solvent cement that meets the ASTM D-2564 standard otherwise the joint can fail. Apply a heavy and even coat of solvent cement to pipe end and thin solvent cement coat inside the fittings socket. Excess solvent cement during jointing may cause clogged water ways. Hence care to be taken to use the right amount. Recommended applicator for Pipe over 90mm is a Brush, 1/2 the Pipe Diameter. All Brass and Plastic threaded fittings must be used with suitable Sealant to ensure leak proof joints. Teflon or equivalent tape is the preferred as thread sealant. Always remember Do Not Over Tighten.
6. ASSEMBLY: Push and assemble the pipes quickly into fittings socket, rotate the pipe to 90°C and 180°C while inserting which confirm even distribution of solvent cement within joints. Cement should be fluid while joining for uniform application.
7. SETUP AND CURING: To create a perfect joint of pipe and fittings hold together for 60 seconds. Solvent cement requires 10 to 20 minutes to set. The joint needs a minimum of 24 hours to cure. Pressure test pipes only after the joint is fully cured.



The joint should not be pressure tested until it has cured, the exact curing time varies with pipe size, temperature and humidity. For relative humidity above 60%, allow 50% more curing time. Use the below details as a guideline only.

Assembly Temperature	1 1/2" to 1 1/4"		1 1/2" to 2"	
	Below 12Kg/cm2	Above 12Kg/cm2	Below 12Kg/cm2	Above 12Kg/cm2
15°C to 37°C	1 Hour	6 Hour	2 Hour	12 Hour
4°C to 15°C	2 Hour	12 Hour	4 Hour	24 Hour
-6°C to 4°C	6 Hour	36 Hour	12 Hour	72 Hour
-18°C to -6°C	8 Hour	48 Hour	16 Hour	96 Hour

**Limited Warranty:**

C.R.I. uPVC Pipes limited warranty warrants to the original owner that the product will be free from manufacturing defects and conform to current applicable ASTM standards under normal use. Buyers' remedy for breach of this warranty is limited to replacement of, or credit for, the defective product. This warranty excludes any expense for removal or reinstallation of any defective product and any other incidental, consequential or punitive damages.

The limited warranty will not apply if

1. C.R.I. products are used in combination with any other brand / make of pipes, fittings and solvent cement.
2. The product is used for purposes other than distribution of domestic water.
3. The product fails due to defects or deficiencies in design, engineering or installation.
4. The joints are not pressure tested before plastering of the casings.
5. The Installation manual for the use of the product is not followed.
6. The temperature exceeds 70°C for short term use and 60°C for continuous use.
7. The pipe is not warranted against any mechanical damage by nails, drilling, chiseling, etc.
8. The warranty will not apply in case of geyser short circuit or temperature control system failure.
9. For open hot water line, the expansion loop is not used as per instruction. For pipes under severe sunlight condition, coating of recommended paint to be done on pipes and fittings.

**Quality:**

Pipes and fittings manufactured at C.R.I. follow a stringent quality control process before being rolled out into the market, in order to supply a defect free system to its users.

**Tests for Pipes**

**Heat Reversion Test:** How much the pipe changes in length when heated in an oven and left to cool. This is a measure of residual stresses left in the pipe during production process.

**Hydrostatic Pressure Test at 23°C:** When subjected to internal hydrostatic pressure the pipe should not burst or crack at the given test pressure for minimum of 1 hour. This pressure must be over 3 times the normal pressure rating.

**Drop Impact Test:** Weights are dropped on the pipe to observe for any cracks or failures.

**Flattening Test:** Samples are compressed so that opposite walls are brought together without the pipe cracking, which is a good measure of correct extrusion techniques during production.

**Tensile Strength:** The maximum stress that a pipe can withstand while being stretched or pulled.

**Tests for Fittings**

**Burst Pressure Check:** Maximum pressure before the fittings burst. This must be over three times the normal pressure rating.

**TESTS FOR BOTH PIPES AND FITTINGS**

**Visual Appearance:** To ensure that all pipes and fittings are uniform in colour and free visual effects such as black dots, scratches, burnmarks, etc.

**Dimensions:** To ensure that all pipes and fittings confirm to the appropriate standards.

**Opacity:** To measure the percentage of light flux passing through the wall and to ensure it is below 0.1%.

**Vicat Softening Temperature:** The temperature at which 1 mm<sup>2</sup> needle penetrates 1 mm through the wall of the pipe.

