British Laminate Fabricators Association

# Chemical resistance of HPL

Technical Information Sheet No. 12 / 2002

These working recommendations were compiled by The International Committee of the Decorative Laminate Industry. They are a summary of good working practices existing in Europe at present.

# Contents

## 1. General

**1.1** In these recommendations emphasis is placed on presenting the chemical resistance of high-pressure decorative laminates (HPL) and the application possibilities arising from it.

Owing to their surface consisting of melamine resin, HPL satisfying EN 438 and ISO 4586 under revision possess, apart from excellent mechanical properties and high temperature resistance, a particularly good resistance to most chemicals. They can therefore be used where, for instance:

Laboratory & technical chemicals
Solvents
Disinfectants
Dyestuffs
Bleaching agents
Cosmetics

act on their surface. The resistance to the individual chemicals is listed in Section 4 of this publication.

**1.2** Particular attention is to be paid to careful manufacture of HPL since, particularly in the construction of laboratories and with medical-technical installations, wear can be heavy. It is therefore essential to take into account the manufacturing guidelines already published.

## 2. Areas of application

HPL is available in almost unlimited variety of decoration and colouring. Moreover, the material permits the creation of numerous shapes (e.g. by subsequent forming or in the form of high pressure compact boards) and also offers the possibility of covering large areas without gaps.

This, as well as the high resistance to wear, makes HPL suitable for installations and structure in, for instance, the following areas:

Pharmacies
Doctors Surgeries
Hospitals
Veterinary Surgeries
Chemists
Laboratories – chemical, photographic, medical
Shops – hairdressers, butchers
Food retailing
Meat processing industry – meat & sausage abattoirs

The following fundamental points have to be observed in that respect:

**2.1** For vertical surfaces e.g. doors, furniture or a wall covering. HPL can generally be used without restriction. The recommendations which follow refer therefore mainly to working surfaces made from HPL.

**2.2** When using HPL working surfaces, their type of surface has to be chosen in accordance with the wear expected of them. It is advisable to discuss this with the HPL manufacturer.

**2.3** HPL is resistant to most chemicals (See Section 4.1) Some chemicals may, however, attack the surface. Decisive in that respect:

the concentration
the exposure time
the temperature

of the chemicals. It is therefore recommended to remove as quickly as possible chemicals listed under 4.2. Chemicals listed in 4.3 must be removed immediately.

**2.4** HPL is generally considerably more heat resistant than most thermoplastics (e.g. PVC, PE, PS, ABS). It resists for instance, temperatures of at least 180ºc (pot test according to EN 438 or ISO 4586/11). High temperatures can be supported for a short time. Extreme heat e.g. from Bunsen burners or infra-red radiators can lead to discolouration or destruction by carbonisation. In such areas the HPL should be protected by heat resistant plates – e.g. asbestos or ceramics.

**2.5** The advantage of HPL lies in good and easy cleaning. HPL is resistant to organic solvents; hence it is possible to remove stains, which cannot be cleaned with water by using organic solvents.

The user should however, be warned that frequent cleaning with abrasive materials can damage the surface and hence reduce its resistance to chemicals. Such

cleaning agents should therefore not be used.

## 3. Characteristics of the various areas of application

### 3.1 Pharmacies & Chemists

Foodstuffs and juices, cosmetic cleaners (e.g. nail varnish removers), medicines, are harmless to HPL.

Chemicals and cleaning agents, however, are usually dispensed in separate rooms. Since the type and composition of a chemical are not always known, it is advisable to remove spills without delay.

Dried lacquer and paint, unless containing hardening binding agents can easily be removed with organic solvents (e.g. acetone).

### 3.2 Doctors surgeries, treatment rooms, operating theatres

Here HPL can be used to advantage since they lend themselves to perfect cleaning and disinfecting.

