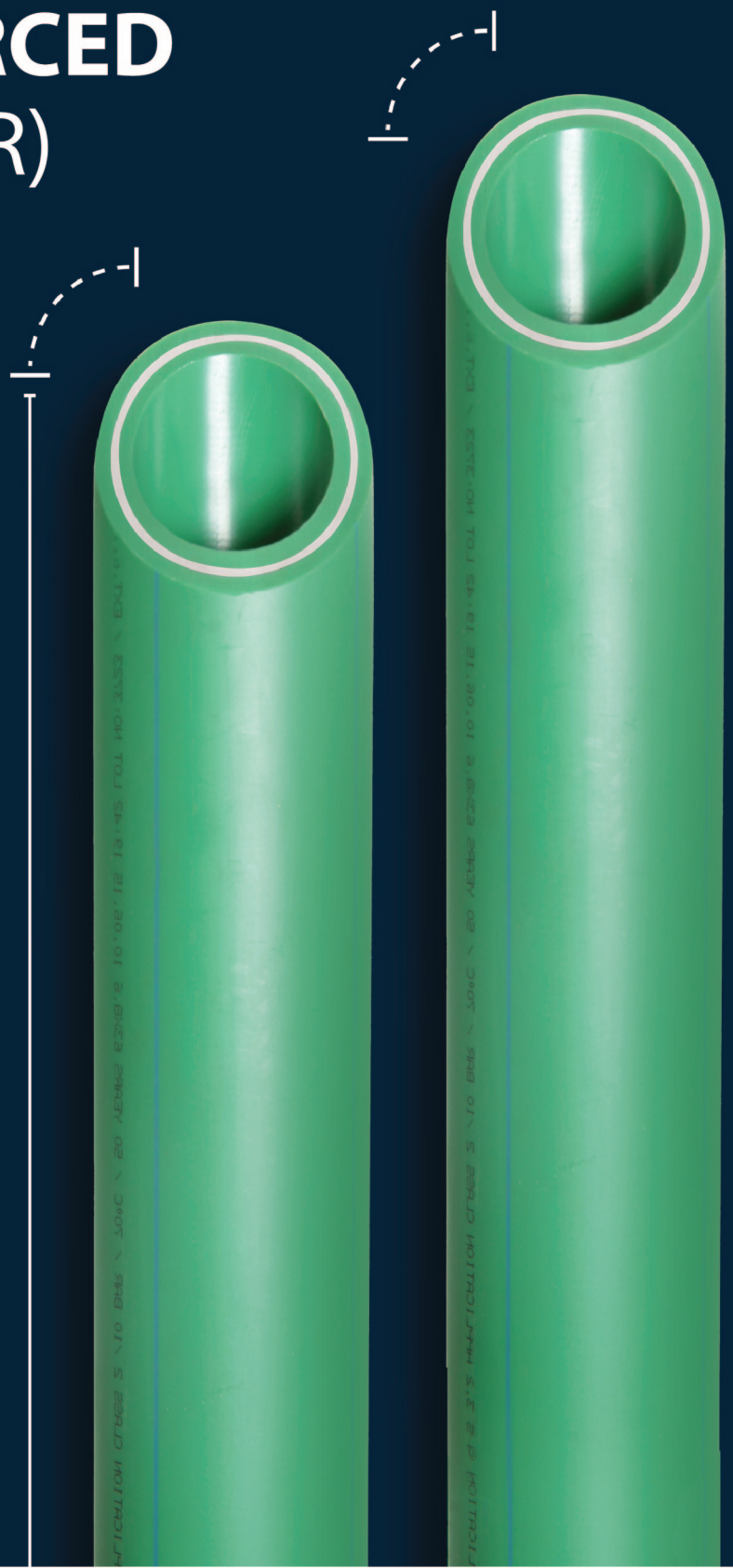
ADVANCED PLASTIC INDUSTRIES

FIBER GLASS REINFORCED PIPE (FGR)



PP-RCT

TECHNICAL HANDBOOK

Fiber Glass Reinforced pipe (FGR)

ADVANCEMENT IN MATERIAL TECHNOLOGY TO BRING NEW SOLUTIONS TO OLD PROBLEMS…

Thermal expansion has been under the light in PP-RCT systems for hot and cold water pipes. Keeping this issue in focus, API with its commitment to quality and innovation developed a multilayer pipe system with a special blend of high quality PP-R material and glass fiber layer to combine the benefits of PP-RCT materials