**Density:** Density of pipes and fittings is to be determined.

## SWR Pipes & Fittings

C.R.I. SWR (Soil, Waste & Rainwater) drainage system is designed for quick and efficient removal of waste without leakage. It is tough, durable and highly resilient with high tensile and impact strength. Also, it is free from scale formation, rusting, weathering and chemical action. It is virtually immune to attack from bacteria, fungi and micro-organisms. Hence, this system is always considered a long-term solution for building drainage with estimated life, approximately upto 50 years. In addition to various other benefits, it is cost effective than any conventional drainage system.

C.R.I. uPVC SWR pipes is manufactured as per IS13592:2013 standards and the fittings are manufactured as per IS14735:1999. C.R.I.SWR system comes in two variants.

- a) Selffit SWR pipes: One end of the pipe is plain and the other end is self-socketed on sophisticated automatic machines for high degree of accurate diameters. The pipes when joined using solvent cement, form a permanent water tight joint.
- b) Ringfit SWR pipes: One end of the pipe is plain and the other end is self-socketed with an integral groove to hold the rubber gasket. The joint formed is trouble free, water tight and also takes care of thermal expansion/ contraction.



Some of the physical properties of uPVC are

Sl. No.	Property	Condition	Test	SI Units
<b>General</b>				
1	Specific Gravity	ASTM D 792	1.42	g/cc
2	Shore Durometer	ASTM D 2240	89	D
3	Water absorption	ASTM D 570	0.06	%
4	Rockwell Hardness	ASTM D 785	115	R Scale
<b>Mechanical</b>				
5	Izod impact	ASTM D 256	1	ft-lb/in
6	Tensile strength	ASTM D 638	52	MPa
7	Tensile Modulus	ASTM D 638	411	psi
8	Flexural modulus	ASTM D 790	481	psi
<b>Thermal properties</b>				
9	Linear Coefficient of Expansion	**	$3.2 \times 10^{-5}$	in/in/°F
10	Thermal Conductivity	0-50°C PE 0.4	0.16	W/(m.k)
11	Heat Deflection Temperature	ASTM D 648	179	°F
12	Vicat Softening Point	ASTM D 1525	181	°F
<b>Flamability</b>				
13	Flammability rating	ASTM D 635	Self-Extinguishing	**
14	Flame spread	E-84	15	**
15	Smoke developed	UL 94	V-0	0



Sl. No.	Property	Condition	Test	SI Units
<b>Electrical</b>				
16	Dielectric strength	ASTM D 149	544	V/mil
17	Dielectric constant	ASTM D 150	3.19	60 Hz
18	Power factor	AS 1255.4	0.01 (0.02)	51 Hz
19	Dissipation Factor	ASTM D 150	0.0096	60 Hz
20	Loss Index	ASTM D 150	0.03	60 Hz
21	Volume resistivity	ASTM D 256	5.4 x 10 <sup>15</sup>	ohm/cm
<b>Chemical</b>				
22	Chemical Resistance	ASTM D 1784	Class B	**

**Features :**

- Manufactured from high quality uPVC compound offering high strength and durability.
- Processed at high end and latest state of the art equipment, which helps to keep up with the consistency in quality and the prescribed specifications.
- Non-corrosive, ensures longer life cycle.
- Lighter in weight than conventional metal pipes, easy handling, transportation and installation
- Longer life – Life cycle upto 50 years, saves replacement and replenishment costs.
- Convenient and reliable – Provides easy and stronger joints.
- Adequate and easy access for cleaning and clearing obstructions.
- Less maintenance - Once installed C.R.I. S.W.R. drainage system needs minimal or no maintenance.
- Cost effective - S.W.R. drainage system is more cost effective than any conventional drainage system.

**NOTE:** As per IS 13592:2013, SWR pipes are classified into Type A & B, based on their application.

TYPE A: Ventilation pipe work and rain water application

TYPE B: Soil and waste discharge system.

Pipes are available in 3 meter lengths in single and double sockets in all sizes.

