

GREENFIT PPR FOR **HVAC**

Reliability you can trust, durability you can depend on

COMMERCIAL
SPACE



HOTEL



MALL



HOSPITAL



INDUSTRY



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ETHOS

Greener
Better
Together



Prince Pipes is not about creating products that are different but providing solutions that make a difference. From our zero defect manufacturing process that involves using recycled plastic to designing and equipping our plants with solar panels and various other energy saving manufacturing techniques, our endeavor has always been to further bring down the emission levels. Our strong belief in the concept of "better lasts longer" has not only helped us deliver premium quality products but also ensure lesser consumption. Together with our channel partners and plumbers, we are sure to leave a strong legacy for the generations to come.

MANUFACTURING UNITS



SANGAREDDY EST. 2021



JAIPUR EST. 2019



KOLHAPUR EST. 2012



CHENNAI EST. 2012



HARIDWAR EST. 2008



DADRA EST. 2000



ATHAL EST. 1995

Industries



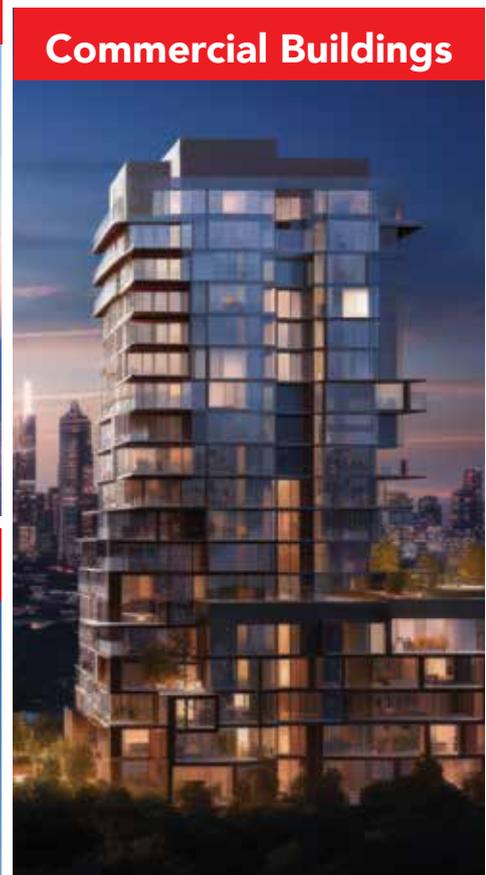
Hospitals



Hotels



Commercial Buildings



Malls



INTRODUCTION

Prince Pipes is not about creating products that are different but providing solutions that make a difference. From our zero defect manufacturing process that involves using recycled plastic to designing and equipping our plants with solar panels and various other energy saving manufacturing techniques, our endeavour has always been to further bring down the emission levels. **Our strong belief in the concept of 'better lasts longer'** has not only helped us deliver premium quality products but also ensure the products are durable and sustainable.

Understanding the needs of the customers, introducing a sustainable solution – Greenfit ppr piping systems for new age HVAC Systems.

Today HVAC is an essential system for maintaining the right atmosphere in wide application areas like Industries, Hotels, Hospitals, Malls etc.



GREENFIT®

COOLING TOWER

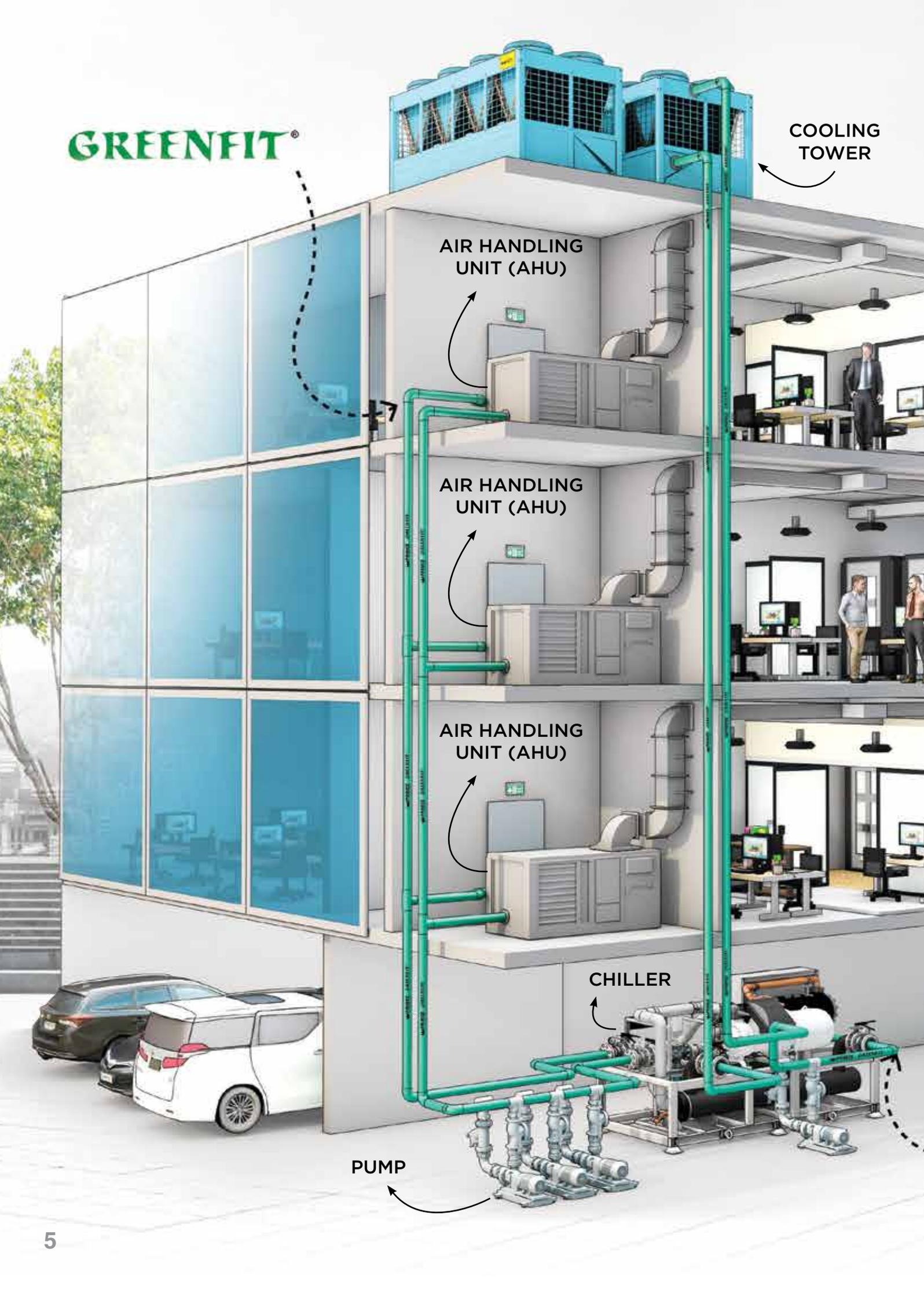
AIR HANDLING UNIT (AHU)

AIR HANDLING UNIT (AHU)

AIR HANDLING UNIT (AHU)

CHILLER

PUMP





WHY GREENFIT PPR FOR HVAC?

