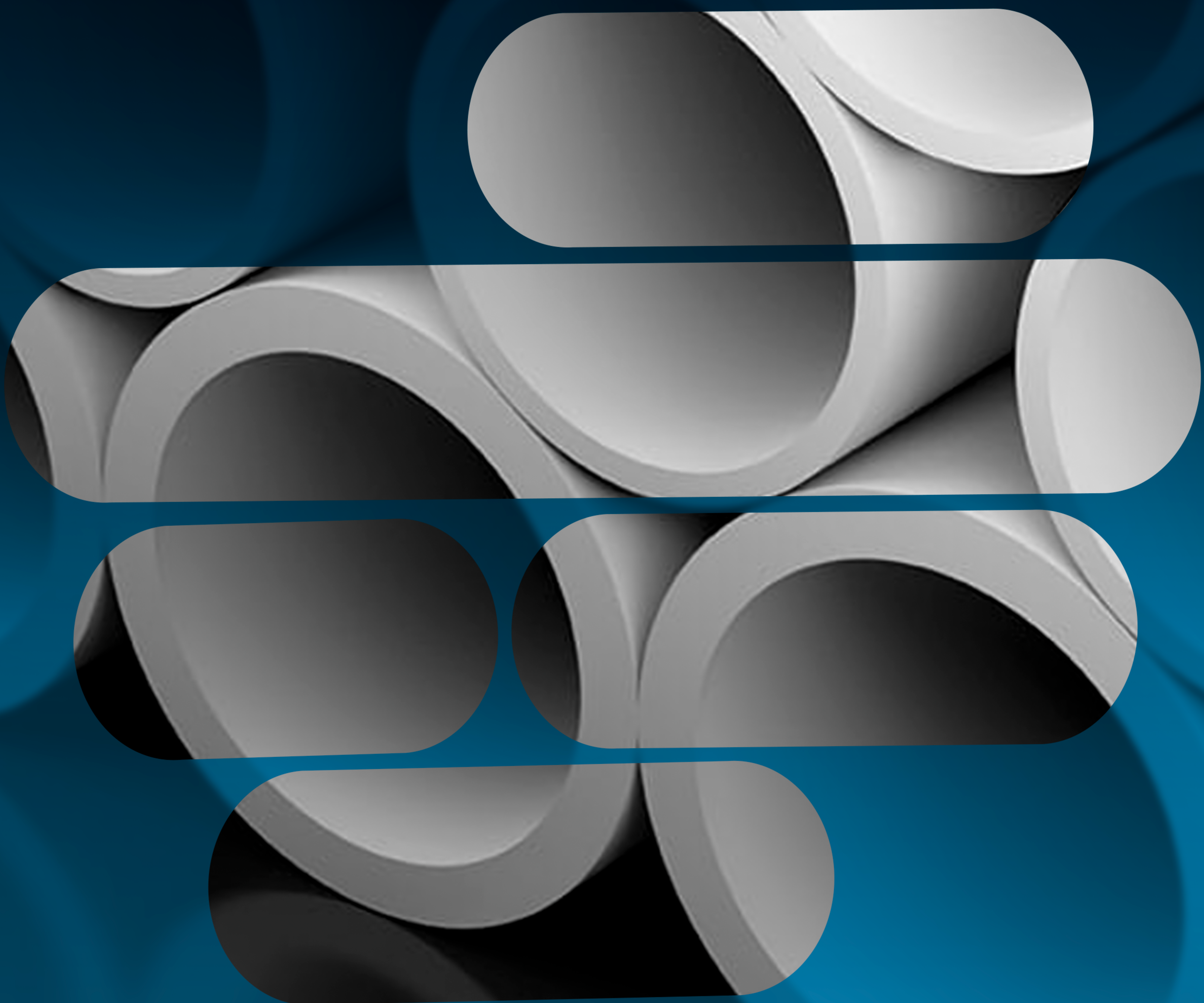


PVC RIGID PIPES

Compliant With ASTM Standards



For Water Supply, Plumbing System, Irrigation System, Drain, Waste and Vent.

INTRODUCTION

This technical catalogue was made for engineers who design and install water and sewage pipelines. This document contains the most up-to-date information now available, based on world wide knowhow and technical knowledge.

SAPPCO, harnesses state of the art and cutting-edge machinery and automation for precision-made PVC pipes.

The accumulated knowledge of our Technical team is openly offered to engineers, and our Technical Service Support is always available to offer guidance and advice on the various applications of SAPPCO PVC pipes.