DIMENSIONS OF SWR PIPES AS PER IS - 13592:2013						
Nominal Outside Diameter	Mean Outside Diameter		Outside Diameter at any point		Wall Thickness	
	Min.	Max.	Min.	Max.	Min.	Max.
40 A	40	40.3	39.5	40.5	1.8	2.2
40 B	40	40.3	39.5	40.5	3.2	3.8
50 A	50	50.3	49.4	50.6	1.8	2.2
50 B	50	50.3	49.4	50.6	3.2	3.8
63 A	63	63.3	62.2	63.8	1.8	2.2
63 B	63	63.3	62.2	63.8	3.2	3.8
75 A	75	75.3	74.1	75.9	1.8	2.2
75 B	75	75.3	74.1	75.9	3.2	3.8
90 A	90	90.3	88.9	91.2	1.9	2.3
90 B	90	90.3	88.9	91.2	3.2	3.8
110 A	110	110.4	108.6	111.4	2.2	2.7
110 B	110	110.4	108.6	111.4	3.2	3.8
125 A	125	125.4	123.5	126.5	2.5	3
125 B	125	125.4	123.5	126.5	3.2	3.8
140 A	140	140.5	138.3	141.7	2.9	3.4
140 B	140	140.5	138.3	141.7	3.6	4.2
160 A	160	160.5	158	162	3.2	3.8
160 B	160	160.5	158	162	4	4.6

**Fields of Application:**

1. Indoor and Outdoor of building drainage systems including ventilation, waste and soil discharge.
2. Rain water discharge and harvesting for residential and commercial building and complexes.
3. Industrial building and public utilities
4. Venting of gases / smells / bad odours
5. Non-pressure industrial drainage application (chemical compatibility to be checked)
6. Domestic and commercial drainage
7. Laboratory drainage (chemical compatibility to be checked)
8. Replacement of cast iron piping

**Thermal expansion and contraction:**

uPVC has a coefficient of expansion of approximately 0.06mm/m/°C. Consequently, a 2m length of soil or waste pipe will expand by 2.4 mm for a 20°C rise in temperature. This expansion is to be taken into consideration in the design of systems and components and must be accommodated when installing. It is important that this movement be allowed by including an expansion gap at ring seal joints. The spigot should be pushed fully into the ring seal socket, marked at the socket face, and then withdrawn by 10 mm. A subsequent check should be made to ensure that the expansion gap is not lost during further installation work.

The expansion & contraction is maximum in vertical lines and hence Ringfit pipes are recommended for this purpose. General site observations are that the rubber rings are removed and Solvent cement is applied for ease of operation. This should be avoided. Expansion & Contraction is minimum in SWR fittings. C.R.I also recommends having all horizontal lines with Selfit jointing.












**Horizontal and Vertical support:**

The British Standard BS EN 12056-2:2000 recommends that the SWR pipe should be supported at the following intervals in the horizontal as well as vertical directions.

Material	Pipe Diameter (mm)	Horizontal (m)	Vertical (m)
Unplasticized polyvinyl chloride (uPVC)	40	0.5	1.2
	50	0.5	1.5
	63	0.7	1.5
	75	0.8	2.0
	90	0.9	2.0
	110	1.1	2.0
	125	1.2	2.0
	140	1.4	2.0
	160	1.6	2.0

**C.R.I. SWR Fittings**

SWR plumbing fittings - Ringfit					
Sl. No.	Description	Images	Sizes available		Item Code
			in mm	in inches	
1	87.5° Bend		75mm	2.5"	RP3SWRF0001
			110mm	4"	RP3SWRF0061
2	87.5° Bend with door		75mm	2.5"	RP3SWRF0011
			110mm	4"	RP3SWRF0071
3	45° Bend		75mm	2.5"	RP3SWRF0021
			110mm	4"	RP3SWRF0081
4	Single Y		75mm	2.5"	RP3SWRF0031
			110mm	4"	RP3SWRF0091