Today, the use of plastic products in construction as well as other industries is extremely widespread. Rapid changes in plastic raw materials and processing techniques provide advantages which cause these materials to be preferred in place of traditional construction and industrial application materials. One of these innovations in plumbing pipes and fittings is Prince Greenfit PPR for HVAC Piping Systems produced out of **Polypropylene Random Copolymer** (PPRC or commonly known as PP-R) material.

HVAC piping is an abbreviation for heating ventilation and air-conditioning piping. The primary use of HVAC is to regulate room temperature, humidity, and air flow, ensuring that such elements remain within their acceptable ranges.

HVAC is one of the most vital component required when setting up a high-rise building, commercial complex, industrial unit, hospital, parking unit, hotels, etc. where air quality and thermal parameters need to be maintained so that the personnel around can live properly.

GREENFIT®

ADVANTAGES OF USING PRINCE GREENFIT PPR FOR HVAC

Prince Greenfit PPR pipes are a type of plastic pipes made from a blend of polypropylene and ethylene copolymers. These pipes are increasingly being used in HVAC piping system due to following advantages:



CORROSION RESISTANCE

Greenfit PP-R is highly resistant to corrosion, making it an excellent choice for HVAC systems where water quality can vary and it does not degrade over time, ensuring long-term reliability.



LOW THERMAL CONDUCTIVITY

Greenfit PP-R material has low thermal conductivity which means it minimizes heat loss during the long transportation of hot water. In HVAC systems, this helps in energy efficiency and reduced operational cost.



NO BACTERIAL GROWTH

Greenfit PP-R pipes are made from food-grade material, which means they are non-toxic and do not contaminate the water with harmful chemicals. These pipes are also resistant to bacterial growth.



ULTRA SMOOTH INTERNAL BORE

The smooth internal surface of Greenfit PP-R pipes ensure efficient water flow. It reduces frictional losses, making it ideal for HVAC systems where smooth and uninterrupted water circulation is essential.



LONGEVITY

Greenfit PP-R pipes have a long service life, ensuring that HVAC system remains reliable and functional for many years.



LEAK-FREE SYSTEM

Due to monolithic homogeneous joint, there is no chance of leakage throughout the life of the system which greatly reduces the maintenance cost.



SOCKET FUSION/BUTT FUSION JOINTS

Jointing performed by socket/butt fusion joint can be set in operation immediately.



EASY AND FASTER INSTALLATION

Greenfit PP-R piping system are light in weight and easy to handle, which makes installation process simple and faster.



FLEXIBILITY AND ADAPTABILITY

In HVAC systems, changes and expansion are common. Greenfit PP-R piping system allows for flexibility in system modifications without extensive rework.



ENVIRONMENTALLY FRIENDLY

Greenfit PP-R is a recyclable material, and its production has a lower environmental impact compared to some alternative materials.



NOISE REDUCTION

Greenfit PP-R pipes have excellent sound insulation properties, reducing noise transmission in HVAC systems, which is crucial in commercial and residential applications.



PROVEN HOT & COLD WATER PERFORMANCE

-20°C to 95°C

KEY APPLICATIONS OF PRINCE GREENFIT PPR IN HVAC



1

HYDRONIC HEATING SYSTEM

PP-R pipes are suitable for use in hydronic heating systems, where hot water is circulated to provide heating. Greenfit PP-R piping system can handle high temperatures (up to 95°C) and pressure associated with hydronic heating system and maintain its structural integrity over time.

CHILLED WATER SYSTEMS

In air conditioning and cooling systems, chilled water is often used to regulate temperature. PP-R pipes can effectively transport chilled water, and its smooth internal bore minimizes frictional losses, making them energy-efficient.



2

AIR HANDLING UNITS (AHU'S)

PP-R pipes can be used in AHUs to transport water for air humidification systems. Their resistance to corrosion and scaling is advantageous in such applications.



3

CONDENSATE DRAIN LINES

HVAC systems generate condensate, which needs to be safely drained away. PP-R pipes are an excellent choice for condensate drain lines because they resist corrosion and do not promote the growth of mold or bacteria.



4



5

COOLING TOWER PIPING

Cooling towers are an integral part of many HVAC systems. PP-R pipes are corrosion resistant, which is beneficial when dealing with water treatment chemicals often used in cooling tower systems.

SOLAR THERMAL SYSTEMS

In solar water heating systems, where heat from the Sun is collected and transferred to heat exchangers, PP-R pipes can be employed after 3.0-meter distance and due to their resistance to UV radiation and temperature fluctuations. *(we recommend not to connect PP-R pipes directly to heat source)*



6



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VENTILATION SYSTEMS

PP-R pipes are also used in ventilation systems for transporting fresh air or exhaust air in commercial and industrial locations. They maintain their integrity in both hot and cold environments.

