

## Panel Warpage

### What are the causes of panel warpage and how can it be prevented?

Warpage has been defined as any variation from a true flat panel. Product Standard-1, PS-1, does not address warpage but this problem is a concern for both manufacturers and customers alike.

The following table lists some possible causes for warpage and suggestions to correct it:

Cause for Warpage	Warpage Solution
Difference in moisture content of face and back	Check moisture content of faces, backs, and inner plies. Review the drying operations.
Panels left on the hot platens of the press too long	Unload the hot press as soon as possible. Automatic chargers have helped with this issue. Loads that exceed the recommended times of the gluing charts should be isolated for additional knife tests.
Unbalanced construction	Review the construction lay-up. One ply could be missing or added. A use of unequal veneer thickness contributes to warpage.
Face and Back wood species are different or variations in veneer density	A mixing of wood species may cause warpage. Face and Backs should be of the same species.
Glue applications or adhesive spreads are not uniform	Check glue application spreads. Spreads may vary from heavy to light. Adjust spreads for uniformity. Spreads should be equally distributed on both sides of the spread. If spreaders are used, spreader rolls that need to be re-grooved can create panel warpage.
Face and Back variations in veneer thickness	Unequal veneer thickness for face and back can cause panel warpage. Quality checks should verify veneer thickness are the same for face and back.
Watering of panels after the hot press	An even application of water across the panel will help to prevent panel warpage.
Panel storage	Panels should be covered to prevent exposure to rain, sleet, and snow. Wrap panels loosely to allow for ventilation. Top panels should be weighed down and straps should be cut to prevent edge damages. A minimum of three supports should be used to protect panels from ground contact. Panels that are transferred on open truck beds should be covered from weather conditions.