SWR plumbing fittings - Ringfit					
Sl. No.	Description	Images	Sizes available		Item Code
			in mm	in inches	
5	Single Y with door		75mm	2.5"	RP3SWRF0041
			110mm	4"	RP3SWRF0101
6	Double Y plain		75mm	2.5"	RP3SWRF0051
			110mm	4"	RP3SWRF0111
7	Double Y with door		110mm	4"	RP3SWRF0121
8	Coupler		75mm	2.5"	RP3SWRF0261
			110mm	4"	RP3SWRF0271
9	Reducer Coupler		110mm x 75mm	4" x 2.5"	RP3SWRF0131
10	87.5° Tee		75mm	2.5"	RP3SWRF0181
			110mm	4"	RP3SWRF0211
11	87.5° Tee with door		75mm	2.5"	RP3SWRF0191
			110mm	4"	RP3SWRF0221
12	Cross Tee		75mm	2.5"	RP3SWRF0201
			110mm	4"	RP3SWRF0231
13	Reducer Tee		110mm x 75mm	4" x 2.5"	RP3SWRF0241
14	Reducer Tee with door		110mm x 75mm	4" x 2.5"	RP3SWRF0251
15	P trap long		110mm x 110mm	4" x 4"	RP3SWRF0151
16	Reducer P trap long		125mm x 110mm	4.5" x 4"	RP3SWRF0141
17	P trap short		110mm x 110mm	4" x 4"	RP3SWRF0171
18	Reducer P trap short		125mm x 110mm	4.5" x 4"	RP3SWRF0161

SWR plumbing fittings - Selfit					
Sl. No.	Description	Images	Sizes available		Item Code
			in mm	in inches	
1	87.5° Bend		75mm	2.5"	RP3SWRF0281
			110mm	4"	RP3SWRF0361
2	87.5° Bend with door		75mm	2.5"	RP3SWRF0291
			110mm	4"	RP3SWRF0371
3	45° Bend		75mm	2.5"	RP3SWRF0301
			110mm	4"	RP3SWRF0381
4	Single Y		75mm	2.5"	RP3SWRF0311
			110mm	4"	RP3SWRF0391

SWR plumbing fittings - Selfit					
Sl. No.	Description	Images	Sizes available		Item Code
			in mm	in inches	
5	Single Y with door		75mm	2.5"	RP3SWRF0321
			110mm	4"	RP3SWRF0401
6	Double Y plain		75mm	2.5"	RP3SWRF0331
			110mm	4"	RP3SWRF0411
7	Double Y with door		110mm	4"	RP3SWRF0421
8	Coupler		75mm	2.5"	RP3SWRF0621
			110mm	4"	RP3SWRF0631
9	Reducer Coupler		110mm x 75mm	4" x 2.5"	RP3SWRF0451
10	87.5° Tee		75mm	2.5"	RP3SWRF0521
			110mm	4"	RP3SWRF0561
11	87.5° Tee with door		75mm	2.5"	RP3SWRF0531
			110mm	4"	RP3SWRF0571
12	Cross Tee		75mm	2.5"	RP3SWRF0541
			110mm	4"	RP3SWRF0581
13	Reducer Tee		110mm x 75mm	4" x 2.5"	RP3SWRF0601
14	Reducer Tee with door		110mm x 75mm	4" x 2.5"	RP3SWRF0611
15	P trap long		110mm x 110mm	4" x 4"	RP3SWRF0471
16	Reducer P trap long		125mm x 110mm	4.5" x 4"	RP3SWRF0461
17	P trap short		110mm x 110mm	4" x 4"	RP3SWRF0491
18	Reducer P trap short		125mm x 110mm	4.5" x 4"	RP3SWRF0481
19	Door cap		75mm	2.5"	RP3SWRF0341
			110mm	4"	RP3SWRF0431
20	Pipe clip		75mm	2.5"	RP3SWRF0351
			110mm	4"	RP3SWRF0441
21	Vent cowl		75mm	2.5"	RP3SWRF0501
			110mm	4"	RP3SWRF0511
22	Cleaning pipe		75mm	2.5"	RP3SWRF0551
			110mm	4"	RP3SWRF0591
23	Nhani trap body		110mm	4"	RP3SWRF0661
24	Nhani trap jali		110mm	4"	RP3SWRF0671
25	Nhani trap with jali		110mm	4"	RP3SWRF0681

## Installation Procedure :

### Ringfit:

#### Step 1: Cutting

Measure and cut pipe to size. Ensure to cut the pipes straight and square. Inspect pipe ends thoroughly before making the cut, if any cracks or split in the ring is noticed cut off a minimum of 25 mm beyond the visible crack before proceeding

#### Step 2: Chamfering and Deburring

Burrs in and on pipe end can obstruct flow/proper contact between the pipe and socket of the fitting during assembly and should be removed from both in and outside of the pipe. A 15 mm dia half round file/a pen knife or a deburring tool is suitable for this purpose. A slight bevel on the end of the pipe will ease entry of the pipe into the fitting socket.