GEOHERMAL HEAT PUMP SYSTEMS

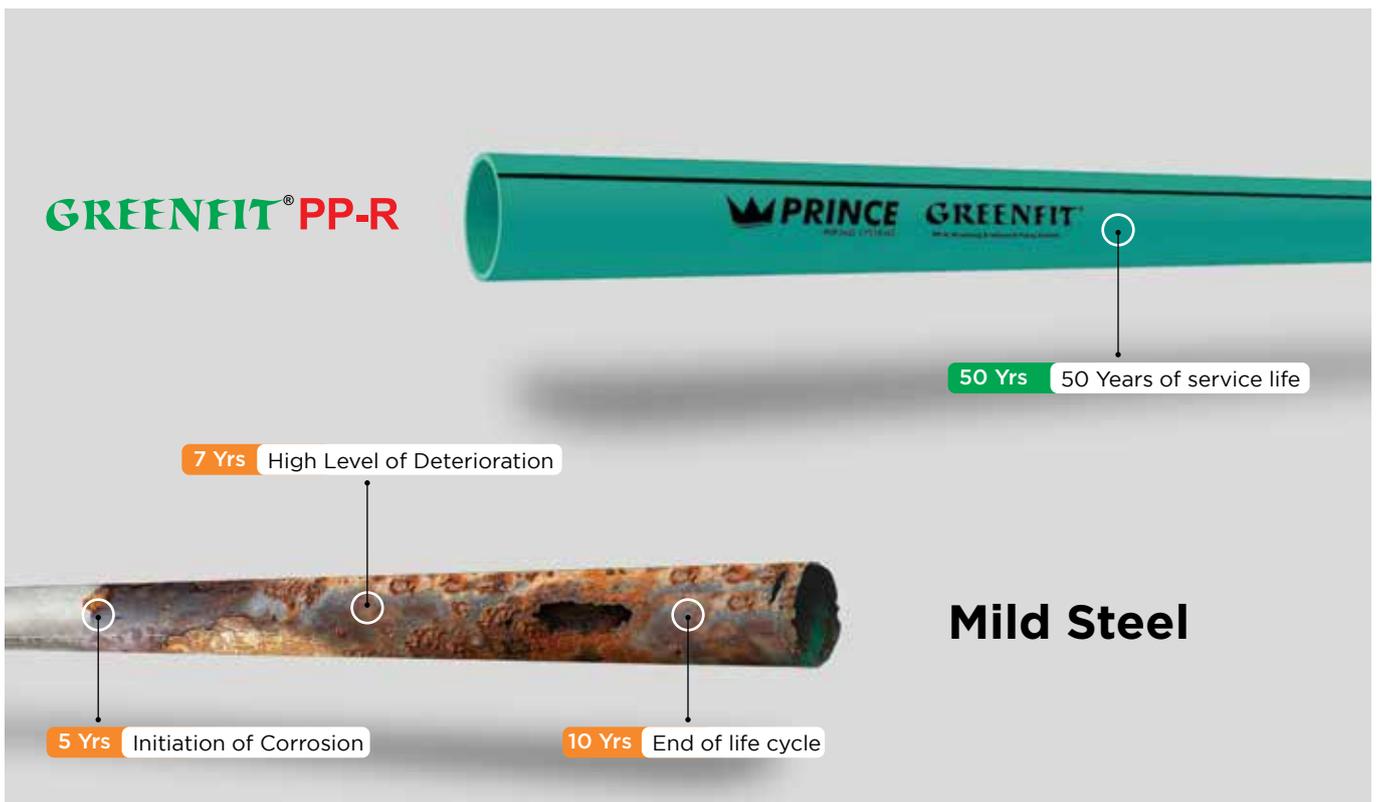
Geothermal HVAC system uses underground loops to exchange heat with the earth. PP-R Coil pipes are used in the ground loop for their resistance to chemicals in the soil and their durability.



8

COMPARISON OF PRINCE GREENFIT PPR V/S MILD STEEL

Property Parameter	MILD STEEL	PRINCE GREENFIT [®] PP-R
Type of joint	Soldering, includes flame	Poly-fusion welding. Does not include flame. For transition joints, fittings with threaded metal inserts, are also available.
Installation	Complicated installation process that involves flames which requires more time. Also heavy clamps are required.	Safe and Flameless Installation. Easy clamping process which are lightweight. Saves time & labour.
Corrosion resistance	Corrosive material	Free from corrosion.
Scale formation	Scaling in natural which results in corrosion	No scaling
Flow Rate	Corrosion reduces flow rates considerably	Smooth internal material ensures higher flow rate
Life Span	5 to 10 years	Can exceed 50 years
Handling	Very difficult to handle	Ease of handling material
Cost	Higher initial cost of material and very high life cycle cost	Low initial cost of material and low life cycle cost
Maintenance	Huge maintenance cost on regular intervals	Maintenance-free polymer product
Insulation	Heavy insulation required	Requires half the insulation than MS

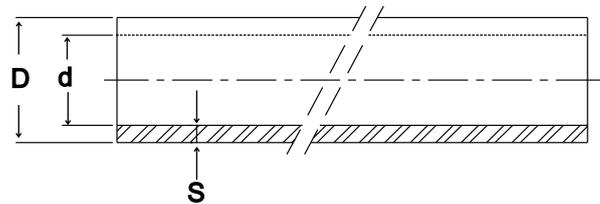


STANDARDS FOR PIPES AND FITTINGS

Pipes						
Type	Size (mm)	Working Pressure (Kg/cm ²)	Class	Standard	Colour	End Connection
Green PP-R	20 to 315	10, 16 & 20	SDR 11 (PN 10), SDR 7.4 (PN 16), SDR 6 (PN 20)	IS: 15801	<ul style="list-style-type: none"> • Single layer pipes - Green, • Triple layer Pipe - Outer layer in green, inner layer in white • Thermex Pipe - Outer layer in green, middle layer in light grey, inner layer in white 	Poly-fusion welding joint

Fittings					
Type	Size (mm)	Working Pressure (Kg/cm ²)	Standard	Colour	End Connection
Green PP-R	20 to 160	20 & 25	DIN:16962	Green	<ul style="list-style-type: none"> • Socket ends suitable for poly-fusion welding. • For transition joints, fittings with threaded metal inserts.

PIPES DIMENSIONS



Nominal Bore		Outside Diameter	SDR 11 (PN-10)		SDR 7.4 (PN-16)		SDR 6 (PN-20)	
(mm)	(inch)	(mm)	d (mm)	s (mm)	d (mm)	s (mm)	d (mm)	s (mm)
20	1/2	20.00	16.20	1.90	14.40	2.80	13.20	3.40
25	3/4	25.00	20.40	2.30	18.00	3.50	16.60	4.20
32	1	32.00	26.20	2.90	23.20	4.40	21.20	5.40
40	1 1/4	40.00	32.60	3.70	29.00	5.50	26.60	6.70
50	1 1/2	50.00	40.80	4.60	36.20	6.90	33.40	8.30
63	2	63.00	51.40	5.80	45.80	8.60	42.00	10.50
75	2 1/2	75.00	61.40	6.80	54.40	10.30	50.00	12.50
90	3	90.00	73.60	8.20	65.40	12.30	60.00	15.00
110	4	110.0	90.00	10.00	79.80	15.10	73.40	18.30
160	6	160.0	130.80	14.60	116.20	21.90	106.80	26.60
180	7	180.00	147.20	16.40	-	-	-	-
200	8	200.00	163.60	18.20	-	-	-	-
225	9	225.00	184.00	20.50	-	-	-	-
250	10	250.00	204.60	22.70	-	-	-	-
280	11	280.00	229.20	25.40	-	-	-	-
315	12	315.00	257.80	28.60	-	-	-	-

PRODUCT CHARACTERISTICS

GREENFIT PP-R TECHNICAL SPECIFICATIONS

PHYSICAL PROPERTIES

Property	Test Method	Units	Value
Density, at 27°C	IS 12235 (Part 14)	Kg /m ³	900 - 910
Melt Flow Rate at 230° C/2.16 kg	IS 13360 Part 4/Sec 1	g/10 min	< 0.25
Viscosity	ISO 1191, ISO 1628 T3	-	-