Application

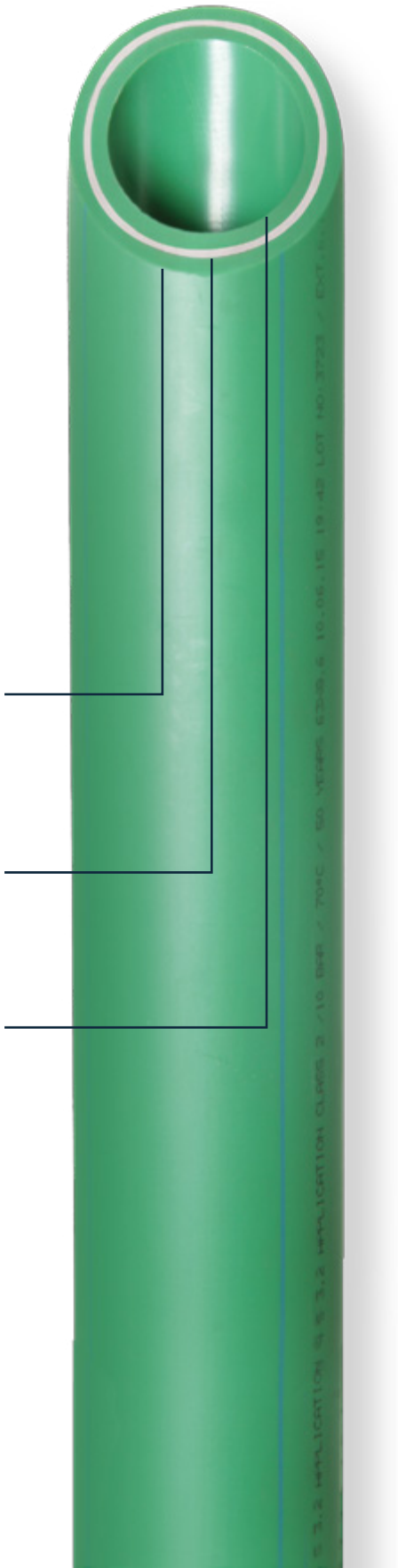
Hot water pipes are installed in conditions and are operated at higher temperatures. Taking this temperature difference into account in the design process aims to develop solutions to reduce any further risk in operation such as stress on the material or failure in welded connections. It also provides an aesthetic appeal to neatly installed pipe systems reflecting API's commitment to quality.

Design

External Layer of PP-RCT material, the new generation of PP-R plastics with special crystalline structure for enhanced long term pressure performance at elevated temperature. This layer will be in contact with fittings in socket fusion and therefore is of the same material as Apitherm fittings

Middle layer of mix between plastic and fiber glass additives in a proprietary formula that not only reduces thermal expansion but also contributes to the pressure performance of the pipe.

Internal layer of the same PP-RCT material as the outside layer; not only contributing to the pressure performance at high temperatures, but also ensuring that water in contact does not change its taste or odor, and remains permissible for drinking and domestic uses.



Benefits

- Reduced thermal expansion
- Enhanced impact resistance at low temperature
- Same jointing methods as plain pipe
- Compatible with PP-RCT fittings

Products

Outer Diameter	Thickness SDR 7.4 (S 3.2)	Thickness SDR 6 (SDR 2.5)
20 mm	2.8 mm	3.4 mm
25 mm	3.5 mm	4.2 mm
32 mm	4.4 mm	5.4 mm
40 mm	5.5 mm	6.7 mm
50 mm	6.9 mm	8.3 mm
63 mm	8.6 mm	10.5 mm
75 mm	10.3 mm	12.5 mm
90 mm	12.3 mm	15.0 mm
110 mm	15.1 mm	18.3 mm
125 mm	17.1mm	20.9 mm
160 mm	21.9	26.7 mm

Pressure Performance

Temp	10 yr	25 yr	50 yr
10 °C	28.7	28.4	28.0
20 °C	25.0	24.6	24.5
30 °C	21.5	21.2	20.7
40 °C	18.4	18.0	17.7
50 °C	15.6	15.3	15.0
60 °C	13.2	12.9	12.6
70 °C	11.0	10.7	10.5

Temp	10 yr	25 yr	50 yr
10 °C	36.2	35.5	34.6
20 °C	31.4	30.8	30.4
30 °C	27.1	26.6	26.2
40 °C	23.2	22.7	22.4
50 °C	19.7	19.3	19.0
60 °C	16.6	16.3	16.0
70 °C	13.9	13.6	13.3

Pressure performance in bars of API Fiber Composite pipes as determined according to:

- ISO 15874 for hot and cold pipe systems made of polypropylene
- ISO 21003 for multilayer hot and cold pipe systems
- DIN 8077 and DIN 8078 for pressure pipe systems from PP-RCT

*SF = 1.5

Thermal Expansion

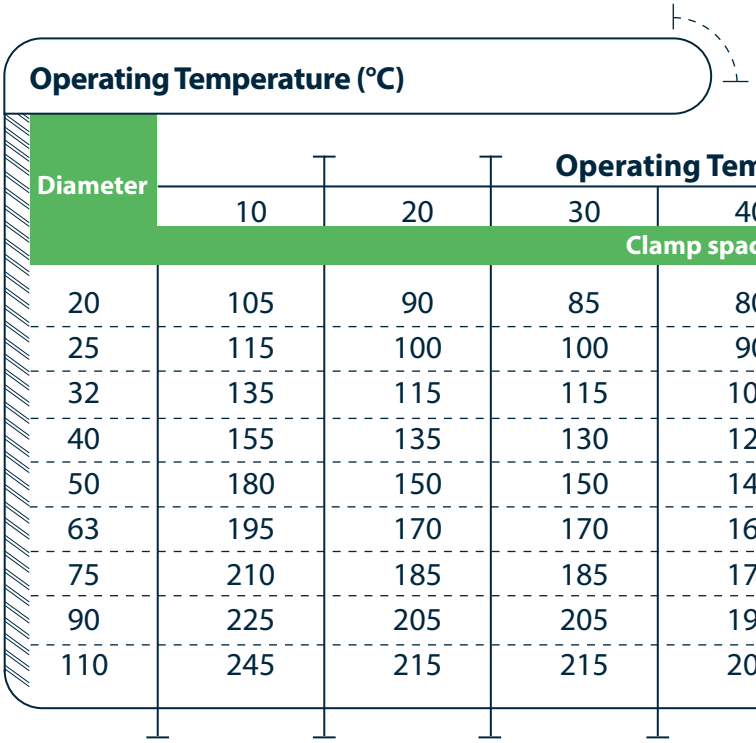
Thermal expansion is a natural occurrence when the fluid in the pipe is at a higher temperature than the temperature at which the pipe was installed. It is determined by the formula $\Delta L = \alpha \cdot L \cdot \Delta T$

