



PRESERVATIVE-TREATED PLYWOOD

Introduction

Most construction applications don't require preservative-treated wood. But in some uses, and in certain climates, treated wood is recommended or required by local building codes to protect against decay, fungi, termites, carpenter ants, or other wood-destroying insects, or from marine borers in sea-water exposure.

Preservative-treated plywood is impregnated with preservatives by a pressure process. The resulting deep penetration of preservative provides protection against decay and insect attack.

Non-pressure preservative treatments are available, but superficial applications of preservatives provide limited protection. Pressure-preservative treated plywood is used in a variety of applications.

- Wood foundations
- Bulkheads
- Retaining walls
- Swimming pools
- Highway noise barriers
- Irrigation structures
- Cooling towers
- Electrical transformer vaults
- Decks, docks, piers and floats
- Tanks
- Liquid manure storage tanks
- Planters
- Food transport, processing and storage

- Roof, wall, and floor sheathing in tropical regions or applications where resistance to termites or decay is required.

Preservative-treated plywood maintains stiffness and strength, thermal properties, workability, light weight and economy.

Wood preservatives and wood treated with these chemicals should be used and handled appropriately (see "Standards and Use Recommendations" and "Precautions for Use and Handling"). Always follow the recommendations provided by the preservative manufacturer or wood treating company.

Acceptances and Availability

Preservative treatments are recognized in model building codes, federal and military specifications, and AASHTO specifications.

Preservative-treated plywood is generally available in metropolitan areas. For availability, contact local building materials suppliers, or consult the Yellow Pages of the telephone directory under "Lumber Treating."

Some panel grades, thicknesses, Span Ratings, or species may be difficult to obtain in some areas. Check with your supplier for availability or include an alternate panel in specifications. Standard panel dimensions are four feet by eight feet, although some mills also produce panels nine or ten feet or longer.

Technical Data

Preservative Types

Two major types of chemicals are used in preservative treatment of plywood.

Organic Preservatives

Organic preservatives used for preservative treating of plywood include creosote, pentachlorophenol (penta) and copper-8-quinolinolate.

Creosote is a coal tar product which is dissolved in a distilled solution or petroleum oil. It is an effective preservative in commercial, industrial or marine applications when there is severe exposure to decay or insect attack, or marine borers in salt water environments. Creosote-treated plywood has an odor and a dark, "oiled" surface appearance, and therefore is not recommended where painting is required.

Penta is commonly dissolved in light petroleum oil or solvent, liquid petroleum gas (LPG), or in a petroleum solvent/water solution. It is suitable as a preservative for ground contact or above-ground uses. Plywood treated with penta has an odor, and oil-borne penta has an "oiled" surface appearance and thus is not recommended for painting. However, plywood treated with solvent- or water-borne penta, including penta in LPG, has an oil-free surface and natural wood appearance, and should be specified where staining or painting is desired.

Note: Penta dissolved in methylene chloride should not be used to treat plywood containing synthetic repairs in face veneers, since the solvent can damage the repairs.

Plywood treated with copper-8-quinolinolate preservative can be used in applications where food is harvested, transported or stored. The preservative is dissolved in liquid petroleum gas or light hydrocarbon solvents so that the treated plywood has a clean surface and is free of solvent odor. Check with the company providing the treatment service regarding applicable FDA and USDA acceptances.

Inorganic Preservatives

Inorganic preservatives are the most popular and commonly available types used for preservative treating of plywood. They include leach-resistant waterborne arsenical preservatives such as CCA, ACA, ACZA and ACQ-B which are highly effective in preventing decay and attack by termites, carpenter ants and marine organisms (see Table 1 for chemical names of common waterborne preservatives). These preservatives are forced into

plywood under pressure and become insoluble or “fixed” in the wood cells after impregnation and drying.

Waterborne preservatives are recommended where clean, odorless and paintable products are required. Wood treated with such preservatives may be used inside residences or commercial and industrial buildings, providing sawdust and construction debris are cleaned up and disposed of after construction.