THERMAL PROPERTIES

Property	Test Method	Units	Value
Thermal Conductivity	DIN 52612	W/m.K	0.24
Specific heat, at 23°C	Calorimeter	KJ/kg.K	2.0
Coefficient of linear expansion	DIN 53752	mm/M°C	1.5 x 10 ⁻⁴
VICAT Softening Temperature	ISO 306	°C	132
Melting Temperature Range	ISO 3146	°C	140 -150

MECHANICAL PROPERTIES

Property	Test Method	Units	Value
Tensile Stress at Yield (50mm/ minute)	ISO 527-1, 2	MPa	24
Tensile Strain at Yield (50mm/ minute)	ISO 527-1, 2	%	>50
Tensile modules (secant)	ISO 527-1, 2	MPa	850
Flexural Modulus	ASTM D 790	MPa	850
Tear Strength	ISO 527	MPa	40
Elongation at tear	ISO 527	%	800
Shore D Hardness	DIN 53 505	-	65
Pipe Friction factor	-	-	0.007
CHARPY Impact Strength - 23°C	ISO179/1eA	KJ/m ²	22
0°C	ISO179/1eA	KJ/m ²	4.0
-30°C	ISO179/1eA	KJ/m ²	2.5

PHYSICAL PROPERTIES

Property	Test Method	Units	Value
Di electric constant	DIN 53483	-	2.3
Volume Resistivity	DIN 53482	Ohm-cm	> 1 x 10 ¹⁶
Di electric strength	DIN 53481	KV/mm	> 20

STANDARD WORKING CONDITIONS & SERVICE LIFE

Long-term performance curve shows the behavior of a pipe line depending on pressure and operating temperature. It establishes the average life expectancy of a pipe line as a function of hoop stress acting on the pipe walls. Hoop stress is in proportion with the pressure according to the following formula:

$$\delta = S_f \times p \times \frac{(d-s)}{2s}$$

WHERE:
 δ = hoop stress (MPa)
 S_f = Safety factor
 p = Internal pressure (MPa)
 d = Outside diameter of pipe (mm)
 s = Wall thickness of pipe (mm)

If we extrapolate the hoop stress from the long term performance curve and apply the formula using 1.5 safety factor, the admissible operating pressures are obtained as given in the tables.

ADMISSIBLE OPERATING PRESSURE

Temperature °C	Service Life in Years	Pipe Series according to DIN 8077/8078		
		SDR 11 - PN 10	SDR 7.4 - PN 16	SDR 6 - PN 20
		Safety-factor 1.5		
		Nominal pressure for PP-R pipes (kgs/cm ²)		
10°C	1	17.6	27.8	35.0
	5	16.6	26.4	33.2
	10	16.1	25.5	32.1
	25	15.6	24.7	31.1
	50	15.2	24.0	30.3
	100	14.8	23.4	29.5
20°C	1	15.0	23.8	30.0
	5	14.1	22.3	28.1
	10	13.7	21.7	27.3
	25	13.3	21.1	26.5
	50	12.9	20.4	25.7
	100	12.5	19.8	24.9
30°C	1	12.8	20.2	25.5
	5	12.0	19.0	23.9
	10	11.6	18.3	23.1
	25	11.2	17.7	22.3
	50	10.9	17.3	21.8
	100	10.6	16.9	21.2
40°C	1	10.8	17.1	21.5
	5	10.1	16.0	20.2
	10	9.8	15.6	19.6
	25	9.4	15.0	18.8
	50	9.2	14.5	18.3
	100	8.9	14.1	17.8

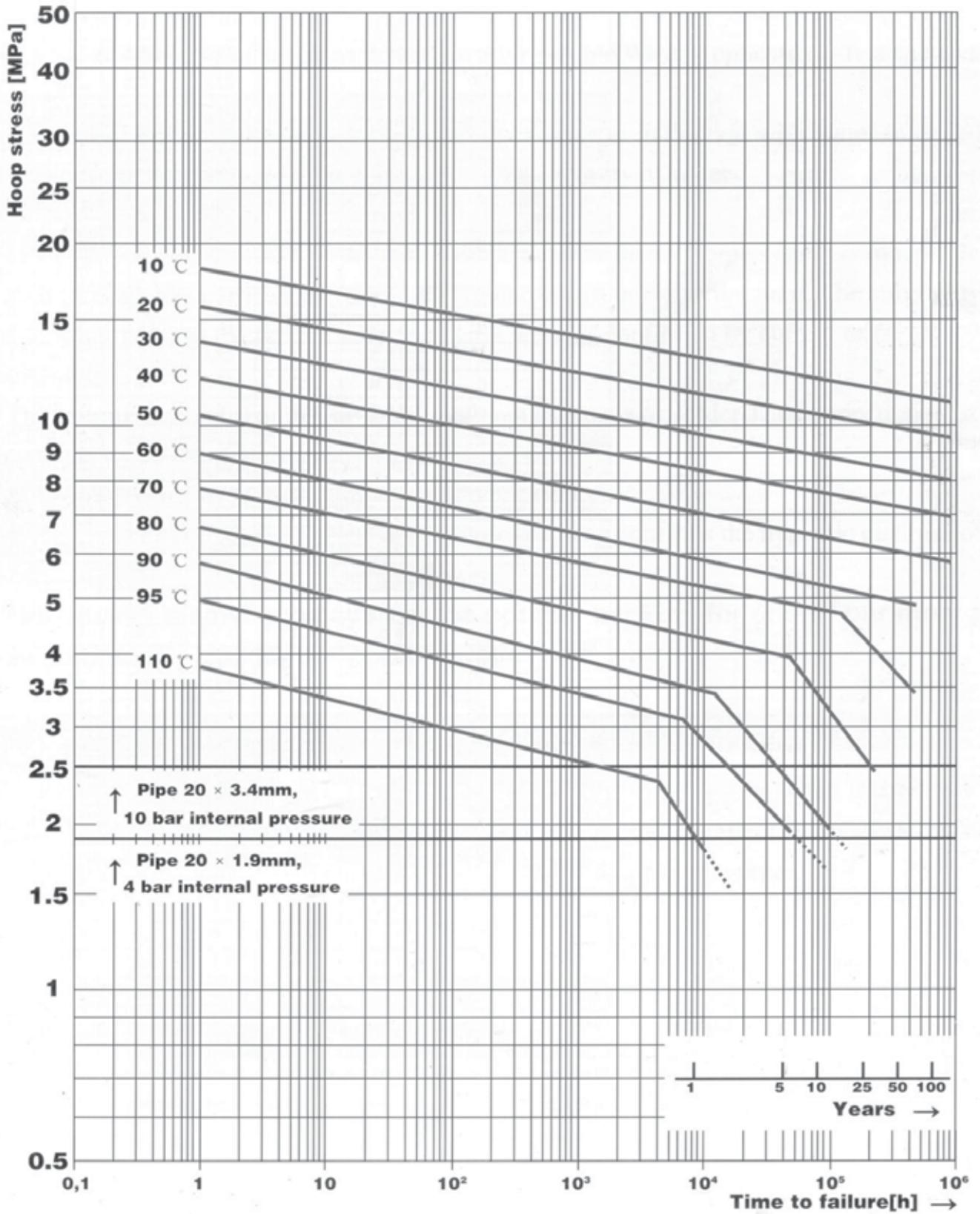
Temperature °C	Service Life in Years	Pipe Series according to DIN 8077/8078			
		SDR 11 - PN 10	SDR 7.4 - PN 16	SDR 6 - PN 20	
		Safety-factor 1.5			
		Nominal pressure for PP-R pipes (kgs/cm ²)			
50°C	1	9.2	14.5	18.3	
	5	8.5	13.5	17.0	
	10	8.2	13.1	16.5	
	25	8.0	12.6	15.9	
	50	7.7	12.2	15.4	
	100	7.4	11.8	14.9	
60°C	1	7.7	12.2	15.4	
	5	7.2	11.4	14.3	
	10	6.9	11.0	13.8	
	25	6.7	10.5	13.3	
	50	6.4	10.1	12.7	
	70°C	1	6.5	10.3	13.0
5		6.0	9.5	11.9	
10		5.9	9.3	11.7	
25		5.1	8.0	10.1	
50		4.3	6.7	8.5	
80°C		1	5.5	8.6	10.9
	5	4.8	7.6	9.6	
	10	4.0	6.3	8.0	
	25	3.2	5.1	6.4	
	95°C	1	3.9	6.1	7.7
		5	2.5	4.0	5.0
(10)*		(2.1)*	(3.4)*	(4.2)*	

