Finishes Checklist

A Guide to Achieving Optimum Coating Performance on Exterior Wood Sufaces

The Joint Coatings & Forest Products Committee

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When the time comes for a consumer to select the wood and finish types for a given outdoor project, there is a wide variety of sources of information, articles, and opinions available. Occasionally, these sources will conflict, mostly due to the data available at the time of publication, or practical experience based on a snapshot of conditions at a given time period. It is our hope to make this article available as a tool for the consumer to weed through the confusion, obtain the best system for the particular application, and understand the compromises that can result from other choices. A bibliography is included for more in-depth research.

STARTING BASICS

To avoid any problems, the best place to start a project is when the structure/home is originally planned. In this way, one can be assured of correct construction practices, that desired types and grades of wood products and proper selection of treatments and finishes are used, and that they are all properly applied.

In the real world, we are typically not that fortunate. A review of the basics, however, may help identify potential problems and avoid or correct their causes before major corrections or damage may occur.

BUILDING DESIGN BASICS

For best performance of a siding finish, certain design choices should be made. These choices can help prevent moisture accumulation or excessive moisture fluctuation within the building components. They include, but are not limited to:

- Use of dry materials during construction
- Provide adequate clearance to grade and drainage at grade
- Design with adequate roof overhang to protect the siding from weathering.

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- Install an interior air barrier and vapor retarder in cold climates
- Install vertical furring strips between sheathing and horizontal lap siding to help with moisture removal
- Install gutter guards to prevent ice dams from occurring during winter months.
- Due to wicking that can occur on the edges of wood siding, it is highly recommended that the contractor seal the ends to help keep moisture from wicking into the wood and causing early coating failure near the end of the board.
- Where possible, the practice of back-priming or sealing all sides of the wood siding can extend the lifetime of the finish substantially.
- Use of an exposed strip of either galvanized or copper flashing at the top of the roof can help prevent mildew growth on shingles in the path of the rain water washdown.

For more on this subject, refer to the *Moisture Control* Handbook, published by the Oak Ridge National Laboratory, or Finishes for Exterior Woods, by R. Sam Williams, Mark T. Knaebe, and William C. Feist, available from the Forest Products Society.

CHART BASICS

The *Surface/Coatings* Checklist is divided into several sections, each containing information regarding durability and general recommendations for improving the life expectancy of the coating system over given exterior wood products.

The following text discusses the key features of the checklist and provides some examples.

Wood Type Section

In this section, different type of wood products are listed. There is also a column for footnotes, giving information on how to get the best coating performance.

FPL Info Section

Referencing the *Surface/Coatings Checklist* the different wood species have been ranked by the Forest Products Laboratory for their characteristics of painting and finishing. For paint holding characteristics, the species are rated from best [I] to worst [V], where hardwoods with large pores are ranked [V]. These species, when filled properly with wood filler can hold paint and qualify as grade [II]. Other species not listed in this chart indude Douglas Fir [IV], Spruce [III], Yellow-poplar [III], and Oak [V or IV].

They are also rated by resistance to cupping [scale of 1-4, with 1 being best] and by conspicuousness to checking [1 or 2, 1 being best].

In this section, composite woods have not currently been rated, as these are being evaluated.

Coatings

This section consists of six groupings, corresponding to the generic coating types available on the market today from water-repellant preservative to top line latex house paint.

Each grouping consists of four columns. The first two columns—water repellant use and primer use—show how much additional durability can be expected by using either or both options. The effect is additive. For example, if use of a paintable water repellant gave an additional year of durability to the coating system, and use of a primer gave an additional two years, using both should give an additional three years.

The second two columns–one coat and two coats—each show the general expected average durability of that coating system with the respective amount of applications. For example, one coat of solid color latex stain might give four years´ durability but two coats might give seven. Assuming the previous example for water repellants or primers were used, up to an additional three years could be added to that coating system's life expectancy—givinga maximum of 10 years durability.

Previously Coated Wood

The condition of a painted substrate is a major factor in the performance of the next coating application. Also, proper preparation of the substrate is critical for obtaining optimum performance of the coating system. This section shows what systems can be applied over existing coating systems, as well as some key surface preparation requirements.

EXAMPLE: You are building a storage shed for the back yard, and have already purchased some T111 plywood siding for the structure, It is rough textured. On the chart, you go down the

wood type section to Plywood and find the grade of rough plywood being used. From the FPL Info section, you see that this type of wood product is best for holding paint, and may develop some cupping or checking upon exposure. From the Coatings section, you can see that water repellant preservatives are not intended for use with plywood, and may not give sufficient protection to the wood. Semi-transparent stains can give a good 3-4 years durability, but that depends on the quality of the plywood. Solid color stains can give 4-6 years durability, but the latex stains will be more stable You can also get an extra year by using a primer. A solventborne house paint system is not recommended (in this case, because of the checking mentioned earlier. Latex paint systems will offer more flexibility over time to reduce the checking.) Latex paint can provide 6-9 years´ durability, with an additional year for paintable waterproofer use and priming is required per the siding manufacturer's association.

Based on your preference of the above coating system choices, budget, time constraints, and the performance of the coating system desired, you can make your choice of what system to use.

WOOD BASICS

Wood differs from other common building materials because it is derived from a natural biological source. Due to the variety of species of trees, as well as growing conditions, not only are there variations between species, but also from tree to tree of the same species, as well as board to board differences within the same tree. These are some of the factors described below which can affect finishing characteristics.

Natural Characteristics [Basics]

Differences from species to species are wood density, grain characteristics, texture, sapwood content, and presence of extractives, resins, and oils.

Density

Density of the wood species is important, in that the denser woods tend to shrink and swell more than the less dense woods, making them harder to keep a finish as the wood expands and contracts due to fluctuations in moisture. Reducing the amount of wide moisture fluctuations over short periods of time can lead to a longer life of the finish, and longer protection of the wood. Density also plays a major factor in the warping and checking (cracking of the wood) characteristics of lumber. High density woods such as Southern pine, Douglas fir, or oak tend to warp and check more than lower density woods such as redwood or cedar.

Grain Characteristics [Earlywood/Latewood]

As each year goes by, most tree species growing in a temperate climate add a growth ring to their diameter. This ring consists of two distinct parts: the springwood [or earlywood] and the summerwood [latewood]. The latewood portion is denser, darker, smoother, and harder. Typically, wide latewood bands are the least likely to hold paint, particularly when the latewood bands are wide and the wood has been smooth-planed prior to coating.

Heartwood/Sapwood

As trees mature, most species develop a darker central column of wood called heartwood. Surrounding the heartwood is a lighter colored section of wood called sapwood. The sapwood consists of live cells that serve to transport water and nutrients throughout the tree, and serve as a structural support. The heartwood cells are no longer living, serving only as structural support. However, the heartwood of some species becomes embedded with oils, extractives, and pitch as the tree grows older, serving as a form of resistance to insects and decay.

