British Laminate Fabricators Association

The processing and use of HPL Compact Sheets

Technical Information Sheet No. 10 / 2002

Magnum Leisure Centre, Perth.

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. Material Description

HPL Compact Sheets are decorative high pressure laminates over 2mm in thickness and conforming to EN 438. They have robust surface qualities with completely sealed homogenous structure to their cut edges. One or both sides may have colour / pattern effect and this can be either smooth or textured. They are available in full size boards.

HPL Compact sheets provide the following excellent advantages.

- Good dimensional stability and flatness.
- Self-supporting ability.
- Toughness – resistance to impact and breakage.
- Especially high resistance to the effect of water and steam.
- Insensitivity to temperature changes - heat and frost.
- Non-corrosive and durable.
- High colour fastness.
- Easily cleanable.
- Biologically harmless.
- Meets the highest hygiene and sterile requirements for both the surface and the edge.
- Little electrostatic build up – no dust gathering.
- Ease of installation – variations of demountable systems offers room saving possibilities.
- Simple to work and process.
- Good fire performance – little smoke developed and will not melt or drip. FR grades can provide Class 1 Surface Spread of Flame and over certain thicknesses meet Class O requirements.

Further properties are set out in EN 438.

In thicknesses under 2mm, Compact Sheets should be bonded to a rigid supporting material. Materials up to 5mm thick will need support from rigid close centred framework.

In greater thicknesses however, they are self supporting. Boards and panels over 8mm are suitable for large horizontal usage with support at wide intervals.

It is left to the user to decide the thickness of the product that will meet the maximum requirements of the intended application, including any special requirements necessary.

2. Application areas

2.1 Interior Usage

Because of the outstanding material properties set out above, HPL Compact Sheets can be unrestricted in its use in interior areas. This applies especially for areas where high demands will be made upon the material.

Areas of use include:

A	B
Chemists	Counter Tops
Doctors surgeries	Lift Linings
Vehicle Building	Bathroom Furn
Hotels and Guesthouse	Ceiling Cladding
Interior installations	Shower cubicles
Hospitals	Kitchen Worktops
Cold stores	Kitchen fronts
Laboratories	Furniture
Shopfitting fixtures	Shelving
Wet rooms	Elevator linings
Sanitary areas	Sanitary cells
Abattoirs	Circuit wiring b'ds
Schools	Plinths
Sports centres & baths	Partitions
Underground stations	Tunnel cladding
Doors	Wall cladding

Note:

HPL Compact Sheets with textured surfaces provide certain better properties in their usage. The advice of HPL manufacture should be sought regarding a particular application.

2.2 Exterior usage

HPL Compact sheets of standard quality may be installed in those areas where high standards of weather resistance do not have to be met. Examples of such areas are provided below but no formal endorsement of their suitability may be taken from this.

Clamping places – Installations
Bus and tram shelters
Installations in open air swimming pools
Children's play grounds
Travel and Information kiosks
Maps and direction boards
Decorative balcony panels & dividing partitions
Balustrade panels for bridges and footbridges

In the course of time, through long exposure to weather the surface of the Compact Sheets may become impaired and lose some of its colour and gloss. For

this reason it is recommended that only light colours are chosen. Surfaces that have become dull through weathering may be restored by an application of lacquer. Note: This information sheet does not affect Compact Sheets, which have been endorsed for use in cladding facades.

3. Transport & storage
HPL Compact Sheet is a dense heavy material and is also relatively expensive. For these reasons it is important to observe the following:

3.1 Transport
Whatever means of transport is used, it is essential that pallets of sufficient size support the entire sheet. They should be strong enough to support the load without buckling or deforming.
The surface of each board should be clear of any debris, grit or foreign bodies as they can become embedded under the weight of the load, resulting in damage. When loading, boards must not be dragged over one another but lifted cleanly by hand or hoist. The stacked boards must be made secure to prevent slippage.

3.2 Storage
HPL Compact Sheets should be stored in enclosed buildings where normal interior conditions (18 – 24^{0}C and 50 – 60% RH) are maintained.

Boards will remain flat if stored in packs, horizontally with their edges flush to one another on a slightly oversized, perfectly flat, stout base board, which has first been covered with plastic sheeting and an **absolutely flat** and substantial cover board used to prevent their possible distortion.

This procedure should be maintained throughout their storage and reinstated whenever a sheet is removed.

