



PROCESSING GUIDELINES FOR POST FORM HPL

This document has been prepared with the purpose of providing general information and guidelines for processing operations of Stylam Post Forming HPL.

1. INTRODUCTION

High Pressure Laminate (HPL) is made of specially selected decorative papers and absorbent kraft paper impregnated with melamine and phenol resins. These papers are then pressed and hardened under heat and high pressure. Strong bonding makes laminates resistant to boiling water, stains and provides increased dimensional stability. Surface protection through special treatment makes laminates scratch resistant. Stylam has wide range of over 2000 designs, 120+ finishes and different sizes. These laminates create an aesthetic look and offer its customers a dynamic range to choose from.

By using the recommendations in this Installation Guide as a starting point, users will find useful information to guide them in obtaining the most appropriate installation. However, these recommendations are not intended to assume or replace the responsibility of the user to establish engineering design, practices, and procedures best suited to individual job conditions. This document will provide basic information on the fabrication and installation of decorative laminates and a better understanding of the product and its uses.

In General:

High-pressure decorative laminates are used as surfacing material on counters, desk tops, cabinets, wall paneling and furniture. Dimensional change is a characteristic found in varying degrees in all cellulose type materials like wood. Also, like wood, high-pressure decorative laminate has grain direction. When humidity changes, the width of the laminate undergoes greater dimensional change than the length by a ratio of approximately 1.5 to 1.

As humidity decreases, the laminate contracts and when the humidity increases, the laminate expands. The physical characteristics of the material should be considered in planning its fabrication and installation.

2. TRANSPORT, HANDLING & STORAGE

2.1 TRANSPORT

In export consignments, Stylam laminates are transported in wooden crates. These crates along with other packing and protection materials provide adequate protection to laminates during shipment and inland transportation. After removal from containers, as far as possible, laminates should be transported in wooden crates to the final point of usage.

In domestic consignments, Stylam laminates are transported as individual laminates with proper wrapping paper to provide protection. For any small quantity transportation from warehouse or dealer to the point of usage, laminates should ideally be transported in flat / horizontal state but can also be rolled into diameter of 500 mm with decorative surface on the inside. Do not roll more than 5 laminates in one bundle otherwise the laminates may crack. The rolled pack should be tied with a strong non-metallic thread with cushion between the knot and the outer laminate.

2.2 HANDLING

Care should be taken when handling decorative laminates to avoid breakages and damage. While loading and unloading, the laminates should be lifted, not slid. Individual laminates should be carried with the decorative face towards the body. It is recommended to use two persons for lifting the laminates, holding the laminate along its length. Abrasion between decorative faces should be avoided.

2.3 STORAGE

Stylam Post Form laminates should always be kept in an enclosed and dry store together with corresponding substrate materials, backing boards and adhesives, at a temperature range of 20°C to 40°C. When materials are brought into a workshop from temperatures or humidity levels different from ambient (e.g. after delivery), they should be allowed to stabilize before fabrication. Usually a minimum of three days is required.

Stylam laminates should preferably be stored face to face and in flat position in horizontal racks. Use similar sizes ply board or block board of suitable thickness after every 150 mm to keep the stack flat. Always place top cover board on the stack to keep the laminates flat. Otherwise, simply turn over the top laminate of the stack upside down to minimize its exposure to environment. If horizontal storage is not possible, you can keep the laminates in vertical inclined position with proper supported racks and ply boards after about 200 laminates to prevent warpage.

3. PREPARATION OF FABRICATION

3.1 PRE-CONDITIONING

Pre-conditioning is the very important to achieve proper stability and strength of bonding of laminates with substrate. Laminates and substrates like MDF, block board or ply board behave differently in terms of expansion and contraction when exposed to changes in climatic conditions. Pre-conditioning ensures that the differential effects of changes in climatic conditions like temperature and humidity on the constituents of furniture like laminates and substrate are minimized.

Decorative laminates and core materials should be conditioned before bonding so that all materials reach equilibrium. The uniformity in climatic conditions will ensure uniform behavior of laminates and substrate during bonding and risk of abnormal behavior like cracking and bowing will be minimized.