CUSTOMER SATISFACTION

SAPPCO's core focus and objective, is to ensure unmatched satisfaction by delivering top-quality products and services. Thus as a leader in the plastic pipe industry, SAPPCO is committed to:

- Continuous evaluation and improvement of the process.
- Modernizing manufacturing extrusion systems and testing equipments.
- Offering extensive industry expertise and field knowledge in the thermoplastic piping products by our experienced team and to our valued clients.

MATERIAL DESCRIPTION

Our PVC pipe product is manufactured from rigid PVC compound, which fully complies with the main material standards ASTM D 1784, and as stated in relevant PVC pipe manufacturing standard.

Material Classification	ASTM D 1784	Cell Class	12454
Material Designation	ASTM D 1784	Type 1 , Grade 1	1120
Hydrostatic Design Stress	PPI - USA	psi	2000
Hydrostatic Design Base	PPI - USA	psi	4000

MANUFACTURING STANDARDS

ASTM D 1785	PolyVinyl Chloride(PVC) Plastic Pipe, Schedules 40, 80, 120
ASTM D 2241	PolyVinyl Chloride(PVC) Pressure Rated Pipe (SDR Series)
ASTM D 2665	PolyVinyl Chloride(PVC) Plastic Drain, Waste & Vent pipe & Fittings

These specifications outline the requirements for manufacturing and testings of SAPPCO PVC pressure and DWV

COLOUR OF PIPE

Grey Color	Schedule 80 pipes
White Color	Schedule 40, SDR Series and DWV pipes

LENGTH OF PIPE

SAPPCO's regular standard 6 meter length pipe, while other lengths are also available up on request.

PIPE JOINTING

Pipes are supplied with integral parallel sockets for solvent weld jointing or pipes with plain ends. Schedule 80 pipes are Supplied with plain ends.

QUALITY MANAGEMENT

SAPPCO operates upgraded Quality Management System (QMS) in accordance with the requirements of EN ISO 9001:2015, and has been successfully assessed and certified in this respect by TÜV , after successful annual surveillance audit by the same.

Routine testing of all products produced at our factory is carried out as laid down in the relevant ASTM Standards in our well-equipped laboratory. Inspection of pipes produced by each machine is carried out “round the clock” to make sure that exact standard is well applied, and pipe is compliant with the standard and before it is delivered to our valued clients.

TESTING FROM INDEPENDENT LABORATORY

SAPPCO Quality Plus PVC pipe Schedule 80 is listed by NSF (USA). Our pipe meets the requirement of NSF/ ANSI 61 specification for Drinking Water System Components Health effects.

FITTINGS

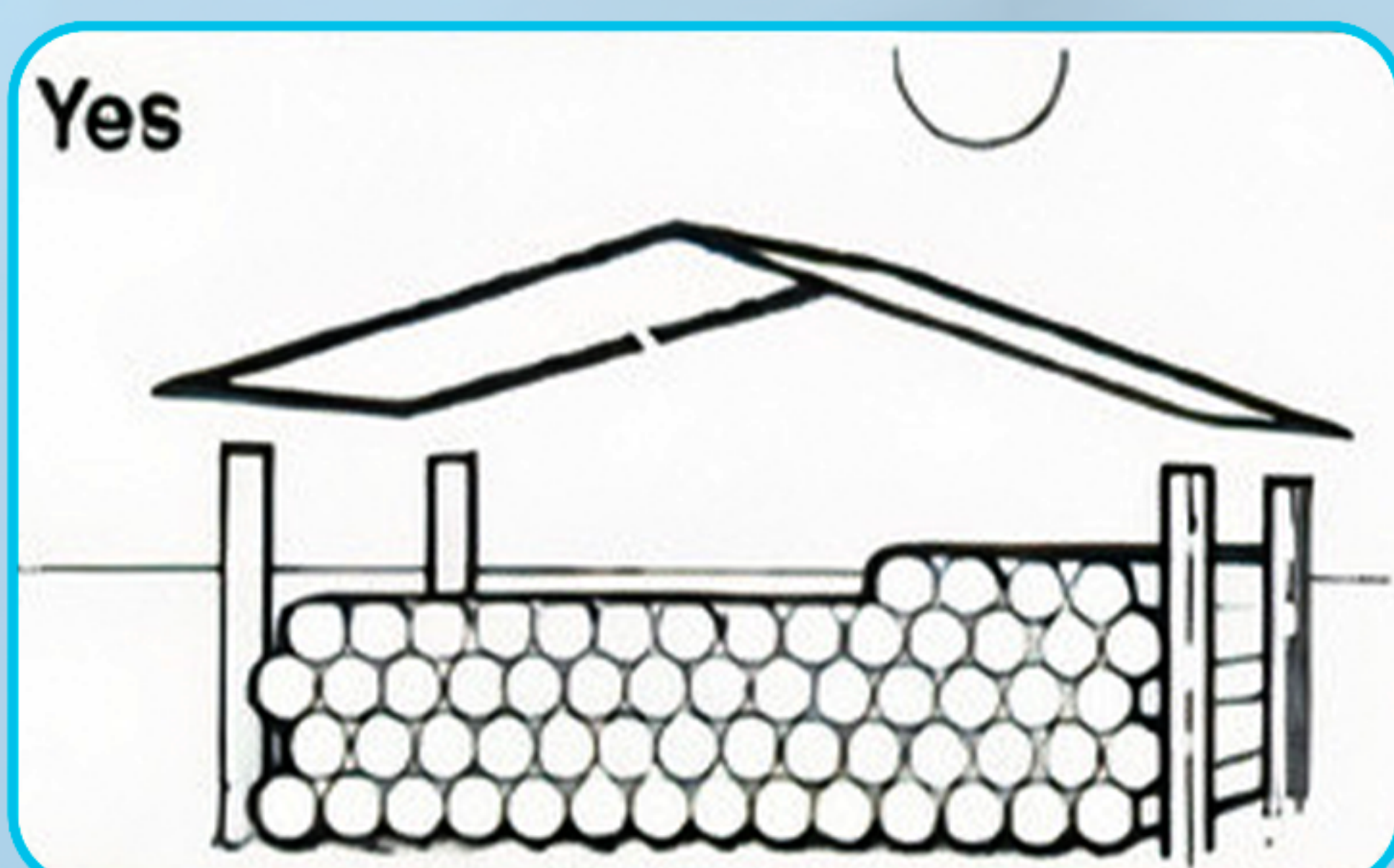
SAPPCO supplies suitable fittings for jointing systems of PVC pipes made by either our associated company APLACO, or other fittings manufacturers who produce the fitting as per the associated standards. These fittings manufactured and conform to the following American Standards:

- ASTM D 2466: PVC pipe fittings - Schedule 40.
- ASTM D 2467: PVC pipe fittings - Schedule 80.
- ASTM D 2665: PVC drain, waste and vent fittings.
- ASTM D 3311: Drain, Waste, and Vent (DWV) fittings patterns.

STORAGE AND HANDLING

PVC Pipes should be shaded but not covered directly when stored outdoor. This will provide for free circulation of air and reduce the heat build-up due to direct sunlight exposure. Care should be taken in handling to avoid dragging, scratching and dropping against sharp objects. Pipe ends should be inspected for cracks resulting from the abuse and which should be cut and discarded.

One of the main reasons for storing PVC pipes in the shade is to avoid ultraviolet (U/V) degradation from the sun's rays.



When continuously exposed to ultraviolet (UV) radiation from sunlight, PVC pipe systems may suffer surface discoloration. This is commonly termed as “UV degradation or sunburning” and color change due to UV attack. Moreover, PVC pipes need to be stored in such a manner as to prevent sagging or

WATER HAMMER CONSIDERATIONS

Surge pressure due to water hammer should be taken into consideration when designing a piping system. A momentary pressure rise may occur when liquid is started and stopped instantly and caused by the momentum of fluid. Pressure rise increases with the velocity of the liquid, the length of the piping system from the fluid source, or with an increase in the speed of starting or stopping actions. For example, hydraulic shock occurs when valves are opened or closed instantly, or pumps are started with an empty pipeline.

Use surge control devices and standpipes wisely to allow flow storage during surge. Check-valves can be used near pumps to help maintain lines full.

Evaluate flow at pump start-up and during shut down. Also determine how much air, if any, is introduced during pump start-up. Fluid velocity not exceeding 1.52 m/sec, will minimize hydraulic shock effects, even with quick-closing of valves.

MATERIAL PROPERTIES

MATERIAL Rigid Polyvinyl Chloride (PVC) Compound

TABLE 1: All values at 23°C (73 °F)