#### Step 3: Fitting Preparation

Use a clean dry cloth to wipe the dirt, moisture from the fitting and pipe end.

#### Step 4: Check for Yellow Seal

Check the socket end for Yellow Seal. Ensure that the yellow part of the seal is towards the outside of socket.

#### Step 5: Lubricant

Apply the lubricant on the chamfered end of the pipe.

#### Step 6: Assembly

Immediately insert the pipe into the fitting socket. Rotate the pipe slightly while inserting. Withdraw pipe until the mark is 12 mm away from socket. This means a 12 mm gap exists between the end of the pipe and the socket register. This gap will allow the pipe to expand without distorting the pipe-work jointing.

C.R.I. RINGFIT Pipes and Fittings are joined with the help of C.R.I.SWR Lubricant. For faster plumbing and leak proof joints we strongly recommend the use of C.R.I. Lubricants only.

### Selfit:

#### Step 1: Cutting

Measure the pipe length accurately and make a visible marking using a felt tip pen. Ensure that the pipe and fittings are size compatible. You can easily cut with a plywood cutting saw/ ratchet cutter or a wheel cutter. Cutting the pipe as squarely as possible (at 90°) provides optimal bonding area within a joint. Inspect pipe ends thoroughly prior to making a joint. If a crack or splintering is noticed cut-off a minimum of 25 mm beyond the visible crack before proceeding.

#### Step 2: Deburring/Beveling

Burrs in and on pipe end can obstruct flow/proper contact between the pipe and socket of the fitting during assembly and should be removed from both in and outside of the pipe. A 15 mm dia half round file/a pen knife or a deburring tool are suitable for this purpose. A slight bevel on the end of the pipe will ease entry of the pipe into the socket of the fitting socket.

#### Step 3: Fitting Preparation

Using a clean dry rag, wipe the dirt and moisture from the fitting sockets and pipe end. Dry fit the pipe to ensure total entry into the bottom of the fittings socket and make a visible marking using a felt tip pen.

#### Step 4: Solvent Cement Application

Apply an even coat of solvent cement on the pipe and the socket end of the fitting. Do not use thickened or lumpy solvent cement. It should have a flow consistency like that of syrup or paint.

#### Step 5: Assembly

Immediately insert the pipe into the fitting socket, rotate the pipe to 90° and 180° turn while inserting. This motion ensures an even distribution of cement within the joint. Hold the assembly for 10 seconds to allow the joint to setup.

C.R.I. SELFIT Pipes and Fittings are joined with the help of C.R.I. SWR solvent cement, which is a single step fast setting solvent cement. The bonding takes place due to chemical fusion of the mating surfaces.

**Limited Warranty:**

C.R.I. Pipes, warrants to the original owner that the product will be free from manufacturing defects and conform to the current applicable IS Standards under normal use. Buyer's remedy for breach of this warranty is limited to replacement of, or credit for, the defective product. This warranty excludes any expense for removal or reinstallation of any defective product and any other incidental, consequential or punitive damages.

The limited warranty will not apply if

1. C.R.I. products are used in combination with any other brand / make of pipes and fittings.
2. C.R.I. Lubricant is not used for C.R.I. Ringfit systems
3. C.R.I. SWR solvent cement is not used for C.R.I. Selfit systems.
4. The product is used for applications other than soil, waste and rain water plumbing.
5. The installation guide provided in the manual is not followed.
6. The systems are not warranted against any mechanical damage by nails, chisels, drilling etc.

**Quality Control Procedures at C.R.I.:**

The pipes and fittings manufactured at C.R.I. follow a stringent quality control process before being rolled out into the market, in order to supply a defect free system to its users. We follow BIS and ASTM Standards for making the product.

