

INSTALLATION AND PREPARATION OF PLYWOOD UNDERLAYMENT FOR RESILIENT FLOOR COVERING

This Data File provides recommendations for residential and light commercial applications.

Underlayment grades of plywood have a solid, touch-sanded surface for direct application of nonstructural finish flooring, and special inner-ply construction for resistance to indentation and punctures from concentrated loads. Applied as recommended, APA trade-marked plywood underlayment is also dimensionally stable and eliminates excessive swelling and subsequent buckling or humps around nails.

For areas where resilient floor covering such as tile or sheet flooring or fully-adhered carpet is to be installed, use plywood grades recommended in Table 1. These grades provide a smooth, sanded surface that is suitable for such floor coverings. Where floors may be subject to unusual moisture, use panels with an Exterior exposure durability classification. Ordinary sanded plywood grades such as APA A-C or B-C Exterior plywood, and APA C-D Plugged Exposure 1 plywood are not adequate substitutes for Underlayment grade, since they do not insure equivalent resistance to indentation or puncture.

The thickness of plywood underlayment needed to bridge an uneven floor will depend on floor roughness and loads

applied. Although a minimum 1 1/32-inch thickness is usually recommended, 1/4-inch plywood is acceptable for underlayment over smooth subfloors, especially in remodeling work.

Thicker plywood underlayment with more plies generally has improved dimensional stability and stiffness, and should reduce the risk of contractor callbacks. This may be a more important factor in large floor areas, especially where sidelighting across long expanses of flooring tends to highlight any floor surface irregularities.

Plywood underlayment also provides a smooth surface for installation of adhered carpet flooring. During construction, the subfloor surface will probably be roughened or scuffed by weather exposure and construction traffic. This creates a potential risk for telegraphing roughness or uneven joints through adhered carpet flooring. After the carpet is installed, moisture from occasional steam cleaning could increase the moisture level in the subfloor and contribute to surface roughness. Thicker underlayment with more plies reduces the potential for buckling after steam cleaning.

Contact APA and floor covering manufacturers for underlayment and resilient flooring recommendations for light commercial or industrial floors, or

for corridors or traffic areas where heavy rolling wheel loads may be anticipated. Concentrated rolling wheel traffic may cause deterioration of the plywood underlayment face beneath resilient floor covering. For such applications, smooth, tempered hardboard underlayment or Plyron® may be more appropriate bases for resilient floor coverings.

The following recommendations will help prevent flooring problems when APA plywood underlayment is installed over a subfloor in a two-layer floor system.*

Subfloor Preparation

Plywood underlayment should be installed only on a dry subfloor. Moisture, which may accumulate when the subfloor is exposed to weather during construction, can cause expansion of the dry underlayment panels if the subfloor is not allowed to dry adequately. A damp subfloor can also contribute to nail pops and squeaks. Normal scheduling, however, usually permits the subfloor to dry out and become conditioned in an enclosed, evenly heated environment prior to installation of the plywood underlayment and floor covering.

To avoid callbacks, inspect the subfloor surface for evenness and flatness before installing plywood underlayment. Uneven floor surfaces may become obvious when

*For areas where resilient floor covering is to be applied, a two-layer floor system is recommended for site-built construction. Veneer-faced APA Rated Sturd-I-Floor with "sanded face" is also suitable for direct application of resilient floor covering, provided the surface is protected from roughening during construction. See *APA Design/Construction Guide: Residential and Commercial*,

Form E30, for complete recommendations on installation and preparation of APA Rated Sturd-I-Floor panels for single-layer floors.

See APA Technical Note F415 for floor system recommendations for manufactured homes.

smooth or shiny resilient floor covering is installed, especially in large areas which have strong sidelighting from windows, doors or interior lighting. The following precautions should be observed:

- When the subfloor panels are dry and prior to installing plywood underlayment, visually check the subfloor end and edge joints for evenness or variations in panel thickness which might telegraph through the underlayment. (A short straight edge – 12 to 24 inches long – provides a quick reference for this purpose.) If necessary, sand the subfloor joints with a commercial floor sander to smooth surfaces within the vicinity of joints.
- Visually check the subfloor surface for flatness between floor framing members. Add blocking or plywood cleats under the floor, and fasten the subfloor to them with screws or nails as necessary to flatten panels. For background information on buckling of panel sheathing, see APA Technical Note D481.

Also check the subfloor for squeaks and re-fasten as necessary before installing the underlayment. Abnormally low moisture content in the wood floor also can contribute to nail pops and floor squeaks. When furnace or hot air ducts are located in close proximity under the floor, the underfloor space should be well ventilated, or insulated above ducts in the joist cavity to avoid excessive drying of the wood floor.

