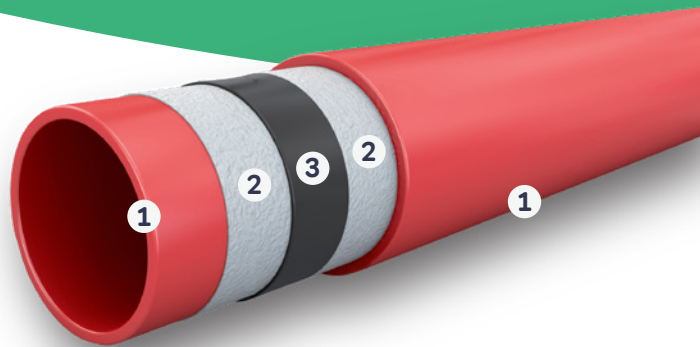


# Wavin Polybutylene Pipe

## System Construction

1. Polybutylene
2. Adhesive – ensures secure bonding of Polybutylene to barrier layer
3. EVOH – Oxygen barrier layer



Material Properties	Method	Unit	Performance
<b>Physical Properties</b>			
Melt flow rate MRF 190°C/2.16kg	ISO 1133	dg/min	0.4
Density	ISO 1183	g/cm <sup>3</sup>	0.937
Hardness shore D	ISO 8608	–	53
<b>Mechanical Properties</b>			
Tensile strength at yield	ISO R 527	MPa	20
Tensile strength at break	ISO R 527	MPa	35
Elongation at break	ISO R 527	%	300
Flexural elastic modulus	ISO 178	MPa	350
Notched impact strength at 20°C	ISO 180	kJ/m <sup>2</sup>	No break
Notched impact strength at 0°C	ISO 180	kJ/m <sup>2</sup>	40
<b>Thermal Properties</b>			
Melting point range	DSC <sup>(a)</sup>	°C	127–129
Vicat softening temperature	ISO 306	°C	113
Coefficient of linear thermal expansion	ASTM D696	–	1.3x10 <sup>-4</sup>
Expansion	ASTM C177	–	0.19
Thermal conductivity (20°C)	DMTA <sup>(a)</sup>	°C	-18
Glass transition temperature			
<b>Specific Characteristics</b>			
Environmental stress cracking (at 50°C in 10% Igepal C0630 solution)		h	15,000 No failure
Wet abrasion (sand slurry test, 23°C, 100h)		%	1

Wavin uses polybutylene barrier pipe to circulate warming or cooling water through the application. The EVOH (ethanol vinyl alcohol) barrier layer is embedded within the pipe-wall using a 5 layer co-extrusion process to ensure that oxygen cannot permeate through the pipe wall over time to enter the water circuit. The introduction of oxygen into the system could potentially contribute to corrosion in the boiler or metal pipework in the rest of the system.

Polybutylene has an unrivalled balance of properties to satisfy the demands of the hot and cold pressurised water pipe market. The main aspects which distinguish it from other candidate materials are its flexibility and superior resistance to stress over long periods of time at high temperatures. Flexibility is a key factor because it eases installation across a broad range of internal temperature conditions. The relative flexibility of different plastics is indicated in the table above. Polybutylene is non-corrosive, resists frost damage, and is unaffected by hard, soft or aggressive water conditions. It is creep-resistant and offers high impact strength meaning that if it is distorted on site, it will return to its original shape.

Wavin polybutylene pipe is designed to last for the life of the building and is guaranteed for 100 years. This guarantee period is longer than other credible warranties being offered. The pipe is manufactured to, and performs to, all known European quality and performance standards. Including:

BS 5750 / BS7251 / BBA / DIN4726 / DIN4727 / BRITISH GAS / WRAS

Polybutylene is produced from crude oil by refining and polymerisation – the polymer is extruded to create the finished product. Polybutylene has markedly less embodied energy than almost all competing materials by virtue of the ease with which raw materials can be transported and the manufacturing process. The manufacturing of polybutylene pipe has significantly less environmental impact in terms of energy usage and emissions than is the case for metal pipe systems and other plastic pipes. Finally, because Warmafloor uses UK-manufactured pipe, there is minimum environmental impact transporting the finished product to site.

Recycling of polybutylene is possible because the molecular structure of the material is not altered by the production process. Any 'clean' production waste during the manufacturing process is reworked and added back to the production process in accordance with ISO 15876 and BS 7291. Polybutylene pipe used in underfloor heating applications will almost always out-live the building. Pipe is installed within the fabric of the building in unjointed pipe-runs. Where polybutylene pipe is damaged, e.g. by building refurbishment, it may be repaired by a simple push connector, which maintains the molecular integrity and performance characteristics on the undamaged pipe.