The laminates that will become the opposite faces of the same substrate should be conditioned as a pair, with their sanded backs joined together. This set of laminates and substrate should be for the duration of time that is suitable with the prevalent climatic conditions at site. This will ensure that they achieve near identical moisture contents prior to so that bonding, and any subsequent dimensional movements will therefore be similar in both magnitude and direction.

3.2 TYPE OF ADHESIVE

A variety of adhesives have been found satisfactory for bonding decorative laminates to core materials. The choice of adhesive is based upon the service for which the assembly is intended and upon the bonding facilities available. In all cases, the adhesive manufacturer's instructions for use should be followed closely. Common type of adhesives used for joining laminates to the substrate includes PVA based, urea/melamine based, epoxy, hot melt and contact adhesives.

Contact adhesives may be used for bonding laminates to a variety of cores. They are particularly useful for application to metal or other impervious surfaces. There are two primary types of contacts; solvent-based and water-based. Water-based adhesives are not suitable for bonding laminates to steel or iron surfaces. The solvent or the water must be evaporated before satisfactory bonding can be accomplished. It should be considered that contact adhesives do not restrict the movement of the laminate caused by varying humidity conditions to the same extent as thermosetting adhesives.

4. FABRICATION TOOLING

Being harder than conventional wood based substrates and ply board, laminates may require use of power tools but conventional hand tools can also be used for various fabrication activities. A brief detail of various power and hand tools used is listed below;

4.1 POWER TOOLS

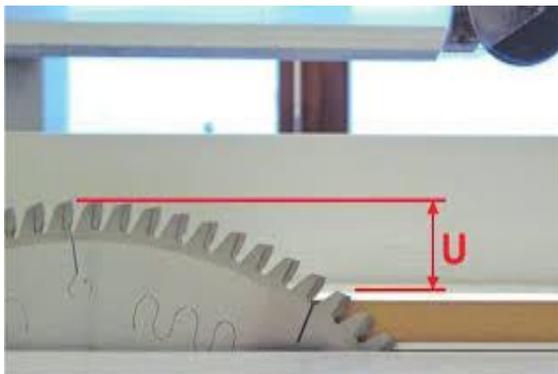
Fixed Circular Saws

Fixed circular saws are best suited when cutting multiple laminates to same size or cutting of fabricated panels. Fixed circular saw give better results of cutting as pressure can be exerted on the material to be cut to avoid chipping.

Most common type of fixed circular saws are **Beam saws** having provision of pressure beam to avoid chipping and **Panel saw** for cutting panels to smaller pieces. Because decorative laminates have a relatively hard surface, tool wear will be greater than with most wood based products. For longer life and better performance, tungsten carbide tipped (TCT) or polycrystalline (PCD) circular saws should be used.

Below parameters should be considered while deciding the circular saw blades.

Blade diameter	: 250 - 350 mm
Feed Speed	: 20 - 30 m/min
Saw rotational Speed	: 3000 - 4000 rpm
Saw projection	: 5 – 10 mm



Saw Projection depicted as "U".



It is recommended that laminates should be cut with decorative side face upwards. Generally, saws should be fine toothed and close pitched, with alternative teeth top beveled. The tooth profile recommended is FZ/TR which means using Flat tooth and Trapezoidal tooth on alternate basis.

Source: Leitz

If laminates with double side décor are to be cut, it is recommended to use scoring saw blade along with the main saw blade. Smaller in diameter, this saw blade is used ahead of the main saw cutter, rotates in opposite direction to the laminate feeding and makes cut of smaller depth on the panel and help in minimizing the chipping of décor surface on the bottom side of the laminates.

Circular Saws (Portable)

Portable circular saws are similar to fixed circular saw cutters in principle but are useful for on-site work. The direction of rotation of these saws requires the laminates to be cut face down to avoid chipping. Use of fine toothed saw helps in avoiding subsequent finishing operations.

Band Sawing

A band saw is recommended for making curved or straight cuts when smooth edges or close tolerances are not required. For smooth edges on curved cuts, the part should be cut oversized and finished by routing, filing or sanding.

A woodworking or metal cutting band saw blade may be used. 19 to 20 gauge carbon steel blades or hardened steel blades with soft backs should be used, with teeth ranging from 16 to 18 points per inch. Straight cutting requires a blade width of 1 to 1-3/4 inch. Saw speed of 1500 to 2400 surface mtr per minute is recommended, feeding the work into the blade at a rate only as fast as it will cut without forcing the saw.