α is the thermal expansion coefficient = 0.035 mm/m.°C

L is the free length on the pipe run in meters

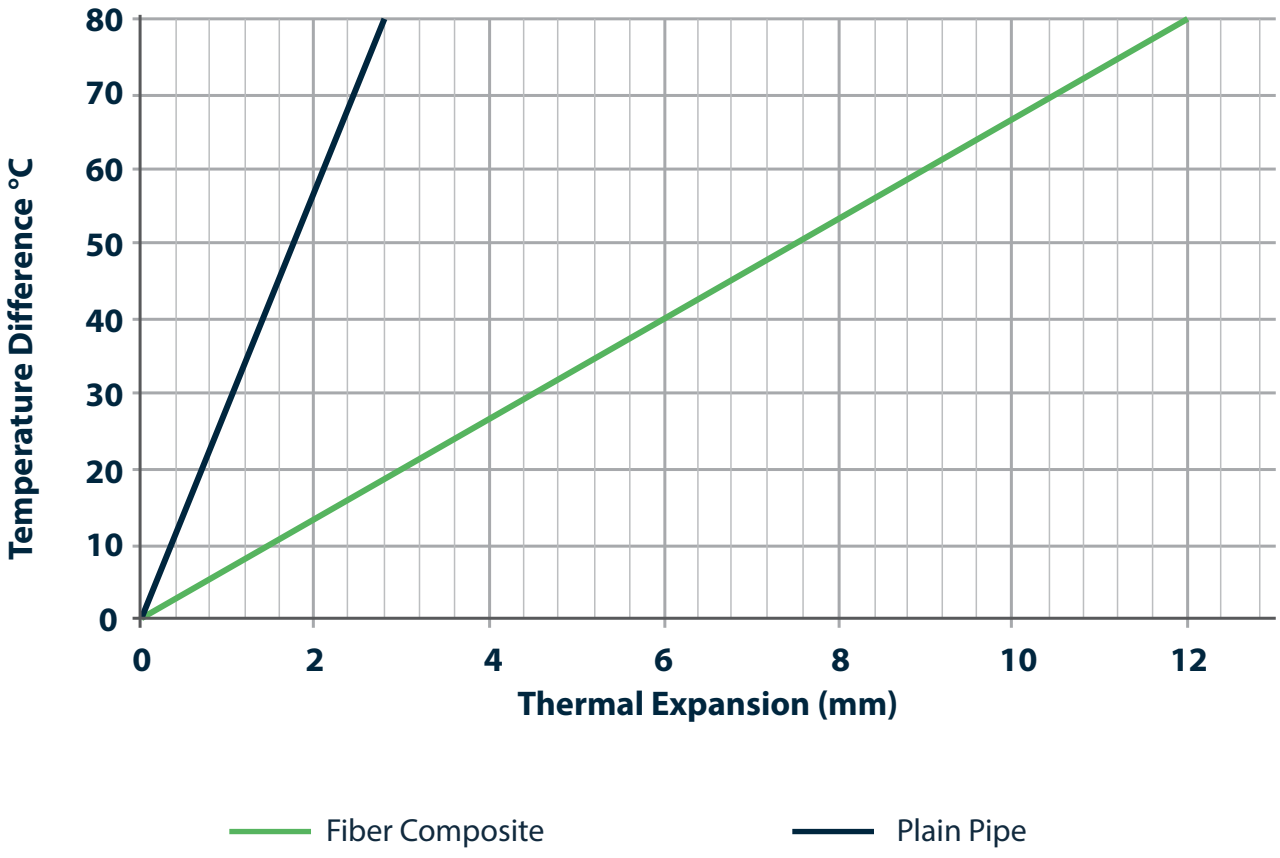
ΔT is the temperature difference

To reduce thermal expansion and keep it under control, the following spacing should be used between hangers.



Diameter	Operating Temperature (°C)						
	10	20	30	40	50	60	70
	Clamp spacing (cm)						
20	105	90	85	80	80	75	65
25	115	100	100	90	90	85	75
32	135	115	115	105	105	100	90
40	155	135	130	120	120	115	105
50	180	150	150	140	140	130	125
63	195	170	170	160	160	150	140
75	210	185	185	170	170	160	150
90	225	205	205	190	190	175	175
110	245	215	215	205	195	195	185

Clamps with a rubber seal are preferred for the friction and holding strength they exert on the pipe.


