



**PERMAFORM**

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Permaform International Pty Ltd

Certification Report

Product Physical Properties & Life Expectancy

Technical note – P00510-1



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## Material – PVC Physical Properties<sup>1</sup>

Permaform is constructed from Rigid PVC type D and the materials are identical to those of PVC pipe. PVC has an amorphous structure with polar chlorine atoms in the molecular structure. Having chlorine atoms and the amorphous molecular structure are inseparably related. Although plastics seem very similar in the context of daily use, PVC has completely different features in terms of performance and functions compared with olefin plastics which have only carbon and hydrogen atoms in their molecular structures.

Chemical stability is a common feature among substances containing halogens such as chlorine and fluorine. This applies to PVC resins, which furthermore possess fire retarding properties, durability, and oil/chemical resistance.

## Fire retarding properties

PVC has inherently superior fire retarding properties due to its chlorine content, even in the absence of fire retardants. For example, the ignition temperature of PVC is as high as 455°C and is a material with less risk for fire incidents since it is not ignited easily.

Furthermore, the heat released in burning is considerably lower with PVC, when compared with those for PE and PP. PVC therefore contributes much less to spreading fire to nearby materials even while burning.

Therefore, PVC is very suitable for safety reasons in products close to people's daily lives.

## Durability

Under normal conditions of use, the factor most strongly influencing the durability of a material is resistance to oxidation by atmospheric oxygen. PVC, having the molecular structure where the chlorine atom is bound to every other carbon chain, is highly resistant to oxidative reactions, and maintains its performance for a long time. Other general-purpose plastics with structures made up only of carbon and hydrogen are more susceptible to deterioration by oxidation in extended use conditions (such as, for example, through repeated recycling). Measurements on underground 35-year-old PVC pipes taken by the Japan PVC Pipe & Fittings Association showed no deterioration and the same strength as new pipes

## Oil/Chemical resistance

PVC is resistant to acid, alkali and almost all inorganic chemicals. Although PVC swells or dissolves in aromatic hydrocarbons, ketones, and cyclic ethers, PVC is hard to dissolve in other organic solvents. Taking advantage of this characteristic, PVC is used in exhaust gas ducts, sheets used in construction, bottles, tubes and hoses.

## Mechanical stability

PVC is a chemically stable material, which shows little change in molecular structure, and also exhibits little change in its mechanical strength. However, long chain polymers are viscoelastic materials and can be deformed by continuous application of exterior force, even if the applied force is well below their yield point. This is called creep deformation. Although PVC is a viscoelastic material, its creep



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deformation is very low compared with other plastics due to limited molecular motion at ordinary temperature, in contrast to PE and PP, which have greater molecular motion in their amorphous sections.

Reference

1. <http://www.pvc.org/en/p/pvcs-physical-properties>

**Applicable Standards**

ISO 877-1:2009      Plastics -- Methods of exposure to solar radiation

ISO 877-1:2009 provides information and general guidance on the selection and use of the methods of exposure to solar radiation described in detail in subsequent parts of ISO 877. These methods of exposure to solar radiation are applicable to plastics materials of all kinds as well as to products and portions of products.

It also specifies methods for determining radiant exposure.

It does not include direct weathering using black-box test fixtures, which simulate higher end-use temperatures in some applications

**Statement of Certification**

Permaform International Pty Ltd certifies that the PVC items that make up the Permaform panels and accessories have been tested to ISO 877-1:2009 and achieves a durability rating of greater or equal to 80 years.

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