Material safety data Sheet Information and Technical Information for Treated Plywood

PRESERVATIVE-TREATED PLYWOOD FOR MANUFACTURING APPLICATIONS Best Practices Guide

The plywood industry consists of over a hundred mills in North America utilizing dozens of wood species for manufacturing.

Since the major application for plywood has been for building construction, the standards and plywood specifications have been primarily geared to providing grades and layups that are optimized for construction applications.

However, structural plywood also has a proven track record in boat manufacturing. With the current grades, specifications and treatments available, it is the best structural material to meet many of the boat manufacturers' needs. From the widespread use in PT boats during World War II to today's modern composite hulls, plywood has been a preferred structural element due to its high strength-to-weight ratio, machinability and excellent fastener holding capabilities.

Given the unique requirements of the boating industry, APA has developed specific recommendations that best address the needs of the boat manufacturer. Combined with readily available preservative treatments, plywood can provide long-term structural performance as boat components. This guide provides specification details for best performance and provides a reference to vast information based on plywood.

Plywood Standards and Specifications Voluntary Product Standard PS-1 for Plywood Plywood grade and workmanship quality are defined in Voluntary Product Standard PS-1.

The standard defines the following panel attributes that are important for the marine industry.

Wood Species.

Over 60 wood species may be used in the structural plywood industry.

Coniferous species are the dominant and preferred species for boat manufacturing applications.

The most popular of such species is Douglas-fir. Other species include southern pine, western larch and western fir.

Veneer Grades.

Veneer grading is based on the size and frequency of natural growth characteristics such as knots, knot holes and splits.

The common veneer grades for plywood are A, B, C, C-plugged and D.

The plywood panel itself is defined by the grade of the face and back veneers (e.g., A-B or C-D).

Bond Requirements.

Virtually all structural plywood made today uses waterproof phenolic resins which maintain the bond during moisture exposure. APA Industrial Specifiers Guide Today, manufacturers of industrial grades of plywood have very tight controls over how plywood is made.

Current technology allows for production of specialty plywood with fewer core voids and gaps, which results in "tighter" panel construction. Such technology improves upon the prescribed combinations in PS 1 by considering exactly what attributes are needed by the industrial customer.

In order to fine tune the plywood grading system to more precisely meet the needs of certain manufacturing industries, APA developed an Industrial Panel Selection Guide. The grading system considers the following panel attributes in a four-number ranking known as the Industrial Category Index, or ICI number.

The four-digit ICI number consists of the following:

Face Veneer Quality Ranking.

A numerical scale indicating the solidness and smoothness quality of the face veneer.

Back Veneer Quality Ranking.

Similar to the face veneer, the ranking addresses the back veneer quality required for the specific application.

Inner ply veneer under the face.

These veneers are often important for applications with heightened fastener holding demands, and where panels are going to be cut into smaller parts.

Other inner plies.

Similar to the veneer under the face, these are assessed for solidness.

APA recommends the following minimum grade specifications for most boat construction applications*: APA C-C Plugged, PS-1, Group 1, EXTERIOR or the panel should meet an ICI Number of 7-3-3-3.

Common Thicknesses of Plywood

1/4" to 1-1/8" thick is available, with the most common thicknesses being 15/32", 19/32" and 23/32".

* The best grade will vary depending on the application. Some boat manufacturers use treated panels with ICI number 4-3-3-3 for applications such as seats.

Preservative Treatments for Plywood

Plywood has a long history of good service in the boating industry. However, as with all wood products, given extreme moisture conditions for a long period of time, plywood may be susceptible to some degree of fungal decay. In many boat applications, the risk of elevated moisture conditions is mitigated by coatings, laminates, encasement in fiberglass or other protective means that reduce the moisture pickup or provides sufficient drying rate in order to reduce the panel moisture content. For the ultimate assurance against the risk of decay, commercial pressure preservative treatments are available. Since preservative treatments render the wood an unsuitable substrate for decay fungi, treated plywood can be considered at the top level of performance with respect to longevity. Treatments and Standards Treated wood products are readily available and are often in used construction where high decay hazards exist.

Unfortunately, much of the treated plywood found in retail lumber yards may not have been re-dried to the degree required for boat construction.

The following recommendations are geared specifically for treated plywood for boat construction. For best performance, care must be taken to specify and purchase treated plywood in accordance with these recommendations.

First, make sure the plywood comes from a mill that is a member of **APA - The Engineered Wood Association**. That is your assurance that the mill is subject to APA's rigorous quality assurance program. Treating is conducted as a secondary process following the commercial treating standards written by the American Wood Preservers Association (AWPA).

The most common treatment and retention level for plywood used in boat construction is CCA (Chromated Copper Arsenate) at 0.40 pcf retention.

Other treatments for boat use are ACA, ACZA and ACQ. AWPA Standard C9, "Plywood - Preservative Treatment by Pressure Process", specifies that the preservative-treated panels be redried to a moisture content of 18% or less, unless waived by the specifier.

For use in boat manufacturing, the redrying of the treated plywood is essential to good performance when laminating with fiberglass.

Treated plywood purchased from lumber yards is often used in construction applications and is not necessarily re-dried after treatment. It is essential for boat manufacturers to specify redrying.

Treated plywood is trademarked by a grading agency that monitors treating quality. The trademark should specify the AWPA standard, treatment and treating retention. Many suppliers of treated plywood for the boat industry offer limited lifetime warranties.

For the BEST performance of plywood in boat manufacturing, APA recommends the use of treated plywood according to the following specifications. Treated in accordance with AWPA Standard C9 with < CCA, ACQ, ACZA or ACA> to 0.40 pcf retention.

Kiln dry after treating (KDAT) to 18% or less.

Laminating Fiberglass to Plywood

Many uses of plywood in boats involve laminating fiberglass over a plywood boat component. APA recently contracted with a marine testing laboratory to study the strength of fiberglass bond using commercial resins applied to treated and untreated plywood.

The objective of the study was to assess the effect of preservative treatments and panel moisture content on the strength of the laminate bond. The study assessed the laminating strength on treated and untreated plywood.

To study the effect of moisture content, half of the panels were humidified to simulate the upper range of moisture content of what may be expected from treated panels after redrying or from panels stored at a boat manufacturer's facility.

The treated plywood developed bond strengths similar to the untreated plywood. As expected, the moisture content of the plywood influenced the strength of the fiberglass bond.

However, even at the highest moisture condition, the ultimate test failure mode in the vast majority of the cases was wood failure within the plywood itself, rather than at the laminate bond interface.

The influence of plywood moisture content reinforces the need to specify drying after treating when using treated plywood. Handling and Storing Plywood Like all materials used in manufacturing, plywood should be properly stored and handled to assure proper performance. Protect the edges and ends of panels during handling. Place panels to be moved by forklift on pallets or bunks when received to avoid damage by fork tines.

Panels to be transported on open truck beds should be covered with tarpaulins.

For open rail transport, use "lumber wrap" to avoid weather exposure.

For best performance, store panels indoors away from open doors to minimize moisture differentials along edges and ends.

Make sure the panels are not exposed to water, solvents or other foreign matter that may interfere with establishing the fiberglass bond.

Stack panels on 4x4 stringers or other blocking. To help assure continued panel flatness, use at least three full-width stringers or bunks to avoid bending of the unit.

Covering and weighing down the top of the bundles assists in keeping the panels flat.