Extractives

Extractives and oils vary between species. Some extractives are water soluble and abundant in woods that are used for exterior applications, such as redwood, western red cedar, and cypress, and to a lesser extent in Douglas fir and pine These extractives can lead to discoloration of the finish, as water and high relative humidity can transport the extractives to the paint surface.

Pitch [or resin] can be found in most softwoods, such as pine, spruce, or fir. Pitch is a mixture of rosin and turpentine, and can migrate through the wood. Typically, kiln drying of the wood helps drive off the turpentine, making the rosin less mobile.

Manufacturing Characteristics [Basics]

Manufacturing processes that take the wood from log to finished wood product can affect the coating performance. These characteristics include the cut of the wood, surface texture, knots and other irregularities, and moisture content.

Cut [Ring Orientation and Effect]

The place from which a board was cut relative to the log it came from determines the orientation of the ring on the piece of wood, and thus the paintablility of the piece For softwood, this can range through extremes of edge grained (vertical sawn) and flat grained. For hard-

wood, the terms are, respectively, quartersawn and plainsawn. Grain orientation can range between these two extremes. Flat grained lumber, although aesthetically pleasing to the eye, shrinks and swells to a greater extent than the edge-grained boards when exposed to the same variations in moisture content, making edge-grain boards much more likely to hold paint better than flat-grain boards.

Surface Texture

Aside from the "natural' texture of the wood, manufacturing processes can give the surface of the wood some texture. These processes indude sawing and planing. Natural finishes, such as clears or semi-transparent penetrating stains, work well on roughsawn (or saw-textured) and flat grain lumber On plywood, paint will last longer over rough textured surfaces because the paint film adheres better to the surface. Planed wood can be painted in cases where a glossy finish is desired, but may lead to adhesion problems if it is too smooth, particularly for dense species.

Knotty Siding

Knots and Other Irregularities

Presence of knots or other irregularities (bark, pitch pockets, insect damage, etc.) determines the lumber grade and affects the paintability of the lumber. Knots generally absorb the finish differently than the surrounding wood and can affect the appearance of the finish. In some species, such as pine, knots often have high content of resin, which can cause paint over the knot to discolor and adhere poorly. Also, hots are susceptible to checking, splitting, or cracking. Higher grades of lumber haw fewer knots and are preferable for painting.

Moisture Content

A piece of wood can have a wide range of moisture content. This depends on its exposure to water and the relative humidity of the surrounding environment. Finishing of wood has been shown to reduce the wide fluctuations of moisture content in the board due to rain or rapid shifts in relative humidity, leading to lower expansion and contraction, and better performance of the coating. However, as relative humidity varies from season to season, the wood tends to equilibrate to that moisture content. Problems associated with moisture content of wood can be reduced by assuring that the wood has a moisture content between 9 and 14%. Most kiln dried lumber is dried to below 20% moisture content

If the wood has a too high moisture content when coated, this can lead to peeling, blistering and discoloration of the paint film, as well as warping and cracking of the lumber. Therefore, assuring the wood is dry will lead to better performance of the coating and wood.

Wood Selection and Preparation

Decking exposes wood and the finishes on the wood to the most severe exposure of all building components. Decks are often located on the sunny side of structures and receive reflected sunlight from the structure in addition to direct sunlight. People walk on them, spill food and drinks on them, and place furniture, barbeque grills, etc., on them. For many families, the deck is the focal point for outdoor living. Yet with all the use a deck receives, maintenance and finishing seldom get a very high priority. This section briefly covers the selection of lumber, finishes, and cleaners for decks and methods for finishing and maintaining decks. This information is covered in more detail in "Wood Decks: Materials, Construction, and Finishing" by McDonald, et al.

lumber and Wood/Plastic Composites

Decking. the material used for the deck surface, is available in various types and grades of lumber and wood/plastic composites. At present, lumber accounts for about 90% and wood/plastic composites about 10% of the decking sold, however wood/plastic composites are gaining more market share each year.

Decay-resistant wood species, such as redwood and western redcedar, are available in several grades from clear vertical-grain to knotty flat-grain. The higher the grade, the higher the cost. The vertical-grain lumber will be less prone to split, develop raised grain, or cup. However all decking boards will tend to cup over time because of the daily and seasonal changes in moisture content. In selecting a grade for decking, be sure to specify all heartwood and, if a knotty grade is desired, specify "tight knot." Loose knots will eventually fall out

leaving a hole in the deck. While the heartwood of redwood and western redcedar is decay-resistant, the sapwood is not.

Preservative treated wood is also available for decking. This wood has been pressure treated with chemicals to upgrade it and give it resistance to insect[a] and decay fungi attack Southern pine, ponderosa pine, and red pine are the most commonly treated species and are usually available in #1 and #2 grades. The #1 grade may have a few small knots; the #2 grade will have many knots. The #1 grade will often have a factory-applied water repellent in addition to the preservative. Both grades will be a mix of vertical and flat grain lumber. Preservative treatment of lumber is usually done according to standards published by the American Wood Preserver's Association. In order for the treated lumber to be stamped with a "quality mark" it must undergo inspection by a third party inspection agency. This quality mark is an ink stamp and it is placed on all pieces of lumber that meet the standard. The stamp gives the type of preservative, the amount, and the treating plant. Treated lumber that has only a tag stapled to the end may not meet AWPA standards. This tag is the manufacturers tag and does not indicate inspection by an independent inspection agency.

As of January 1, 2004, the providers of pressure treated lumber have agreed with the EPA to discontinue using CCA [copper, chromium, arsenic] as the chemicals for treating the lumber. As of this writing, two chemistries are currently being used that replace CCA: Alkaline Copper Quaternary (ACQ) and Copper Azole. How well these newer, more expensive finishes perform to protect and beautify the pressure treated lumber is not as well-known as CCA, but evaluations are under way.

Concerns have been raised as to the safety of the existing CCA-treated decks. Studies made by the Forest Products Laboratory, and referenced by the EPA, have shown that applying and maintaining a good deck finish will help substantially reduce leaching of CCA, as well as prevent the wearing away of UV-damaged CCA impregnated wood fiber. This is an area of interest by the EPA, with several studies under way to make sure consumer safety is maintained. Updates are available on the EPA and the Forest Products Laboratory websites.

In dry areas of the country, particularly in the southwest and the intermountain region, untreated Douglas fir is sometimes used for decking.

(a) The most imfamous of insects for damage to decks, or exterior wood in general is the Formosan Subterranean Termite, known to join forces with other colonies of the same species. Nests of these termites have been known to get as large as 350 feet from end to end, consist of over two million members, and are able to completely destroy an unprotected home in two years or less. Estimates are that the state of Hawaii spends over $50 million to stop or control attacks by these termites. For more information, go to www.aces.edu/department/ipm/formoterm.htm or www.ars.usda.gov/is/AR/archive/oct00/termite1000.htm

Wood/plastic composites are a mixture of a thermal plastic such as polypropylene and wood chips or wood flour. They are available in a number of different styles and have different amounts of wood in them. Regardless of the type of composite they require periodic maintenance, just as with a wood deck Because they contain wood fiber as a reinforcing fiber, care must be taken to protect the wood from degradation by UV light. Typically these composites will need a pigmented finish of some sort to protea the fiber from degradation and fungal attack.