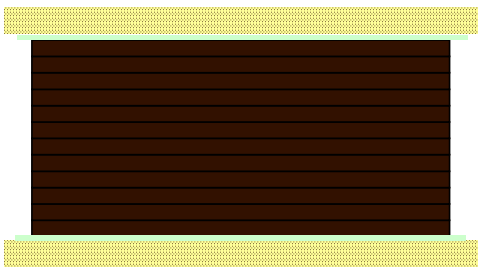

fig. 1. Storage of sheets in stacks.

If boards are not stored flat for any length of time deformation can result. This will be more difficult to rectify the thicker the board. When a protective film is removed it should be done on both sides simultaneously.

4. Machining
In principle the instructions given in the General Recommendations (Section 3) for HPL will apply. Additionally the following special recommendations for Compact Sheets should be observed.

4.1 General
The increased thickness and density of HPL Compact Sheets imposes greater demands on cutting tools and causes greater wear. Tool manufacturers should be consulted as to the type and quality of tungsten carbide tipping to provide the best yield; especially where long runs of production are contemplated and where high quality finishes are required. Preliminary tests should also be carried out.

In all machine processes, localised heating caused by poorly maintained cutting tools must be avoided. Equally important is the removal of cutter swarf by an adequate dust extraction system during machining, as this can cause surface marking.

4.2 Sawing
With HPL Compact Sheets, slower feed speeds should be used than with HPL bonded boards and panels.
Altering the exit angle of the saw blade by adjustments to its height can reduce breakout on the underside of Compact Sheets.

Note: The higher the saw blade the better the top cut and the worse the bottom cut and vice versa.

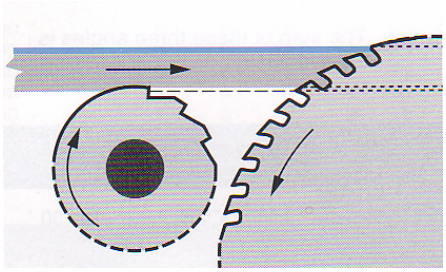

fig. 2. Pre-scoring the underside of the sheet.

Good results can also be obtained by using a baseboard of plywood, hardboard or HPL beneath the Compact Sheet.

The best means of avoiding underside breakout is to use a scoring saw blade to scribe the underside, prior to cutting with the main blade.

These saws of smaller diameter operate in the same parallel plane as the main saw blade but may revolve in the same, or contrary, direction to it.

The rate of the feed speed essentially governs the quality of the saw cut when sawing HPL Compact Sheets, having two decorative faces. A speed of between 0.03 and 0.05mms. per saw tooth has been found the most successful.

The feed speed is obtained from the following formula. When the rpm of the spindle is pre-regulated, the most favourable speed is obtained thus:

Feed speed per tooth: $Sz = \frac{S}{n \times Z}$ mms/tooth

Feed speed in mm/min $S = Sz \times n \times Z$ (mms/min)

Or

No. of teeth required: $Z = \frac{S}{n \times Sz}$

Where : Sz = Feed speed in mm. per tooth
S = Feed speed in mm/min
n = Spindle speed rpm
Z = Number of saw teeth

Example: Number of teeth Z = 52
Spindle speed n = 3500
Feed speed/tooth
Sz=0.004mm

In the formula S = Sz x n x Z therefore 0.04 x 52 x 3500 = 7280mm/min = 7.28m/min.

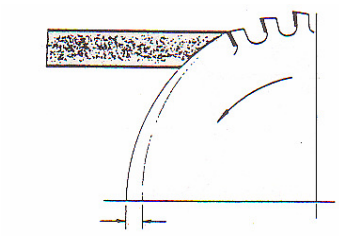

fig. 3 Feed speed per tooth (Sz)

4.3 Profile cutting and edge finishing
The sawn edges of HPL Compact Sheets may be machine finished by spindling or routering. For good edge quality an allowance for this should be from 2-5mm.

For mass production, or where long runs are contemplated special cutter heads have been developed for machining HPL Compact Sheets.

For profile cutting, the use of diamond impregnated cutting tools can be recommended in these instances.

Because of the higher cutting impact the work being machined must be securely held and firmly guided past the cutters.

In general, HPL Compact Sheets does not require any further protection by lacquering or veneering. Where the edges of the board are seen, they can be machine finished in a number of ways.

