

Panel Underlayment: What to Use and How to Use It

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This column is the first one of my fourth year writing for *Floor Covering Installer*. It's hard to believe my first column was in October of 2003. The time has sure flown by and I have had a lot of changes in my professional life in that time. Through it all, John Moore, Jeff Golden and the team at *FCI* have stuck by me and been a supportive and professional group to work for. For this I am very grateful and I also thank the readers of *FCI* for the many positive comments and suggestions I have received over the years.

We've talked a lot about substrate preparation – most of the time dealing with concrete testing and preparation- but today we'll cover panel underlayments such as plywood and what to watch out for when selecting and installing underlayment. I usually do not like to mention brand names in my columns but in this case I will break my own rule so that my readers will have more information about the variety of products on the market.



This condition was caused by over-sanding the joints on a properly installed, properly patched plywood underlayment. Sometimes it's possible to overdo it! (Photo courtesy of Mark Violand)

Terminology



Plywood with knots should not be covered with resilient flooring or patched. An underlayment should be installed to provide a smooth substrate

I have heard many floor covering salespeople and installers tell customers that they would need a new "subfloor" before installing the new resilient flooring. Actually, that is not the correct term. The subfloor is the structural part of every flooring system – it's the base layer. A concrete slab is a subfloor and in the first layer of wood is the subfloor. In older buildings that is 1-by-6 tongue and groove boards, laid diagonally across the floor joists. In newer buildings the subfloor is plywood, particle board, oriented strand board (OSB) or any number of other 4-by-8 panels that form the first layer of the flooring system. The subfloor, as I said, is actually structural. So, unless you are tearing out the floor down to the joists, you should not say, "I am putting down a new subfloor."

The main idea in preparing for a resilient flooring installation is to be sure there is a smooth substrate. The substrate is what the floor is adhered to. Concrete subfloors are often smooth and dry enough to provide a smooth substrate for a new floor. However, most wood subfloors are either not thick enough, not smooth enough, or there is an existing floor that is not suitable. In these cases, to create a smooth substrate, we need to install an underlayment, which is often incorrectly called a subfloor.

You can see I have used three different terms here regarding the flooring system. This may sound confusing, but there is a difference and it is explained in a document that is actually a dictionary for resilient flooring. ASTM F 141, *Standard Terminology Relating to Resilient Floor Coverings*, defines these terms as follows:

Subfloor: that structural layer intended to provide support for design loadings which may receive resilient floor coverings directly if the surface is appropriate or indirectly via an underlayment if the surface is not suitable.

Underlayment. A material placed under resilient flooring, or other finished flooring, to provide a suitable installation surface.

Substrate: the underlying support surface upon which the resilient flooring is installed.

A professional in any trade should know and use the proper terminology so I hope this clears that up for our readers.

When to Use and When Not to Use Panel Underlayment

If the new resilient floor is a perimeter adhered or loose laid product, check with the flooring manufacturer. There are usually more options for acceptable substrates in these cases. For fully adhered resilient tile or sheet floors, there are pretty strict guidelines. When a room is built on a wood subfloor and there is an existing floor installed, or there is a floor that is not smooth enough for resilient flooring, an underlayment is needed to create a smooth substrate for the new floor. For wood subfloor systems, a 1/4" or thicker underlayment should be used over the following substrates:



It may or may not be necessary to patch the joints and fasteners on the underlayment - check with the manufacturer to be sure. (Photo courtesy of Tarkett)

- An existing resilient flooring that is embossed, textured (not smooth) or has a slight cushioning. Heavily cushioned floors should be removed.
- When there are 2 or more layers of resilient flooring installed. It is not recommended to install a resilient floor directly over more than one layer of existing resilient flooring, even if you use an "embossing leveler".
- A 3" wide (or less) tongue and groove wood floor. If an existing wood plank floor has boards wider than 3", it should be covered with a 1/2" or thicker underlayment.
- A wood subfloor that is at least 3/4" thick.
- An existing wood subfloor that is stained, painted, has old adhesive residue, or is otherwise damaged to the point that it is not suitable.
- Particleboard. Don't install resilient over particleboard because of the risk of edge swelling.
- Other unsuitable wood substrates such as CCA (pressure treated) plywood, CDX or other plywood with knots, OSB (oriented strand board), underlayment made of pine or other soft woods, Masonite™ or other hardboard underlayment, oil treated or otherwise coated wood material or other uneven or unstable substrates.

Check with the flooring manufacturer for their underlayment recommendations for the flooring you plan to install.