Substrate Preparation

For new construction, there is usually no need for any surface preparation. Wood species having no preservative treatment should be finished as soon as possible after construction. Decking having a factory applied preservative may still be wet from the treatment after the deck is complete The wood should be dry enough to finish after a week or two of warm weather. It should be furnished as soon a possible after this. Some wood/plastic decking cannot be finished until it weathers. If the decking has a large amount of wood fiber and the surface has been roughened during the manufacturing process, it can be finished just after construction. As with wood decks, the surface of the wood/plastic deck will weather and become more rough as it ages.

As decking (whether wood or wood/plastic composites) weathers, mildew, algae, and other microorganisms may grow on the surface. These should be removed prior to finishing. They can be removed using a commercial cleaner or a mixture of household bleach, detergent, and water (see next don). Sanding. power washing and other abrasive methods are usually not necessary and should not be used.

Deck Cleaners

A wide variety of deck cleaners are available. Some are extremely strong chemicals and actually degrade the wood surface. Sodium hydroxide and potassium hydroxide are not very effective against mildew and they pulp the wood surface. Oxalic acid will remove iron

stains. Products that contain sodium percarbonate or sodium/calcium hypochlorite are effective against mildew and algae. Sodium/calcium hypochlorite are the active ingredients in household bleach. For commercial products, follow the manufacture directions. If using household bleach, add one gallon of bleach to two gallons or water and some powdered detergent. Do not use liquid detergent with strong bleach solutions as they may react to form toxic gases.

It is best to dean the deck on a cool cloudy day in order to minimize drying of the cleaning solution. Apply the solution to the deck using a mop. Keep the deck wet with the solution for about 15 minutes. Aggressive scrubbing with a brush or power washing should not be necessary. If the mildew is under or incorporated into the residual finish still remaining on the deck, then more aggressive scrubbing or even power washing may be necessary. It is best to start as gently as possible. Power washing should be used only as a last resort. Power washing and aggressive scrubbing remove the wood surface, are the new finish does not absorb very well. Allow the deck to dry for 3-7 days before refinishing.

Finish Selection

Any type of penetrating finish (dear unpigmented finishes, tinted finishes and oil-based semitransparent stains) can be used on decking. Clear film-forming finishes, waterborne semitransparent stains, and solid color stains (both oil-based and latex-based) do not perform very well on decks. Clear finishes last about 1-2 years but are extremely easy to apply. Tinted finishes last 2-3 years and are a little more difficult to apply. If the old finish shows wear patterns or has weathered unevenly, it is sometimes difficult to blend the new finish into the areas still having finish. Semitransparent stains last 3-5 years, but are also more difficult to apply. Care must be used to avoid lap marks and during refinishing; the new finish must be blended into the areas still having finish to avoid a blotchy appearance.

Choice of Substrate

As is apparent by now, the choice of wood substrate is directly related to the quality and durability of the finished product. Furthermore, one must consider the maintenance requirements for the substrate and coating choices.

On the substrate side choice of regular lap cedar siding, or hardboard, or T 1-11 siding, has implications on what kind of finish is available, as well as how often the homeowner will have to maintain the finish. For example, frequent inspection of hardboard siding is required, with attention to the nail holes and edges of the board to prevent moisture wicking in through the edges. Failure to upkeep the finish and prevent that moisture buildup can lead to major damage to the siding.

Proper construction practices must also be observed. Keeping the siding at least 18 inches off the ground to prevent splashing and moisture buildup should be observed, as well as making sure that if tongue and groove siding is made that the tongues are not installed in a downward fashion, and that lap siding is not double nailed (that the nails for the lap siding only go through one board, not two). Failure to follow these proper common sense construction practices can lead to substantial early failures of the siding and its finish.

COATING BASICS

Finishes used on wood-based sidings exposed outdoors can be classified into several categories, each with positive and negative features. They are: clear (nonpigmented) formulations, semitransparent stains, solid-color stains, and house paints.

Clear Finishes

Clear finishes do not protect wood from ultraviolet light unless W light stabilizers or pigmentation axe added. Uneven weathering of the wood surface can result from exposure to varying amounts of UV light and moisture. The southern and western sides of a structure are generally exposed to more sunlight and consequently weather more rapidly than the northern and eastern sides or protected areas under eaves or behind shrubs. Damage resulting from UV can lead to erosion of the wood surface and poor finish performance if coated later.

Water repellents help reduce the ingress of liquid moisture into wood but are not effective against water vapor. Water-repellent preservatives are similar to water repellents but incorporate a preservative or mildewcide. Although either type of product can help reduce decay in wood exposed above ground in low decay-hazard applications, water repellent preservatives are generally more effective. Pressure-preservative treated wood should be used in high-decay hazard applications such as ground contact ox water immersion. Water-repellent