They are resistant to disinfectants based on:

Ethanol 70%
Formaldehyde 1% & 5%
P-chloro-m-cresol 0.3%
Tosyl chloride-Na 1%
Alklyl-dimethyl-benzyl-ammonium Chloride 0.1%
Alcohols
Aldehydes
Phenols
Quaternary ammonium compounds

With HPL it is possible to cover large areas without gaps. The surface is not affected by residue or urine, blood or ointments which can be readily removed.

HPL is excellently permeable to X-rays and is therefore suitable for medical couches and is, moreover, resistant to UV and IR radiation emanating from medical treatment installations.

### 3.3 Medical & biological laboratories

HPL is also well suited to laboratories of this kind (ease of cleaning – ease of disinfection). Strong staining substances (eg agents for staining microscopic specimens) and strongly oxidising substances (eg hydrogen peroxide) can, however, leave stains, if the solutions are allowed to react a long time with the surface. Such substances should therefore be removed immediately.

### 3.4 Chemical laboratories

Chemical laboratories usually work with aggressive materials and HPL is resistant to most of them (example see 4.1). Some chemicals, however, depending on their composition and concentration, can damage the laminate surface if allowed to react for any length of time (example see 4.2).

The chemicals listed under 4.3 which attack most materials also cause irreversible changes on the decorative surface of HPL. When using such substances, therefore, the HPL surface should be protected, eg by using a suitable cover.

HPL is also suitable for the inside walls of fume cupboards. After prolonged action of aggressive vapours such as sulphur dioxide, chlorine, bromine, acid fumes, etc, one must reckon, with an alteration of the appearance of the HPL surface, which however, does not affect it's use.

### 3.5 Physical & technical laboratories

In general HPL can be recommended for use as working surfaces in these areas without hesitation. Where strong mechanical demands are made upon the surface it could be good advice to consider the use of textured grades of surface. Beware of battery acid! Remove drops quickly, since otherwise matt spots will remain on the HPL.

### 3.6 Photographic laboratories

The common developers and fixing agents do not damage the HPL surface, but when using dye and silver compound solutions one must expect discolouration. It is therefore of particular importance to remove these spillages as soon as possible.

### 3.7 Hairdressing salons

The majority of products used in hairdressing salons do not attack HPL.

Dried-on residues of nail lacquer, hair fixatives, or oil and grease – containing residues of cosmetics (lipstick, hair oil) are easily removed with organic solvents (acetone).

**3.8 Foodstuff industry & retail shops**
Because of it's ease of cleaning, it's resistance to disinfectants and the ease with which it can be disinfected HPL is particularly suitable for these applications.

**3.9 Meat processing**
Because of it's hygienic properties and ease of cleaning HPL has proved to be a versatile material for walls, doors, working surfaces etc. In abattoirs butchers and meat processing plants. It is also resistant to blood and animal excrements. As cleaning is often carried out using high pressure water or steam, boards and panels should be manufactured so as to prevent ingress of moisture to the core material. Fixing systems should also be designed accordingly.

**4. Surface resistance of HPL**

The following list whilst not claiming to be exhaustive gives a survey of the resistance of HPL (at room temperature) to the action of commonly encountered or used substances (solid, in solutions, liquid, gaseous).

For resistance of HPL to chemicals not listed hereunder the laminate manufacturer should be consulted.

**4.1** HPL is resistant to the following substances and reagents. These substances do not change the appearance of the surface of the HPL even after prolonged contact (see list 4.1.1).