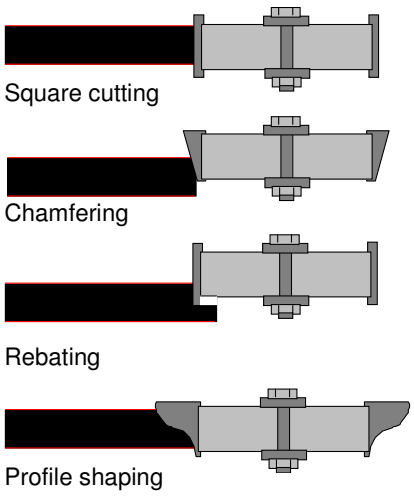

fig. 4 Various forms of machined edges.

Complete freedom from chatter marks from the cutter blades in spindle moulding or routering is unavoidable. They may be reduced by feeding the work at a constant controlled speed (only by the use of a mechanical power feed). In a subsequent finishing process these can be removed by rubbing the edges with fine sandpaper followed by steel wool. If a further improvement is required this can be done with silicone free furniture oil.

Where necessary the exposed edges of HPL Compact Sheets should be

chamfered and corners softened to avoid danger of injury.

4.4 Drilling
For drilling holes in HPL Compact Sheets, drill bits as supplied for plastic sheets are most suitable. These are special drills with a point angle of between 60-80 degrees instead of the normal 120 fluting which is also wider which provides more room for swarf.

For the avoidance of breakout on the exit side, the feed speed and pressure applied should be gradually reduced at this point. Most important is to support the work piece with another piece of plywood or chipboard firmly in contact with the exit side of the sheet.

Best results for the through drilling with minimum breakout of the underside is a point angle between 50-60 degrees.

For blind boring Fig 5, the depth of the hole should be such that no less than 1.5mm remains at (a).

fig. 5 Drill holes made in Compact Sheets

When drilling parallel to the board surface a minimum thickness of 3mm should be left between the edge of the hole and the surface of the board.

For simultaneous drilling and countersinking a combined drill and countersinking bit may be used.

Threaded holes in HPL Compact Sheets can be produced with engineers screw cutting taps. Self-tapping screws may also be used.

5. Installation
Throughout their subsequent installation, it should be borne in mind that HPL Compact Sheets alter in dimension with changes in climatic conditions. In this respect the change in longitudinal direction is about half that of the transverse direction.

For fastening or connecting boards together, several well tried methods are available, e.g. surface mounted or concealed extruded retaining strips, tongue and groove joints or fastening by screws or nails*. In areas subject to damp, corrosion resistant fixings should be used.
* Should it be necessary to bond HPL Compact Sheets the principles set out in General Recommendations for processing HPL – Chapter 4 Section 5, should be observed.

For the mechanical fastening and jointing the following information is recommend.

5.1 Jointing HPL Compact sheets together

5.1.1 Tongue and Groove
When two HPL Compact sheets are to be jointed together the width of the groove (a) and the thickness of the cheeks (b) should be at least 3mm. Where the board thickness allows, the cheek thickness (b) should always be greater than the groove width (a). The depth of the groove should be kept as small as possible (max 10mm). The following guidelines should be maintained:

Groove width (a)	= 3mm
Thickness of cheeks	= >3mm(=a)
Depth of tongue	=<10mm
Sheet thickness	= 10mm

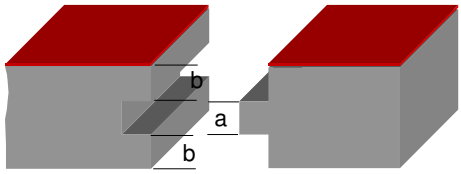

fig 6. Jointing by Tongue and Groove

Because of possible changes in dimensions the HPL Compact Sheets must be provided with sufficient play between the tongue and the groove.

Tongue and groove type joints should not be made on Compact sheets of less than 10mm in thickness.

It is often advantageous to use separate loose tongues. Preparation is generally simplified when both edges of a panel are grooved only.

5.1.2 Corner jointing
Precautions should be taken where impact damage is likely to occur on external corners. Angle brackets or full-length metal strips should be used.

5.1.3. Bonded Joints
Joints made with adhesive should be so arranged so that dimensional changes are not restricted. It is essential that the separate panels be assembled having the same longitudinal and transverse direction to avoid incurring differential stresses.