Surface/Coatings Checklist

Wood	Siding	Type		Footnotes	FPL Info			Water Repellant Preservative				Top Line Semi-Transparent Stains				Top Line Solid Color solvent-borne Stain				Top Line Solid Color Latex Stain			
					Original FPL Paint Holding Rating	Cupping Resistance (1=Best)	Conspicuous Checking (1=Least)	Paintable Water Repellent (add'l)	Primer (additional durability)	One coat	Two coats *(Wet on wet)	Paintable Water Repellent (add'l)	Primer (additional durability)	One coat	Two coats *(Wet on wet)	Paintable Water Repellent (add'l)	Primer (additional durability)	One coat	Two coats	Paintable Water Repellent (add'l)	Primer (additional durability)	One coat	Two coats
BARE WOOD - Initial Exterior Coating																							
Cedar (Eastern White & Western Red)					1	1	1																
	Smooth	Clear	Edge Grained	F,N	I	1	1	-	-	2	3	-	-	3	6	+1	+1	3	6	+1	+1	4	7
	Smooth	Clear	Flat Grained	F,N	-	-	-	-	-	1	2	-	-	2	4	+2	+1	U3	U6	+1	+1	U4	U7
	Smooth	Knotty	Edge Grained	F,N,Q	-	-	-	-	-	1	2	-	-	2	3	+2	+1	U3	U5	+1	+1	U3	U6
	Smooth	Knotty	Flat Grained	F,N,Q	-	-	-	-	-	1	1	-	-	1	2			NR*				NR*	
	Rough	Clear	Edge Grained	F,N	I	1	1	-	-	3	3	-	-	3	6	+1	+1	3	7	+1	+1	4	8
	Rough	Clear	Flat Grained	F,N	-	-	-	-	-	2	3	-	-	2	5	+2	+1	U4	U7	+1	+1	U5	U7
	Rough	Knotty	Edge Grained	F,N,Q	-	-	-	-	-	2	2	-	-	2	3	+2	+1	U3	U6	+1	+1	U4	U6
	Rough	Knotty	Flat Grained	F,N,Q	-	-	-	-	-	1	1	-	-	1	2	+2	+1	U3	U5	+1	+1	U3	U5
Redwood				Lumber	I	1	1																
	Smooth	Clear	Edge Grained	F,N	I	1	1	-	-	2	3	-	-	3	6	+1	+1	3	6	+1	+1	4	7
	Smooth	Clear	Flat Grained	F,N	-	-	-	-	-	1	2	-	-	2	4	+2	+1	U3	U6	+1	+1	U4	U7
	Smooth	Knotty	Edge Grained	F,N,Q	-	-	-	-	-	1	2	-	-	2	3	+2	+1	U3	U5	+1	+1	U3	U6
	Smooth	Knotty	Flat Grained	F,N,Q	-	-	-	-	-	1	1	-	-	1	2			NR*				NR*	
	Rough	Clear	Edge Grained	F,N	I	1	1	-	-	3	3	-	-	3	6	+1	+1	3	7	+1	+1	4	8
	Rough	Clear	Flat Grained	F,N	-	-	-	-	-	2	3	-	-	2	5	+2	+1	U4	U7	+1	+1	U5	U7
	Rough	Knotty	Edge Grained	F,N,Q	-	-	-	-	-	2	2	-	-	2	3	+2	+1	U3	U6	+1	+1	U4	U6
	Rough	Knotty	Flat Grained	F,N,Q	-	-	-	-	-	1	1	-	-	1	2	+2	+1	U3	U5	+1	+1	U3	U5
Pine (White or Sugar), Fir, Spruce, etc.				Lumber	II-III	2	2																
	Smooth	Clear	Flat Grained	N	II-III	2	2	-	-	2	3	-	-	2	3	+2	+1	U3	U6	+1	+1	4	7
	Rough	Clear	Flat Grained	N	II-III	2	2	-	-	3	3	-	-	2	3	+2	+1	U3	U6	+1	+1	U4	U7
	Smooth	Knotty	Flat Grained	N	-	-	-	-	-	1	2	-	-	1	2	+2	+1	U3	U5	+1	+1	U4	U7
Pine (Southern Yellow or Norway Red)				Lumber	IV	2	2																
	Smooth	Clear	Flat Grained	N	IV	2	2	-	-	2	4	-	-	2	4	+2	+1	U3	U6	+1	+1	4	7
	Smooth	Knotty	Flat Grained	N	-	-	-	-	-	1	3	-	-	1	3	+2	+1	U3	U5	+2	+1	U4	U6
	Treated	Clear	Flat Grained	N	IV	2	2	-	-	3	3	-	-	3	5	-	+1	U4	U7	-	+1	U5	U7
	Treated	Knotty	Flat Grained	N	-	-	-	-	-	2	4	-	-	2	4	-	+1	U3	U6	-	+1	U4	U7
Douglas Fir				Lumber	IV	2	2																
		Clear	Flat Grained	N	IV	2	2			NRA				NRA		+2	+1	U4	U6	+1	+1	U4	U7
Hardboard					-	-	-																
	Hardboard		Unprimed	N,P,H	-	-	-			NRA				NRA				NRA				NRA	
	Hardboard		Pre-Primed	N,P,H	-	-	-			NRA				NRA				NRA				NRA	
Oriented Strand Board					-	-	-																
	OSB		Unprimed	P	-	-	-			NRA				NRA				NRA				NRA	
	OSB		Pre-Primed	P	-	-	-			NRA				NRA				NRA				NRA	
Plywood																							
	Sanded		Smooth	Soffits only	IV	2	2			NRA				NRA				NR				NR	
	Overlaid	APA 303	Smooth (0L)		I	-	1			NRA				NRA				NRA		-	+1	6	8
	Textured	APA 303	Smooth (0C)		I	2	2			NRA				NR		-	+1	U4	U6	-	+1	U4	U7
	Textured	APA 303	Rough (NR)		I	2	2			NRA		-	-	U3	U4	-	-	U4	U6	-	+1	4	6
	Textured	APA 303	Rough (SR)		I	2	2			NRA		-	-	U3	U4			NRA		-	+1	U4	U7
Wood Shingles/Shakes																							
	Roof				-	-	-	-	-	2E	3E	-	-	2E	3E			NR				NR	
	Siding				-	-	-	-	-	3E	4E	-	-	3E	4E	+1	+1	4	6	+1	+1	4	7
Pressure Treated Lumber/Decks																							
	New	Smooth		A,N	-	-	-	-	-	2E	3E	-	-	2E	3E			NRD				NRD	
	Overly weathered			B,N	-	-	-	-	-	3E	4E	-	-	3E	4E			NRD				NRD	
Weathered Wood (unpainted)																							
	After treatment, look at specific wood type			A,N	-	-	-																
Misc. & Composite Materials																							
	Concrete Composite Board			N	-	-	-			NRB													
	Plastic Composite Board			N	-	-	-			NRB													
	Plastic/Vinyl Composite Siding			N	-	-	-			NRB				NRB				NRB				NRB	
	Metal Siding			N	-	-	-			NRB				NRB				NRB				NRB	
Previously Coated Wood																							
Coating in good condition:																							
	Previously Coated		WR Preservative	B,L,N				NR	NRB		NR	NR	NRB		NR	NR				NR			
	Previously Coated		S/T Stain	B,L,N				NR	NRB	NR	NR	NR	NRB		NR	NR				NR			
	Previously Coated		Solid Stain, Solvent	L,N				NR	NRB	NR	NR	NR	NRB	NR	NR	NR	NRC			NR	NRC		
	Previously Coated		Solid Stain, Latex	L,N				NR	NRB	NR	NR	NR	NRB	NR	NR	NR	NRC	NRB	NRB	NR	NRC		
	Previously Coated		House Paint, Solvent	L,N				NR	NRB	NR	NR	NR	NRB	NR	NR	NR	NRC			NR	NRC		
	Previously Coated		House Paint, Latex	L,N				NR	NRB	NR	NR	NR	NRB	NR	NR	NR	NRC	NRB	NRB	NR	NRC		
Coating Peeling/Worn to bare wood in spots:																							
	Previously Coated		WR Preservative	B,K,L,N				NR	NRB		NR	NR	NRB		NR	NR				NR			
	Previously Coated		S/T Stain	B,K,L,N				NR	NRB	NR	NR	NR	NRB		NR	NR				NR			
	Previously Coated		Solid Stain, Solvent	K,L,N				NR	NRB	NR	NR	NR	NRB	NR	NR	NR	K			NR	K		
	Previously Coated		Solid Stain, Latex	K,L,N				NR	NRB	NR	NR	NR	NRB	NR	NR	NR	K	NRB	NRB	NR	K		
	Previously Coated		House Paint, Solvent	K,L,N				NR	NRB	NR	NR	NR	NRB	NR	NR	NR	K			NR	K		
	Previously Coated		House Paint, Latex	K,L,N				NR	NRB	NR	NR	NR	NRB	NR	NR	NR	K	NRB	NRB	NR	K		