New construction is a bit trickier because you have to know what the existing floor is and how thick it is. As far as how thick it should be, there is an industry standard that most flooring manufacturers are quoting in their recommendations, and which specifies the thickness and construction for a wood subfloor/underlayment system.



The blue tape shows the nailing pattern on this plywood underlayment - nails are almost one foot apart, so the plywood must be re-nailed every 5-6 inches apart and 3-4" on the seams, before the floor can be installed. (Photo courtesy of Jon Namba - FCI October 2003)

ASTM F 1482 *Standard Practice for Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring*, states "A combination of a wood subfloor and panel underlayment shall be of double layer construction. Total thickness shall be a minimum of 1". This is important, because a lot of new homes today are being built on 5/8" or 3/4" single layer subfloors, and the builder may be expecting that the resilient floor be installed right over the top. This may be appropriate for a hardwood floor, but the problem with resilient over these subfloors is that there may be a bit too much flex in the floor, which can affect the adhesive bond, cause nails to pop, and so on. The other problem is that the wood subfloor is often OSB or plywood that has knots or other imperfections that will show thorough a fully adhered floor.

One other point about wood subfloor systems is for floors that are over crawl spaces or over concrete. Make sure there is at least 18 inches of well-ventilated air space beneath all wood subfloors and crawl spaces that are insulated and protected by a vapor barrier. Do not install resilient flooring over plywood installed directly over a concrete slab or over a "sleeper" system. A sleeper system is when 2-by-3 or 2-by-4 boards are laid on a concrete slab and plywood is installed over the sleepers. Hardwood floors are often installed over sleepers or over plywood on concrete but resilient should not be installed in these cases.

The problem with these three types of subfloor systems is that if even a small amount of moisture comes up through the subfloor into the underlayment, the plywood will well, which means the joints and fasteners will show through the new floor.

Underlayment Selection

As far as what type of panel underlayment to use, there have been a variety of products available over the years. When I started in the industry in 1978, the most common was hardboard underlayment such as Masonite™ and other brands. By the early 1980s, the industry moved away from hardboard because of major problems with joint telegraphing. Luan started getting used back when lauan was of excellent quality. In the late '80s a new product arrived in the form of 1/4" Oriented Strand Board, or OSB. Some of us switched and some didn't and by the mid '90s OSB underlayment fell out of favor and some went back to the increasingly poor quality luan because it was cheap and readily available. The name luan comes from trees found in the Philippines but has become a generic term in the United States for imported tropical plywood. As the rainforests became depleted, other types of woods were used and the quality went down. Today, I am not a fan of luan at all - the thickness is often not a full 1/4" and it can have voids, thickness variations and other problems.

I did a research project for one of my clients and I was able to find over 20 references against using Luan as a flooring underlayment. For example the National Association of Home Builders said, "Typically, 1/4-inch luan plywood is used as an underlayment when vinyl is installed over wood subflooring. The problem with luan is that it is soft and susceptible to denting and crushing under concentrated loads such as furniture legs or high heels".

The Import Plywood Marketing Group, Inc website says, "Luan or Meranti was never intended to be used as an underlayment for vinyl flooring. It was originally designed as a three-ply plywood for paneling" Flooring manufactures agree, and Tarkett said, "A wide variety of species and grades of Luan plywood have been imported into the United States and sold for use as underlayment. Many of these panels have caused severe problems such as discoloration, delamination and adhesion failures." Many other resilient manufacturers have similar statements, so if you are using lauan, the word warranty may not be in the conversation.



A/C Plywood being installed over an unsuitable plywood subfloor. (Photo courtesy of Mickey Moore - FCI October 2004)



This photo shows a fastener pushing up from the underlayment. Be sure your fasteners are set flush before you install the floor. (Photo courtesy of Bill Baxley - FCI May 2005)

Other panel underlayments are available that are much higher quality than luan. I prefer "real" plywood that is comprised of layers of wood throughout, so there are no voids. My favorite is what is known as "5-ply arctic birch," also known as "Baltic or Russian birch." This is sold under a number of brand names today, such as Tecply, Halex, Capital, Accuply and other brands. There are also some other plywood panels such as the Canadian "Multiply" brand that are made from hard woods and are of excellent quality. These products perform well and have a manufacturer's warranty, which you will rarely see in luan. You can also use standard "A/C" grade plywood from the lumber yard, but chances are there is no warranty on this type of panel like there are for the other products I have mentioned.

