

# Difference Between EPDM and PVC

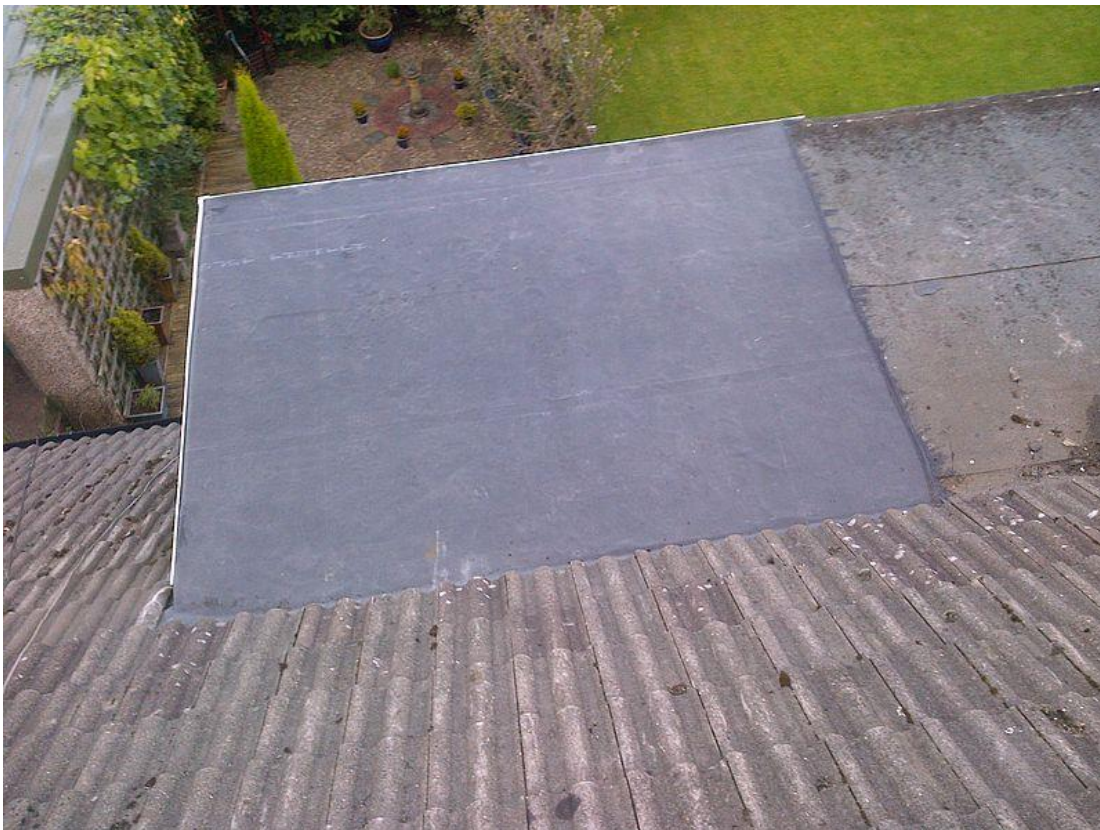
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## Key Difference - EPDM vs PVC

EPDM and PVC are widely used [polymers](#) owing to their unique set of properties. The **key difference** between EPDM and PVC is **EPDM is a [synthetic rubber](#), whereas PVC is a [thermoplastic](#)**. The difference between EPDM and PVC is discussed below.

## What is EPDM?

EPDM (ethylene propylene diene monomer) is a widely used synthetic rubber that derives from ethylene and propylene. It's a terpolymer produced by the grafting of a non-conjugated diene on to the main chain. Vulcanization of EPDM using [sulfur](#) is possible due to the presence of crosslinks in interchains. EPDM is manufactured in various viscosities and different ethylene/propylene ratios. When the ethylene content is high, the rubber will give more green strength and poor low-temperature properties. The type and amount of diene [monomer](#) units grafted on the rubber determine the ease of vulcanization. EPDM is well-known as weather and ozone resistant rubber. According to raw gum elastomer manufacturers, the upper continuous heat ageing temperature is somewhere around 126 °C to 150 °C.