Top Line solvent-borne House Paint				Top Line Latex House Paint			
Paintable Water Repellent (add'l)	Primer (additional durability)	One coat	Two coats	Paintable Water Repellent (add'l)	Primer (additional durability)	One coat	Two coats
+1	+2	5	7	+1	+2	7	10+
+2	+2	U5	U7	+1	+2	U7	U10+
+2	+2	U4	U6	+1	+2	U7	10+
	NR*			+2	+2	U6	U9+
+1	+2	5	7	+1	+2	7	10+
+2	+2	U5	U7	+1	+2	U7	U10+
+2	+2	U4	U6	+1	+2	U7	10+
	NR*			+2	+2	U6	U9+
+1	+2	5	7	+1	+2	7	10+
+2	+2	U5	U7	+1	+2	U7	U10+
+2	+2	U4	U6	+1	+2	U7	10+
	NR*			+2	+2	U6	U9+
+1	+2	5	7	+1	+2	7	10+
+2	+2	U5	U7	+1	+2	U7	U10+
+2	+2	U4	U6	+1	+2	U7	10+
	NR*			+2	+2	U6	U9+
+1	+2	U5	U7	+1	+2	6	9+
+2	+2	U5	U7	+1	+2	6	9+
+2	+2	U5	U6	+1	+2	U6	U9+
+2	+2	4	6	+2	+2	6	9+
+2	+2	U4	U6	+1	+2	U6	U9+
-	+2	5	7	-	+2	8	9+
-	+2	U5	U7	-	+2	U8	U10+
+2	+2	U4	U6	+2	+2	U7	U10+
	NRA			G	R	NR	10
	NRA			G	Rec	NR	10
	NRA			-	R	L7	L10
	NRA			-	Rec	L7	L10
	NR			+1	R	U6	U9
	NR			+1	R	7	U9
	NR			+1	R	U7	U10
	NR			+1	R	6	9
	NR			+1	R	U7	U10
	NR				NR		
	NRB				NRB		
	NRD				NRD		
	NRD				NRD		

NR			
NR			
NR	NRC		
NR	NRC	NRB	NRB
NR	NRC		
NR	NRC	NRB	NRB
NR			
NR			
NR	K		
NR	K	NRB	NRB
NR	K		
NR	K	NRB	NRB

Products are rated by the average lifespan, or years of service before recoating must be done. The actual lifespan depends upon the degree of exposure to sunlight and moisture, the quality of the coating, the fade resistance of the color used, the thoroughness of surface preparation before painting, and proper application. Due to these factors, the years of service you experience from these products may be greater or less than the average lifespan indicated.

KEY

10+	over 10 years before recoating
10	recoat in approximately 10 years
9	recoat in approximately 9 years
8	recoat in approximately 8 years
7	recoat in approximately 7 years
6	recoat in approximately 6 years
5	recoat in approximately 5 years
4	recoat in approximately 4 years
3	recoat in approximately 3 years
2	recoat in approximately 2 years
1	recoat in approximately 1 years
U	Results of coating substrate are unpredictable. Coating could experience early failure depending on the grade of lumber and the extent of flat grain or other defects. The number following will indicate the probable lifespan on more stable grades of lumber.
NR	Not recommended
NR*	Same as above, but chances are better with the use of a paintable water repellant.
NRA	The finish is not intended for this purpose, will not offer sufficient surface protection, and early failure is probable.
NRB	The finish is architectually (aesthetically) incorrect for the surface listed. and early failure is probable.
NRC	Painting, unless for color change, is not needed at this point in time. If still desired, follow instructions as per weathered coating.
NRD	Use of a film-forming coating system is usually not recommended by manufacturers because the failure mode is peeling.

Warning: In structures built prior to 1978, there is a potential that lead based paint may have been used. Remodeling or refinishing projects that will require disturbing, removing, or demolishing portions of the structure that are coated with lead-based paint pose serious problems. Dry sanding, dry scraping, or removal by heat is NOT recommended, due to the potential danger of lead poisoning. The home dweller should seek information, advice, and perhaps professional assistance for addressing this hazard. Contact HUD for the latest information on the care or removal of lead-based paints. Debris consisting of or coated with lead-based paint is considered hazardous waste. A list of properly trained and certified contractors should be available from the local or state health department .

Footnotes From Chart

A	Sand surface or allow to weather until water no longer beads on surface of wood.
B	Wood must be thoroughly cleaned with a commercial cleaner or power washing.
C	Pastel and midtone colors only. Dark colors absorb heat and may buckle siding.
D	Only top quality latex topcoats are recommended.
E	Dipping is recommended coating method .
F	Deep, preferably earthtone colors recommended. Water soluable extractives may discolor light colors. Use of an exterior grade stain blocking primer will help reduce discoloration.
G	Primer plus 2 topcoats recommended to help control extractive bleed
H	Light colors recommended to help avoid activating waxes and water soluable extractives.
I	Some colors may require use of tinted primer to help selected color hide.
J	Peeling or cracking suggests problem is related to either structural problems leading to buildup of moisture, or of many previous coats of paint. It is essential to correct this problem prior to recoating for best results.
	Other species of cedar may perform differently and thus should be coated as instructed by the proper lumber association or reputable distributor.
K	Scrape, sand or power wash problem area to remove the loose paint (see NOTE!). Spot prime after feathering the paint edges, then recoat with topcoat.
L	Durability expected to be same as for previous coat. For unstable substrates, if prevous coating is still adhering, then recoating will either lead to eventual paint failure due to paint buildup, or will adhere as well as previous coat.
M	Typically solvent-borne paints are recommended. Check with siding manufacturer for suitable grades.
N	Clean surface to remove any chalking, dirt or mildew that may cause adhesion problems.
P	ALWAYS check with the siding and coating manufacturers for their recommendations regarding the suitability of coating and siding type.
Q	Seal knots with shellac.
R	Required use of primer, per siding manufacturer's association.
Rec	Manufacturers HIGHLY recommend the use of a primer for this type of siding.
+1,+2	Number of years use of primer or paintable water repellant will extend the lifetime of the coating system, on an average basis.
	Blank signifies that there is not enough independent performance data available as of yet.

