About Natural Wood Finishes

An Overview of Conventional Uses

film \ *n.* **1:** a thin covering or coating **2:** an exceedingly thin layer

penetrate \ *vb* **1.** to diffuse through or into **2. a:** to pass, extend, pierce, or diffuse into or through something

Film Forming or Penetrating Finishes

Some wood finishes find themselves in a classification called "natural wood" finishes. The finish systems that fall into this classification span a broad range of aesthetic and performance properties. Each finish system offers various advantages and disadvantages. These finishes can be separated into two major categories—

Film Forming *0r* **Penetrating**

Sub-categories to these include:

Drying *0r* **Semi-drying** *and*

Color Gradients *from* Clear to Opaque

A finish may possess any given combination qualities that may give it suitability in warding off degradation from weathering and/or lend to a certain aesthetic.
The penetrating finishes can be further subdivided into clear, transparent, semi-transparent, solid (opaque) and waterborne salts.

Film Forming Finishes

Varnishes are the primary transparent film forming materials used for natural wood finishes outdoors, and their use greatly enhances the natural beauty of wood. Varnishes lack exterior permanence unless protected from direct exposure to sunlight, and varnish finishes on wood exposed outdoors without protection will generally require refinishing every 1 to 2 years. Drying oils (linseed, tung, etc.) are sometimes used themselves as natural finishes. Film-forming finishes create a difficult problem upon subsequent applications if the original or previous application is not completely eroded or removed. What tends to happen is subsequent layers tend to ruin the once attractive enhancement of the wood appearance by accentuating uneven wear and uneven build up of the film. These films are also very susceptible to lifting and peeling from the wood surface especially on surfaces exposed to water. Permeation of the film layer by water allows water to swell the wood underneath the surface thereby breaking the adhesion of the film to the wood and consequently causing the film layer to lift and/or peel. Permeation of the film layer can also allow vapor pressure to break the adhesion of the film-layer to the wood surface.

Latex paints are the broadest category of film forming materials used on wood as a whole. For the purposes of this discussion we will limit this category as it pertains to a natural wood appearance type finish because most paints entirely cover the appearance of grain on natural wood. There are, however, some hybrid latex stains that achieve a more transparent aesthetic than a pure solid color latex paint that do fall under the category of a film forming finish.

Penetrating

The penetrating finishes are the second broad classification of natural wood finishes. These finishes do not form a film on the wood surface and are further divided into (1) clear systems (2) transparent systems (3) semi-transparent systems (4) opaque (solid color) systems and (5) water borne salts.

Clear Systems

Clear systems are most often water-repellent preservatives. They tend to be the most important category of protection for wood because water is the #1 biggest threat to the preservation of wood. Also, exposure to water is what causes oxidation of the surface, thus turning it gray in appearance. Also, the conjunction of water and air and lack of sunlight is the impetus for the growth of mold and mildew. Water-repellants can significantly resist these occurrences. Treatment of wood reduces warping and cracking, prevents water staining at edges and ends of wood siding, and helps control mildew growth. The first application of a water-repellent preservative may protect exposed wood surfaces for only 1 or 2 years, but subsequent reapplications may last 2 to 4 years because the weathered boards absorb more of the finish.

Transparent Systems

Transparent stains are the second group of penetrating finishes. They are systems that often incorporate elements of the water-repellency and mildew resistance with the addition of a ultra-violet inhibitor or pigment to assist in negating the affects of sun exposure. Many of these systems incorporate the use of various drying oils (linseed, tung, etc.) and transoxide or iron oxide pigments, which are said to have ultra-violet blocking or reflective capabilities. Many of these systems are hovering in a state somewhere between being a film forming and a penetrating type of finish.