Routing

Router cutters should be carbide tipped. The speeds recommended are same as those used in standard woodworking practices at 16000 to 22000 rpm. It is important to use a router having adequate power to maintain cutting speeds (based on the type and amount of material cut).

Drilling

- Decorative laminates can be drilled using an electric drill with the more common types of drill bits (e.g. high speed steel, twist drill or point bits). Large holes can be drilled using a hole saw, fly cutter or can be plunge cut with a router and template.
- For machine drilling (drill press), a high speed straight shank twist drill is satisfactory. Longer tool life helps improve reproducibility while sharper blades like HSS improve the quality of the cuts. Controlling the feed speed of drill may lead to less damage.
- Screws and bolts should be slightly countersunk and use lower rotational speed to make countersunk holes.
- To prevent stress cracking, the drill diameter should always be 0.05 mm (0.002 inch) larger than the specified diameter of the hole. It also helps in adjusting to small dimensional movements. Edges of the hole should be smooth and cleaned after drilling.
- Regardless of the diameter of the hole, all material being drilled should be backed up with wood at the exit to prevent breakout at the bottom of the drilled hole.

4.2 HAND TOOLS

Hand Saw

Laminates should be cut with a sharp, fine-toothed dovetail saw held at a low angle. The laminate should be supported on both sides of the cut as close as possible and over the entire length. Adequate pressure should be applied to avoid chipping of cut edges.

Laminate Cutters

A pen cutter knife with a laminate scoring tooth blade fixed on the metal blade can be used. The laminate should be laid flat firmly with decorative side up. It should then be cut repeatedly with sharp teeth of the cutter using firm pressure. Care should be taken not to scratch the decorative surface.

5. BONDING OF LAMINATES AND SUBSTRATE

All required precautions to be considered before bonding operation have been listed above in pre-fabrication clause. The same should be followed and the laminates cut as per the clause of cutting listed above, laminates must be prepared by smoothening of edges whatsoever by emery. The two key steps to a good bond are surface preparation and proper application.

Precautions to be taken for bonding

- Ensure proper cleaning of substrate and the laminates to be pasted. The presence of dust or foreign particles between the laminate and the substrate may result in problems related to poor bonding.
- Ensure proper selection of adhesive as listed in clause related to pre-fabrication.
- The applicator must carefully read the instructions by the adhesive manufacturer regarding the application of adhesive and make sure the adhesive has been processed accordingly. Multi-part adhesives should always be stirred and mixed thoroughly.
- The applicator has to ensure uniform application of adhesive on both substrate and laminate. In case any non-uniformity is observed, recoat the surface. The substrate edges should be double coated with adhesive as they have higher porosity.
- After pasting laminate with substrate, ensure proper pressure on the bonded surface as recommended by the adhesive manufacturer. Pressure to be applied over the entire laminate, ensuring the edges are clamped closely together to avoid any air gaps.
- Another way of exerting proper pressure and avoidance of air gaps is the use of dowels to ensure that the laminate aligns properly with the substrate.
- To remove any air bubbles, hand rollers can be used, moving them from centre towards the edges.

- If contact adhesives are used, panel width should be restricted to a maximum of 600 mm. Though contact adhesives should be avoided if the ambient conditions for the installation are warm and dry.
- Contact adhesives can often be reactivated by heat and re-bonded with proper pressure provided that adequate adhesive has been applied. In cases where the edge is lifting, extra adhesive may be added and the proper pressure applied.
- Adhesives as well as laminates are sensitive to environmental conditions. Unsuitable temperature and humidity may affect the shelf life of the adhesive, and lead to adhesive being overly dry or wet.
- When fabricating vertical panels onsite, limit the laminate to about 3 feet width and larger panels should be fabricated in a workshop.
- Once the rough cut laminate has been bonded to the substrate, it should be allowed to set for a few hours before attempting any further fabrication.