NOTE on Pressure-Treated Lumber:

As of 1 January 2004, the providers of pressure treated lumber have agreed with the EPA to discontinue using CCA [Copper, Chromium, Arsenic] as the chemicals for treating the lumber. As of this writing, two chemistries are currently being used that replace CCA: ACQ [Alkaline Copper Quatemary] and Copper Azole. These newer, more expensive treatments are not as well known in the industry for how well finishes perform to protect and beautify the pressure treated lumber as CCA, but evaluations are under way.

Concerns have been raised as to the safety of the existing CCA treated decks. Studies made by the Forest Products Laboratory, and referenced by the EPA, have shown that applying and maintaining a good deck finish will help substantially reduce leaching of CCA, as well as prevent the wearing away of UV damaged CCA impregnated wood fiber. This is an area of interest by the EPA, with several studies under way to make sure consumer safety is maintained. Please look for regular updates on the EPA or Forest Products Laboratory websites.

preservatives or water-repellants are nonfilm-forming, which means they penetrate into the wood and are not meant to form a film on the surface of the wood. They eventually fail by erosion and/or leaching of the finish due to weathering. and generally need to be reapplied regularly. Care should be taken during refinishing that areas that have not weathered away the finish may not accept penetration of the new finish very well. Follow label instructions and cautions.

One coat of paintable water repellent or water-repellent preservative can be used on new wood prior to painting. These treatments help to slow the absorption of liquid moisture by the painted wood, thus helping to stabilize the surface and reduce stresses to the paint film caused by moisture induced dimensional changes. Not all water repellents or water-repellent preservatives are paintable. Concentrating on the ends (where water wicks in more readily) and back of siding [to protect from moisture from home] can drastically reduce the moisture uptake of the wood, helping make it more dimensionally stable over time.

Clear film-forming finishes such as lacquers or varnishes are generally not recommended on wood products exposed outdoors because they do not provide adequate protection from UV light. Damage to the siding surface from UV undermines the bond at the wood/finish interface, resulting in flaking or peeling of the finish and sloughing of wood material. Although some dear finishes contain UV light stabilizers, these stabilizers haw a limited lifetime which necessitates frequent recoating. The resulting film will eventually fail by cracking, flaking, and peeling, leaving a surface that is difficult to refinish. Failures due to peeling are not always due to the coating/wood interface, as the wood may lose its bond as it becomes more photodegraded. Typically for varnishes, removal of the original film is required prior to recoating.

In recent years, finely ground inorganic pigments have been incorporated into some clear film-forming finishes to help with resistance to photodegradation. This type of finish gives much better performance than a traditional varnish.

Semi-Transparent Stains

Semi-transparent stains contain a small amount of pigment and help to retain the natural appearance of wood while still providing some protection from ultraviolet light. Only penetrating oil-based formulations are recommended by the major trade associations representing the forest products industry. The pigmentation helps block the UV exposure of the wood substrate, reducing the UV. Although these finishes require more frequent maintenance than paints, surface preparation is usually minimal since the finish fails by erosion, not by peeling. Research at the U.S. Forest Products Laboratory in Madison, WI has demonstrated that when staining new saw-textured wood, application of a second coat of semi-transparent stain before the first coat is dry can significantly extend the life expectancy of the stain and improve its protection to the wood surface Dipping is also a preferred method for new construction. Since smooth surfaces do not accept semi-transparent stains very well, recommendations for use of semi-transparent stains on smooth surfaces vary with the paint and siding manufacturers. Check with the manufacturers of the specific products before applying semitransparent stains to smooth surfaces.

Some semi-transparent stains incorporate a water repellent or water-repellent preservative in their formulation. These types of stains help to slow penetration of liquid water into the wood surface. This added resistance to moisture helps to retard the effects of weathering and guard against staining due to water-soluble extractives. Both the water repellency and the preservative provide additional protection from fungal attack and decay. Penetrating oil-based semitransparent stains generally perform best on saw-textured surfaces. They allow the grain and texture of wood to show through and are suitable for all grades of lumber siding and certain plywood or composite grades. They are not suitable for hardboard or overlaid products.

Solid Color Stains

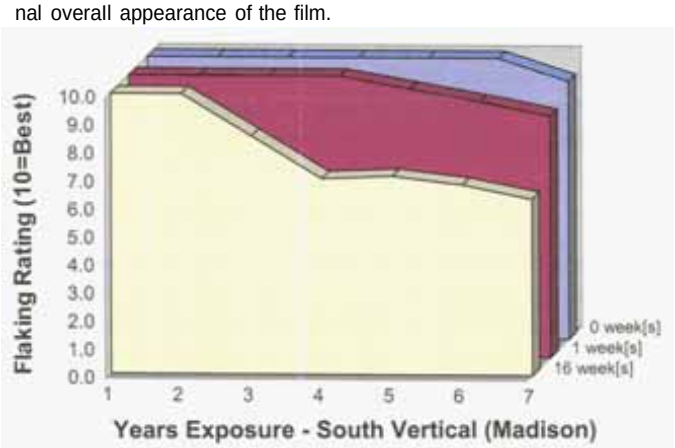
Solid color stains are manufactured in both oil-based and latex formulations and are typically lower in solids than a basic paint. They often provide better protection to the wood surface than semi-transparent stains, but are filmforming and usually fail by flaking and peeling. They are generally self-priming and have typically been applied in one coat. However, due to the lower solids, two coats of latex stain will provide better protection and often last longer than one coat. To guard against discoloration of light-colored latex stains from water-soluble extractives, use of a stain-blocking primer is required. Solvent-based stains are generally more effective in blocking water-soluble extractives than water-based systems. Solid color stains perform best on saw-textured surfaces, although they are sometimes used on smooth or embossed surfaces that have been primed. Recommended application methods vary, but usually end with use of a good quality brush on new wood to help work the finish in. Solid color stains

in favor of higher solids paint systems, in order to better protect the siding from moisture. Check the recom-

Paints

House paints typically have the highest solids content of the finishes listed here. When used on new wood the typical recommendation calls for a primer and one or two topcoats. The idea is, the more layers of finish, the better will be the protection of the wood. Two topcoats will significantly extend the durability of the System. 30th the primer and topcoat are available in solvent-thinned or water-thinned formulations. The selection of the correct primer and topcoat will depend on the nature of the wood substrate. Typical applicator recommendations call for use of a good quality brush to help work the finish into new wood.

Figure 1—Effects of preweathering of wood [none, 1 week, and 16 weeks] prior to coating with a film-forming solid color stain on the final overall appearance of the film.



Research has demonstrated that the most durable paint system on wood exposed outdoors is a top quality latex formulation, due to its flexibility. Solvent-based systems can become brittle over time and will crack and peel sooner. While stain-blocking latex primers are generally effective in blocking water-soluble extractives found in the heartwood of most species, some sidings such as cedar and redwood lumber may present stubborn cases where a solvent-based primer is more effective. However, water-based primers are generally more durable on wood because they retain their elasticity during weathering and are better able to accommodate the dimensional changes in wood that accompany moisture fluctuations, as well as being inherently more mildew resistant. Both primer types are included in the finishing recommendations of various trade associations representing most types of wood-based siding.

