FORMICA® LAMINATE BY FORMICA GROUP/AVOID LAMINATE-CLAD PANEL WARPAGE TECHNICAL BRIEF

CAUSES OF PANEL WARPAGE

Laminate-clad panels are susceptible to warpage if they are not physically restrained or balanced. Balanced panel construction equalizes the forces acting on both sides of the core material. If for any reason these forces become unbalanced, warpage can result.

Warpage of wood product panel assemblies (e.g., laminate-clad particleboard or MDF) is attributed to the differences in dimensional movement between the face and back laminates and the core or substrate material. This movement and its subsequent stresses are caused by the expansion or contraction of paper fibers in the laminate skins and wood fibers in wood composite cores as they respond to relative humidity changes. The stress and dimensional movement generated within a laminate skin are transmitted to the core through its glue line. The forces involved are tremendous and, if they are not properly considered in the panel design, warpage can result.

The use of laminates and substrates that have different strengths and/or dimensional movement potentials is not the only cause of warpage. Exposing one side of a panel assembly to different humidity conditions than the other side can also cause warpage. For example, a “balanced” panel will warp if one side is exposed to air conditioning and the other is against a damp, below-grade wall (e.g., basement wall without a proper moisture barrier).

TIPS FOR AVOIDING PANEL WARPAGE

1. All panel components should be acclimated to the same environment prior to assembly. This will ensure that one component will not be contracting while the other is expanding due to subsequent relative humidity changes. In addition, under extreme conditions, materials that have not been properly acclimated to the same condition prior to fabrication can buckle or delaminate, as well as warp. Proper preconditioning of materials can also help to minimize shrink-back or laminate growth problems on machined edges.

2. For critical applications requiring a well-balanced assembly (doors, etc.), the same laminate or skin should be applied on both sides. Less critical applications may only require a cabinet liner or phenolic backer. Small components and mechanically restrained panels (countertops, etc.), on the other hand, may not need balancing sheets.

3. Thick panels warp less than thin panels due to increased rigidity and the geometry of the forces involved. For critical applications, the thickest core material permissible should be selected to help minimize warpage.

4. Laminates expand and contract twice as much in their cross-grain direction as they do in their grain (parallel with the sanding lines) direction. Always align the sanding lines of the front and back laminates in the same direction and, wherever possible, align the grain direction of the laminate with the longest panel dimension. It is also advisable to align the grain and cross-grain directions of the laminates with that of the substrate.

Note: When multiple panels are viewed together, keep all laminate components aligned in the same direction to minimize visual changes in color or gloss due to the directionality of the underlying surface paper and laminate finish.

5. Use the same adhesive and application techniques (application rate, method of application, drying techniques, etc.) for bonding the front and back laminates. This is especially important when using water-based adhesives such as PVAc (white glue), ureas or water-based contacts which introduce additional moisture into the panel assembly. In addition, if panels are being hot pressed, the top and bottom platen temperatures may require temperature adjustments to produce flat panels. Temperatures used to effect glue line cure can cause shrinkage of the glue and surfacing materials. Generally, the side having the thicker skin will require a slightly higher platen temperature than the side having a thinner skin (cabinet liner, phenolic backer, etc.), due to heat transfer rates. Bottom platen temperature may also require reduction to compensate for the additional contact time involved while the press is being closed and opened.

6. Moisture barriers such as paint, varnish, vinyl film, and other coverings including impregnated fiber backers will not balance a panel having a laminate on the other side. Coatings or materials of this type do not exhibit the same strength or dimensional change characteristics as a laminate. Remember, the strength and expansion/contraction rates of the face and back skins must be matched for proper balancing.

7. Installed laminate-clad panels will expand and contract with humidity changes. Provide sufficient spacing between panels to allow for this. Panels or countertops that are locked between two walls or other such restraints should have a sufficient gap allowed to accommodate dimensional movement. Wider panels and higher humidity swings require more spacing. A general rule of thumb is to allow 1/8" (3.18mm) minimum between panels having widths of 48" (121.9cm).

SUMMARY

- Acclimate or precondition materials.
- Use same laminate on both sides unless panel is small or mechanically restrained.
- Thick core resists warpage better than thin core.
- Align sanding marks on both sides.
- Use the same adhesive and application techniques on both sides.
- Paint, varnish, vinyl film and fiber backers will not balance high pressure laminates.
- Spacing is required between panels to allow for movement.

FORMICA® LAMINATE BY FORMICA GROUP/AVOID LAMINATE-CLAD PANEL WARPAGE TECHNICAL BRIEF CONTINUED

TECHNICAL SERVICES

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GreenGuard Environmental Institute
Formica® high-pressure laminate (HPL) is GreenGuard Indoor Air Quality Certified under the GreenGuard Standard for Low-Emitting Products.