Underlayment Installation

Always protect plywood underlayment against physical damage or water prior to application. Panels should be allowed to equalize to atmospheric conditions before installation. This can be accomplished by standing individual panels on edge for several days in the room(s) where they will be installed.

Install plywood underlayment with smooth side up immediately before laying the finish flooring. For maximum stiffness, underlayment panels should be positioned with the face grain oriented

across floor joists. Stagger end joints in underlayment panels, and offset end and edge joints of underlayment panels by at least two inches from joints of subfloor panels, unless otherwise recommended by the finish flooring manufacturer.

Spacing of 1/32 inch at panel edges and ends is recommended. Edge spacing allows for panel expansion during construction and as the underlayment becomes conditioned to the temperature and humidity which will be typical in service. Edge gaps should be filled just before the floor covering is installed (allowing cure time), when no movement is expected.

Note: Some floor covering manufacturers recommend that edges and ends of underlayment panels should be butted to a light contact, or with an edge and end joint spacing of 1/64 inch (approximately the thickness of a matchbook cover), without filling panel joints. In this case, installation over a dry subfloor is essential.

The recommended fastener schedule for plywood underlayment, including fastener size, type and spacing, is given in Table 2. Begin fastening at one edge and, assuring that the panel is uniformly flat, continue by fully fastening towards the opposite edge. If power-driven fasteners are used, foot pressure should be applied near the fastener to assure contact between the underlayment and subfloor. Do not overdrive or underdrive fasteners, which could result in “telegraphing” fastener or panel joint location through resilient tile or sheet flooring; fasteners pulling through underlayment panels if later exposed to moisture, water leaks or flooding; or floor squeaks due to movement between underlayment and subfloor panels. Check to insure that fasteners are driven so that the fastener heads are flush with, or just slightly below the panel surface. Avoid gluing the underlayment to the subfloor with construction adhesives, which could develop installation or staining problems with certain types of resilient sheet flooring products.

Occasionally, fasteners may “pop” or “back out.” In these cases, fastener heads sometimes raise above the underlayment surface and “telegraph” as bumps through resilient floor covering. The best precautions against nail popping are to use ring- or screw-shank nails which have higher withdrawal resistance; to use a fastener length approximately equal to the total thickness of the underlayment and subfloor; and to assure that the subfloor is dry. Fasteners that are too long may “ream” a hole through the subfloor when driven, causing them to loosen later. Also, short underlayment fasteners will minimize joist penetration and reduce fastener popping problems caused by lumber shrinkage.

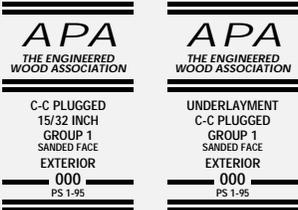
Underlayment Preparation

Shortly before the floor covering is installed, fill all edge gaps, splits, damaged areas and rough spots in the plywood underlayment with a hard, quick-setting filler. (This step also may be necessary when fully-adhered textile (carpet) resilient floor covering is used – check recommendations of floor covering manufacturer.)

A filler restrains the edges of the panel underlayment from closing and causing wrinkling or ridging of the floor covering over joints between underlayment panels. Tests by APA have shown that some floor covering materials wrinkle or ridge when an underlayment gap closes as little as 0.010 inch, and that the wrinkle is permanent, even when the underlayment dries out and the joint reopens. If not restrained by filler, such minor panel movement at an edge joint could result from normal seasonal changes in relative humidity. Water-based flooring adhesive also may cause panels to expand temporarily. The filler also prevents flooring adhesive from entering the joint, where it could later be squeezed back out to develop a ridge in the floor covering.

TABLE 1

RECOMMENDED PLYWOOD GRADES FOR UNDERLAYMENT

Grade ⁽¹⁾⁽²⁾	Exposure Durability Classification	Look for These Special Notations in Panel Trademark ⁽³⁾	Typical Trademarks
APA Underlayment	Exposure 1	Sanded Face	
APA C-C Plugged Underlayment C-C Plugged	Exterior	Sanded Face	
APA A-C	Exterior	Plugged Crossbands Under Face ⁽⁴⁾	
APA B-C	Exterior	" " " "	
APA A-D	Exposure 1	" " " "	
APA B-D	Exposure 1	" " " "	
APA Underlayment A-C Underlayment B-C	Exterior	Sanded Face	

(1) Veneer-faced, 19/32-inch or thicker panels; or APA Rated Sturd-I-Floor, Exposure 1 or Exterior marked "Sanded Face"; or APA Marine Exterior plywood also may be used for underlayment under resilient floor covering.
 (2) Specific plywood grades and thicknesses may be in limited supply in some areas. Check with your supplier before specifying.

(3) Recommended for use under resilient floor covering.
 (4) "Plugged Crossbands (or core)," "plugged inner plies" or "meets underlayment requirements" may be indicated as alternate designation in or near trademarks.