FINISHING CONSIDERATIONS

Preweathering of Wood

Studies conducted in the 1380s by the Forest Products Laboratory have shown that the time that wood is exposed to weathering prior to finishing has a major impact on the durability of the finish, and that the longer the wood is preweathered, the quicker the coating system fails by peeling. Failure by prolonged peweathering can be identified by observing the weathered wood fibers coming off on the backs of paint chips. This has led to the recommendation that the wood be checked for dryness. (Water droplet test: sprinkle a few drops of water on the substrate. If it beads up, it is is not ready, if the water soaks in, it is ready.) Once dryness is established the wood should be finished as soon as possible.

Weathering of the wood, wen for periods as short as a few weeks, leads to the opening up of the pores and photodegradation of the top layer of wood. Catastrophic paint failures have occurred, where the paint actually is adhering to the wood, but the photodegraded layer of wood has actually been removed from the rest of the lumber. When in doubt as to the length of time wood has been exposed to the elements prior to coating, a light sanding with 60 grit sandpaper should remove the sun damaged layer.

Surface Preparation

Improperly prepared surfaces can lead to premature finish failure and poor siding performance. Foreign matter such as dirt and mildew can interfere with finish adhesion and cause aesthetic distractions. New saw-textured surfaces may contain loose wood particles or protruding wood fibers. Loose wood material not removed prior to finishing or protruding fibers that are not thoroughly coated may lift and fall off during weathering cycles and leave bare, unprotected wood. Therefore, it is essential that all foreign matter or loose material be removed prior to finishing.

Loose finish on previously coated surfaces can also lead to poor performance of subsequently applied finishes, Blistered or flaking paint and chalking finishes provide an unsound surface for adhesion of new finish coats. It is essential that all such surfaces be properly treated and cleaned before applying additional finish.

Finally, any construction features that allow moisture behind the siding can interfere with finish performance, Improper nailing, lack of flashing, cracks or open joints not properly caulked and plugged gutters or downspouts can all contribute to early paint failure and even decay of the siding.

Flat vs. Edge Grain

Mildew

If siding has sat for any extended period of time, or if this is a repaint project, there is a distinct possibility that mildew will be present. Proper treatment to remove the mildew and rinse the cleaners off the substrate should take place prior to applying paint.

Surface Wetting

For optimum finish adhesion, a coating must adequately wet the wood surface. Surface wetting requires intimate contact between the finish and the substrate. Voids between the finish and the substrate surface weaken the adhesive bond of the coating. Spray application of finishes over rough or porous surfaces often does not provide satisfactory wetting of the entire wood surface. Brushing is the best method to achieve full contact between the finish and the substrate, particularly on rough and/or grooved surface. If the finish is spray applied, back-brushing or back-rolling are effective means of assuring proper wetting of the wood surface.

Weather Conditions

Temperature and moisture conditions during application can affect the drying, appearance and performance of finishes. Although individual manufacturers may vary in their recommendations, a good rule of thumb is to avoid application of oil-based finishes at temperatures below 40°F and latex finishes at temperatures below 50°F These temperatures also apply to the finishing material and the surface to be finished. Best results can be expected if the outside air temperature does not fall below these minimums during the 24-hour period following application. Drying of oil-based finishes and coalescence of latex finishes can be severely retarded or nonexistent at temperatures below these minimums, leading to early failure of the coating.

Excessive temperatures during finish application can also cause problems. Temperatures in excess of 80-85°F can interfere with proper wetting of the wood surface, promote uneven thickness of the coating and leave lap marks. Finishes should never be applied in the direct sun. Hot, dry wood surfaces may be dampened prior to application of latex finishes to cool the surface and improve application characteristics. Oil-based finishes should only be applied to dry surfaces.

Rain, condensation, and fog all interfere with drying of finishes. Moisture can interfere with adhesion as well as cause blistering and wrinkling of oil-based finishes. Latex finishes might be washed off or diluted by excessive moisture during the drying stage. Water marks or streaking can also occur. Finishing should be avoided during damp early morning or late evening hours or when rain, condensation, or fog is expected.

Extractive Staining

Colored chemical compounds in wood can cause finish discoloration on painted wood surfaces. One-coat stains, especially light pastel colors, can become unsightly due to bleeding of these extractives from the wood into the finish. The discoloration may range from yellow to reddish brown. The most common form of extractive staining is from water-soluble extractives such as tannins which can dissolve in the presence of liquid moisture and migrate to the finish surface.

Inadequate Dry Film Thickness

Pigments vary in their ability to hide the wood surface Top quality coatings are formulated with pigments such as titanium dioxide and iron oxide in sufficient quantity to efficiently hide and protect the wood surface Even coatings with these pigments must be applied in sufficient thickness to provide optimum dry hiding. A good example is the difficulty often encountered when painting a new color over a previously finished surface. One coat may not be sufficient to hide the old color.

Even when a coating appears opaque to the eye, it may still transmit ultraviolet light if the coating is too thin. This phenomenon occurs because visible light and ultraviolet light are emitted from the sun at different wavelengths. If ultraviolet light is allowed to penetrate to the siding surface, the physical and chemical structure of the surface wood cells can be damaged. Such damage at the finish/wood interface can result in coating failures.

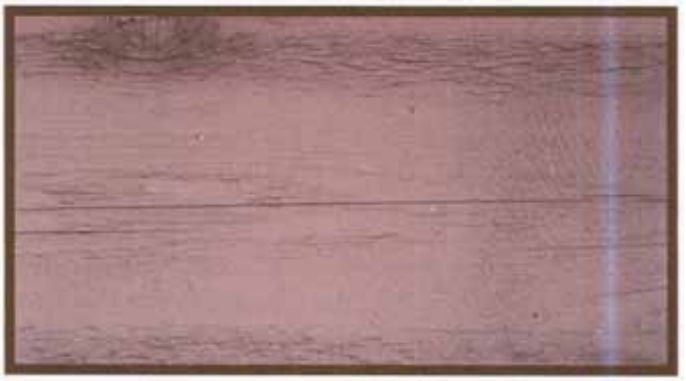
New siding is frequently finished with one coat solid color stains. If the coating is too thin to keep UV light from reaching the wood surface premature finish failure may occur, resulting in costly refinishing and maintenance schedules. Film-forming coatings perform best on new wood surfaces if a primer is applied prior to the

topcoat. Primers promote optimum adhesion and increase dry film thickness resulting in better protection to the wood surface. Even self-priming finishes generally perform best when applied in two coats. For optimum durability, a top quality three-coat house paint system such as a stain-blocking latex primer and two companion top quality latex topcoats is recommended.

Of equal importance is the surface texture of the siding. Because smooth surfaces generally accept less paint per coat than textured surfaces, they may require more coats to realize the same film thickness and, therefore, the same degree of protection. Always follow the finish manufacturer's recommendations.