Temperature Difference °C
80
70
60
50
40
30
20
10
0
0
2
4
6
8
10
12
Thermal Expansion (mm)
Fiber Composite
Plain Pipe

Pressure Friction Loss

Friction of flowing water on pipe walls creates miniscule pressure drops. API's expertise in manufacturing provides a smooth inner surface free of bumps and waves to ensure minimal pressure losses. The tables below summarize average velocities and pressure drops per linear meter of pipe at various water flowrates.

FLOW RATE L/s		Outer Diameter (SDR 7.4 Pipes)										
		20	25	32	40	50	63	75	90	110	125	160
0.01	R	0.09	0.03	0.01								
	V	0.06	0.04	0.02								
0.02	R	0.27	0.10	0.03	0.01							
	V	0.12	0.08	0.05	0.03							
0.03	R	0.54	0.19	0.06	0.02							
	V	0.18	0.12	0.07	0.05							
0.04	R	0.87	0.31	0.09	0.03	0.01						
	V	0.25	0.16	0.09	0.06	0.04						
0.05	R	1.28	0.45	0.14	0.05	0.02						
	V	0.31	0.20	0.12	0.08	0.05						
0.06	R	1.75	0.61	0.18	0.06	0.02	0.01					
	V	0.37	0.24	0.14	0.09	0.06	0.04					
0.07	R	2.28	0.79	0.24	0.08	0.03	0.01					
	V	0.43	0.28	0.17	0.11	0.07	0.04					
0.08	R	2.88	1.00	0.30	0.11	0.04	0.01					
	V	0.49	0.31	0.19	0.12	0.08	0.05					
0.09	R	3.53	1.22	0.37	0.13	0.05	0.02					
	V	0.55	0.35	0.21	0.14	0.09	0.05					
0.1	R	4.24	1.47	0.44	0.15	0.05	0.02	0.01				
	V	0.61	0.39	0.24	0.15	0.10	0.06	0.04				
0.12	R	5.83	2.02	0.61	0.21	0.07	0.02	0.01				
	V	0.74	0.47	0.28	0.81	0.12	0.07	0.05				
0.14	R	7.64	2.64	0.79	0.27	0.10	0.03	0.01				
	V	0.86	0.55	0.33	0.21	0.14	0.08	0.06				
0.16	R	9.66	3.33	1.00	0.35	0.12	0.04	0.02				
	V	0.98	0.63	0.38	0.24	0.16	0.10	0.07				
0.18	R	11.89	4.09	1.22	0.42	0.15	0.05	0.02	0.01			
	V	1.11	0.71	0.43	0.27	0.17	0.11	0.08	0.05			
0.19	R	13.09	4.50	1.34	0.47	0.16	0.05	0.02	0.01			
	V	1.17	0.75	0.45	0.29	0.18	0.12	0.08	0.06			
0.2	R	14.33	4.93	1.47	0.51	0.18	0.06	0.03	0.01			
	V	1.23	0.79	0.47	0.30	0.19	0.12	0.09	0.06			
0.3	R	29.48	10.08	2.99	1.03	0.36	0.12	0.05	0.02	0.01		
	V	1.84	1.18	0.71	0.45	0.29	0.18	0.13	0.09	0.06		
0.4	R	49.39	16.82	4.97	1.71	0.59	0.19	0.09	0.04	0.01	0.01	
	V	2.46	1.57	0.95	0.61	0.39	0.24	0.17	0.12	0.08	0.06	
0.5	R	73.90	25.08	7.39	2.54	0.88	0.29	0.13	0.05	0.02	0.01	
	V	3.07	1.96	1.18	0.76	0.49	0.30	0.22	0.15	0.10	0.08	
0.6	R	102.8	34.81	10.23	3.50	1.21	0.39	0.17	0.07	0.03	0.02	
	V	3.68	2.36	1.42	0.91	0.58	0.36	0.26	0.18	0.12	0.09	
0.7	R	136.2	45.99	13.48	4.61	1.59	0.52	0.23	0.09	0.04	0.02	0.01
	V	4.30	2.75	1.66	1.06	0.68	0.42	0.30	0.21	0.14	0.11	0.07
8	R	174.0	58.58	17.14	5.85	2.02	0.66	0.29	0.12	0.05	0.03	0.01
	V	4.91	3.14	1.89	1.21	0.78	0.49	0.34	0.24	0.16	0.12	0.08
9	R	216.0	72.57	21.19	7.22	2.49	0.81	0.35	0.15	0.06	0.03	0.01
	V	5.53	3.54	2.13	1.36	0.87	0.55	0.39	0.27	0.18	0.14	0.08