PROPERTY	ASTM TEST METHOD	UNIT	VALUE
General Properties			
Density	D792	g/cm ³	1.42
Water Absorption	D-570/24 Hrs	%	< 0.03
Co-efficient of friction	Hazen-Williams	C (factor)	150
Poisson's Ratio	-	-	0.38
Light Transmission-Grey	E 308	Opacity (%)	Opaque
Mechanical Properties:			
Tensile Strength	D-638 / Type 1	MPa	>48
Modulus of Elasticity in tension	D-638 / Type 1	MPa	>3000
Flexural Strength	D-790 / Proc. B	MPa	93
Compressive Strength	D-695	MPa	66
Izod Impact Resistance	D-256 / notch	J/m	>60
Hardness (Rockwell)	D-785	R	110-120
Thermal Properties:			
Heat Deflection Temp.	D-648 (1.82 MPa)	°C	> 78 (158)
Vicat Softening Temp.	D-1525 (rate)	°C	> 80 (250)
Co-efficient of Linear Thermal Expansion	D-696	cm/ (cm °C)	6.0 × 10 ⁻⁵
Thermal Conductivity	C-177	Kcal/ mh°C	0.14
Flammability Properties:			
Flammability	D-635	Resistance	Self-extinguishing
Time of Burning (Average)	D-635	s	<10
Extent of Burning (Average)	D-635	mm	<15
Flammability rating	UL-94/0.062"	Rating	V-0
Electrical Properties:			
Dielectric Strength	D-149	volts/mil	1100
Dielectric Constant	D-150	60cps@30°C	4.00
Volume Resistivity	D-257	ohm\cm	>10 ¹⁴
Chemical Properties: SAPPCO PVC pipe has excellent chemical resistance to strong mineral acid and bases. (For special application consult our technical sales department)			



SAPPCO Rigid PVC Pipes FOR PRESSURE APPLICATIONS

TABLE 2: Dimensions based on ASTM D1785

Nominal Pipe Size	Outside Diameter	SCHEDULE 40				SCHEDULE 80			
		Minimum Wall Thickness		Nominal Weight	Working Pressure	Minimum Wall Thickness		Nominal Weight	Working Pressure
inch	mm	inch	mm	kg/m	Psi	inch	mm	kg/m	psi
1/2	21.34	0.109	2.77	0.248	600	0.147	3.73	0.309	850
3/4	26.67	0.113	2.87	0.329	480	0.154	3.91	0.418	690
1	33.40	0.133	3.38	0.483	450	0.179	4.55	0.614	630
1 1/4	42.16	0.140	3.56	0.652	370	0.191	4.85	0.850	520
1 1/2	48.26	0.145	3.68	0.779	330	0.200	5.08	1.03	470
2	60.32	0.154	3.91	1.04	280	0.218	5.54	1.43	400
2 1/2	73.02	0.203	5.16	1.65	300	0.276	7.01	2.18	420
3	88.90	0.216	5.49	2.16	260	0.300	7.62	2.91	370
4	114.30	0.237	6.02	3.07	220	0.337	8.56	4.26	320
6	168.28	0.280	7.11	5.41	180	0.432	10.97	8.13	280
8	219.08	0.322	8.18	8.15	160	0.500	12.70	12.4	250
10	273.05	0.365	9.27	11.5	140	0.593	15.06	18.3	230

NOTE:

1. Working pressure indicated in psi is maximum value and is based on water temperature of 23°C. For use of safety factors at higher temperatures please refer to Table 3.
2. Threading of only Schedule 80 pipe is recommended. For threading pipe working pressure consult SAPPCO Technical Sales Team.
3. 14.5 psi = 0.1 MPa = 0.1 N/mm2 = 100 kPa = 1 BAR = 1.02 kg/cm2 = 0.987 atm.

EFFECT OF ELEVATED TEMPERATURE

Rigid PVC pipe is suitable for water application up to 60°C (140°F) and the relationship between recommended maximum working pressures and various temperatures for pipes to ASTM Standards is given in Table 3.

TABLE 3: Safety Factors

Working Temperature	°F	73	80	90	100	110	120	130	140
	°C	23	27	32	38	43	49	54	60
Derating Factors Suitable at elevated temp	Factor	1.0	0.88	0.75	0.62	0.50	0.40	0.30	0.22