Note: Treatment of tongue-and-groove panels with waterborne preservatives may result in difficulty in mating T&G edges. Use of square-edge panels, or milling T&G edges after treatment, should be considered.

Standards and Use Recommendations

Table 2 lists applicable American Wood-Preservers’ Association (AWPA) preservative-treating standards for plywood, according to the intended end use. Table 3 summarizes plywood applications and recommended preservative treatments for these uses, in accordance with AWPA Standards.

Preservative Penetration and Retention

AWPA Standards specify preservative retention in terms of pounds of retained preservative per cubic foot of wood. Specified retention levels vary according to the type of preservative and the severity of exposure (see Table 3).

For preservative-treated plywood, AWPA Standards require that all veneers must be penetrated by preservative. The net retention of preservative in plywood is high – up to 25 pounds per cubic foot in some treatments – because of plywood’s high ratio of surface area to volume. Therefore, preservative-treated plywood may be cut in the field, without loss of preservative protection at cut edges.

Fasteners

Hot-dipped or hot-tumbled galvanized steel, stainless steel, silicon bronze or copper fasteners are recommended for use in preservative-treated wood. Only stainless steel fasteners are recommended for attaching preservative-treated plywood to lumber below grade in wood foundations.

TABLE 1

CHEMICAL NAMES OF COMMON WATERBORNE PRESERVATIVES

ACA:	Ammoniacal Copper Arsenate ⁽¹⁾
ACZA:	Ammoniacal Copper Zinc Arsenate ⁽¹⁾
CCA:	Chromated Copper Arsenate ⁽¹⁾ (Types A, B or C)
ACC:	Acid Copper Chromate
ACQ-B:	Ammoniacal Copper Quat (Type B) ⁽¹⁾
ACQ-D:	Amine Copper Quat (Type D)
CC:	Ammoniacal Copper Citrate
SBX:	Borate Oxide

⁽¹⁾ These preservatives are highly leach-resistant.

TABLE 2

PRESERVATIVE-TREATING STANDARDS FOR PLYWOOD⁽¹⁾

Use	AWPA Standard	Preservative Types			
		Creosote	Pentachlorophenol	Copper-8-Quinolinolate	Waterborne Preservatives
General	C9	X	X	X	X
Highway	C14	X			X
Commercial-Residential Construction	C15			X	X
Farm	C16	X	X	X	X
Marine	C18	X	X		X
Wood Foundation	C22				X
Food Handling, Storage, Transportation	C29			X	
Cooling Tower	C30	X			X

⁽¹⁾ For government and military procurement, Federal Specification TT-W-571 should be cited when specifying preservative-treated wood.