V : Velocity in m/s *R : Pressure loss in mbar/m*

FLOW RATE L/s		Outer Diameter (SDR 7.4 Pipes)										
		20	25	32	40	50	63	75	90	110	125	160
1	R	262.3	87.94	25.62	8.72	3.00	0.97	0.43	0.18	0.07	0.04	0.01
	V	6.75	3.93	2.37	1.67	0.97	0.61	0.43	0.30	0.20	0.15	0.09
1.1	R	312.8	104.6	30.44	10.35	3.56	1.15	0.51	0.21	0.08	0.04	0.01
	V	6.75	4.32	2.60	1.67	1.07	0.67	0.47	0.33	0.22	0.17	0.10
1.2	R	367.5	122.7	35.65	12.10	4.16	1.34	0.59	0.24	0.09	0.05	0.02
	V	7.37	4.72	2.84	1.82	1.17	0.73	0.52	0.36	0.24	0.19	0.11
1.3	R	426.5	142.2	41.23	13.98	4.80	1.55	0.68	0.28	0.11	0.06	0.02
	V	7.98	5.11	3.08	1.97	1.26	0.79	0.56	0.39	0.26	0.20	0.12
1.4	R	489.6	163.0	47.18	15.98	5.48	1.77	0.78	0.32	0.12	0.07	0.02
	V	8.60	5.50	3.31	2.12	1.36	0.85	0.60	0.42	0.28	0.22	0.13
1.5	R	556.8	185.1	53.50	18.10	6.20	2.00	0.88	0.36	0.14	0.08	0.02
	V	9.21	5.89	3.55	2.27	1.46	0.91	0.65	0.45	0.30	0.23	0.14
1.6	R	628.2	208.5	60.20	20.34	6.96	2.24	0.98	0.41	0.16	0.08	0.03
	V	9.82	6.29	3.78	2.42	1.55	0.97	0.69	0.48	0.32	0.25	0.15
1.7	R	703.8	233.3	67.26	22.71	7.77	2.50	1.10	0.45	0.18	0.09	0.03
	V	10.44	6.68	4.02	2.57	1.65	1.03	0.73	0.51	0.34	0.26	0.16
1.8	R	783.4	259.4	74.68	25.19	8.61	2.77	1.21	0.50	0.19	0.10	0.03
	V	11.05	7.07	4.26	2.73	1.75	1.09	0.77	0.54	0.36	0.28	0.17
1.9	R		286.7	82.47	27.79	9.49	3.05	1.34	0.55	0.21	0.12	0.04
	V		7.47	4.49	2.88	1.85	1.15	0.82	0.57	0.38	0.29	0.18
2	R		315.4	90.62	30.51	10.41	3.35	1.46	0.61	0.23	0.13	0.04
	V		7.86	4.73	3.03	1.94	1.21	0.86	0.60	0.40	0.31	0.19
2.2	R		376.8	107.9	36.30	12.37	3.97	1.74	0.72	0.28	0.15	0.05
	V		8.65	5.20	3.33	2.14	1.34	0.95	0.65	0.44	0.34	0.21
2.4	R		443.3	126.7	42.56	14.48	4.65	2.03	0.84	0.32	0.17	0.05
	V		9.43	5.68	3.63	2.33	1.46	1.03	0.71	0.48	0.37	0.23
2.6	R		515.0	147.0	49.27	16.75	5.37	2.34	0.97	0.37	0.20	0.06
	V		10.22	6.15	3.94	2.53	1.58	1.12	0.77	0.52	0.40	0.25
2.8	R			168.6	56.45	19.16	6.13	2.67	1.10	0.42	0.23	0.07
	V			6.62	4.24	2.72	1.70	1.20	0.83	0.56	0.43	0.26
3	R			191.7	64.08	21.73	6.95	3.03	1.25	0.48	0.26	0.08
	V			7.10	4.54	2.91	1.82	1.29	0.89	0.60	0.46	0.28
3.5	R			255.4	85.12	28.79	9.19	4.00	1.65	0.63	0.34	0.10
	V			8.28	5.30	3.40	2.12	1.51	1.04	0.70	0.54	0.33
4	R			327.8	108.9	36.77	11.71	5.09	2.09	0.80	0.43	0.13
	V			9.46	6.06	3.89	2.43	1.72	1.19	0.80	0.62	0.38
4.5	R			408.9	135.5	45.65	14.51	6.30	2.59	0.99	0.53	0.16
	V			10.65	6.81	4.37	2.73	1.94	1.34	0.90	0.69	0.42
5	R				164.9	55.43	17.59	7.63	3.13	1.20	0.64	0.20
	V				7.57	4.86	3.03	2.15	1.49	1.00	0.77	0.47
5.5	R				197.0	66.10	20.94	9.07	3.72	1.42	0.76	0.23
	V				8.33	5.34	3.34	2.37	1.64	1.10	0.85	0.52
6	R				231.8	77.65	24.56	10.63	4.35	1.67	0.89	0.27
	V				9.08	5.83	3.64	2.58	1.79	1.20	0.93	0.57
6.5	R				269.4	90.08	28.45	12.30	5.03	1.92	1.03	0.32
	V				9.84	6.32	3.95	2.80	1.93	1.30	1.00	0.61
7	R				309.6	103.3	32.60	14.09	5.76	2.20	1.18	0.36
	V				10.60	6.80	4.25	3.01	2.08	1.40	1.08	0.66
7.5	R					117.5	37.03	15.98	6.53	2.49	1.34	0.41
	V					7.29	4.55	3.23	2.23	1.50	1.16	0.71
8	R					132.5	41.71	17.99	7.35	2.80	1.50	0.46
	V					7.77	4.86	3.44	2.38	1.60	1.24	0.75
8.5	R					148.4	46.66	20.11	8.21	3.13	1.68	0.51
	V					8.26	5.16	3.66	2.38	1.70	1.31	0.80
9	R					165.2	51.86	22.34	9.11	3.47	1.86	0.57
	V					8.74	5.46	3.87	2.68	1.80	1.39	0.85
9.5	R					182.8	57.33	24.67	10.05	3.83	2.05	0.62
	V					9.23	5.77	4.09	2.83	1.90	1.47	0.90
10	R					201.3	63.06	27.12	11.04	4.20	2.25	0.68
	V					9.72	6.07	4.30	2.98	2.00	1.54	0.94