Fiber reinforced panel underlayments such as USG "Fiberock" brand, or other types of gypsum or cement backer boards are common in the stone and ceramic industry and are starting to gain popularity for resilient flooring as well. The fiber reinforced panels are starting to gain favor for so called "green" building projects because of their recycled content. They remind one of drywall in appearance and in their "score and snap" method of cutting. I've installed these products and they are quite easy to work with. Although they seem like drywall, they are designed to be underlayments so they carry the performance characteristics and warranties for use under resilient, at least

for residential and light commercial use.

Regardless of what underlayment you use, make sure it's recommended by the flooring manufacturer for the flooring you are installing and make sure the underlayment recommends it for the end use of the finished floor. For example, if you are doing a commercial job, there may be different requirements than for a residential job. Some of the products I have mentioned cost more than cheaper underlayments like luan, but most customers will pay more for a better product with a manufacturer's warranty, so why take a chance?

Repairing Damaged or Squeaky Subfloors

Before installing underlayment, make sure the floor you are going over is structurally solid. In an older floor or one that is in bad shape, the best way to tighten up a floor and minimize squeaks is to re-nail the entire floor. Locate the floor joists, mark them on the surface and snap chalk lines to mark their location. A 2-inch or so deck nail or rosin coated nail usually does quite well because the nails are engineered to hold, as opposed to a "common" nail that may back out again in the future. Some might prefer to use screws, but there is always the risk of hitting a hard spot and having the heads break off, plus screwing rather than nailing the floor usually takes longer. Threaded or coated nails are just as effective.



Soft spots caused by damage to the subfloor such as water damage need to be removed completely. Again, find the joists and mark them. Cut only the thickness of the subfloor, down to the joist and place the cut in the center of the joist so that the existing good subfloor still has support and so the new piece you put in will also have support. Once you remove the existing subfloor, measure the thickness and replace the cut out piece with plywood of that thickness. Do not build up thinner layers of plywood such as 1/4' because they will not be as strong as a single layer. If the repair is in a heavy traffic area, use cross pieces (2-by-4 or 2-by-6) between the joists for extra support.

Fiber reinforced underlayment with cork installed over it.

Once the floor re-nailed, and/or the damaged section is replaced, check to be sure the whole floor is solid. If you only nailed the squeaky spots, those squeaks may have moved so be sure you are close to squeak

Underlayment Installation Tips



A plywood subfloor is installed directly over the floor joists and is part of the structure of the building. (Photo from www.quiltbus.com)

It's important to follow the underlayment manufacturer's recommendations for what type of fastener to use and how far apart to space them. The generally means 1/4" or thicker underlayment panels, fastened with underlayment staples or underlayment ("ring shank") nails, spaced 2-3 inches apart on the joints and 4-6 inches apart in the rest of the panel. Underlayment staples are really the best way to go - they have the best holding power and the least chance of problems.

Coated nails should not be used for underlayment because they may stain the resilient flooring. Construction adhesives can stain resilient flooring so they should also be avoided. I do not recommend screws to fasten thin panels. Drywall screws are most often used and they can rust, which will stain many floors. Other problems with screws are that they often have no thread in the top 1/4" of the screw, so it's just the head holding the panel down. Plus, it's easy when using a screw gun to drive the screws too far into the board, which has even less holding power and leaves a lot of little circles to fill.

One of the most common mistakes with fasteners (staples or nails) is using a fastener that is too long. If it comes through the subfloor, it is too long. Have you ever been in a basement and looked up to see nails coming through the subfloor? Not good! This reduces the holding power plus the fasteners can pick up moisture from the basement and rust, which may stain the finished floor. When selecting fasteners, make sure you know how thick the subfloor is that you are fastening to. If you are putting 1/4" plywood over a double layer subfloor that is 1" thick, don't use a fastener longer than 1 1/4". Finally, when installing underlayment, check the underlayment manufacturer's instructions to see if the joints of the panels need to be patched or sanded or both. It may not be necessary to patch the joints so be sure, because patching itself can sometimes telegraph through the floor. If you use a floor patch, use a good quality patch, and mix it properly. Too much water will make weaker patch and may cause the edges of the underlayment panels to swell. Allow the proper drying time before spreading your adhesive. It's also a good idea to give a light sanding after the patch dries, but don't over sand or you can create a different type of problem, as you see in the photo where there is a dip in the finished floor caused by over sanding.

Remember the 5 Ps when you install resilient flooring: Proper Preparation Prevents Poor Performance. A true professional will use a high quality underlayment and spend the time to prepare floors correctly so that the finished floor is smooth and flat and gives the customer many years of good service.