5.2. Fitting to Groundwork

Metal grounds change their dimensions with variations of temperature whereas the dimensions of HPL Compact Sheets are essentially altered by changes in relative humidity (see also Para 5).
These differences of movement of HPL and metal can often be in different directions to each other.
The assembly must therefore contain sufficient play in their fastenings to allow for their respective movements.

These dimensional changes whilst strongly influenced by temperature and moisture conditions are also relative to the size and thickness of the sheet.

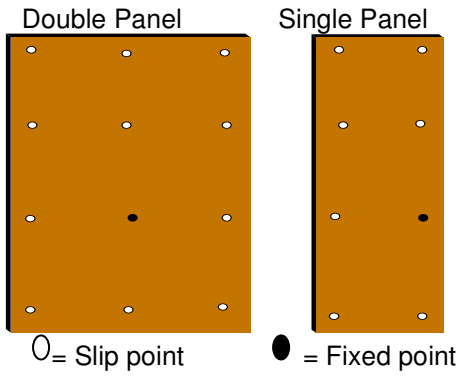

Fig 7 Example of pattern of ‘fixed’ and ‘slip’ points for securing sheets to sub framing. There are approved methods of erecting sheets. A stable and secure, stress free, regular, level and in good alignment structure, is of fundamental significance for the success of an installation.

In regard to its cladding, it should be taken into account that:

- The stability of the cladding is determined both by the sub framing and the thickness of the cladding panels.
- The sub framing must be protected against the possibility of corrosion and/or decay.
- The HPL Compact sheets must be provided with ample allowance for possible movement of both shrinkage and expansion.
- A special advantage with HPL Compact sheets is that where required, panels may be removed and/or replaced by using jointing techniques and sufficient allowance for side movement of the panels to accommodate this requirement.

5.2.1. Simple Installation

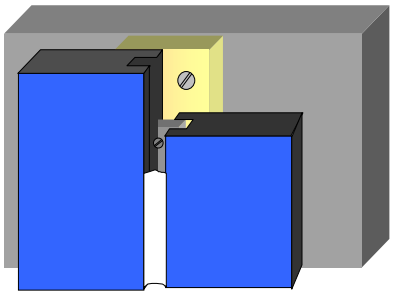

fig. 8 Simple securing of panels to walls.

The appropriate depth of the groove that allows panels to be shifted sideways and taken out and/or changed should be used. Fig 8 shows a possible solution where this can be done. The gap is shown filled with a hygienic (for hospitals) type of seam filler. Alternatively, a laminate insert cut to the exact width can also be bonded in to provide a matching or contrasting detail, however, this detail should only ever be used in dry areas.

5.2.2 Fastening panels with overlapping profiles.
This type of fixing permits sufficient movement of the HPL Compact sheets to occur.

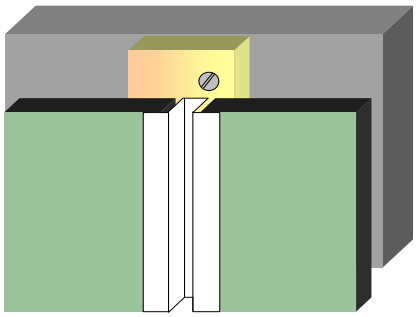

fig. 9 Securing panels with an ‘Omega’ profile.

5.2.3. Face fixing by screwing or bolting.
When securing HPL Compact Sheets to rigid sub structures such as metal frames or masonry, sufficient movement between the components should be guaranteed by the use of correspondingly oversized screw holes and:

(a) washers under screw heads or bolt heads
(b) a slip foil between the back of the Compact sheet and ground at its fixing point.

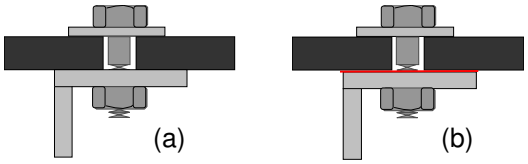

fig. 10 Examples of through face bolting.

5.3 Doors
Small sized doors of HPL Compact sheets (e.g. furniture) can be hung on one pair of hinges.

Larger doors, (e.g. for changing cubicles), should be supported by more than two hinges. Not only should these be strong enough to support them without deformation, but should contain sufficient play to accommodate their dimensional changes. To keep these changes as minimal as possible the length of the door should be cut from the length direction of the sheet. The doorframe must be sufficiently strong and must be erected in a flat and even plane to prevent stresses occurring at the points of closure. Also the use of rubber buffers and/or seals will dampen shocks from impact on closure in this respect. The constant influence of high humidity and/or high temperature on one side of the door can eventually cause it to bow. It is therefore essential that sufficient air circulation be provided to prevent this.