* Bracketed values apply where testing can be shown to have been carried out for longer than 1000 hours at 95°C

Explanations :

- = Recommended application - cold water installation
- = Recommended application - hot water installation
- = Recommended application - central heating installation

LONG TERM PERFORMANCE



TECHNICAL DETAILS

THERMAL EXPANSION

A pipe line which is subjected to a variation of temperatures changes its length if it is free to do so, This change in length is proportional to the linear coefficient of thermal expansion of the material of pipeline. The linear expansion or contraction caused by the change in ambient temperature gradient can easily be calculated using the following formula.

$$\Delta L = \sigma \times L \times \Delta T$$

WHERE:

- ΔL = Expansion(+) or contraction(-) in length,(mm)
- L = Initial pipe length, (Meter)
- σ = Coefficient of thermal expansion (for PP-R = 0.15 mm/m°C)
- ΔT = Change in temperature (°C)

EXAMPLE: for 5 meter PP-R line operating between 25 to 55°C
 $\Delta T = (55-25)=30^{\circ}\text{C}$
 $\Delta L = 0.15 \times 5 \times 30 = 22.5 \text{ mm}$

The expansion and contraction adjustment of GREENFIT PP-R pipeline is generally made in longitudinal direction only. Enough space shall be provided and proper type of supports shall be used to allow the free movement of pipe in axial directions.

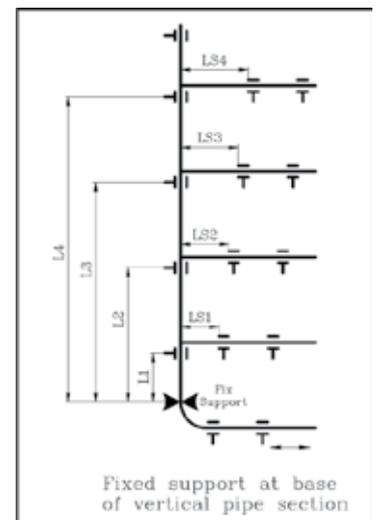
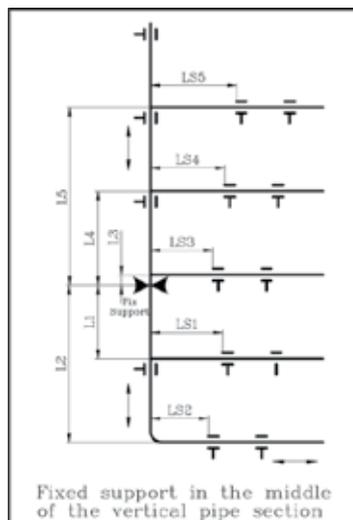
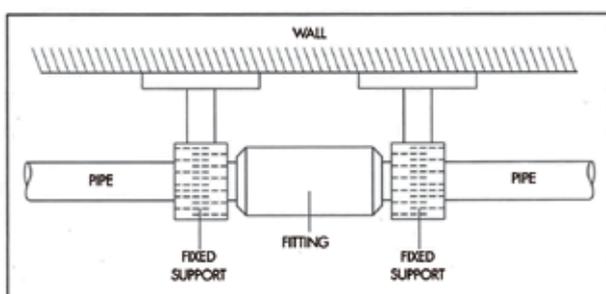
Once the change in length of pipeline on account of thermal expansion/contraction has been calculated, a correct planning of pipelines is necessary to ensure that its effect do not cause deformation of the piping itself. GREENFIT PP-R systems make it possible to easy and convenient compensation for change in length using the suitable provision of following:

- Fixed & Sliding supports.
- Free flexible pipe segment (Expansion Arm).
- Free flexible pipe loop (Compensation Loop).

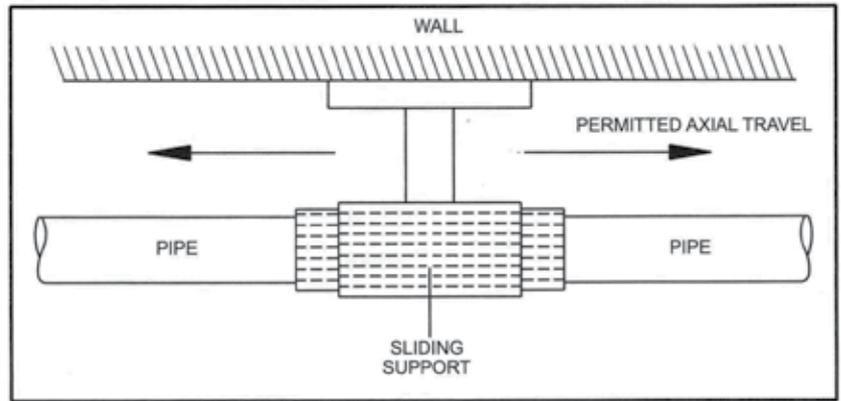
FREE AND SLIDING SUPPORTS

Fixed and Sliding supports secure external pipelines to the masonry structure of the building, to prevent the movements generated by thermal expansion, totally or partially.