**Figure 01: EPDM (ethylene propylene diene monomer) rubber flat roof**

The low-temperature flexibility of EPDM is well above when compared with natural rubber and SBR (styrene butadiene rubber), but with very poor oil resistance. Because of the

properties mentioned above, EPDM is widely used as roof membrane linings and extruded channels for windows. Also, it is used in a blend with natural rubber in tire sidewalls to reduce the cracking by ozone attack. Moreover, excellent electrical insulation property of EPDM enables it to use in medium and high voltage cable covers. The combination of properties including good resistance to water absorption and good mechanical properties and low cost make it uses as pond liners. EPDM is also used in automotive industry as radiator and heater hoses and weather strips.

## What is PVC?

(PVC) is made by the polymerization of vinyl chloride. The monomer vinyl chloride is produced by chlorine obtained from salt water electrolysis, and ethylene obtained from naphtha. Various additives must be added to PVC during the processing to meet the desired properties, as PVC possesses low thermal stability and high melt viscosity. The appropriate formulations of PVC can cover a broad range of applications as a thermoplastic. It is the second largest commodity thermoplastics after polyethylene (PE) in the world owing to its excellent set of properties, low cost and medium to long-term lifespan applications. The glass transition temperature ( $T_g$ ) of PVC lies around 80 °C. PVC is mainly amorphous (90%), so it does not have an exact melting point. PVC can be made flexible by adding plasticizers. Hence the material is called PVC-C. A dry blend of PVC without plasticizers are called PVC-U and are used for rigid applications such as pipes, gutters etc.



**Figure 02: PVC Pipes and Fittings**

PVC is durable and can be formulated to increase the weather resistance. It can also be used for food contact, and medical applications are owing to its inertness and clarity. The rigid PVC is non-flammable and has high impact strength. Also, it is resistant to many chemicals, greases, and oils. When compared to other thermoplastics, the specific gravity of PVC is higher, and the continuous service temperature is relatively low. Due to the health hazardous behaviour of monomer (vinyl chloride), dioxins and phthalate plasticizers, and lead

(cadmium), some consumers tend to limit PVC usage. Applications of PVC include doors, window frames, pipes, gutters, roofing membranes, telecommunication cables, wall plugs, dialysis tubing, surgical gloves, food packages etc.

## What is the Difference Between EPDM and PVC?

EPDM vs PVC	
EPDM is a synthetic rubber derives from ethylene and propylene.	PVC is a thermoplastic elastomer produced by the polymerization of vinyl chloride.
Main Properties	
Excellent weather and ozone resistance, good low-temperature flexibility, crack resistance, good resistance to water absorption and good mechanical properties.	Medium to long-term lifespan, weather resistance, biocompatibility, high impact resistance, resistant to many chemicals, oils and grease, and good clarity
Limitations	
Very poor oil resistance and hardness, and poor low-temperature properties	Low thermal stability, low continuous service temperature and health hazards associated with monomer and additives.
Typical Glass Transition Temperature	
-55 °C	80 °C
Applications	
Roof membrane linings, extruded channels for windows, tire sidewalls, high voltage cable covers, pond liners, radiator and heater hoses, weather strips etc.	Doors, window frames, pipes, gutters, roofing membranes, telecommunication cables, wall plugs, dialysis tubing, surgical gloves, food packages etc.

## Summary - EPDM vs PVC

EPDM and PVC are widely using polymers due to their manufacturing cost and excellent properties. EPDM is a synthetic rubber made from ethylene and propylene and has excellent ozone and weather resistant properties. PVC is a widely used thermoplastic elastomer with chemical and oil resistance, and good impact resistant properties. Both these polymers are used in weather resistant applications. However, their properties can be altered based on the final applications/ product. This is the difference between EPDM and PVC.

### Reference:

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- 2.Carraher Jr, C. E. (2012). Introduction to polymer chemistry. CRC press.
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