TABLE 2

APA PLYWOOD UNDERLAYMENT FASTENER SCHEDULE

Application ⁽¹⁾	Minimum Plywood Thickness (in.)	Fastener Size & Type	Fastener Spacing (in.) ⁽³⁾	
			Panel Edges ⁽²⁾	Intermediate
Over smooth subfloor	1/4	3d (1-1/4-in.) ring- or screw-shank nails, min. 12-1/2 gage (0.099 in.) shank dia. ⁽⁴⁾	3	6 each way
Over lumber subfloor or other uneven surfaces	11/32	3d (1-1/4-in.) ring- or screw-shank nails, min. 12-1/2 gage (0.099 in.) shank dia. ⁽⁴⁾	6	8 each way

(1) For underlayment recommendations beneath ceramic tile, see *APA Design/Construction Guide: Residential & Commercial*, Form E30.

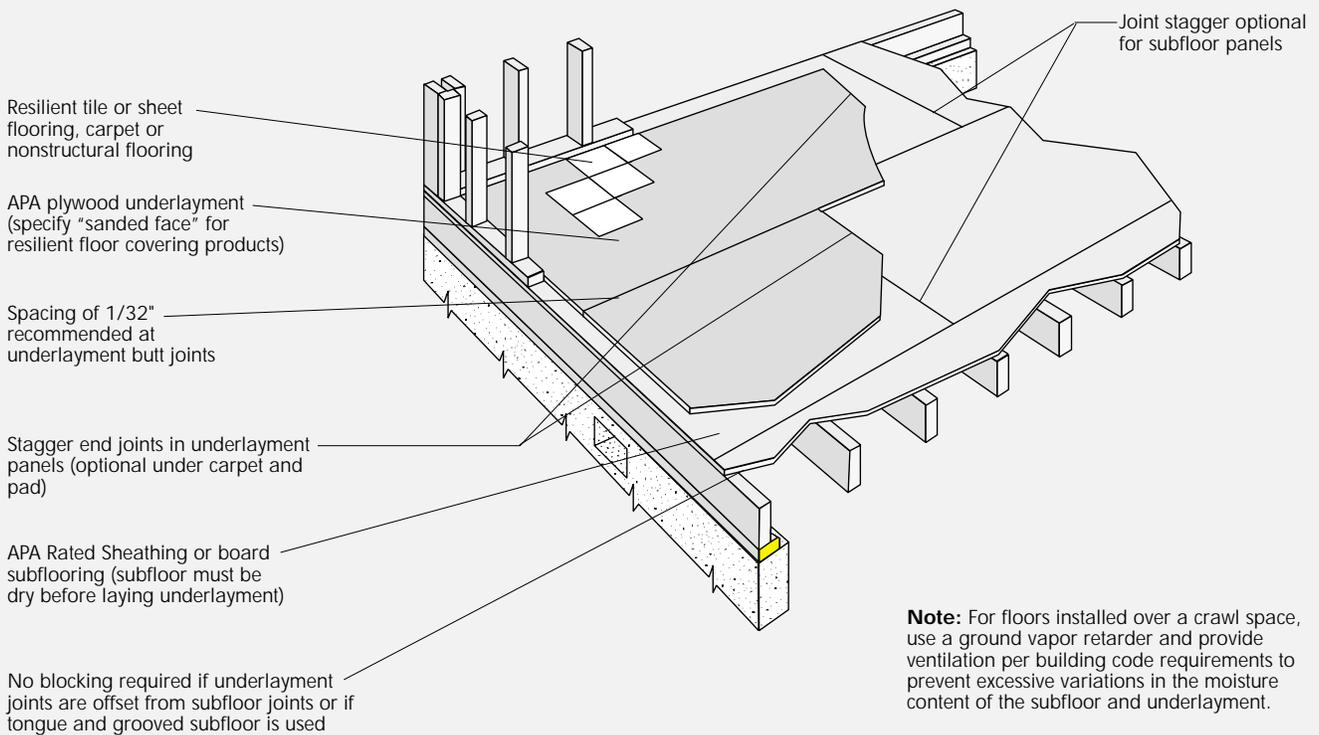
(2) Fasten panels 3/8-inch from panel edges.

(3) Fasteners for 5-ply plywood underlayment panels, and for panels greater than 1/2-inch thick, may be spaced 6 inches on center at edges and 12 inches on center each way intermediate.

(4) Use 4d (1-1/2-in.) ring- or screw-shank nails, min. 12-1/2 gage (0.099 in.) shank diameter, for underlayment panels 19/32-inch to 3/4-inch thick.