**LIST 4.1.1**

| **Substance** | **Chemical formula** |
|---|---|
| A-naphthaline | $C_{10}H_7NH_2$ |
| A-naphthole | $C_{10}H_7OE$ |
| Acetic acid | $CH_3COOH$ |
| Acetic acid ethyl ester | $CH_3COOC_2H_5$ |
| Acetic acid iso-amyl ester | $CH_3COCH_5H_{11}$ |
| Acetone | $CH_3COCH_3$ |
| Active Carbon | |
| Adhesives – Water Soluble | |
| Alcoholic beverages | ROH |
| Alcoholis | |
| Alcohols | |
| - Primary | $RCH_2OH$ |
| - Secondary | RR'CHOH |
| - Tertiary | RR'R'COH |
| Aldehydes | RCHO |
| Alum solution | $KAI(SO_4)_3$ |
| Aluminium sulphate | $AI_2(SO_4)_3$ |
| Amides | $RCONH_2$ |
| Amines | |
| - Primary | $RNH_2$ |
| - Secondary | (RR')NH |
| - Teritary | (RR'R'')N |
| Ammonia | $NH_4OH$ |
| Ammonium chloride | $NH_4CI$ |
| Ammonium sulphate | $(NH_4)_2SO_4$ |
| Ammonium thiocyanate | $NH_4SCN$ |
| Amyl acetate | $CH_3COOC_5H_{11}$ |
| Amyl alcohol | $C_5H_{11}OH$ |
| Aniline | $C_6H_5NH2$ |
| Animal fats | |
| Animal feedstock | |
| Arabinose | $C_5H_{10}O_5$ |
| Asorbic acid | $C_6H_8O_6$ |
| Asparagic acid | $C_4H_7O_4N$ |
| Aspargine | $C_4H_8O_3N_2$ |
| Baking yeast | |
| Barium chloride | $BaCI_2$ |
| Barium sulphate | $BaSO_4$ |
| Benzaldehyde | $C_6H_5CHO$ |
| Benzene | $C_6H_6$ |
| Benzidine | $NH_2C_6H_4C_6H_4NH_2$ |
| Benzonic acid | $C_6H_5COOH$ |
| Biogel | |
| Blood | |
| Blood test seren | |
| Boric acid | $H_3BO_3$ |
| Butyl acetate | $CH_3COOC_4H_9$ |
| Butyl alcohol | $C_4H_9OH$ |
| Cadmium acetate | $Cd(CH_3COO)_2$ |
| Cadmium sulphate | $CdSO_4$ |
| Calcium carbonate (chalk) | $CaCO_3$ |
| Calcium chloride | $CACI_2$ |
| Calcium hydroxide | $Ca(OH)_2$ |
| Calcium oxide | CaO(aq) |
| Calcium nitrate | $Ca(NO_3)_2$ |
| Cane sugar | $C_{12}H_{22}H_{11}$ |
| Carbol-xylene | $C_6H_5OH$-$C_6H_4(CH_3)_2$ |
| Carbolic acid | $C_6H_5OH$ |
| Carbon tetra chloride | $CCI_4$ |
| Caseine | |
| Castor oil | |
| Caustic soda up to 10% | NaOH |
| Cedar wood oil, thickened | |
| Cement | |
| Chloral hydrate | $CCI_3CH(OH)_2$ |
| Chlorobenzene | $CHCI_3$ |