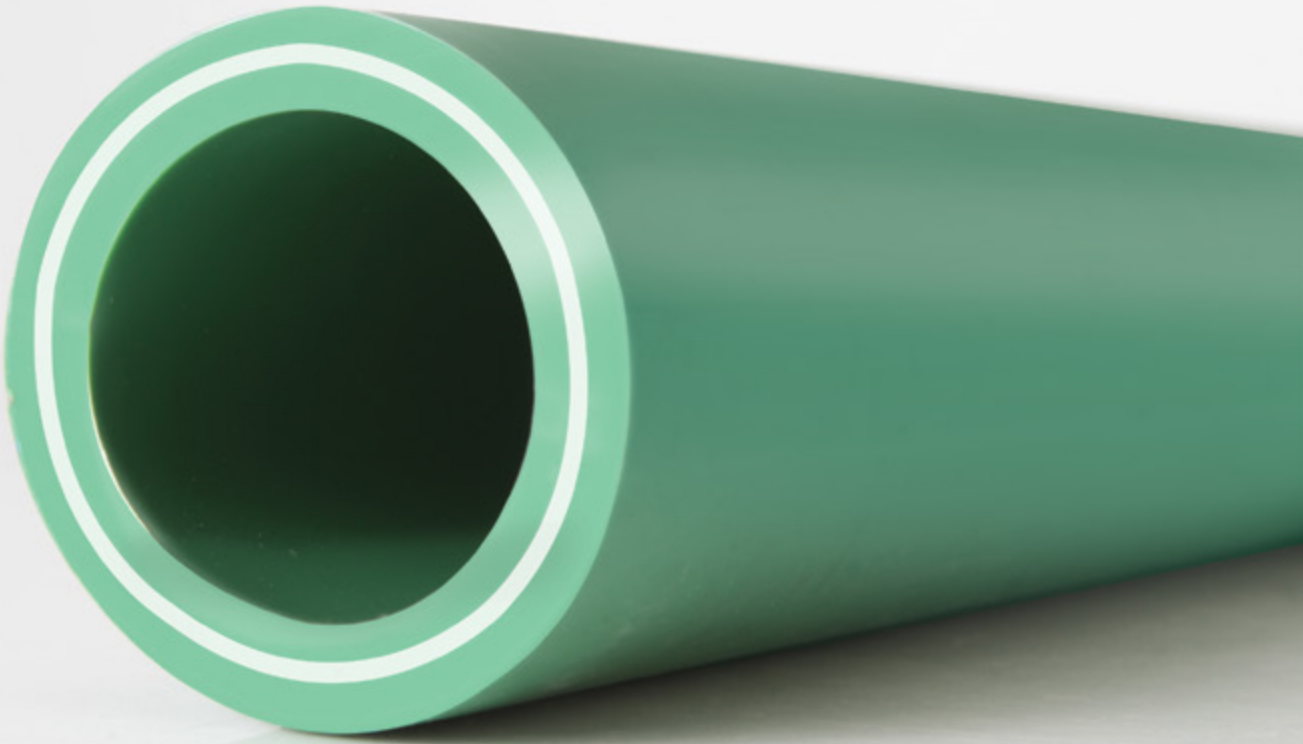
V : Velocity in m/s *R : Pressure loss in mbar/m*