FIGURE 1

INSTALLATION OF APA PLYWOOD UNDERLAYMENT



A filler should be chosen which dries hard and is quick-setting. Most manufacturers call for about 1/2-hour to cure fully. If the setting time is rushed, the exposed surface of the filler may harden, but not necessarily the interior of the filled joint. Application of the floor covering further slows curing, and underlayment joint closure may squeeze the uncured filler out of the joint, resulting in a raised bead or ridge in the floor covering.

Some fillers expand slightly as they cure, making it important to complete curing before sanding. The ridge which develops in this manner is difficult to see, but it can be detected by feeling across the joint with the fingers or palm of the hand. Even this small amount of ridging may cause joint show-through in resilient floor covering.

Thorough sanding of underlayment panel joints with a heavy-duty sanding machine is recommended. Hand sanding or scraping usually is not sufficient to correct unevenness between panels which might cause joint show-through, or to remove excess filler. Construction adhesive squeeze-out or excess joint filler could cause roughness, or a poor bond between floor covering and the underlayment. Some joint fillers may prevent the flooring adhesive from absorbing into the underlayment panel. Sanding, then, not only smooths the joint, but aids good bonding performance.

APA has not evaluated joint fillers, and therefore does not recommend specific brands. The recommendations of the floor covering manufacturer should be followed.

Selection and Application of Resilient Floor Covering

When resilient sheet flooring is installed, consider "loose-laid" perimeter-attached flooring products to minimize exposure of plywood underlayment to moisture from water-based adhesives used for installing

flooring; or choose premium-quality flooring adhesives with higher solids content and reduced water content, and allow maximum "open" time within manufacturer's recommendations before installing flooring. For other types of finish flooring, follow flooring manufacturer's recommendations for installation.

Shiny, no-wax floor coverings seem to be highly susceptible to telegraphing any irregularities in the floor surface. Impeccable floor surface preparation is necessary when these floor covering products are used. Thicker and some "loose-laid" floor coverings are reportedly able to bridge or mask most of these imperfections. The flooring contractor should be consulted for advice on the most suitable floor covering product for a particular application, keeping in mind the points raised on page 1 of this brochure.

If a monolithic appearance is desired, sheet flooring should be specified. If tile flooring is used, consider orienting embossed or inlaid patterns of adjacent tiles at 90° relative to each other to accentuate the tile joint grid. Color is also a consideration, since tile joints are not as obvious in the darker hues.

Even after conscientious preparation, underlayment panel edge joints may later open slightly, such as during the transition from high humidity in summer to lower humidity during the winter heating season. Sometimes tile flooring joints separate on the underlayment panel module (every four feet, for example). To help prevent the tile joint from opening and collecting dirt, edge joints of tile flooring should be offset at least two inches from underlayment joints.

APA: The Mark of Quality

The trademarks of APA – *The Engineered Wood Association* appear only on products manufactured by APA member mills and is the manufacturer's assurance that the product conforms to the standard shown

on the trademark. That standard may be an APA performance standard, the *Voluntary Product Standard PS 1-95 for Construction and Industrial Plywood* or *Voluntary Product Standard PS 2-92, Performance Standard for Wood-Based Structural-Use Panels*. APA maintains five quality testing laboratories in key producing regions and a 37,000-square-foot research center at Association headquarters in Tacoma, Washington.

APA – *The Engineered Wood Association's* functions and services go far beyond quality auditing, however. APA also operates the most sophisticated program for basic panel research in the world, maintains an international network of field representatives to assist panel product users and specifiers, conducts informational meetings and seminars, publishes a vast inventory of design and application literature, works to secure code acceptance of panel products and applications, develops and maintains performance and industry product standards, and conducts in-depth market research and development programs.

Always insist on panels bearing the mark of quality – the APA trademark. Your APA panel purchase or specification is not only your highest possible assurance of product quality, but an investment in the many trade services that APA provides on your behalf.

Additional Information

For additional information about APA trademarked plywood underlayment or other APA panel construction systems, contact APA – *The Engineered Wood Association*, P.O. Box 11700, Tacoma, WA 98411-0700, or the nearest APA regional office listed on the back cover. For a complete listing of other APA publications, ask for the *Publications Index*, Form B300.

We have field representatives in most major U.S. cities and in Canada who can help answer questions involving APA trademarked products. For additional assistance in specifying APA engineered wood products, get in touch with your nearest APA regional office. Call or write:

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The product use recommendations in this publication are based on APA – The Engineered Wood Association's continuing programs of laboratory testing, product research, and comprehensive field experience. However, because the Association has no control over quality of workmanship or the conditions under which engineered wood products are used, it cannot accept responsibility for product performance or designs as actually constructed. Because engineered wood product performance requirements vary geographically, consult your local architect, engineer or design professional to assure compliance with code, construction, and performance requirements.

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