**Tests for Pipes**

1. Dimensions: To ensure that all pipe dimensions, particularly wall thickness and outer diameter (roundness), conform to the appropriate standards.
2. Flattening Test: Samples are compressed so that opposite walls are brought together without the pipe cracking, which is a good measure of correct extrusion techniques during production.
3. Drop Impact Test: Weights are dropped on the pipe to observe any cracks or failures.
4. Heat Reversion Test: How much the pipe changes in length when heated in an oven and left to cool. This is a measure of residual stresses left in the pipe during production process.
5. Tensile Strength: To find out the maximum stress that our pipe sample can withstand while being stretched or pulled before breaking OR To check the ability of a material to withstand a pulling force.
6. Stress Relief Test: Test specimen pipe must not show blisters, excessive de-lamination or cracking or signs of weld line splitting after keeping under specified temperature (150 degree Celsius) and specified time duration in air oven or immersion method.
7. Vicat Softening Temperature (VST): To find out the softening point of the material, It is the temperature at which the specimen is penetrated to a depth of 1 mm by a flat-ended needle with a 1 mm<sup>2</sup> circular or square cross-section. OR At which temp. 1 mm<sup>2</sup> needle will penetrate in hot the sample 1 mm depth under a specified load.
8. Water Tightness of Joint: To ensure the pipe joints are free from leakage when applying internal hydrostatic pressure.
9. Resistance to H<sub>2</sub>SO<sub>4</sub>: To check the resistance of pipes with concentrated sulphuric acid.
10. Axial Shrinkage: To check the percentage change in length or shrinkage of pipes and tested at 90°C.
11. Resistance to Dichloromethane at specified Temperature: To check the gelation in pipes, after conducting this test sample should not show any sign of attack.

**Tests for Fittings**

1. **Dimension Check:** To ensure that fittings have correct dimensions, particularly wall thickness, socket diameters and socket depth.
2. **Burst Pressure Check:** Maximum pressure before the fittings burst. This must be over three times the normal pressure rating.
3. **Drop Impact:** Test To check the mechanical property of fittings by dropping freely, in random position from a specified height and temp, on to a flat concrete floor.
4. **Stress Relief Test:** Test specimens fitting must not show blisters, excessive de-lamination or cracking or signs of weld line splitting after keeping under specified temperature (150 degree Celsius) and specified time duration in air oven or immersion method.
5. **Vicat Softening Temperature (VST):** To find out the softening point of the material, It is the temp. at which the specimen is penetrated to a depth of 1 mm by a flat-ended needle with a 1 mm<sup>2</sup> circular or square cross-section. OR At which temp. 1 mm<sup>2</sup> needle will penetrate in hot the sample 1mm depth under a specified load.
6. **Resistance to H<sub>2</sub>SO<sub>4</sub>:** To check the resistance of fittings with concentrated sulphuric acid.
7. **Water Tightness of Joint:** To ensure the fittings joints are free from leakage when applying internal hydrostatic pressure.
8. **Titanium Dioxide Content Test:** To determine the weathering property of fittings by checking the percentage of titanium dioxide present in fittings.
9. **Sulphated Ash Content Test:** The sulphated ash test uses a procedure to measure the amount of residual substance not volatilized from a sample when the sample is ignited in the presence of sulphuric acid. The test is usually used for determining the content of inorganic impurities in an organic substance.

**Handling & Storage:**

Even though our pipes are rigid, they are to be handled with reasonable care. It is suggested to avoid throwing of the pipes or bundles of pipe on the floor. The pipes should not be dragged or pushed from the bed of the truck or container. On the receipt of the pipes, kindly check and inspect for any damage that has occurred during transportation or by improper handling / treatment. In all cases, severe contact of the pipe with any sharp objects such as nails, rocks, angle irons, pieces of glass, etc. should be totally avoided.

Preferably, the pipes are to be stored indoors. If this is not viable, the pipes should be stored on level ground which is dry and free from sharp objects, properly covered avoiding exposure to direct sunlight. If different variants of pipes are to be stacked together, the pipe with the thicker walls should be at the bottom. Kindly see to it that the pipes are placed in alternative layers, perpendicular to each other, with the first layer in a square shape. The maximum stacking height of these pipes should be 7 feet.

**Container stuffing:**

The maximum length of each bundle of pipe is 3.3 meters. Hence, a maximum of three rows of pipe can be stuffed in a 40-foot container. Whereas, in a 20-foot container only one row of pipe can be stuffed. Hence, it is advised to our customers, to order the pipes in a 40-foot container, which significantly reduces their cost of investment per pipe. The remaining space in the container is used to stuff other fittings, which are required to install the plumbing pipes.