Semi-transparent Systems

Semi-transparent stains are the third group of the natural wood finishes. These finishes provide a less natural appearance because they contain a pigment that partially hides the original grain and color of the wood. They are generally much more durable than varnishes or water-repellent preservatives and provide more protection against weathering. With these systems weathering is slowed by retarding the alternate wetting and drying of the wood surface. The presence of pigment particles on the wood surface minimizes the degrading effects of sunlight. The amount of pigment in the stain can vary considerably, thus providing different degrees of protection against ultraviolet degradation and masking of the appearance of the original wood surface. Higher pigment loading yields greater protection against weathering. Semi-transparent stains are commonly used on exterior natural wood in an attempt to more adequately protect and waterproof a wood surface while still allowing the beautiful grain and textures of wood to show through the stain.

Opaque Systems (Solid Color)

This category inherently excludes itself from the realm of natural wood finishes but I feel that it is important to understand the progression of relative hide characteristics that are present in the market place. It is within this category that confusion to the layperson abounds. Primarily it is the question of: What is the difference between a stain and a paint? I will attempt to lend some clarity to this subject.

The simple answer of the past has been that a stain is oil-based and penetrating and paint is water-based and film forming. And… paint completely covers the grain of the wood and a stain allows the grain to show. This is true and fine and dandy to the point that what is really meant is that paint covers the grain and also hides the texture or relief of the grain and stains hide the appearance of the grain but do not hide the texture or relief of the grain.

Hybrids

Modern technology has given birth to new products that possess the properties of both a film forming product and a penetrating product. It is often very difficult to discern the difference between the two and it is my opinion that most of the products on the market that proclaim to be penetrants are simply a well-adhered surface film. Proof of this claim lies in the fact that many of these products can readily be stripped through the process of pressure washing or a combination of chemical stripping and pressure washing and it is very easy to scratch deep enough into these finishes to get to the raw wood underneath.

Concerning oil-based products- in the past, most oil based products that were considered penetrants and achieved this by dilution with an oil-based carrier known as a solvent. Solvents were mixed with oils such as tung oil and linseed oil because these oil by themselves would form too heavy a layer on the surface they were applied and they had a propensity to be slow drying as well as semi-drying (tacky) in this state. Linseed oil has been around for decades and

has long been known to enhance spread ability of paints by increasing viscosity (thickness) and providing lubricity. Ironically, this is the opposite characteristic desirable in a true penetrating product.

With the implementation of new environmental laws concerning paint products many of the oil based products are now thicker and therefore much more a film forming product than their predecessors.

In the arena of water-based products- modern chemical technology has enabled the development of products known as emulsions. An emulsion suspends oils in water. This allows such oils as linseed oil to be suspended in water-based products and many latex paints to have the water proofing benefits of oils. Also, these emulsions enable the dilution of a latex paint in a base that will produce transparent types of appearances on a wood surface while still maintaining a performance level that is not significantly compromised.

Traditionally, a latex paint needed to maintain a certain level of thickness in order that it maintain sufficient hide characteristics. In laymen's terms this means the ability to cover.
However, if the goal is to produce a paint that is transparent or semi-transparent then the hide characteristics do not matter. It then becomes an issue of performance. Performance involves issues such as fading, longevity, waterproofing, mildew resistance, etc.
When the desired effect is to produce a transparent or semi-transparent stain, then the issue of thickness is no longer as relevant. This allows these types of products to be thinner and thus penetrate and/or adhere better to the wood surface and especially where there is a rough surface.

Linseed Oil Products As A Class

linseed oil \ ***n.*** **1.** a yellowish drying oil obtained from flaxseed and used especially in paint, varnish, printing ink, and linoleum.

Because the use of linseed oil is so prolific, I think it deserves its own class for the purposes of discussion regarding wood finishes and specifically regarding natural wood finishes.

By far the majority of natural wood products being manufactured in North America, at the present time, are a linseed derivative or contain linseed in some way. Conventional wisdom says that any product that contains linseed is a quality product to the point that it is the most recommended for deck surfaces, which arguably are the most difficult wood surfaces to protect. There are several reasons for this:

- Linseed is tough and durable and actually contributes to a harder surface than if it were not present.
- Linseed is supposed to be a good waterproofer.
- Linseed helps the spread ability of products.
- Linseed causes wood to look almost wet when it is first applied and thus high lighting and accentuating the colors and grain variations in wood at its optimal level.