FLOW RATE L/s		Outer Diameter (SDR 6 Pipes)										
		20	25	32	40	50	63	75	90	110	125	160
0.01	R	0.13	0.04	0.01	0.01							
	V	0.07	0.05	0.03	0.02							
0.02	R	0.41	0.14	0.04	0.02							
	V	0.15	0.09	0.06	0.04							
0.03	R	0.81	0.27	0.09	0.03	0.01						
	V	0.22	0.14	0.08	0.05	0.03						
0.04	R	1.32	0.45	0.14	0.05	0.02						
	V	0.29	0.18	0.11	0.07	0.05						
0.05	R	1.93	0.65	0.21	0.07	0.02						
	V	0.37	0.23	0.14	0.09	0.06						
0.06	R	2.64	0.89	0.28	0.10	0.03						
	V	0.44	0.28	0.17	0.11	0.07						
0.07	R	3.45	1.16	0.37	0.13	0.04	0.01					
	V	0.51	0.32	0.20	0.13	0.08	0.05					
0.08	R	4.34	1.47	0.46	0.16	0.05	0.02					
	V	0.58	0.37	0.23	0.14	0.09	0.06					
0.09	R	5.33	1.80	0.56	0.19	0.07	0.02	0.01				
	V	0.66	0.42	0.25	0.16	0.10	0.06	0.05				
0.1	R	6.41	2.16	0.68	0.23	0.08	0.03	0.01				
	V	0.73	0.46	0.28	0.18	0.11	0.07	0.05				
0.12	R	8.82	2.96	0.93	0.32	0.11	0.04	0.02				
	V	0.88	0.55	0.34	0.22	0.14	0.09	0.06				
0.14	R	11.56	3.87	1.21	0.41	0.14	0.05	0.02				
	V	1.02	0.65	0.40	0.25	0.16	0.10	0.07				
0.16	R	14.62	4.89	1.53	0.52	0.18	0.06	0.03	0.01			
	V	1.17	0.74	0.45	0.29	0.18	0.12	0.08	0.06			
0.18	R	18.01	6.02	1.88	0.64	0.22	0.07	0.03	0.01			
	V	1.32	0.83	0.51	0.32	0.21	0.13	0.09	0.06			
0.2	R	21.71	7.24	2.25	0.77	0.26	0.09	0.04	0.02			
	V	1.46	0.92	0.57	0.36	0.23	0.14	0.10	0.07			
0.3	R	44.72	14.84	4.60	1.56	0.53	0.18	0.08	0.02	0.01		
	V	2.19	1.39	0.85	0.54	0.34	0.22	0.15	0.07	0.05		
0.4	R	75.01	24.79	7.65	2.58	0.87	0.29	0.13	0.03	0.01	0.01	
	V	2.92	1.85	1.13	0.72	0.46	0.29	0.20	0.11	0.07	0.05	
0.5	R	112.3	36.98	11.38	3.83	1.29	0.43	0.19	0.05	0.02	0.01	
	V	3.65	2.31	1.42	0.90	0.57	0.36	0.25	0.14	0.09	0.07	
0.6	R	156.5	51.37	15.76	5.29	1.78	0.60	0.26	0.08	0.03	0.02	
	V	4.38	2.77	1.70	1.08	0.68	0.43	0.31	0.18	0.12	0.09	
0.7	R	207.4	67.89	20.77	6.97	2.34	0.78	0.34	0.11	0.04	0.02	0.01
	V	5.12	3.23	1.98	1.26	0.80	0.51	0.36	0.21	0.14	0.11	0.07
0.8	R	265.0	86.53	26.42	8.84	2.96	0.99	0.43	0.14	0.05	0.03	0.01
	V	5.85	3.70	2.27	1.44	0.91	0.58	0.41	0.25	0.17	0.13	0.08
0.9	R	329.2	107.2	32.67	10.92	3.66	1.22	0.53	0.18	0.07	0.04	0.01
	V	6.58	4.16	2.55	1.62	1.03	0.65	0.46	0.28	0.19	0.15	0.09
1	R	399.9	130.0	39.53	13.19	4.41	1.47	0.64	0.22	0.09	0.05	0.01
	V	7.31	4.62	2.83	1.80	1.14	0.72	0.51	0.32	0.21	0.16	0.10
1.1	R	477.2	154.8	46.98	15.66	5.23	1.74	0.76	0.27	0.10	0.06	0.02
	V	8.04	5.08	3.12	1.98	1.26	0.79	0.56	0.35	0.24	0.18	0.11
1.2	R	560.9	181.6	55.03	18.32	6.11	2.03	0.88	0.37	0.14	0.08	0.02
	V	8.77	5.54	3.40	2.16	1.37	0.87	0.61	0.42	0.28	0.22	0.13
1.3	R	651.1	210.5	63.67	21.17	7.05	2.34	1.02	0.43	0.16	0.09	0.03
	V	9.50	6.01	3.68	2.34	1.48	0.94	0.66	0.46	0.31	0.24	0.15
1.4	R	747.7	241.3	72.88	24.21	8.06	2.68	1.16	0.48	0.19	0.10	0.03
	V	10.23	6.47	3.97	2.52	1.60	1.01	0.71	0.50	0.33	0.26	0.16

