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Stress Crack Avoidance

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Introduction

The growing utilization and adoption of high-pressure laminates underscore their ongoing recognition for their enduring functionality and visual appeal.

Over the past few years, the high pressure decorative laminate sector has witnessed numerous advancements in both technical and aesthetic aspects of its products. These improvements are closely overseen and regulated through contemporary testing and techniques and enhanced manufacturing methods.

General Discussion

High pressure laminates are used as surfacing materials on counters, desktops, cabinets, wall panelling, and furniture. The physical characteristics of the material should be considered in planning its fabrication and installation.

First Aid

The occurrence of stress cracking in high-pressure laminates arise from the accumulation of stress in specific areas within a laminated structure. When this stress surpasses the laminate's tolerance, it leads to the formation of stress crack. If these stress concentrations happen around a cut-out or other fabrication detail, one or more cracks may extend from the
sharp corners of the cut-out, where the laminate is particularly vulnerable for mechanical reasons.

These stresses can stem from external mechanical forces, but they are commonly triggered by the natural dimensional changes that laminated assemblies undergo in response to environmental conditions. Like other wood-based products, high-pressure laminates and their underlying materials respond to fluctuations in humidity. In humid conditions, laminated assemblies absorb moisture and expand dimensionally. Conversely, in situations where low humidity is prevalent due to central heating or localized heating from radiator grilles or hot air vents, shrinkage can occur, potentially leading to cracks emerging from areas of high stress, such as sharp internal corners or chipped edges.

Stress cracking occurs due to the tensions that develop when the dimensional changes of the laminate and the substrate to which it is affixed differ either in terms of their rate or their direction.

Recommended Techniques for Controlling Stress Cracking

a) Preconditioning

Before commencing the fabrication process, it is recommended to let both the laminate and the substrate acclimate to the surrounding conditions for a minimum of 48 hours. Ideal conditions typically involve maintaining a temperature of around 75˚F (24˚C) and a relative humidity level between 45% and 55%. Ensure that there is adequate air circulation around the components during this acclimatization period.

Stress Crack Avoidance

b) Adhesive Bond

The quality and the type of adhesive bond between the laminate and the substrate play a crucial role in minimizing stress cracking. In essence, a stronger and more rigid bond reduces the likelihood of stress cracking. Contact adhesives, due to their inherent elastomeric nature, transmit less stress to the substrate. Consequently, assemblies constructed with contact adhesives are generally less resistant to cracking compared to those assembled using rigid or semi-rigid adhesives. When employing contact adhesives, it is imperative to apply them correctly and ensure they are properly fused to achieve the strongest bond possible.

Adhesives with a rigid or semi-rigid nature, such as resorcinol, ureas, and PVAc (commonly known as white glue), directly convey stresses to the substrate. Consequently, assemblies created using these adhesives tend to exhibit greater resistance to cracking.

Stress cracking is most frequently observed when contact adhesives are utilized because these adhesives possess an elastomeric, non-rigid quality that permits the laminate to undergo gradual deformation or "creep."

c) Cut-outs

Cut-outs and recesses, whether for items like switches, ventilation grilles, or access points, should always have rounded edges. Sharp corners can be a potential cause of cracking, as shown in Figures A-1. Internal corners radius should be determined by the fabricator or user to be deemed necessary (see Figure B-1). Fabricator or user's expertise and judgement are crucial in determining the appropriate radius for internal corners.

Factors such as the intended use, carrier board properties, structural requirements, and potential stress points should be considered to determine the optimal radius for these corners. All edges must be smooth, devoid of cracks and notches (see Figure A-2).

Additionally, grooves and rebates should also be rounded to prevent notch-induced cracks. When creating cut-outs, you can use a router directly or, alternatively, pre-drill with an appropriate radius and then saw out from one drill hole to another.

It's important to allow for adequate expansion gaps for integrated components.