Fixed Supports: - These are used when the axial expansion of the pipeline should be limited. Fixed support provides a rigid connection between external pipeline installations with masonry structure. The fixed supports must normally be positioned where the system changes direction (Elbows, Tees, etc.) & near to Valves, Cocks, Water meter, etc. to ensure that expansion forces are not induced these points. In all cases, fixed support should always be provided next to any joint in the pipeline created using any welded fitting. Obviously the fixed supports limit the length of section of pipe free to expand, and reduce the relative change in length value.



Sliding Supports: - are used to allow the pipe to move axially in both directions. They have to be positioned well away from joints made using welded fittings, on a free length of the pipes surface. The sliding support collar must be absolutely free from pipe diameter otherwise it may damage the surface of the pipe where it is installed. Sliding support also ensures that the pipeline remain straight in spite of thermal stresses.



Support Spacing: - For horizontal and vertical external pipeline installation on wall, the recommended distances between supports - are given in following tables for various pipe sizes.

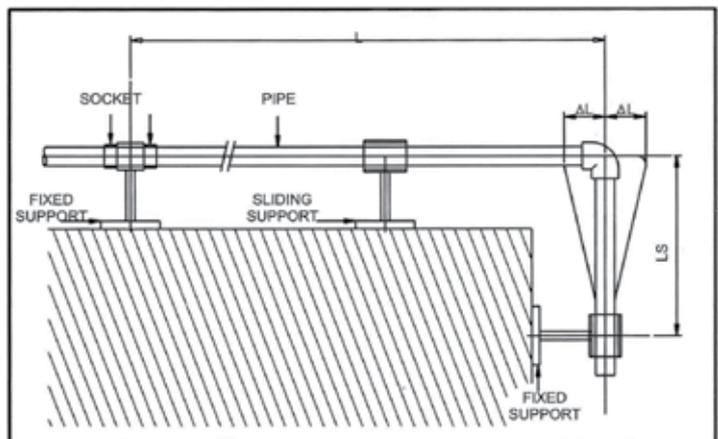
Size (mm)	Horizontal clamp spacing distance according to temperatures, cm						
	20°C	30°C	40°C	50°C	60°C	70°C	80°C
20	65	63	61	60	58	53	48
25	75	74	70	68	66	61	56
32	90	88	86	83	80	75	70
40	110	110	105	100	95	90	85
50	125	120	115	110	105	100	90
63	140	135	130	125	120	115	105
75	155	150	145	135	130	125	115
90	165	160	155	145	140	130	120
110	175	175	170	165	155	145	135

Size (mm)	Vertical clamp spacing distance according to temperatures, cm						
	20°C	30°C	40°C	50°C	60°C	70°C	80°C
20	85	82	79	78	75	69	62
25	98	96	91	88	86	79	73
32	117	114	112	108	104	98	91
40	143	143	137	130	124	117	111
50	163	156	150	143	137	130	117
63	182	176	169	163	156	150	137
75	202	195	189	176	169	163	150
90	215	208	202	189	182	169	156
110	228	228	221	215	202	189	176

FREE FLEXIBLE PIPE SEGMENT (EXPANSION ARM)

With the help of free flexible pipe segment, provided at the position of change in direction, the change in length of pipeline is totally compensated. The length of free flexible pipe segment is calculated using following formula:

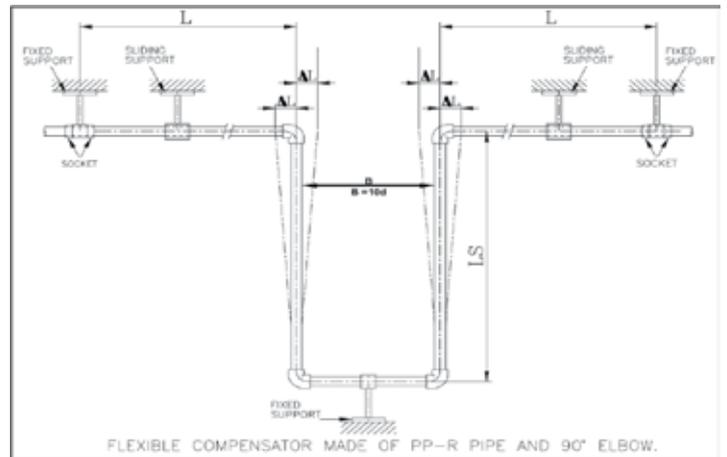
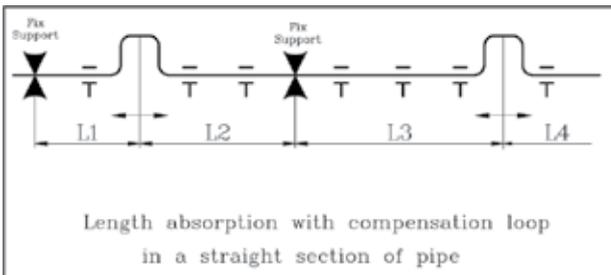
- LS = $C\sqrt{d \times DL}$ where
- LS = Length of free flexible segment (mm).
- C = Constant of material (for PP-R, C= 30).
- d = Pipe outside diameter (mm).
- DL = Expansion or contraction length (mm).



FREE FLEXIBLE PIPE LOOP (COMPENSATION LOOP)

If the change in length cannot be compensated using expansion arm, it is necessary to install a free flexible loop (Compensation loop). Free flexible bend can be easily prepared on site with required lengths of GREENFIT PP-R pipe & 4 nos. of 90 ° elbows. To prepare a free flexible loop you have to calculate:

- The length of free flexible segment (LS) with the help of formula as explained in Free flexible pipe segment (Expansion Arm)
- The minimum width (B) between two arms of the loop = 10 times the outside diameter of the pipe.



LAYING IN SANITARY SHAFT / PIPE DUCT OF A BUILDING

No.	Recommendation For Pipe Connection	Description
1		Pipe connection can be made At some distance away from The wall
2		The connecting pipe can be Passed through a hole much Larger than the pipe diameter
3		The connection can Be made through a Branch pipe to provide flexibility

When making the apartment pipe connections from main pipe going through the sanitary shaft of the building, the alternative techniques shown above can be applied in order to compensate for thermal expansion & contraction.

BENDING

During laying of pipeline, GREENFIT PP-R pipes may be required to be bent. Bending shall be done by using hot air blowing at 140°C. Direct heating by open flame shall be avoided, Radius for GREENFIT PP-R pipe bend should be minimum 8 times its diameter. The table given besides indicate minimum bending radius for each sized of pipe.

