

# Difference Between UPVC and CPVC

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## Key Difference - UPVC vs CPVC

**PVC** or polyvinylchloride is a synthetic [thermoplastic](#) often made by the [suspension or emulsion polymerization](#) of acetylene and anhydrous hydrochloride acid. It is one of the oldest and most common plastics. During its production process, various chemicals such as impact modifiers, plasticizers, fillers, reinforcing agents, lubricants, and stabilizers can be added in order to widen the uses of PVC. PVC may be available in the forms of flexible thin films, rigid plastics, foams or [elastomers](#). Depending on the addition of certain ingredients, there are three types of PVCs, namely PPVC (plasticized PVC), PVCA (polyvinyl chloride acetate), UPVC and CPVC. In this article, the difference between UPVC and CPVC is highlighted. UPVC stands for unplasticized PVC, whereas CPVC stands for post-chlorinated PVC. The **key difference** between UPVC and CPVC is that **UPVC is produced without the addition of plasticizers, whereas CPVC is produced by post-chlorination of PVC to enhance the chlorine content in the [polymer](#).**

## What is UPVC?

UPVC is the PVC type contains no plasticizers. UPVC can be manufactured by calendaring, extrusion, and injection moulding. UPVC is well known for its low water absorption. In addition, it offers good resistance to [alkalis](#), [oils](#), acids and inorganic chemicals. However, it is not compatible with [ketones](#), chlorinated and [aromatic hydrocarbons](#), aromatic ethers, [esters](#), [amines](#). UPVC is widely used in many applications including electrical insulation applications, pipes, sheets and films, window frames, translucent glazing, gaskets, seal frames, packaging, flexible toys, books, bottles, office equipment, etc. UPVC possess high [tensile](#) and high impact strength.



Figure 01: A UPVC Pipe

Moreover, it can withstand high pressures for long periods of time even in high temperatures. However, its low-temperature stability is limited. UPVC is lightweight and much easy to handle

during installation. The plasticizers of UPVC can be leached out by certain hydrocarbons resulting in the degradation of properties.

## What is CPVC?

CPVC is produced by raising the chlorine content from 56% to around 66% through the post-chlorination process. Chlorination takes place at  $-CH_2$  groups that ultimately converts the PVC into a copolymer of vinyl chloride with 1,2-dichloroethylene. Chlorination process reduces the attraction forces between polymer chains and makes PVC more amorphous. These factors will lead CPVC to increase its glass transition temperature approximately by 50% than PVC and also to enhance the melt [viscosity](#) during processing.



**Figure 02: CPVC Pipes**

The upper service temperature of CPVC is about 100 °C, whereas that of PVC is about 60 °C. When compared to PVC, CPVC is non-toxic and possess excellent heat resistant properties. In addition, CPVC offers greater flexibility and strength over PVC. CPVC is also known for its fire-resistant properties and will not burn without a flame source. This lightweight material is easy to install. The pipes of CPVC are used for hot-water lines, metal treating, food and [beverage](#) industry, and wastewater treatment. CPVC is also resistant to polar organic solvents such as chlorinated

hydrocarbons, esters, ketones, etc. However, CPVC may not be reliable to use with certain oils and grease under stress conditions.

## What is the Difference Between UPVC and CPVC?

UPVC vs CPVC	
UPVC contains no plasticizers.	CPVC is produced by post-chlorination, so the chlorine content is greater than UPVC.
High Temperature Stability	
High temperature stability in UPVC is low.	High temperature stability in CPVC is high.
Compatibility with Chlorinated and Aromatic Hydrocarbons	
UPVC is incompatible with chlorinated and aromatic hydrocarbons	CPVC is compatible with chlorinated and aromatic hydrocarbons
Toxicity	
UPVC can be toxic especially when plasticizers leached out	CPVC is non-toxic
Density	
The density of CPVC is higher than that of UPVC.	The density of UPVC is lower than that of CPVC.
Melt Viscosity in Processing	
UPVC has low melt viscosity in processing.	CPVC has higher melt viscosity in processing.
Maximum Service Temperature	
Around 65 °C	Around 100 °C
Glass Transition Temperature	
80-84 °C	99-123 °C
Flammability	
Lesser compared to CPVC	Higher compared to UPVC

## Summary - UPVC vs CPVC

UPVC and CPVC are two types of PVC that are used in wide range of applications owing to their different set of properties. UPVC contains no plasticizers, thus resulting in more strength and impact resistant. CPVC is made by post-chlorination to increase the chlorine content. Thus it is more strong and resistant to wide range of chemicals. In addition, the service temperature is high in CPVC than UPVC due to higher glass transition and melting viscosity of CPVC.

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