Figure A-1

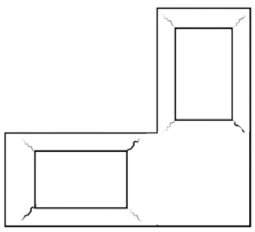

Figure A-2

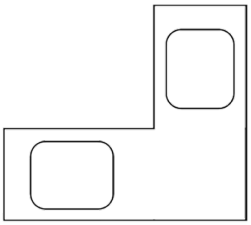

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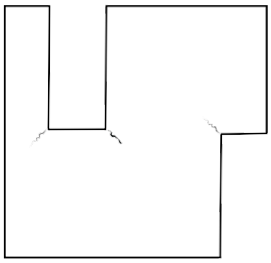
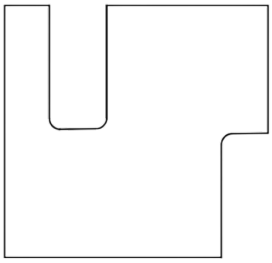
Figure B-1



Corners without a radius

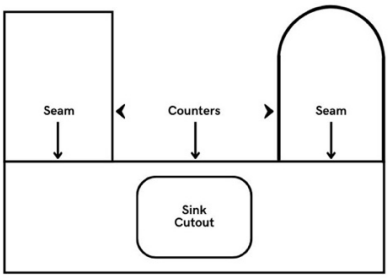


Corners with radius

d) Seam Placement

Another effective strategy to reduce the likelihood of stress cracking is to carefully plan the placement of seams to minimize the number of internal corners. An illustration demonstrating the correct positioning of seams is shown in Figure C-1.

Figure C-1

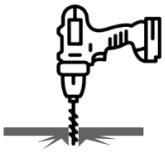


e) Drilling

When drilling decorative laminates, it is advisable to use special drill bits. The recommended tools for this purpose are spiral drills with a point angle ranging from 60˚ to 80˚. This contrasts with the typical 120˚ point angle used for drilling metals.

Place a piece of wood as a protective barrier when drilling through high-pressure laminates to prevent cracking or damage to the laminate surface. It suggests a practical approach to safeguarding the laminate during drilling activities. An example is shown in the following illustration (see Figure D-1).

Figure D-1



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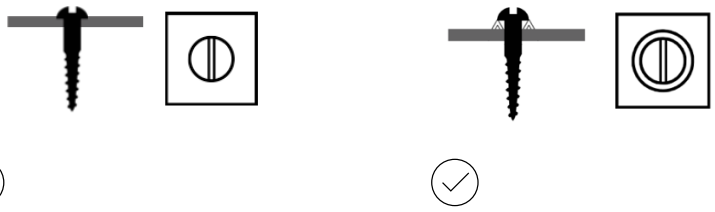
Drilled holes intended for securing screws and similar fasteners should be slightly larger in size to guarantee that the fastenings do not impinge with the edge of the laminate.



f) Installation

During the installation of the laminated assembly, ensure there is ample clearance around pipes, electrical boxes, panel edges, and other components to accommodate regular dimensional changes. Items like sinks, louvers, and drop-in ranges should easily fit into their designated openings without requiring excessive force. Avoid forcefully fitting a panel or laminated assembly. Instead, panels should be installed in a level and flat plane, using shims as needed to prevent mechanical stresses stemming from bending or twisting.

IMPORTANT NOTES

It's important to note that while all these measures stated above help reduce the likelihood of cracking, there is no absolute assurance against crack, as external factors such as vibrations, fabrication process, and the chassis play a significant role in crack formation, particularly in the context of recreational vehicles. Vibration from the recreational vehicle's motion can induce stress on the structure, leading to cracks, and the chassis's rigidity, or lack thereof, can further influence the distribution of this stress and the potential for crack development.

Technical Services

For technical assistance, simply reach out to our Account Manager at 03 9357 0934 or email info@urbanrepublic.com.au.

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