6. POST FORMING

6.1 GENERAL

Post forming is the process to carry out bending process on special grade of laminate. Besides the properties of standard laminates, these can also be formed into simple curved shapes resulting in formability of laminates. Apart from other properties, thickness of laminate is the most critical aspect determining the formability. Due to more flexibility, thin laminates are generally capable of being formed to tighter radii than thicker laminates. The formability of laminates are deteriorates over time, hence these laminates have lower shelf life than standard laminates.

6.2 POST FORMING PROCESS

In the post forming process, the laminate surface to be formed is heated below the blistering temperature. The recommended forming temperature range for Stylam post forming laminates is 163°C to 170°C. White or light coloured laminates should always be formed at the upper end of this temperature range. The rise of temperature of the laminate should be rapid with the reference time being $t/0.025$ sec (t – thickness of laminate).

As it is the most critical aspect of post forming, the heating of laminate must be strictly controlled and monitored. Fluctuations in the ambient temperature, heater voltage or machine speeds can affect the process, resulting in cracking due to insufficient heat or blistering from too much heat. Common method of monitoring the temperature of heated surface is application of heat sensitive waxes/crayons to the area to be heated or use of hand held IR

temperature guns.

Before the post form process, the laminate is first glued to the flat portion of the substrate which has prefabricated curved surface on which the balance un-pasted laminate is to be formed. On this curved portion, the forming and gluing operation is conducted simultaneously.

Recommended Post Form Conditions

Product Type	Forming temperature range	Minimum radius
VGP	163 - 170°C	10 x thickness of laminate
HGP	163 - 170°C	10 x thickness of laminate

If the laminate is having protective coating, trials should be made to ensure that the protective film does not soften and contaminate the equipment (particularly with continuous machines), and is removable after post forming.

6.3 SUBSTRATES USED IN POST FORMING

Substrate also plays an important part in carrying out good post forming. The substrate should have smooth clean finish with minimum break out at the curved surface. The substrate should provide a smooth transition from the flat into the curved radius and flawless adhesion over the curve.

MDF: MDF is most commonly used substrate due to its excellent machining qualities to produce smooth edge profiles.

Chipboard: Chipboard should have a smooth and uniform surface finish and the curved surface should be fabricated without tearing out of the chip particles during the edge profiling process and provide a fine even surface with no voids.

The blades of fabrication tool must be sharp enough and a post sanding operation followed by brushing is advisable after machining.

6.4 EQUIPMENT

There are two common methods of post forming the laminate, stationary forming (work piece remains static during forming) and continuous forming (work piece is moving through the heating and forming zones of the machine).

6.4.1 Stationary Forming

Stationary forming machines consist of a flat table bed to which the panel is clamped with the overhanging laminate edge projecting. This portion is heated with a radiant or IR heater to

achieve the required temperature and then an angled section folds the heated laminate over the edge profile and holds it in position until cooled.

6.4.2 Continuous Forming

In continuous forming machines, the substrate with the curved edge has laminate pre-pasted on the flat portion. This substrate is passing through a heated zone with the help of chain or belt conveyors. Then the heated part passes through metal bars or rollers which turn the now softened laminate over the profiled edge. Shaped rubber or metal rollers then take over and press the formed laminate edge in place until the adhesive is cured. Continuous machines can be divided into two groups using different adhesive systems, i.e. PVAC and Contact adhesives.

7. TYPICAL PROBLEMS—CAUSES AND PREVENTION

High Pressure Laminates are the most commonly used surfacing material in urban living spaces. Finding their uses in domestic as well as commercial applications, laminate laminates have outperformed their competitors like hardwood, granite, composite stone etc. by a huge margin. Some qualities that make High Pressure Laminates stand out are their low maintenance and easy installation. Despite all the care and precautions, some typical problems can come during the various fabrication activities for laminates.