TABLE 3

RECOMMENDED TREATMENTS

Exposure	Typical Application ⁽¹⁾	Minimum Preservative Treatment ⁽²⁾ (lb. per cu. ft. by assay)					
		Creosote		Pentachloro-Phenol ⁽⁴⁾		Copper-8-Quinolinolate ⁽⁶⁾	Waterborne Preservatives ⁽³⁾
Contact with sea water, exposed to marine borer attack.	Pontoons, wharf bulkheads, scows, floats and flood gates, etc.	Creosote: full-cell	25.0	Not recommended		Not recommended	ACZA 2.50 ACA 2.50 CCA (Type A, B or C) 2.50
Contact with ground, chemicals, continuous moisture or high humidity.	Permanent trench and tunnel lining, retaining walls, skirting for post and pier or pole type foundations, snow sheds, floats, irrigation structures, tanks, linings for wet process industries, poultry dropping trays, septic tanks, some chemical storage tanks, industrial sewers, and smelter roofs.	Creosote: empty-cell	10.0	Penta: empty-cell	0.50	Not recommended	ACZA 0.40 ACA 0.40 ACC 0.40 CCA (Type A, B or C) 0.40 ACQ (Type B or D) 0.40 CC 0.40
	Permanent Wood Foundation system ⁽⁵⁾	Not recommended		Not recommended		Not recommended	ACA, ACZA, CCA (Type A, B or C) or ACQ (Type B) 0.60
Above ground uses where plywood is subject to insect infestation or fungus attack.	Under these exposure conditions, protection may be advisable for sub-flooring over unexcavated areas or shallow crawl spaces; sheathing and other uses such as fences, exterior siding, exposed structural units such as stressed-skin panels and box beams, reservoir roofs, splash boards in pole-type buildings.	Creosote: empty-cell	8.0	Penta: empty-cell	0.40	Copper-8-quinolinolate: empty cell 0.20	ACZA 0.25 ACA 0.25 ACC 0.25 CCA (Type A, B or C) 0.25 ACQ (Type B or D) 0.25 CC 0.25 SBX ⁽⁷⁾ 0.17
	Interior linings of refrigerators and box cars; food processing plants and warehouses; greenhouses and milk processing facilities; fruit, vegetable and grain harvesting; transport and storage containers requiring low human toxicity fungicide.	Not recommended		Not recommended		Copper-8-quinolinolate: empty-cell 0.20	Not recommended

(1) See applicable EPA-approved Consumer Information Sheet (CIS) for precautions involving uses and handling of creosote, pentachlorophenol or inorganic arsenical pressure-treated wood.

(2) Recommended minimums from the American Wood-Preservers' Association Standards.

(3) Based on dry preservative per cubic foot, oxide basis, full-cell treatment.

(4) Oil, gas or other solvent-borne.

(5) Plywood marked PS 1 or PS 2, or APA Standard PRP-108 is required for the Permanent Wood Foundation system.

(6) Volatile petroleum (AWPA P9, Type B) or light hydrocarbon (AWPA P9, Type C) solvents only.

(7) For dry above-ground applications not subjected to liquid water or Formosan termites.

Gluability

Plywood can be glued when treated with most of the waterborne preservatives, and with some penta treatments using light petroleum oil or solvent, liquid petroleum gas, or petroleum solvent/water as a carrier. Consult treating firms or their trade associations for specific recommendations.

Structural Properties

Preservative treatments applied under AWPA standards do not affect plywood strength and stiffness. See APA "Plywood Design Specification" (Form Y510) or APA Technical Note N375 for allowable working stresses and section properties, or design capacities for plywood.

Finishing Recommendations

Waterborne preservatives are readily paintable when dried after treatment. Finishing recommendations are generally the same as those for untreated plywood.

Some slight surface degradation is possible in sanded plywood after drying because of surface checking, and/or discoloration. For this reason, Medium Density Overlay plywood gives best results where treated paintable surfaces are required. Unsanded grades of plywood do not require further finishing, but can be finished with two-coat acrylic paints or opaque stains. Stain finishes or two-coat acrylic paints (stain-blocking primer and topcoats) are recommended for textured plywood.

Painting plywood treated with creosote or oil-borne preservatives such as pentachlorophenol is not recommended. Painting can be done only with difficulty and requires extensive care using an aluminum base paint. Paintable pentachlorophenol treatments are available. (See discussion under "Organic Preservatives.")

For certain interior applications in commercial, industrial or farm buildings, creosote or pentachlorophenol treated wood may be used if exposed surfaces are sealed by painting with two coats of urethane or epoxy paint or shellac (varnish may also be used for pentachlorophenol-treated wood). For guidelines on use precautions in these cases, refer to Table 4 and the EPA-approved Consumer Information Sheet (CIS) for the applicable preservative treatment.

Precautions for Use and Handling

The chemical formulations used for preservative treatment of plywood are registered with the U.S. Environmental Protection Agency (EPA), which has approved guidelines for the use of pressure-treated wood to ensure safe handling and avoid environmental or health hazards.