5.4 Fastening to Compact sheets
When securing rigid objects (e.g. fixing hook plates, profile strips or metal fittings) by bolting through the sheets as described in Para 5.2.3, a clearance hole in the sheet should be used. When fixing into the sheet with bolts or screws that do not penetrate right through the sheet (e.g. when using a spreader dowel or brass bush inserts) a clearance hole in the fitting should be provided. It is also recommended that a slip foil between the two components be used.

5.4.1. Self-tapping screws
Screws with slow threads provide better resistance to working loose than those with fast threads. In all cases a pilot hole one-thread depth smaller than the outside diameter of the screw must first be made in the sheet.

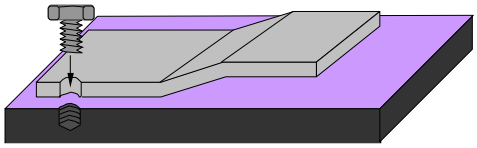

fig. 11 Bolting into Tap threaded holes.

5.4.2. Spreader Dowels (Brass inserts)
The depth of the hole ought to be at least 1mm deeper than the penetrating depth of the screw.

The highest screw holding is obtained by the use of spreader dowels – brass, threaded inserts which expand when screws are inserted into them.

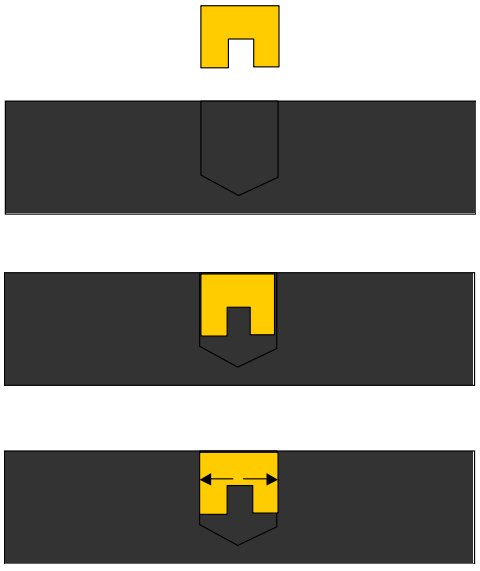

fig. 12 Insertion of a spreader dowel

Dowel inserts should be plain sided without grooves or ridges. At least 1.5mm should be left between the bottom of the hole and the surface of the sheet.

5.4.3 Through face fixings
Holes for this purpose should be drilled 2-3mm larger than the diameter of the fixing screw or nail. The important allowance for movement can also be achieved by the use of flexible insert bushes (e.g. polyamide)

6. Cleaning and maintenance
HPL Compact Sheets are undemanding in this respect and do not require special maintenance.

(a) Lightly soiled sheets may be cleaned with a soft damp cloth.
(b) More heavily tarnished grime or stains can be removed with warm soapy water or with a proprietary cleaning agent which does not contain any abrasive material or strong alkaline – (bleaching materials)
(c) Particularly hard dried deposits of lacquer or glue, ink from felt tipped or ballpoint pens, lipstick and others may in general be removed with a solvent agent such as Methylated Spirits, Acetone or MEK etc. Where large scale quantity processing in which lacquers and/or adhesives are used it is recommended that the producers of these products are consulted as to which cleaning agent is the most suitable for the removal of these and other spillages, such as deposits of synthetic resins (Urea, Melamine, Phenol or Resorcinol adhesives) together with reaction adhesives and lacquers based on Epoxy unsaturated Polyester and Polyurethane after they have cured. Nitro Cellulose thinners should not be used as a cleaning agent because of their tendency to leave smears.
After cleaning with solvents, any streaks or smears may be removed with a proprietary cleaning agent. Some solvents agents present a danger of flammability or if used in large quantities – a health hazard. Windows should be opened and good ventilation should accompany such processes.
(d) Paraffin and wax deposits must first of all be removed, avoiding scratching of the surface and any remaining residue may be ironed off over a layer of blotting paper.

Polishing waxes or other polishes are unnecessary and should not be used on HPL Compact Sheets.