- 1. Cracking of laminates:** Cracking of the laminate at corners and around cutouts may be caused by improper conditioning, improper bonding, poor planning or any combination of these. Conditioning both the laminate and the substrate helps to prevent cracking caused by shrinkage. Rough edges, inside sharp corners (without radius) and forced fits can also cause cracking. All edges and inside corners should be provided 3 mm (1/8 in.) radius to minimize stress cracking. A radiused corner created by a 6 mm (1/4 in.) diameter router bit is normally used. Seam placement of the laminate can also reduce stress cracking.
- 2. Open seams:** Open joints or seams are typically caused by improper conditioning and bonding. Conditioning of both laminate and substrate helps prevent open seams caused by shrinkage. Some dimensional allowance should also be made for the movement of laminate
- 3. Separation of laminates from substrate:** Separation of the laminate from the substrate is generally caused by a poor adhesive bond. Factors that can influence the bond and cause poor adhesion are:
 - Improperly prepared or dirty gluing surfaces
 - Insufficient amount of adhesive on either or both laminate and substrate
 - Insufficient agitation or mixing of the adhesive
 - Temperature of the gluing area and materials below 20°C

- Blushing caused by excessive humidity
 - Bonding when the adhesive coated surfaces are over-dried or under-dried
 - Bonding with insufficient pressure
 - Field bonding of oversize laminates
- 4. Blistering or bubbling caused by exposure to heat:** The forming of a blister or bubble over a small well defined area, often accompanied by darkening of the laminate, can be caused by either a single or continual exposure to an outside source of heat. Appliances which produce heat, hot objects, light bulbs etc. should not be placed in contact or close proximity to the laminate surface. Temperatures exceeding 65°C may result in separation of laminate from the substrate due to adhesive failure.
- 5. Laminate warpage:** Warping of the assembly is generally attributed to the differences in dimensional change between the face and back laminates and the core or substrate material.
- Different adhesives or application techniques used on the front and back face can also cause panel warpage.
 - Warpage can result when one side of a panel assembly is subjected to different humidity conditions than the other side.
 - All panel components should be acclimated to the same environment prior to fabrication.
 - Critical applications requiring a well balanced assembly should be constructed with the laminate of similar thickness applied to both sides.
 - Paint, varnish, vinyl film and other coatings will not balance a panel having laminate on the other side.
 - If the panel is secured to a framework, the framework should be designed and constructed to hold the assembly in a flat plane.

8. DO'S AND DON'TS OF INSTALLING

Although it is often recommended to use professional help and guidance when installing laminate laminates, it is also true that with a little practice, laminates can be installed easily on surfaces like furniture, table tops and even walls by simple Do-it-Yourself techniques.

Here are some things that you may want to bear in mind while installing decorative laminates yourself, or while supervising a professional at home.

8.1 DO'S OF HIGH PRESSURE LAMINATE INSTALLATION

1. **Carefully consider the area of laminate installation:** While installing decorative laminates, it is of utmost importance to consider the extent of external environmental distress. In simpler words, always keep in mind the possibility of dust and scratches, mechanical abrasion and also factors like moisture. A common occurrence besides external spillage is the seepage from walls and floors in the kitchen and bathroom areas.
2. **High-Quality water proofing:** When using high pressure laminates for flooring, walls, door and table tops, it is important to have effective waterproofing in place. It is advisable to use high-quality waterproofing material during construction of your house, which protects the subfloor from moisture coming from the earth. This moisture, when not given the correct outlet to escape, may accumulate and cause damage over time. Even though laminate laminates are long-lasting, they are generally affected by the presence of moisture.
3. **All decorative laminates are different:** The general rules of application and installation apply to all decorative laminates, but when it comes to finding the most effective technique for your designer laminate, it is important to read the laminate laminates installation instruction manual for that specific laminate. Many laminate manufacturers use various techniques to make their products stand out. These may come with a specific set of slightly different properties which may have to be taken into account during installation of different laminates.
4. **Temperature plays a huge role:** High pressure laminates are bad conductors of heat. Laminates do not expand or contract too much with the effect of heat. However, it would also be incorrect to say that decorative laminates do not expand or contract at all. Therefore, it is important to know that floor temperature may affect the settling capability of the designer laminate, so it is crucial to let the floor acclimatize for at least 48 hours after being pasted. Also, it is advisable to leave a gap of 10 mm at the perimeter to give the laminate planks plenty of room to expand on exposure to heat.

8.2 DON'TS OF HIGH PRESSURE LAMINATE INSTALLATION

1. **Sharp objects:** Never use knives or other sharp objects directly on the decorative surface. Use of chopping block or counter saver is recommended.
2. **Abrasives:** Don't use abrasive pads, scouring powders or cleansers as they may permanently damage the laminate surface making it susceptible to staining.
3. **Harsh chemicals:** Don't use harsh chemicals such as oven cleaner, toilet cleaner and drain cleaner as they may etch and discolour the decorative surface. High pressure decorative

laminates are not designed to have continual contact with these chemicals. If any of these products spill over the surface, remove immediately, rinse thoroughly and wipe dry hot objects.