THE LINSEED PERCEPTION	THE LINSEED FACT
Linseed oil is a good water proofer	Linseed is usually 100% water vapor permeable within 3 weeks of an application. *
Linseed looks great and highlights the "natural" beauty in wood	Linseed looks good only for a very short period after application then heads in a rapid and serious decline thereafter
Linseed will keep wood looking new because it is clear and will keep it that way if it is re-applied often	Linseed only retains a good appearance if it is extremely protected from the forces of nature Linseed is the road to "No Return" Linseed starts to get ugly and splotchy almost immediately.
Linseed can be prevented from causing blackening of the wood from mildew growth if there is a fungicide in it.	Linseed is the "host" for mold and mildew growth. It is the food source for mold and mildew. Fungicides can only temporarily block

	the growth of mildew because they (the fungicides), too, fall pray to the forces of nature and degradate over time.
Linseed oil penetrates deep into the wood because it is an oil.	Linseed oil is just another film forming layer that adheres well to the surface cells
Linseed oil will keep my wood from drying out.	Linseed does virtually nothing to keep wood from drying out. It is both water and vapor permeable within days of initial application.*

* According to laboratory tests conducted by the Forest Products Laboratory- Moisture-excluding effectiveness of various finishes. List of publications on wood finishes. 81-024. Madison, WI: US department of Agriculture, Forest Service, Forest Products Laboratory; 1981

Linseed is capable of providing a reasonable degree of protection for wood where water exposure is limited and when subsequent applications provide a layering effect on the surface. It does seem to keep sun degradation to a minimum when reasonable application cycles have been maintained. This is, however, not without dire consequences in other regards***. Ironically, a well-maintained linseed treated surface is almost impossible to restore to a like-new natural wood appearance where as a neglected and abused linseed treated surface is fairly easy to restore to a like-new natural wood appearance.*** Also, where there is both a lot of moisture and a lot of linseed present, the occurrence of blackening is imminent. This will cause considerable decay to occur and has a tendency to blacken the wood so deeply as to render it impossible to extract or strip the blackening from the wood. This makes for a situation that causes irreversible destruction of an attractive natural wood appearance.

There are other concerns to address in regard to linseed.

1. Linseed oil in its raw form is a thick, gooey substance that is difficult to work with by conventional paint application standards. Because of this characteristic, it is typically reduced or diluted by the addition of a thinning agent or the linseed oil itself is added to something that is a lesser viscosity or contains a thinning agent. In terms of oil-based products specifically, a thinning agent is called a solvent. Chemical solvents are used to reduce substances in order to render the product more manageable for the purposes of application or aid in the drying process or both.
2. The environmental consequences of heavily solvent diluted products are increasingly garnering the attention of the E.P.A. and other regulating bodies of the government. Specifically, where solvents are concerned it is the air borne particulates that are of most concern. Solvents evaporate into the air once they are applied to a wood surface. Many manufacturers have been forced to re-formulate their linseed/oil-based products, thereby, causing the end product to be a thicker, less-manageable, more surface building product. This further exacerbates the many undesirable characteristics of film-forming types of products. The last comment is that the only reason the manufacturers were even able to claim that they had a penetrating product is that they diluted it so much with solvent that it would penetrate deeper than the thicker, less diluted formulas.
3. Be advised of, Joe, the painter next door and his magic formula of Linseed, T's Water Seal, and Olympus Maximus Stain. There are many home-based formulas for treating wood that have been born of the hands on experience of a painting contractor. I would like to highlight the thought process or rational behind this to illustrate the conventional perceptions of what logic would dictate should be an affective solution to the treatment of exterior wood and how these rationales, although well intended, fall short on the performance side of the equation.