**Installation Warning:**

1. Dry fit all joints prior to application of solvent adhesive to confirm proper interference fit.
2. Discard fitting joints without proper interference fit.
3. DO NOT apply solvent adhesive joints that are too loose or too tight.
4. Always use proper bevelling tools to prepare pipe ends before applying adhesive.
5. DO NOT apply solvent adhesive on joints without first bevelling pipe ends.
6. Always provide proper ventilation when applying primers and solvent adhesives.
7. Avoid unnecessary skin or eye contact with primers and solvent adhesives.

8. Wash immediately if contact occurs to avoid prolonged exposure.
9. Follow all manufacturer-recommended precautions when cutting or sawing pipe or when using any flame, heat or power tools.
10. After fixing with the fittings, always check the joint for any leakage by filling it with water.
11. After hydrostatic testing, thoroughly flush the system for at least 10 minutes to remove residual trace amounts of solvent adhesive.
12. Avoid open flames or soldering around solvent adhesive applied joints.
13. Never test C.R.I. pipes, fittings or accessories with compressed air. Serious injury or death can occur.
14. C.R.I. pipes and fittings are for use with water and compatible fluids only. They are not to be used for compressed air.

#### **Frequently Asked Questions:**

##### **1. Are C.R.I. plumbing pipes and fittings UV protected?**

Yes, C.R.I. plumbing pipes and fittings are UV radiation protected upto a certain temperature. In the areas which are predominantly exposed to normal temperatures, i.e. temperatures less than 30°C, C.R.I. plumbing pipes and fittings need no extra protection. Meanwhile, in the areas where temperatures soar above 30°C, it is recommended to cover the pipe in water-based paint, to ensure no change in the colour of the pipe. Kindly note, no oil / solvent based paints to be used on the pipe, as they reduce the life of the pipe drastically.

##### **2. Do we need to insulate C.R.I. CPVC pipes?**

CPVC pipes are very bad conductors of heat. We recommend only a light insulation, that too in applications, where there is a continuous flow of hot water. Kindly ensure that the insulation material does not contain any phthalate plasticiser, as it is not compatible with CPVC and can cause damage to the plumbing system in the long run.

##### **3. For concealed piping, how to prevent damage during drilling / hammering?**

During the concealing work, kindly ask the mason to note down and provide the piping diagram with exact dimensions and file it for future usage. Even though the pipe routing diagram is planned by the engineer, due to operational challenges, most of the cases, it differs from the planned one. A proper layout diagram / pipe routing diagram with exact measurements will always be helpful at the time of need. It can be shared with tiling, electrician and carpentry teams whenever they are working. It will also be helpful to them.

##### **4. Why are the expansion loops used?**

PVC is a plastic material and it expands and contracts, due to the exposure to direct sunlight and due to the change in temperature. To accommodate this change in length, expansion loops are used. The exact usage and the lengths at which they are to be used is explained detailly in the catalogue.

##### **5. Can we use the combination of cPVC and uPVC piping systems?**

Theoretically, yes. We can use the combination of CPVC and uPVC piping systems. But, in many of the cases, it has been observed that due to pressure differentials between the hot and cold-water lines and sometimes due to malfunctioning of NRV valve connected to the heating sources, hot water enters the cold-water lines and if the cold-water line is not temperature resistant, it will lead to bursting of internal lines, causing a huge damage and inconvenience to the customer. Hence, we recommend to use only CPVC for all the internal / concealed plumbing applications for both the hot and cold-water applications.

##### **6. Is the clamping of the pipes, horizontally or vertically essential**

As explained previously, PVC will expand or contract due to temperature changes. Over the period of usage, if not supported properly, the pipes will become wobbly and there are few possibilities of the failure of the system. Hence, we strongly recommend usage of supports, which helps in the sustenance of the system. The distance at which these supports are to be installed for various pipes is explained detailly in the catalogue.

##### **7. What materials are incompatible with cPVC?**

Following are some of the materials, with which CPVC pipes and fittings are incompatible. Vaseline, Roofing tar, Silicone pipe sealants, Insecticides, vegetable oil, Peppermint oil, Liquid adhesive, PVC pipe wrap tape, Acrylic latex caoul and silicone, Tiles and all-purpose adhesive chalk, Aggressive chemical agents, Fire stopping systems, thread sealants, insulation material with phthalate plasticiser, lubricants such as WD 40, Leak detectors, Dioctyl phthalate, etc.