Drawing	Pipe diameter (mm)	Minimum bending radius (mm)
	20	160
	25	200
	32	256
	40	320
	50	400

INSULATION FOR LOWER TEMPERATURE

FOR HOT WATER

When conveying hot water through any pipe, heat is transferred through the pipe wall. PRINCE pipes have a much lower GREENFIT PP-R coefficient of thermal conductivity (0.24 W / mK) compared to metal pipes. Therefore, normally it may not be required to insulate the pipelines which is used for hot water concealed application. However, for centralised heating systems, to prevent heat loss and isolate the pipelines from other utilities, it is advisable to insulate these lines. The required thickness of insulation is quite lower as compared with conventional lines. Given besides are the recommended insulation thickness for different pipe size.

Pipe Size (mm)	Thermal conductivity of insulation material	
	0.030 W /m.K	0.035 W /m.K
	Recommended minimum insulation thickness in mm	
20	6	10
25	6	10
32	10	13
40	10	13
50	10	13
63	13	20
75	20	20
90	20	25
110	25	32

FOR COLD WATER

Potable cold water plants have to be protected against heat gain and the formation of condensation. Standard value for the minimum thickness of insulation as stipulated in DIN-1988, part 2 have to be taken from the following table :

Minimum insulation thickness for the insulation of potable water pipes (10°C) as per DIN 1988, part 2	
Type of installation	Insulation thickness (for 0.04 W/m.K thermal conductivity material) in mm
Open installed pipes, in non heated room (I.e. cellar)	4mm
Open installed pipe in heated room	9mm
Pipe in a duct, without warm pipe	4mm
Pipe in a duct beside warm pipe	13mm
Pipe in a pipe chase riser	4mm
Pipe in a pipe chase, beside warm water pipes	13mm
Pipe on concrete floor	4mm

RESISTANCE TO ULTRA VIOLET (UV) RAYS

PRINCE monolayer pipes & fittings are have sufficient U.V. stability in order to protect them GREENFIT PP-R from UV rays during storage in open area for a period of about 6 months. However, it is not advisable to use these pipes and fittings under direct sunlight continuously. For outdoor installation on pipelines, PRINCE Piping Systems offers 3 layers GREENFIT PP-R pipes, which are resistant to U.V. rays.

SUITABILITY FOR DRINKING WATER

PRINCE pipes & fittings meet the requirements of IS 10500-91 for drinking water and GREENFIT PP-R IS 10146-87 for leachable additives as its safe use for drinking water.

FIRE RESISTANCE

PRINCE pipes & fittings have combustion point 330°C & burning point 360°C. These conform GREENFIT PP-R with B2 class fire requirements of normal combustibility according to DIN 4102. On fire, PP-R pipes & fittings emit carbon dioxide and water. Other than this, carbon monoxide gas, molecular hydrocarbon and oxidation products of these are also emitted in proportion to the availability of oxygen. Even if the fire is incomplete, the materials emitted are less poisonous than wood or similar materials on fire under the same conditions. The smoke that comes out of GREENFIT PP-R fire does not cause rusting.

LOW TEMPERATURE RESISTANCE

At lower temperature of 0° C and below, the flexibility of pipes reduces and impact strength GREENFIT PP-R also reduces. This makes pipes more prone to mechanical damages against impact loads. To avoid the damages at low temperature, it is advisable to insulate the pipe lines.

PRESSURE LOSS

In normal piping, two types of pressure loss can be found,

1. Distributed pressure loss related to pipe roughness, dimensions, physical properties and velocity of the liquids.
2. Local loss related to elbows, tees, valves and fittings which cause a remarkable variation in the liquid flow.

1. DISTRIBUTED PRESSURE LOSS

The GREENFIT PP-R pipe has extremely smooth inner surfaces compared to metal pipes. Therefore, pressure loss is quiet low.

2. LOCAL PRESSURE LOSS

In pipeline, local pressure loss takes place due to presence of fittings which can be calculated using following formula

$$R = \frac{(r) V^2 \sigma}{2 g}$$

WHERE: R = Total local pressure loss in (mm)
r = Local resistance coefficient

value as given in following table
V = Mean velocity of fluid in (m/s)
g = Acceleration of gravity = 9.81 (m/s²)
σ = Specific gravity of water = 1000 (kg/m³)

Local resistance coefficient “r” for PRINCE GREENFIT PP-R plumbing fittings.

Note:

1. These are reference values and they vary according to water temperature.
2. As fitting diameter increases, the value of ‘r’ decreases.

Name of PP-R Fitting	Symbol for PP-R Fitting	Coefficient Value (r)
Coupler		0.25
Reducer: Single stage reducer Double stage reducer Three stage reducer Four stage reducer		0.50 0.60 0.70 0.85
Elbow 90° Elbow 45°		1.2 0.5
Tee		1.8
Male / Female Threaded Tee		1.8
Reducing Tee		3.0
Male / Female Threaded Adaptor Reducing Male / Female Adaptor		0.5 0.8
Male / Female Threaded adaptor Reducing Threaded Elbow adaptor		1.4 1.6
Valve 20 25 32		9.5 8.5 7.6
Union		8.3

JOINTING METHODS

PROCESS: Fusion Welding

CUTTING

- Cut the pipe at a right angle to its axis using burr-free cutter.
- Ensure that the pipe is free from burrs or cutting chips.
- Clean the pipe & fitting perfectly before welding.
- Mark welding depth at the end of pipe.



HEATING

- Mount the suitable dyes on the heating element of the welding machine according to the diameter of pipe and fitting.
- Connect the welding machine to 220 volts A.C. power supply.
- Select 260°C temperature on the welding machine thermostat.
- Wait until the required working temperature is reached.
- Insert the pipe and the fitting in the dyes by exerting light pressure.



WELDING

- After heating, quickly insert the pipe into the fitting by exerting light pressure.
- Any misalignment should be corrected immediately after insertion to avoid any stress in the weld.
- Allow the joint to cool as per the cooling time given in table.

DON'Ts



CUTTING

Do not cut slant/unevenly.



DEBURRING AND RIDGE REMOVAL

Do not proceed with installation of pipe without deburring as the burr when heated will create an extra blockage inside the pipe.



CLEANING & MARKING

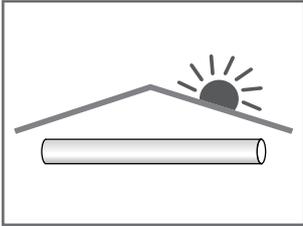
Do not proceed without cleaning as it will create problems during welding due to the presence of dirt or mud.

WELDING JOINT

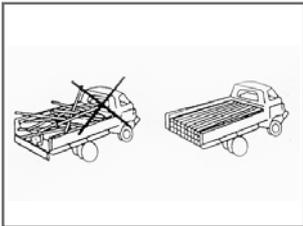
- Do not set the temperature of the heater higher or lower than 260°C
- Do not initiate the jointing process without gloves.
- Misalignment of jointing to be corrected immediately before cooling, so as to avoid stress in the weld.