4. **Hot objects:** Do not place hot frying pans or dishes directly from the oven or cook top on the laminate surface. Even though laminate is high heat resistance, exposure to temperatures greater than 130°C is not recommended. As a precaution, protect the surface from heat generating appliances such as pressing irons, toasters, curling irons and electric cookers etc. by using a insulated pad. Prolonged exposure to temperatures above 65°C may result in separation of the laminate from the substrate.
5. **Impact:** Do not abuse the laminate by dropping heavy objects such as cans, dinnerware, or glasses or deliberately hammering directly on the surface. Even though laminates have excellent impact resistance, chipping or cracking may occur.
6. **Soap and mop:** Generally speaking, it is unadvisable to use strong soaps or detergents to clean the surface of laminate laminates.

9 CLEANING OF STAINS ON LAMINATES

9.1 RESISTANCE TO STAINS

Stylam Laminates are resistant to stains belonging to Group 1 and 2 but may take stains of reagents of Group 3 and 4. Even group 3 and 4 reagents should not be allowed to spill on the surface and in case of spillage, they should be immediately wiped off.

Classifications of Reagents:

Group 1: Acetone, trichloromethane, toothpaste, hand cream, urea, alcoholic beverage, natural fruit, fruit drink, meat, vegetable oil, water, NaCl (solution), mustard, soap solution, paint remover (kerosene), phenol and citric acid.

Group 2: Coffee, black tea, milk (condensed and evaporated), cola beverages, vinegar, hydrogen peroxide (3% solution), ammonia (10% solution of commercial concentrate), nail polish remover, lipsticks, water colour, laundry marking ink and ball point ink

Group 3: Sodium hydroxide (25% solution), hydrogen peroxide (30% solution), concentrated vinegar (30% acetic acid), acid based metal cleaners, shoe polish, hair colours, iodine, boric acid and lacquers

Group 4: Citric acid (10% solution) and acetic acid (5% solution)

9.2 CLEANING OF CHEMICAL STAINS

- To clean the surface, use a damp cloth or sponge and a mild soap or detergent.
- Stains belonging to group 2 such as coffee or tea can be removed using a mild household cleaner/detergent and a soft bristle brush.
- If a stain persists, apply a paste of baking soda and water with a soft bristled brush. Light scrubbing should remove most of the stains.
- Although baking soda is low abrasive, excessive scrubbing or exerting too much force may damage the decorative surface.
- For gloss finish laminates having stubborn stains belonging to Group 3 and 4, use undiluted household bleach or nail polish remover.
- Apply the bleach or nail polish remover to the stain and let it stand no longer than two minutes. Rinse thoroughly with warm water and wipe dry. This step may be repeated if the stain appears to be going away and the colour of the laminate has not been affected.

9.3 CLEANING OF ADHESIVE FILM STAINS

Film once pasted on the laminate surface will remain intact for six months from the date of lamination without leaving any adhesive residue. It is strongly recommended to remove the film within six months of receipt of laminates to avoid transfer of glue stains. If by any chance, some glue is transferred to the laminates, follow below process for cleaning of glue stains.

- In case of light stains, do not scratch the stains. Use clean hot water with towel, soft sponge or nylon brush to soak and remove. Remove stains with solution of normal non-abrasive cleaning agent, or let it soak according to the degree of soiling, then wash off with clean water or glass cleaner. Remove all traces of cleaning agent, to prevent streaks developing. With clean, absorbent cloth or paper towels, wipe the surface dry and change cloths frequently.
- For harder stains, repeat the above process several times if necessary. General purpose IPA (Isopropyl alcohol) can also be used for removal of glue stains.

9.4 WARNING

Prolonged exposure of the laminate surface to bleach will cause discoloration. Acid based cleaners will permanently damage the laminates. Never allow these cleaners, or bottles, rags or other items contaminated with these cleaners, to come in contact with the laminates. Wipe such areas immediately and rinse thoroughly with water.

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