**8. Can CPVC pipes be directly connected to water heating source?**

It is not advised to connect the CPVC pipes and fittings, directly to the water heating sources. Instead, one-meter long metal pipe is to be connected to the water heating source, and to this metal pipe, the CPVC pipes and fittings are to be connected. This method is advised to reduce the heat build-up caused by the excessive radiant heat from the flue. Also, kindly refer and satisfy the plumbing codes applicable to your region.

**9. Are C.R.I. uPVC plumbing pipes and fittings lead free?**

C.R.I. uPVC pipes and fittings are lead free. Across the globe, lead free pipes are preferred for the transportation of potable water. Without any hesitation, you can choose C.R.I. uPVC plumbing pipes and fittings for your potable water requirements.

**10. Are there any health and safety hazards in using a C.R.I. uPVC plumbing pipe for drinking water application?**

No, C.R.I. uPVC plumbing pipes and fittings are perfectly safe to use for drinking water applications. We get our pipe samples tested by some of the leading agencies in the world and we also adhere to strict safety standards. C.R.I. uPVC plumbing pipes and fittings are very resistant to the growth of fungi, algae, bacteria and any other microorganisms. Also, these pipes do not impart any taste or odour into the water. Many of our customers across the globe are using our uPVC pipes and are very satisfied with the quality and the results. And, installation of C.R.I. uPVC plumbing pipes and fittings is time saving and economical. With all these inherent advantages, we strongly recommend you to use C.R.I. uPVC plumbing pipes and fittings for all your drinking water applications.

**11. Does scaling occur in C.R.I. pipes and fittings?**

Scaling is caused by the corrosion of the pipes and is measured by the Hazen-Williams 'C' factor. Higher the value of 'C', lower is the friction and head loss and lower is the possibility of the formation of scaling. In the case of the metal pipe, once the corrosion starts, the value of 'C' will reduce and results in head loss and scaling formation. Since, corrosion does not occur in C.R.I. pipes and fittings, the formation of scaling is inhibited.

**12. Can we interchange the pipes of Ringfit and Solfit SWR systems?**

Ringfit and Solfit are two different technologies for the installation of a SWR piping system. In Ringfit systems, there is no need for a solvent cement to make the connection. The rubber ring takes care of most of the essential functioning of the solvent cement. Whereas, in the Solfit variety, we need to apply the recommended C.R.I. solvent cement and make the connection. The functioning of both of these systems are different. Hence, you cannot interchange a Ringfit system in Solfit system or vice-versa.

**13. Are the lengths of the pipe standard?**

Yes. The lengths of the pipe are standard. Since, we stock most of the pipes to meet the market requirements, we make the length of the pipes standard. But, in one of a condition, if the customer needs a different length of the pipe, other than the standard one, he can enquire with our executives for the same. We would definitely try to accommodate the request. But, there would be a waiting period as we need to accommodate the changes in production plan.

**14. For CPVC pipes, how to repair the punctures in the wall chasing/concealed installation?**

Repair of punctured & damaged pipe due to drilling/chiseling can be done by removing the cement plaster and using the pipe repair piece supplied by the company. Clean thoroughly the area of pipe damaged and make it dry. Apply solvent cement on the surface of pipe at damaged portion in the entire circumference. Also apply solvent cement on the inner surface of pipe repair piece & snap on over damaged area. Tie a small piece of string/binding wire around the repair piece and pipe for sometime to allow to set. This is a unique system available with CPVC pipe where the damaged pipe need not be cut or shifted back & forth for repair. Please conduct pressure test before replastering.

**15. How to support the pipeline during wall chase installations?**

The installation may be supported with the help of pre-drilled 15 mm thick plywood piece, 6" long by 2" wide. After fixing the pipe the wall chasing it may be supported by fixing the plywood piece over the pipe & the chasing. Only 3 to 4 such support may be needed in one toilet/bathroom installation. During installation it is best to avoid contact between pipe & nails. Properly align and firmly grout all threaded fittings inside the chasing with strong mix of cement and sand. Pipe line ends or elbow should be laid at least 2.5 cm inside the wall surface.

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