SAPPCO Rigid PVC Pipes FOR NON-PRESSURE (DWV) APPLICATIONS

TABLE 4: Dimensions based on ASTM D2665

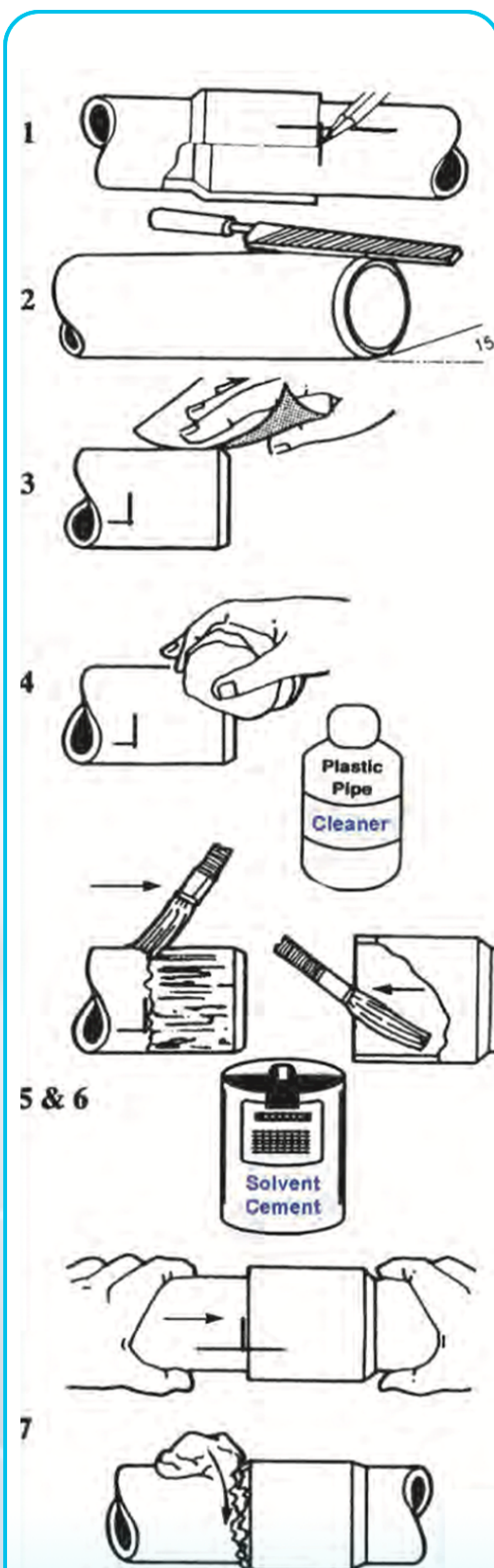
Nominal Pipe Size		OUTSIDE DIAMETER		Minimum Wall Thickness		Nominal Weight
Inch		mm		Inch	mm	Kg/m
1 ^{1/4}		42.16		0.140	3.56	0.652
1 ^{1/2}		48.26		0.145	3.68	0.779
2		60.32		0.154	3.91	1.04
2 ^{1/2}		73.02		0.203	5.16	1.65
3		88.90		0.216	5.49	2.16
4		114.30		0.237	6.02	3.07
6		168.28		0.280	7.11	5.41
8		219.08		0.322	8.18	8.15
10		273.05		0.365	9.27	11.5

TABLE 5: Dimensions based on ASTM D2241 SDR (PRESSURE RATED) SERIES

Nominal Pipe Size	OUTSIDE DIAMETER	SDR 32.5 125 psi		SDR 26 160 psi		SDR 21 200 psi		SDR 17 250 psi	
		Wall Thickness	Nominal Weight	Wall Thickness	Nominal Weight	Wall Thickness	Nominal Weight	Wall Thickness	Nominal Weight
Inch	mm	mm	Kg/m	mm	Kg/m	mm	Kg/m	mm	Kg/m
1 ^{1/2}	48.26					2.3	0.520	2.9	0.634
2	60.32	1.9	0.558	2.3	0.657	2.9	0.804	3.6	0.970
2 ^{1/2}	73.02	2.2	0.772	2.8	0.952	3.5	1.16	4.3	1.39
3	88.90	2.7	1.13	3.4	1.39	4.2	1.68	5.2	2.05
4	114.30	3.5	1.85	4.4	2.28	5.4	2.79	6.7	3.39
6	168.28	5.2	3.99	6.5	4.97	8.0	6.06	9.9	7.39
8	219.08	6.7	6.72	8.4	8.35	10.4	10.2	12.9	12.5
10	273.05	8.4	10.5	10.5	13.0	12.8	15.6	16.1	19.4

JOINTING PROCEDURE FOR SOLVENT WELD JOINTS

Always use solvent cement conforming to ASTM D2564 and check date of expiry on the can.



1. Mark depth of entry of the pipe into the socket and alignment mark. Pipe should be cut square and free from any damage.
2. Make a small chamfer on the edge of the pipe end. Protect the pipe from serrated holding devices and abrasion.
3. Roughen the outside of the pipe and the inside of the socket using sandpaper or emery cloth up to the entry mark.
4. Clean both surfaces and remove all dust, grease and swarf using a dry clean cloth and cleaner. Read instruction on the can.
5. Use proper solvent cement and read instructions on the can. Observing method of usage, precaution, and warning. Do not dilute the solvent cement with cleaning fluid.
6. Apply cement without delay after cleaning, using a flat clean and proper brush. Apply an even unbroken layer brushing axially to the pipe end and socket mouth with a heavier layer on the pipe. Where loose fits are found, the pipe should be given a second coat.
7. Immediately insert the pipe into the socket up to the entry mark, align pipe and socket. Hold in position for a few seconds, then wipe off excess cement.
8. Joints should not be moved or disturbed for initial set time depending on size. Then the jointed pipe may be handled with care. Allow 4 hours if the jointed pipe lengths are to be laid in a trench.
9. Solvent Weld Jointing of large diameter pipe requires special care. Use sufficient hand power to maintain proper alignment and to bottom pipe in socket /fitting.