V : Velocity in m/s *R : Pressure loss in mbar/m*

FLOW RATE L/s		Outer Diameter (SDR 6 Pipes)										
		20	25	32	40	50	63	75	90	110	125	160
1.5	R	850.6	274.1	82.67	27.43	9.12	3.03	1.31	0.55	0.21	0.11	0.04
	V	10.96	6.93	4.25	2.70	1.71	1.08	0.76	0.53	0.35	0.27	0.17
1.6	R	960.1	308.9	93.04	30.83	10.25	3.40	1.47	0.61	0.23	0.13	0.04
	V	11.69	7.39	4.53	2.88	1.83	1.15	0.81	0.57	0.38	0.29	0.18
1.7	R	1076	345.7	103.9	34.42	11.43	3.79	1.64	0.68	0.26	0.14	0.04
	V	12.42	7.85	4.82	3.06	1.94	1.23	0.87	0.60	0.40	0.31	0.19
1.8	R	1198	384.4	115.4	38.20	12.67	4.20	1.82	0.76	0.29	0.16	0.05
	V	13.15	8.32	5.10	3.24	2.05	1.30	0.92	0.64	0.43	0.33	0.20
1.9	R		425.1	127.6	42.15	13.97	4.62	2.00	0.83	0.32	0.17	0.05
	V		8.78	5.38	3.42	2.17	1.37	0.97	0.67	0.45	0.35	0.21
2	R		467.7	140.2	46.28	15.33	5.07	2.19	0.91	0.35	0.19	0.06
	V		9.24	5.67	3.60	2.28	1.44	1.02	0.71	0.47	0.37	0.22
2.2	R		558.9	167.1	55.08	18.22	6.02	2.60	1.08	0.41	0.22	0.07
	V		10.17	6.23	3.96	2.51	1.59	1.12	0.78	0.52	0.40	0.25
1.7	R		233.3	67.26	22.71	7.77	2.50	1.10	0.45	0.18	0.09	0.03
	V		6.68	4.02	2.57	1.65	1.03	0.73	0.51	0.34	0.26	0.16
1.8	R		259.4	74.68	25.19	8.61	2.77	1.21	0.50	0.19	0.10	0.03
	V		7.07	4.26	2.73	1.75	1.09	0.77	0.54	0.36	0.28	0.17
1.9	R		286.7	82.47	27.79	9.49	3.05	1.34	0.55	0.21	0.12	0.04
	V		7.47	4.49	2.88	1.85	1.15	0.82	0.57	0.38	0.29	0.18
2	R		315.4	90.62	30.51	10.41	3.35	1.46	0.61	0.23	0.13	0.04
	V		7.86	4.73	3.03	1.94	1.21	0.86	0.60	0.40	0.31	0.19
2.2	R		376.8	107.9	36.30	12.37	3.97	1.74	0.72	0.28	0.15	0.05
	V		8.65	5.20	3.33	2.14	1.34	0.95	0.65	0.44	0.34	0.21
2.4	R		657.8	196.3	64.60	21.34	7.04	3.04	1.26	0.48	0.26	0.08
	V		11.09	6.80	4.32	2.74	1.73	1.22	0.85	0.57	0.44	0.27
2.6	R		764.4	227.7	74.81	24.68	8.14	3.51	1.46	0.55	0.30	0.09
	V		12.01	7.37	4.68	2.97	1.88	1.32	0.92	0.61	0.48	0.29
2.8	R			261.3	85.73	28.25	9.30	4.01	1.67	0.63	0.34	0.11
	V			7.93	5.04	3.20	2.02	1.43	0.99	0.66	0.51	0.31
3	R			297.1	97.34	32.04	10.54	4.54	1.89	0.72	0.39	0.12
	V			8.50	5.40	3.42	2.17	1.53	1.06	0.71	0.55	0.33
3.5	R			396.2	129.4	42.48	13.94	6.00	2.49	0.94	0.51	0.16
	V			9.92	6.30	3.99	2.53	1.78	1.24	0.83	0.64	0.39
4	R			508.9	165.7	54.27	17.78	7.64	3.16	1.20	0.65	0.20
	V			11.33	7.20	4.57	2.89	2.04	1.41	0.95	0.73	0.45
4.5	R			635.1	206.3	67.42	22.04	9.45	3.91	1.48	0.80	0.24
	V			12.75	8.10	5.14	3.25	2.29	1.59	1.06	0.82	0.50
5	R				251.1	81.89	26.72	11.45	4.74	1.79	0.97	0.30
	V				9.00	5.71	3.61	2.55	1.77	1.18	0.92	0.56
5.5	R				300.1	97.68	31.82	13.62	5.63	2.13	1.15	0.35
	V				9.90	6.28	3.97	2.80	1.95	1.30	1.01	0.61
6	R				353.3	114.8	37.34	15.97	6.59	2.49	1.34	0.41
	V				10.80	6.85	4.33	3.06	2.12	1.42	1.10	0.67
6.5	R				410.7	133.2	43.26	18.48	7.63	2.88	1.55	0.47
	V				11.70	7.42	4.69	3.31	2.30	1.54	1.19	0.73
7	R				472.1	152.9	49.60	21.17	8.73	3.29	1.78	0.54
	V				12.60	7.99	5.05	3.57	2.48	1.65	1.28	0.78
7.5	R					173.9	56.34	24.03	9.90	3.73	2.01	0.61
	V					8.56	5.41	3.82	2.65	1.77	1.37	0.84
8	R					196.2	63.48	27.05	11.13	4.19	2.26	0.69
	V					9.13	5.77	4.07	2.83	1.89	1.46	0.89
8.5	R					219.8	71.03	30.24	12.44	4.68	2.52	0.77
	V					9.70	6.14	4.33	3.01	2.01	1.56	0.95
9	R					244.7	78.97	33.60	13.81	5.19	2.80	0.85
	V					10.27	6.50	4.58	3.18	2.13	1.65	1.00
9.5	R					270.8	87.31	37.12	15.25	5.73	3.09	0.94
	V					10.84	6.86	4.84	3.36	2.25	1.74	1.06
10	R					298.2	96.05	40.81	16.75	6.29	3.39	1.03
	V					11.41	7.22	5.09	3.54	2.36	1.83	1.12

V : Velocity in m/s *R : Pressure loss in mbar/m*



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