DOs**STORAGE**

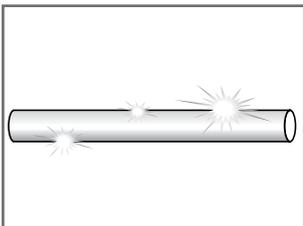
Although Greenfit PP-R Pipe system material is stabilized for use at elevated temperatures do not expose the pipes & fittings to direct sunlight.

**TRANSPORTATION**

During transportation, Greenfit PP-R pipes should be loaded in a proper manner, otherwise pipes may get deformed.

**PREPARATION FOR WELDING**

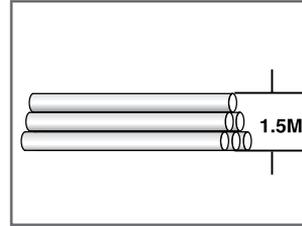
Before welding/jointing, clean the surface of Greenfit PP-R Pipes & Fittings with a clean piece of cloth and then start welding.

**WELDING**

Avoid air draughts during welding to avoid stress in the welds.

**DON'Ts****STORAGE**

Greenfit PP-R Pipe storage height should not be more than 1.5 meter.

**HANDLING**

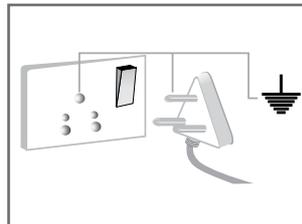
The Greenfit PP-R Pipe system should be protected from impact of hard and sharp objects.

**HEATING**

While welding of Greenfit PP-R Pipes and fittings check that the thermostat of welding machine and dyes have reached correct temperature (260°C). While welding, the pipe must not be twisted.

**SAFE WELDING**

Welding machines shall be earthed properly during use.

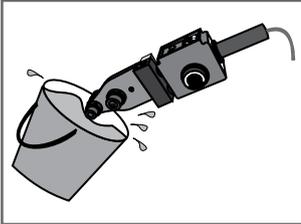


DOs



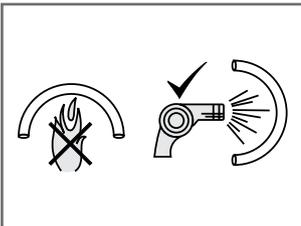
SAFE WELDING

Do not cool welding machine in water.



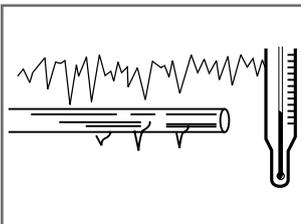
BENDING

Do not apply direct flame to fabricate bends or crossover pipes, as the direct exposure to fire may cause damage to the Greenfit PP-R pipes. Use only hot air blowing equipment at 140°C. (Cross overs are readily available.)



INSTALLATION AT LOWER TEMPERATURE

At sub zero temperatures (0°C & below) Greenfit PP-R Pipe system tends to break under impact. Therefore, installation at low temperatures should be done with care, and the pipe lines shall be insulated.



DON'Ts



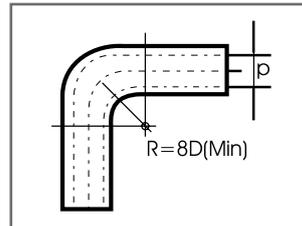
THREAD JOINT

Do not over tighten threaded fittings & valves.



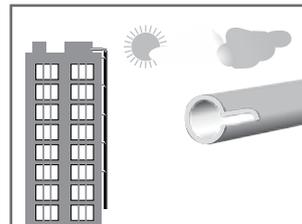
BENDING

While bending the pipe, the bending radius shall be more than 8 times the diameter of the pipe.



OUTDOOR INSTALLATION

Use 3 layered pipes for outdoor application.



INSTALLATION TIME FOR PPR SYSTEMS

RECOMMENDED TIME WITH FUSION JOINTS

Pipe Dia (mm)	Welding Depth (mm)	Heating Time (sec)	Welding Time (sec)	Cooling Time (mins.)
16	14	6	4	2
20	14.5	6	4	2
25	16	7	4	2
32	18	8	6	4
40	20.5	12	6	4
50	23.5	18	6	4
63	27.5	24	8	6
75	30	30	8	6
90	32.5	40	8	6
110	37	50	10	8
160	42	60	15	10

RECOMMENDED TIME WITH BUTT JOINTS

Pipe Dia (mm)	Welding Machine Temperature °C	Heating Time (min)	Welding Time (sec)	Cooling Time (mins.)
200	220-240	30	180	15-20
250	220-240	30	240	16-24
315	225-240	30	300	20-25

PROJECT REFERENCE

Sr. No.	Customer Name	Location
Automobile Industry		
1	Seco Tools India	Ranjangaon MIDC
2	Sandvik Asia	Dapodi
3	Jbm Automobile	Sanand
4	SI Lumax	Irrungattukottai
5	Super Auto Forge Pvt Ltd	Vallam
6	Sundaram Fasteners	Chengalpattu
7	Sri Vari Industries	Vallam
8	Parkson Packaging India Limited	Sri City
9	Omni Auto Limited	Sri City
10	Rico Auto Industries Limited	Vallam
11	Lucas Tvs Group - Indrad Auto Components	Maraimalai Nagar
12	Mando Automotive India Limited	Pillaipakkam
13	Gestamp Pune Automotive Pvt Ltd	Budruk
14	L&L Products India Pvt. Ltd	Pune
15	Minda Instruments Limited Pune	Pune
Chemical industry		
16	Berzelius Chemicals	Kurkumbh MIDC
17	Halides Chemicals	Kurkumbh MIDC
18	Neogen Chemicals	Bharuch & Baroda
Manufacturing industry		
19	Polycab Cables	Nashik
20	Mitsu Chem	Patalganga & Boisar
21	Zenith Rubber	Dombivali
22	Kimplast Nashik	Nashik
23	Supreme Equipment	Nashik
24	Funskool India Limited	Ranipet
25	Apollo Tyres	Oragadam
26	Multibase India	Daman
27	Polybond India Pvt. Ltd.	Pune
Pharmaceutical industry		
28	Datweyler Pharma	Shirwal MIDC
29	S Kant Healthcare	Boisar
30	Accumex Labdevices Pvt Ltd	Ahmedabad
31	Ipca Laborateries	Baroda
Textile industry		
32	Safari Industry	Baroda
Packaging Industry		
33	Cosmo Films Ltd	Aurangabad
34	Jolly Containers	Rajasthan & Ludhiana
35	Trent Pouchplast Ltd	Mehsana
Hotel		
36	Gem Park	Ooty
37	Taj Hotel	Ooty
38	Conrad Hotel	Pune
Hospital		
39	Ruby Hall Clinic	Pune
Warehousing		
40	Db Shenker	Padgha

INSTALLATION IMAGES

GREENFIT PP-R INSTALLATION





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