HOT WEATHER CHALLENGES

Frequently, when laying pipe in hot weather, the direct rays of the sun may cause the surface temperature of the pipe to be in the range of $>50^{\circ}\text{C}$. This is beyond the maximum cementing temperature of 38°C . Following are several suggestions for cementing in hot weather:

1. Cool down the pipe surface by wiping a water-dampened rag, making sure that all traces of moisture are removed from the surface before applying primer and solvent cement. Evaporation of this applied moisture from pipe surface should lower its temperature several degrees.
2. If practical, keep the ends of the pipe shaded from the hot sun before cementing. Fittings and cement should also be shaded.
3. Assemble the pipe into the socket as quickly as possible after applying cement.
4. It is recommended to make the cemented joints during the early morning hours or late evening hours.

PRECAUTION



CAUTION

Cleaners and cements are extremely flammable and must not be stored or used near heat or open flame. Read all warnings on cleaner and cement cans.

Note: All Solvent-welded PVC pipeline systems should be filled and/or flushed with water immediately after installation.

HYDRAULIC TESTING OF PIPELINE

The pressure testing of the pipeline shall be conducted with water at interval initially not exceeding 500 meters and subsequently not exceeding 1000 meters. Pipe should be adequately anchored to prevent movement. The joint and the pipeline should be slowly filled with clean water while taking extra care to prevent surge and air entrapment. All entrapped air must be purged from the line before applying pressure. All air release valves should be installed at high points and a further precaution against air entrapment is to pass a foam swab through the pipeline. The passage of foam swab will additionally clean the line of any debris left in the line during the process of laying.

The temperature of test water should preferably be at maximum 23°C. When testing above 23°C, please use the safety factor given in Table 3 on page 6 in this catalogue. Consideration of safety factor for fittings is also recommended.

The test pressure and duration shall meet the requirements of local regulations where applicable. All safety measures should be taken care of accordingly.

The pipeline should be pressurized to 1.5 times of the system design operating pressure but neither less than 15 psi, nor in excess of the pressure rating for pipe or appurtenances. Measure the pressure at the lowest elevation possible.

The duration of pressurization shall preferably be 1 hour but not to exceed 3 hours. Testing in hot weather is recommended in early morning.

All visible leaks or any leak in excess of the permitted variation should be repaired and the pipeline retested following the same procedure.

IMPORANT NOTES

1. Pipeline system should be designed and constructed to avoid excessive water hammer / surge pressure.
2. Air must be purged from pipelines before applying pressure.
3. Joint must be covered and protected from heat and UV particularly in the mid-day time.
4. Allow 24 hours for line test pressure, with small pipe sizes up to 1 ½ inch it is possible to reduce the time or 8 hours to elapse before working pressure.
5. In hot weather, pressure test in early morning is highly recommended.
6. PVC Non-pressure pipelines installed are tested to low pressures for a specific period of time (leakage tests).