    - Joe buys raw linseed oil and on the can it says to reduce it with mineral spirits (a solvent) buy at least 50%. His experience has told him that he likes to reduce by 25% or a ratio of 1 to 3 because it is easier to spray through his airless sprayer and he can put two thin coats on instead of one thick coat. Joe likes the way his jobs look initially when he uses just linseed on new wood and he knows that it ends up drying fairly hard on the surface. In his mind he believes this must indicate that the product is protecting the wood adequately.
    - Joe doesn't know how to restore a natural wood surface to a like-new appearance. So, Joe tells his customer, who has a house that has been treated once with a clear product but it is starting to look like

it needs something on it, that the best thing to do is put a product on the house that has a little color in it in order to hide some of the unevenness and discoloration that is evident. The homeowner tells him that this sounds good as long as it doesn't hide too much of the grain in the wood.

- Joe has seen how well T's Water Seal works on a deck floor in terms of its ability to cause water to bead on the surface. The disappointing fact is that it starts to let the wood turn gray and the natural wood tones to fade very soon after an application. After several months it appears that it isn't doing much of anything.

Next, Joe starts to think why not combine a little of each of these products making them an all-in-one sort of product and thus reaping the benefits of each product as well as nullifying some of the negatives associated as well. Example, the stain keeps color in the wood where T's Water Seal would have faded sooner. The stain evens out the unevenness of the linseed. The linseed gives the stain more substance and gives the appearance a richer, shinier, look. The linseed makes the stain and the water seal easier to apply because it isn't as runny and the stain and water seal help thin the linseed to a desirable consistency.
Wow! This sounds like a win/win solution.
The problem is that in reality this only marginally increases the performance of any one of these stand-alone products. And, as is the case with repeated "linseed only" applications, it just makes the redo that much more difficult.

Solvent \ *n.* **1:** a usually liquid substance capable of dissolving or dispersing one or more other substances.

IMPORTANT NOTE: All this having been said, it has been my experience and observation that all properties that apply to linseed oil also apply to any plant oil derivative such as tung oil or Brazilian rosewood oil.

Chart of moisture-excluding effectiveness of various finishes.

Ponderosa pine sapwood was initially finished and conditioned to 80°F and 30 percent relative humidity and then exposed to 80°F and 90 percent relative humidity.

Finish Type	No. of coats	1 day (%)	7 days (%)	14 days (%)
Linseed oil sealer (50%)	1	7	0	0
	2	15	1	0
	3	18	2	0
Linseed oil	1	12	0	0
	2	22	0	0
	3	33	2	0
Tung oil	1	34	0	0
	2	46	2	0
	3	52	6	2
Acrylic latex flat house paint	1	43	6	1
	2	66	14	2
	3	72	20	4
Solid color latex stain (Acrylic resin)	1	5	0	0
	2	38	4	0
	3	50	6	0
Solid color oil-based stain (Linseed oil)	1	45	7	1
	2	84	48	26
	3	90	64	42
Semi-transparent oil-based stain (Commercial)	1	7	0	0
	2	13	0	0
	3	21	1	0
Urethane varnish (Oil-modified)	1	55	10	2
	2	83	43	23
	3	90	64	44
Paraffin Wax- brushed	1	97	82	69
Paraffin wax- dipped	1	100	97	95
Floor and deck enamel (Phenolic alkyd)	1	80	31	18
	2	89	53	35
	3	92	63	46
Floor seal (Phenolic resin/tung oil)	1	31	1	0
	2	80	37	18
	3	88	56	35
Gym seal (Linseed oil/phenolic resin/tung oil	1	53	9	1
	2	87	53	28
	3	91	66	44
Spar varnish (Soya alkyd)	1	48	6	0
	2	80	36	15
	3	87	53	30
FPL natural finish (Forest Service Oil) (Linseed oil-based, semi-transparent stain)	1	62	14	1
	2	70	48	26
	3	76	64	42

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