10.00 CHEMICAL RESISTANCE

Hunter Underground Systems

10.01 Chemical Resistance

CHEMICAL RESISTANCE OF UNPLASTICISED PVC (PVCu)

The resistance of plastic pipe materials to a wide range of chemicals is listed in the tables of British Standard Code of Practice 312: Part 1:

DRAIN PIPES AND FITTINGS

The type of behaviour to be expected for PVCu on the basis of laboratory tests is summarised in the following paragraphs with additional information based on practical experience for the fabricated articles being given in some instances. It should be noted that PVC is not normally recommended for use above 60˚C.

WATER AND DILUTE SOLUTIONS

No failure has been observed due to contact with water or aqueous solutions for PVCu pipe of the type which conforms to the relevant British Standards.

ACIDS

PVCu is highly resistant to strong acids, although some oxidising acids in high concentration attack it. Hydrochloric acid can be used at all concentrations at temperatures up to 60˚C. Sulphuric acid at less than 90% concentration has no effect at temperatures up to 60˚C, but acid of 90 - 95% concentration should not be carried at temperatures in excess of 50˚C. Cold nitric acid is satisfactory at concentrations up to 50%, but hot concentrated nitric acid attacks PVCu.

ALKALIS

PVCu satisfactory in the presence of alkalis at all concentrations at temperatures up to 60˚C.

HALOGENS

Dry chlorine gas does not attack PVCu at room temperatures but there is some attack at elevated temperatures or if the gas is moist. Bromine and fluorine, even in low concentrations, will attack PVCu at room temperature.

OXIDISING AGENTS

PVCu is resistant to all but the most severe oxidising conditions. Hydrogen peroxide at all concentrations has no effect, and even concentrated solutions of oxidising conditions. Hydrogen peroxide at all concentrations has not effect, and even concentrated solutions of oxidising salts such as potassium permanganate cause only superficial attack.

REDUCING AGENTS

These reagents have practically no effect on PVCu at temperatures up to 60˚C.

ORGANIC LIQUIDS AND VAPOURS

PVCu is resistant to most oils, fats, alcohols and petrol.

GENERAL

Generally PVC is unsuitable for use in contact with aromatic and chlorinated hydrocarbons, ketones, nitro compounds, esters and cyclic ethers, which penetrate the PVC and cause marked swelling and softening. Some petrol-based fuels containing benzene cause swelling. Thee penetrating solvent may be harmful to PVC even when dilute, but as they are diluted further their effects fall off noticeably, and very low concentrations, such as are present in effluents, can be safely handled.

The advisability of using PVC pipe for conveying gas needs careful consideration based on detailed information concerning the constituents, particularly any aromatic constituents, of the gas.

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KEY TO CHEMICAL RESISTANCE

GENERAL RESISTANCE

Expected Action.

G - Good/Excellent resistance to attack.
F - Fair resistance to attack.
P - Poor resistance to attack.

SUBSTANCE	*EXPECTED ACTION*
Mineral Acids (Diluted)	G
Mineral Acids (Concentrated)	G
Alkalis	G
Alcohols	G
Ketones	P
Aromatic Hydrocarbons	P
Chlorinated Hydrocarbons	P
Greases and Oils	G

SPECIFIC RESISTANCE

Expected Action

E - Negligible at temperatures to 600C
G - Negligible at room temperature I80C
P - Appreciable or extensive even at room temperature.

SUBSTANCE	*EXPECTED ACTION*
Alcohols (Aliphatic)	G
Alcohols (Aromatic)	P
Acetaldehyde	P
Acetic Acid (Aqueous)	E
Acetone	P
Aldehyes (Aliphatic)	P
Aldehyes (Aromatic)	P
Ammonia (Gas)	G
Ammonia (Solution)	G
Ammonium Salts	E
Amyl Acetate	P
Amline	P
Amline Salts	P
Animal Oils	G
Aqua Regia	P
Aqueous Solutions (Diluted)	E
Beer	E
Benzaldehyde	P
Benzene	P
Benzene - Sulphuric Acid	P
Benzonic Acid	P
Benzyl Alcohol	P
Borax	E
Boric Acid	E
Brine	E
Bromine	P
Butane	G
Butyl Alcohol	G
Butyraldehyde	P
Carbon Disulphide	P
Carbon Tetrachloride	P
Caster Oil	G
Chloral Hydrate	P
Chlorine	P
Chloring Water	P
Chlorobenzene	P
Chloroform	P
Chlorosulphonic Acid	P
Chlomic Acid (Plating Solution)	P
Cider	E
Citric Acid	E
Creosote	P
Cresols	P
Cyclohexanol	P
Detergents	E
Developers	E
Dibutyl Phthalate	P
Dichlorobenzene	P
Diethyl Ether	P
Dimethylamine	G
Dioctyl Phthalate	P
Emulsions (Photographic)	E
Ether	P
Ethyl Acetate	P
Ethyl Alcohol	G

SUBSTANCE	*EXPECTED ACTION*
Ethyl Chloride	P
Ethylene Chloride	P
Ethylene Glycol	G
Ethylene Oxide	P
Esters	P
Fixing Solution	E
Flourine	P
Formaldehyde (Aqueous)	E
Formic Acid	G
Fruit Pulp	E
Fuel Oil	G
Furfural	P
Furfural Alcohol	P
Gallic Acid	E
Gin	G
Glycerine	E
Glycol	E
Halogenated Hydrocarbons	P
Hydrocarbon Liquids	P
Hydrochloric Acid	E
Hydrocylamic Acid (10%)	E
Hydrofluoric Acid (Aqueous)	G
Hydrofluoric Acid (Concentrated)	P
Hydrogen Bromide	E
Hydrogen Chloride	E
Hydrogen Peroxide (40 vol)	E
Hydrogen Peroxide (100 vol)	E
Inks	E
Iodine in KI Solution	P
Ketones	P
Lactic Acid	P
Linseed Oil	E
Maleic Acid	G
Metal Salts and Solutions	E
Methyl Acetate	P
Methyl Bromide	P
Methyl Alcohol	G
Methyl Ethyl Ketone	P
Methyl Chloride	P
Methylene Chloride	P
Methylated Spirit	G
Mineral Oils	E
Milk	E
Naphtha	E
Molasses	E
Nitric Acid (Diluted))	E
Naphtha lene	P
Nitrobenzene	P
Nitric Acid (Concentrated)	P
Oleic Acid	E
Oils	G
Oxidising Acids	P
Oxalic Acid	E
Paraffin	E
Ozone	E
Petrol	G

SUBSTANCE	*EXPECTED ACTION*
Perch loric Acid	G
Phenol	G
Petroleum Ether	P
Phosphoric Acid (Concentrated)	E
Phosphoric Acid (Diluted)	E
Photographic Emulsions	E
Photographic Developers	E
Potassium Hydroxide	G
Photographic Fixes	E
Propylene Glycol	G
Propylene Chloride	P
Sea Water	E
Solicyclic Acid	E
Soap Solutions	E
Silicone Fluids	G
Stannic Acid	E
Sodium Hydroxide	G
Sulphuric Acid (Diluted)	E
Sugars	E
Sulphuric Acid (10%)	E
Sulphuric Acid (Concentrated)	P
Tannic Acid	E
Surface Active Agents (Normal Solutions of)	E
Tetrahydrofuram	P
Tartaric Acid(10%)	G
Transformer Oil	G
Toluvene	P
Trichlorobenzene	P
Trich lorethylene	P
Turpentine	G
Triethanolamine	E
Vegetable Oils	G
Urine	E
Water	E
Vinegar	E
Xylene	P
Wines and Spirits	G