SAFETY MEASURES

WARNING



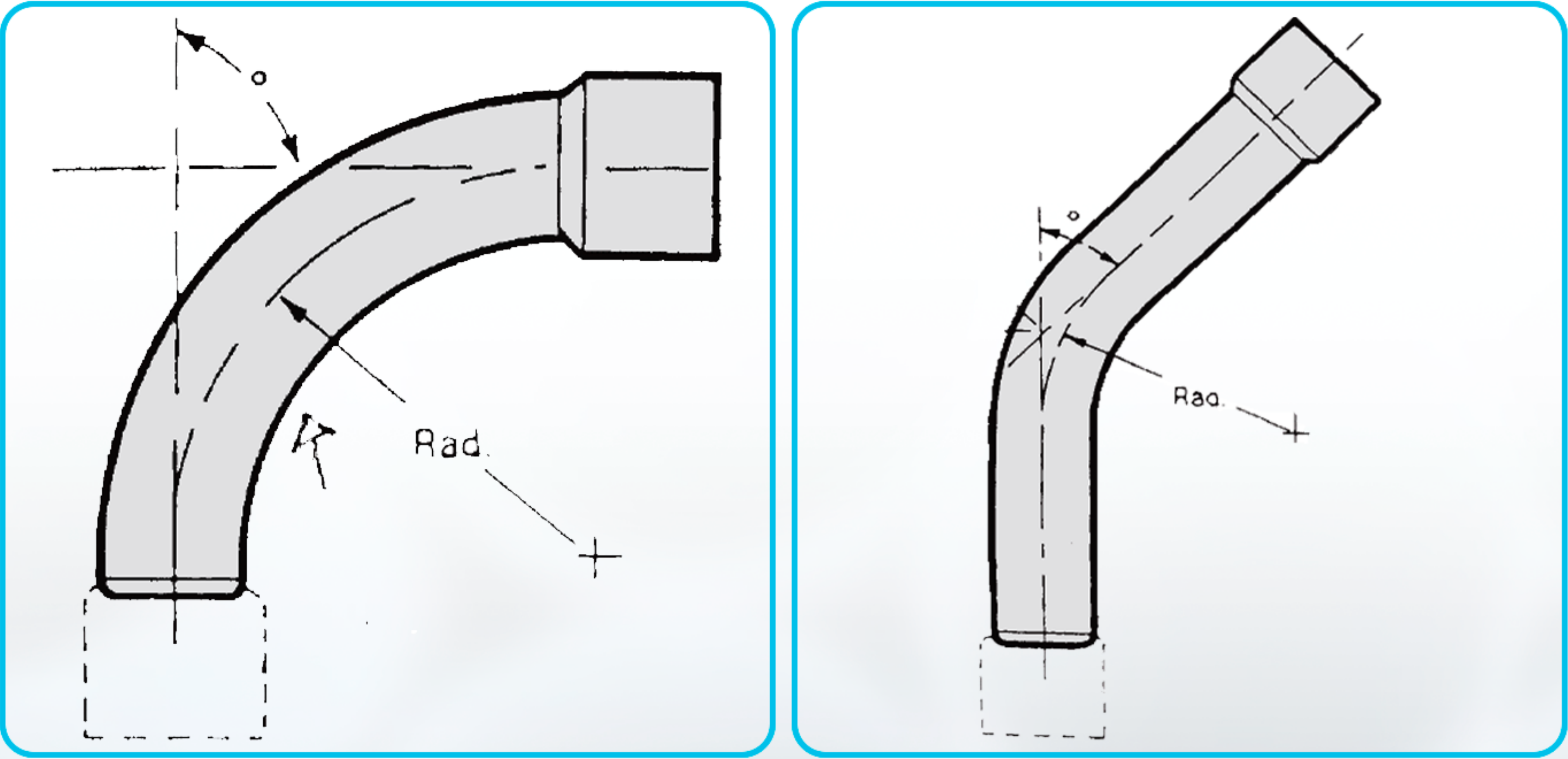
- NEVER use compressed air or gas in PVC pipeline.
- NEVER test PVC pipe and fittings with compressed air or gas.
- ONLY use PVC pipe for water and approved chemicals.

Use of compressed air or gas in PVC pipe and fittings can result in explosive failures and cause severe injury or death.

SAPPCO Rigid PVC Fabricated Fittings to ASTM SCHEDULE 40 Standards

LONG RADIUS

TABLE 6: DIMENSIONS OF 90°C, 45° 22 ½ AND 11¼BENDS



Nominal Pipe Size	Outside Diameter		Radius		LENGTH			
					ANGLE 90°	ANGLE 45°	ANGLE 22 1/2°	ANGLE 11 1/4°
inch	inch	mm	Inch	mm	mm	mm	mm	mm
1/2	0.84	21.34	2.756	70	400	320	280	250
3/4	1.05	26.67	3.456	88	450	350	280	250
1	1.315	33.40	4.409	112	500	370	300	250
1 1/4	1.66	42.16	5.512	140	600	450	320	300
1 1/2	1.90	48.26	6.89	175	700	600	450	450
2	2.375	60.32	8.701	221	1000	850	800	750
2 1/2	2.875	73.02	10.354	263	1100	950	850	800
3	3.500	88.90	12.402	315	1300	1200	1000	1000
4	4.500	114.30	15.157	385	1500	1300	1100	1000
6	6.625	168.28	22.047	560	2000	1500	1200	1100
8	8.625	219.08	31.024	788	2500	2000	1500	1300
10	10.750	273.05	38.582	980	3100	2500	2000	1800

NOTE:

- 1. Fabricated Bends and Fittings are supplied with Solvent Weld Joint on one end or on both ends.
- 2. Fabricated Bends and Fittings in other angles and radius are available on request.
- 3. Specify long radius bend with or without sockets on one end or on both ends.
- 4. These fittings are fabricated from "PASS" pipes manufactured to ASTM D 1785 and D 2665 standards.