| | |
|---|---|
| Cholesterol | $C_{27}H_{45}OH$ |
| Citric acid | $C_6H_8O_7$ |
| Clay | |
| Coal | |
| Cocaine | $C_{17}H_{21}O_4N$ |
| Coffee | |
| Caffeine | |
| Cooking salt | NaCl |
| Copper sulphate | $CuSO_4$ |
| Cosmetics | |
| Cresol | $CH_3C_6H_4OH$ |
| Cresylic acid | $CH_3C_6H_4COOH$ |
| Cyclo hexane | $C_6C_{11}OH$ |
| Cyclo hexanol | $C_6C_{12}$ |
| Detergents | |
| Dextrose | $C_6H_{12}O_6$ |
| Digitonine | $C_{56}H_{92}O_{29}$ |
| Dimethyl fornamide | $HCON(CH_3)_2$ |
| Dioxane | $C_4H_8O_2$ |
| Dulcite | $C_6H_{14}O_6$ |
| Dyes, paints | |
| Dimethyl sulphoxide | $(CH_3)_2SO$ |
| Earth | |
| Ester | RCOOR’ |
| Ethanol | $C_2H_5OH$ |
| Ether | ROR’ |
| Ethyl acetate | $CH_3COOC_2H5$ |
| Ethylene chloride (di-chloro-ethylene) | $CH_2:CC1_2$ |
| Fats | |
| Feedstuffs | |
| Foodstuffs | |
| Formaldehyde | HCHO |
| Formic acid up to 10% | HCOOH |
| Fructose | $C_6H_{12}O_6$ |
| Galactose | |
| Gelatin | |
| Glacial acetic acid | $CH_3COOH$ |
| Glucose | $C_6H_{12}O_6$ |
| Glycerine | $CH_2OH.CHOH.CH_2OH$ |
| Glycocol | $NH_2CH_2COOH$ |
| Glycol | $HOCH_2.CH_2OHC$ |
| Graphite | |
| Gypsum | $CaSO_4.2H_2O$ |
| Heparine | |
| Heptanol | $C_7H_{15}OH$ |
| Hexane | $C_6H_{14}$ |
| Hexanol | $C_6H_{13}OH$ |
| Hydrogen peroxide 3% | $H_2O_2$ |
| Hydroquinone | $HOC_6H_4OH$ |
| Hypophysine | |
| Imod’ Roc” | |
| Immmersion oil | |
| Ink | |
| Inorganic salts and their mixtures (exception No 4.2) | |
| Inosite | $C_6H_6(OH)_6$ |
| Insecticides | |
| Iso-proponal | $C_3H_6OH$ |
| Ketone | RCR |
| Lactic acid | $CH_3CHOHCOOH$ |
| Lactic sugar | $C_{12}H_{22}O_{11}$ |
| Lactose | $C_{12}H_{22}O_{11}$ |
| Lead acetate | $Pb(CH_3COO)_2$ |
| Lead nitrate | $Pb(NO_3)_2$ |
| Levulose | $C_6H_{12}O_6$ |
| Lipstick | |
| Lithium Hydroxide up to 10% | LIOH |
| Lithium carbonate | $Li_2CO_3$ |
| Magnesium carbonate | $MgCO_3$ |
| Magnesium chloride | $MgCI_2$ |
| Magnesium hydroxide | $MG(OH)_2$ |
| Magnesium sulphate | $MgSO_4$ |
| Maltose | $C_{12}H_{22}O_{11}$ |
| Mannite | $C_6H_{14}O_6$ |
| Mannose | $C_6H_{12}O_6$ |
| Methylene chloride (Di-Chloromethane) | $CH_2CL_2$ |
| Mercury | Hg |
| Mesoinosite | $C_6H_6(OH)_6$ |
| Methanol | $CH_3OH$ |
| Milk | |
| Mineral oils | |
| Mineral salts | |
| Mixtures (exception: No 4.2) | |
| Nail lacquer | |
| Nail lacquer remover | |
| Nickel sulphate | $NiSO_4$ |
| Nicotine | $C_{10}H_{14}N_2$ |
| Nonne-Apet reagent | |
| Octanol (Octylacohol) | $C_8H_{17}OH$ |
| Ointments | |
| Oleic acid | $CH3(CH_2)_7CH:CH(CH_2)_7COOH$ |
| Olive Oil | |
| Organic solvents | |
| P-amino aceto-phenone | $NH_2.C_6H_4COCH3$ |
| P-nitro phenol | $C_6H_4NO_2OH$ |
| Pandys reagent | |
| Paraffin | $C_NH_{2N+2}$ |
| Paraffin oil | |
| Pentanol | $C_5H_{11}CH$ |
| Petroleum benzine (petrol) | |
| Percaulic acid | HCLO4 |
| Phenolphthaleine | $C_{20}H_{14}O_4$ |