TABLE 4

USE PRECAUTIONS FOR PRESSURE-TREATED WOOD⁽¹⁾

Application	Organic Preservatives		Inorganic Preservatives (Arsenicals)
	Creosote	Pentachlorophenol	
1. Skin contact applications.	OK ⁽²⁾	OK ⁽²⁾	OK
2. Residential interiors.	NO	NO	OK
3. For industrial and farm buildings, interior components which are in ground contact and subject to decay or insect attack. Also see Application 5.	OK ⁽²⁾	OK ⁽²⁾	OK
4. Laminated beams for commercial or industrial buildings	NO	OK ⁽²⁾	OK
5. Interiors of farm buildings when animals can crib (bite) or lick the treated wood.	NO	NO	OK
6. Agricultural farrowing or brooding facilities.	NO	NO	OK
7. Applications where preservative may become component of food or animal feed, such as structures or containers for storing silage or food.	NO	NO	NO
8. Cutting boards or counter-tops for preparing food.	NO	NO	NO
9. Decks, patios and walkways if surface is visibly clean and free from residues.	OK	OK	OK
10. Portions of beehives which may come into contact with honey.	NO	NO	NO
11. Applications where treated wood can come into direct or indirect contact with drinking water for public or animal consumption.	NO ⁽³⁾	NO ⁽³⁾	NO ⁽³⁾

(1) Based on EPA-approved Consumer Information Sheets.

(2) Must be painted with recommended sealer (two coats).

(3) OK for incidental contact such as bridges or docks.

The use precautions for creosote, pentachlorophenol and inorganic arsenical preservative-treated wood are published in EPA-approved Consumer Information Sheets (CISs) for these treatments, available from treaters, and are briefly summarized in Table 4.

Tips

- Dispose of treated wood by ordinary trash collection or burial. Treated wood should not be burned in open fires or in stoves, fireplaces or residential boilers.
- Treated wood from commercial or industrial use (e.g., construction sites) may be burned only in commercial or industrial incinerators or boilers in accordance with state and federal regulations.
- Avoid frequent or prolonged inhalation of sawdust from treated wood. When sawing and machining treated wood, wear a dust mask. Whenever possible, these operations should be performed outdoors to avoid indoor accumulations of airborne sawdust from treated wood.
- When power sawing and machining, wear goggles to protect eyes from flying particles.
- Avoid frequent or prolonged skin contact with pentachlorophenol or creosote-treated wood; when handling wood treated with these chemicals, wear long-sleeved shirts and long pants and use gloves.
- After working with treated wood, and before eating, drinking or using tobacco products, wash exposed areas thoroughly.
- If preservatives or sawdust accumulate on clothes, launder before reuse. Wash work clothes separately from other household clothing.

Suggested Specification

Preservative treated plywood for (state application) shall be pressure-treated in accordance with AWPAs Standard C9 with

(creosote) (pentachlorophenol) (copper-8-quinolinolate) (waterborne) preservatives as required for (salt water marine) (fresh water marine) (wood foundation) (ground contact) (above ground) exposure.

Preservative-treated plywood shall be all-veneer APA RATED SHEATHING (or better, depending on appearance desired) EXP 1 marked APA Series V-600, or EXT marked APA Series V-611.^(a) **Note: For PWF applications, plywood marked PS 1, PS 2, or APA Standard PRP-108 is required.**

Plywood treated with waterborne preservatives shall be dried after treatment to a moisture content of 18 percent or less.

Preservative-treated plywood shall be marked by an approved inspection agency certified to inspect preservative-treated wood, indicating compliance with the treating, drying, retention and penetration requirements of applicable AWPAs Standards or equivalent code-approved preservative-treating and quality control requirements.

(a) For further information on plywood grades and use recommendations, see APA *Design/Construction Guide Residential & Commercial*, Form E30.

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For More Information

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Form No. Q220X
Revised July 1999/0100

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