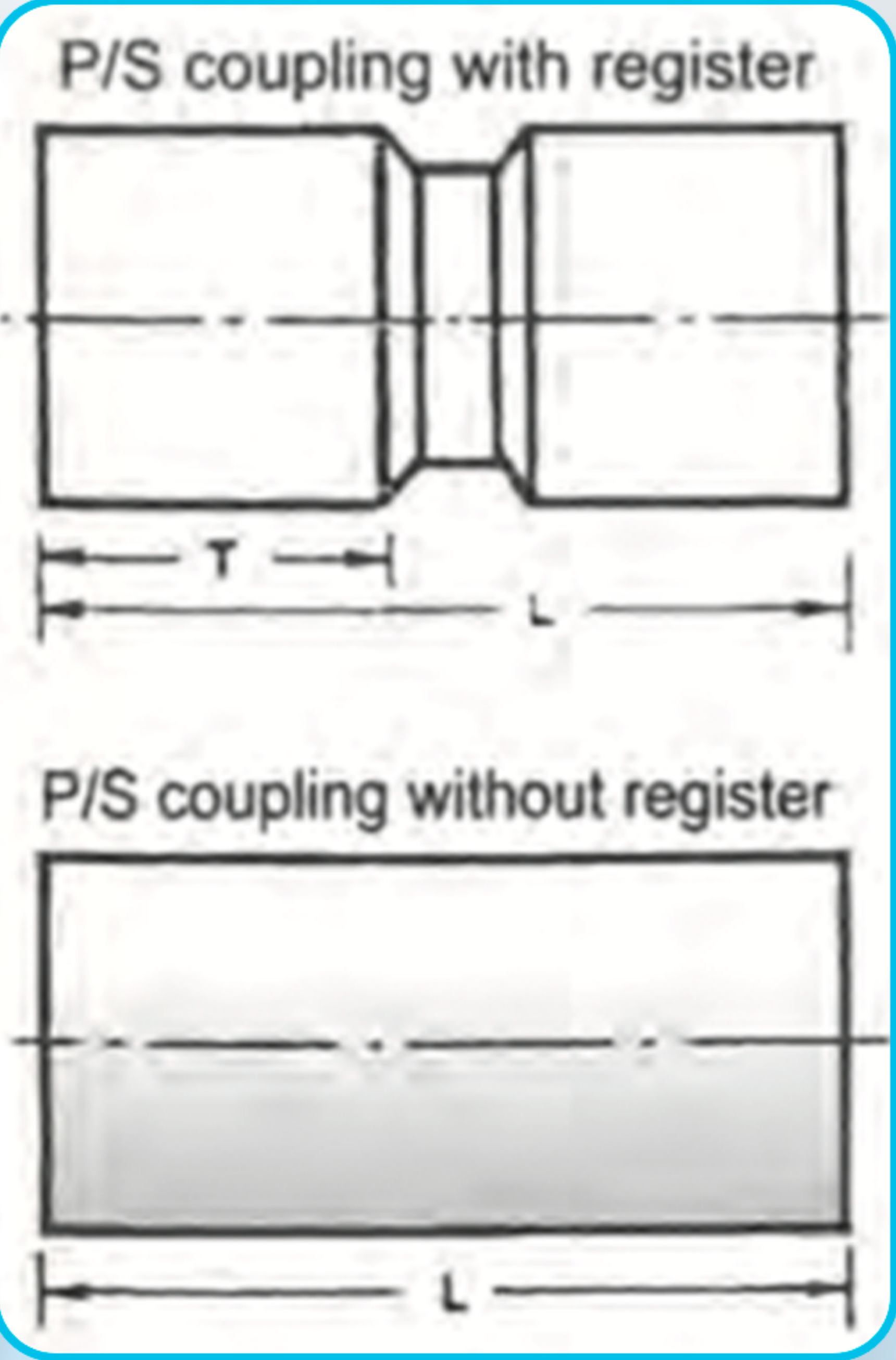
For further inquiries feel free to consult our Technical Sales Team.

SAPPCO Rigid PVC Special Fabricated Fittings

COUPLING WITH REGISTER OR WITHOUT REGISTER
TABLE 7 DIMENSIONS OF COUPLINGS

Nominal Pipe Size Inch	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4	6	8	10
L=MM Coupling Length	58	66	74	94	96	126	140	160	185	250	360	420

NOTE:



- 1. Coupling to be specified with or without register when ordering.
- 2. Adapter couplers (from ASTM to metric system) also available.

For further information or in case of technical enquiry feel free to contact our Technical Sales Team

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