| | |
|---|---|
| Phenol & phenolic derivates | $C_6H_5OH$ |
| Polishes (creams & waxes) | |
| Potassium aluminium sulphate | $KAI(SO_4)_2$ |
| Potassium bromate | KBr |
| Potassium bromide | $KBr0_3$ |
| Potassium carbonate | $K_2CO_3$ |
| Potassium chloride | KCI |
| Potassium hexa cyano ferrate | $K_4Fe(CN)_6$ |
| Potassium hydroxide upto 10% | KOH |
| Potassium iodate | $KIO_3$ |
| Potassium nitrate | $KNO_3$ |
| Potassium sodium tarate | $KNaC_4H_4O_6$ |
| Potassium sulphate | $K_2SO_4$ |
| Potassium tarate | $K_2C_4H_4O_6$ |
| Potato starch | |
| Potters'reagent | |
| Propanol | $C_3H_7OH$ |
| 1.2-propylene glycol | $CH_3CHOH_2OH$ |
| Pyridine | $C_5H_5N$ |
| Quinine | |
| Rafinose | $C_{18}H_{32}O_{15}.5H_2O$ |
| Rhamnose | $C_6H_{12}O_5.H_2O$ |
| Rochelle salt | |
| Saccharose = raw sugar | |
| Salicylic acid | $C_6H_4OHCOOH$ |
| Salicyclic aldehyde | $C_6H_4OH.CHO$ |
| Saponine | |
| Soap | |
| Sodium acetate | $CH_3COONa$ |
| Sodium b-sulphate | $NaHSO_3$ |
| Sodium carbonate | $Na_2CO_3$ |
| Sodium chloride | NaCI |
| Sodium citrate | $Na_3C_6H_5O_7.5H_2O$ |
| Sodium di-ethyl-barbiturate | $NaC_8H_{11}N_2O_3$ |
| Sodium hydrogen carbonate (sodium bi-carbonate) | $NaHCO_3$ |
| Sodium hypo-sulphate | $NA_2S_2O_4$ |
| Sodium nitrate | $NaNO_3$ |
| Sodium phosphate | $Na_3PO_4$ |
| Sodium silicate | $Na_2SAiO_3$ |
| Sodium sulphate | $Na_2SO_4$ |
| Sodium sulphide | $Na_2S$ |
| Sodium sulphite | $Na_2SO_3$ |
| Sodium tartrate | $Na_2C_4H_4O_6$ |
| Sodium Thio Sulphate | $Na_2S_2O_3$ |
| Soot | |
| Sorbite | $C_6H_{14}O_6$ |
| Standard acetate solution | |
| Standard I-agar nutrient | |
| Standard II-agar nutrient | |
| Standard I-bouillon nutrient | |
| Standard II-bouillon nutrient | |
| Starch | |
| Starch common salt solution | |
| Stearic acid | $C_{17}H_{35}COOH$ |
| Styrene | $C_6H_5.CH:CH_2$ |
| Sugar & sugar derivatives | $H_{22}O_{11}$ |
| Sulphur | S |
| Talcum | $3Mg0, 4SiO_2, H_2O$ |
| Tannin | $C_{76}H_{52}O_{46}$ |
| Tartaric acid | $C_4H_8O_6$ |
| Tea | |
| Terpentine | |
| Tetra hydro furan | $C_4H_8O$ |
| Tertraline | $C_{10}H_{12}$ |
| Thio-urea | $NH_2CSNH_2$ |
| Thymol | $C_{10}H_{14}O$ |
| Thymol buffer solution | |
| Toluene | $C_6H_5CH_3$ |
| Trehalose | $C_{12}H_{22}O_{11}$ |
| Trichorethylene | $CHC1:COI_2$ |
| Trypsine | |
| Tryptophane | $C_{11}H_{12}O_2N_2$ |
| Urease | |
| Uric acid | $C_5H_4N_4O_3$ |
| Uric acid solution | $CO(HN_2)_2$ |
| Urine | |
| Vanilline | $C_8H_8O_3$ |
| Vaseline | |
| Water | $H_2O$ |
| Water colours | |
| Xylene | $C_6H_4(CH)_2$ |
| Yeasts | |
| Zinc chloride | $ZnCI_2$ |
| Zinc sulphate | $ZnSO_4$ |

**4.2** Surfaces of HPL are not altered*, if the substances quoted below (especially in liquid or dissolved form) are split and if they interact only for a short time, i.e. if the boards are wiped with a wet cloth within 10-15 minutes and are subsequently wiped dry.