Maintenance

Any wood surface exposed outdoors which is improperly prepared or finished is likely to present more frequent and more costly maintenance problems. Poor finish adhesion, inadequate protection from ultraviolet light, unevenly coated surfaces and poor quality finishes can all lead to premature and frequent finish failures. The result is deterioration of the siding and an unsightly appearance as well as higher costs and increased labor to restore the siding surface and apply a new finish. And finally, customer dissatisfaction leads to increased complaints.



Grain Cracking

Cracking and flaking

Wood surfaces can crack due to moisture changes during weathering. Thick, brittle coatings or elastic coatings applied too thin are also subject to cracking due to thermal and moisture induced dimensional changes. Cracking as a result of to excessive dry film thickness of brittle coatings is often related to bond loss and flaking of the finish. Cracking of elastic coatings due to inadequate dry film thickness may indicate insufficient protection to the siding.

Peeling Paint

Typically peeling paint can be attributed to either moisture or improper surface preparation. Examine the back of the paint chip. It if has mildew, chalk, dirt, wood grain, or greasy residue, then the surface was probably not prepared properly, To address this, remove the loose paint, feather edges of the section with sandpaper, clean if necessary to remove mildew or grease, apply spot primer where the paint has peeled down to bare wood, and recoat the area.

If blistering, water spotting, mildew, or extractive bleedthrough is present, these are typical signs of moisture problems. Before repainting, investigating for and eliminating sources of moisture is required. Possible sources of moisture are: roof leaks, ice dam damage, bathroom or laundry room venting problems, the need for a vapor barrier, or the siding being prevented from removing excess moisture

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CONSIDERATIONS

Performance of exterior finishes in protecting wood siding and substrates comes dawn to following manufacturer's recommendations, and needing to assure the following:

- Causes of existing problems are investigated and proper repairs are made prior to refinishing
- Proper high quality substrate is being used.
- Proper high quality surface preparation is done.
- Proper high quality paint is being used
- Proper high quality applicator and application method is being used.
- Proper recommended weather conditions are observed for application and curing
- Recommended spreading rate is followed.
- Please make sure proper personal protective

Joint Coatings/Forest Products Committee

Purpose:

The Joint Coatings & Forest Products Committee (JCFPC) was established in the 1980s as a group of scientists and professionals from within the coatings industry and the forest products industry, committed to the following: Seeking fundamental information which will increase basic knowledge of both the coatings and forest products industries, improving protection and performance of their products and construction practices, sharing non-proprietary information regarding the changing nature/emerging technologies of coatings and forest products, establishing the challenges and best practices for protecting forest products, seeking channels through which to publicly distribute and update information on best practices, publicly disclosing this information in a comprehensive and easily understood manner, and providing a source of industry support and guidance for the Forest Products Laboratory.

Member Responsibility:

The members recognize their responsibility to the committee and their industries by: serving on the committee and task groups with professional integrity, courtesy, and cooperation, collecting relevant data from internal and external sources to support public disclosures, providing the most useful, serviceable and accurate information, encouraging the dissemination of true, fair, and unexaggerated statements of facts.

Committee Vision:

The committee and its members will strive to be a prominent source of information regarding the use and best performance of our respective products by providing accurate, useful, up-to-date information and best practices to our industries, businesses, architects, builders, contractors, and the general public.

Contact:

For more information, or to join the JCFPC, contact Committee Co-Chairs, D. Douglas Mall Sr,, Architectual Coatings, Technical Service & Development, UCAR Emulsion Systems, The Dow Chemical Company, 919.469.6717; email: malldd@dow.com; or R. Sam Williams, USDA Forest Products Lab, 608.231.9412; email: rswilliams@fs.fed.us.

equipment is worn during the preparation and coating process. This includes wearing protective gloves, protective clothing, safety goggles or safety glasses, and dust masks as necessary.

- Proper use and cleaning of the equipment and tools used for the project are also very highly recommended. This indudes proper use of ladders, cleaning equipment, power washers, scaffolding. as well as brushes, rollers, and other applicators.

FIELD HINTS

- Proper surface preparation begins with providing a clean surface.
- Remove all loose wood material. This can be accomplished with a stiff nonmetallic bristle brush or broom.
- Remove dirt. If the siding is dirty and mildewed, it can be cleaned with a commercially available mildew remover or a solution of *non-ammoniated* detergent and household bleach (5% sodium hypochlorite), or sodium percarbonate based cleaners.
- On repaint jobs, set loosened nails and repair caulking around windows and doors. Clean chalky surfaces and remove any blistered or peeling finish. Prime bare wood areas.
- Make sure siding is properly protected from water drainage via rain gutters and downspouts and flashings.
- New wood should be finished as soon as possible. Weathering of unprotected wood can cause surface damage in as little as one to two weeks and adversely affect performance of subsequently applied finishes.
- Surfaces should be clean and dry for oil-based finishes. Latex finishes may be applied to dampened surfaces
- Follow the finish manufacturer's recommendations regarding weather conditions during application. Oil-based finishes should generally be applied at temperatures above 40 °F. Application of latex finishes is normally not recommended when the temperature is expected to drop below 50°F within 24 hours after application. Finishes should not be applied early in the morning if condensation is present or in the evening within two hours of sunset.
- Always apply finishes according to the manufacturer's recommended spread rate. Finishes applied at the proper spread rate assure optimum film thickness to protect the wood surface from weathering.
- All new wood should be primed for best performance. Primers help to provide proper adhesion to

the surface. Stain-blocking latex or oil-alkyd primers protect against discoloration of the topcoat from water–solubleextractives.

- All edges and ends of the siding should be sealed prior to installation. Check with the coatings manufacturer for recommendations regarding, suitable edge sealers for siding that is to be stained. For painted siding. use the same primer that is applied to the face of the siding. Lumber sidings should also be back-primed.
- The first coat of finish on new wood should be applied by brush or liberally sprayed and back-brushed or back-rolled. Brushing helps work the finish into the surface texture to provide wetting and coating of all surfaces and is especially important on saw-textured sidings.
- Paint from the top down on panel products and horizontally on lap siding, always maintaining a wet edge to avoid lap marks. Try to terminate paint at a logical point such as a comer or window before quitting for the day.

Helpful Web sites

www.apawood.org: American Plywood Association

wwwhardboard.org: American Hardboard Association

www.awpi.org: American Wood Preservers Institute

www.wrcla.org: Western Red cedar Lumber Association

www.fpl.fs.fed.us: U.S. Forest Products Laboratory

www.pdra.org: Paint and Decorating Retailers Association

www.paintinfo.org/links.htm: Paint Info list of paint and decorating links.

www.calredwood.org: California Redwood Association

www.cedarbureau.org: Cedar Shake and Shingle Bureau

www.pbmdf.com: Composite Panel Association/ Composite Wood Council

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