*Some decorative colours are sensitive to acid owing to their pigment composition. It is therefore recommended to select the dye – and perhaps also the type of surface – by consultation with the laminate manufacturer. (see list 4.2.1)

**List 4.2.1**

| | |
|---|---|
| Aluminium chloride | $AICl_3$ |
| Amino-sulphonic acid up to 10% | $NH_2SO_3H$ |
| Ammonium hydrogen sulphate | $NH_4.HSO_4$ |
| Aniline dyes | |
| Arsenic acid up to 10% | $H_3AsO_4$ |

| | |
|---|---|
| Caustic soda in concentration over 10% | $N_8OH$ |
| Crystal violet (gentian violet) | $C_{24}H_{26}N_3Cl$ |
| Esbach reagent | |
| Ferric chloride | $FeCl_3$ |
| Ferrous chloride | $FeCl_2$ |
| Fuchsine | $C_{19}H_{19}N_3O$ |
| Hair dyeing & bleaching agents | |
| Hydrochloric acid up to 10% | HCl |
| Hydrogen peroxide 3-30% | $H_2O_2$ |
| Inorganic acids up to 10% | |
| Iodine | I2 |
| Lacquers | |
| Lithium hydroxide over 10% | LiOH |
| Mercuric chloride solution | $HgCl_2$ |
| Mercuric di-chromate | $HgCr_2O_7$ |
| Methylene blue | $C_{16}H_{16}N_3ClS$ |
| Million reagent | $Ohg_2NH_2Cl$ |
| Nitric acid up to 10% | $NaHSO_3$ |
| Nylander reagent | |
| Oxalic acid | COOH.COOH |
| Phosphoric acid up to 10% | $H_3PO_4$ |
| Picric acid | $C_6H_2OH(NO_2)_3$ |
| Potassium chromate | $K_2CrO_4$ |
| Potassium di-chormate | $K_2Cr_2O_7$ |
| Potassium hydrogen sulphate | $KHSO_4$ |
| Potassium hydroxide in Concentration over 10% | KOH |
| Potassium iodine KI | |
| Potassium permanganate | $KMnO_4$ |
| Silver nitrate | $AgNO_3$ |
| Sodium hydrogen sulphate | $NaHSO_4$ |
| Sodium hypo-chlorite | NaOCl |
| Sulphuric acid up to 10% | $H_2SO_4$ |

**4.3** The following substances must be immediately removed since they can irreparably damage the HPL surface after a very short time of contacts (see list 4.3.1).

**LIST 4.3.1**

| | |
|---|---|
| Adhesives (chemically hardened) | |
| Amino sulphonic acid* | $NH_2SO_3H$ |
| Inorganic acids* eg | |
| Aqua regia* | $HNO_3$+HCl=1:3 |
| Arsenic acid* | $H_3AsO_4$ |
| Chrome – sulphuric acid* | $K_2Cr_2O_7+H_2SO_4$ |
| Formic acid* | HCOOH |
| Hydrochloric acid* | HCl |
| Hydrofluoric acid* | HF |
| Hydrogen bromide* | HBr |
| Nitric acid* | $HNO_3$ |
| Phosphoric acid* | $H_3PO_4$ |
| Sulphuric acid* | $H_2SO_4$ |

*In concentration over 10%

**4.4** Repeated interaction with the following aggressive gases and vapours leads to a change in he HPL surface (see number 3.4):

| Chemical | Chemical Formula |
|---|---|
| Acid Fumes | |
| Bromine | $Br_2$ |
| Chlorine | $Cl_2$ |
| Nitrous fumes | $N_xO_y$ |
| Sulphur dioxide | $SO_2$ |