

Western Red Cedar Finish Options Maximize Versatility

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Pine Street Duplex. Architect: Webster Wilson Architect. Photography: Caitlin Murray, Builtphoto.

INTRODUCTION TO WESTERN RED CEDAR

Western red cedar (WRC) is one of nature's most outstanding building materials. Renowned for its performance and exceptional beauty, it brings warmth, character, and longevity to homes and commercial projects around the world. Western red cedar, or *Thuja plicata*, is a coniferous softwood tree that grows primarily in the pacific northwest of the United States and Canada.¹ The lumber from western red cedar has a uniform, fine-grained texture with colors ranging from amber yellow to cinnamon red and sienna brown.²

Western red cedar has numerous performance attributes that make it suitable for both interior and exterior applications,

but the most important may be its natural insect, rot, and decay resistance, provided by the same natural compounds that give cedar its signature aroma. Western red cedar is also very dimensionally stable, with a very low shrinkage factor and high resistance to warping, twisting, and checking. The wood's low density provides superior thermal insulation because it has a high proportion of air-filled cell cavities, keeping a home cool in the summer and well-insulated in the winter. This low density also makes the material light weight for easier transport and installation.³

Because western red cedar is naturally insect and rot resistant, a protective finish is not required to maintain the wood's durability. Building owners can allow their western red cedar to weather naturally or, with the

LEARNING OBJECTIVES

1. Discuss the exterior applications for western red cedar and the many exterior finish options available, including the level of maintenance required for each.
2. Identify interior applications and finish options for western red cedar.
3. Examine the difference between factory and on-site finishing and application techniques for siding and trim.
4. Explore trends in western red cedar finishing and case studies demonstrating various exterior and interior finishes that were used to achieve a wide variety of design aesthetics.

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application of a protective coating that will ensure maximum performance, they can retain and enhance the natural beauty of the wood by using coatings in a wide array of types and colors. This course will address both options and provide designers with the important information needed to determine which option best suits a project's needs.⁴

EXTERIOR APPLICATIONS FOR WRC

Western red cedar's natural durability and physical properties make it highly versatile and ideal for exterior applications such as siding, trim, soffits, and decking.⁵ In fact, the wood is so highly-coveted that many man-made siding and trim materials attempt to mimic the grain and color of cedar.



Western red cedar siding provides a wealth of options to provide the perfect look for a home, as it can be finished to complement all styles of buildings from modern to traditional to rustic. Bank Barn. Architect: Birdseye. Photography: Jim Westphalen Photography, Birdseye.

Siding

Siding is one of the most important elements of a building, both for aesthetics and durability. It defines the design and style of a home, complements the surroundings, and protects the building from the elements. While there have been a lot of different materials used as siding over the decades, and new products emerge on the market all the time, one product has remained a constant: western red cedar.

Cedar siding provides a wealth of options to provide the perfect look for a home, as it can be finished to complement all styles of buildings from modern to traditional to rustic. Western red cedar comes in a variety of grades that are divided into clear and knotty. Clear cedar comes in vertical, mixed, and flat grain, which are achieved based on how it's cut. Knotty grades show the wood's

natural features and are often used to provide a warm and rustic look. Cedar also comes in a spectrum of profiles and patterns, which can create very different styles for a home or building. Profiles include bevel siding, tongue and groove, lap siding (also called shiplap), and boards for board and batten. These profiles can be installed vertically or horizontally and will create different shadow and line effects once on the wall. Cedar shingle siding is also available in 8-foot panels, making it easier than ever to install this traditional look.

What's really unique to natural wood siding is the different surface textures that are created based on how the wood is manufactured. For example, a rough texture is created in the milling process by using roughing planing knives, while less pronounced rough-sawn textures come from the blade marks of a circular or band saw.

GLOSSARY

Bleaching

Weathering products designed to provide the weathered look of cedar sooner and more evenly than natural exposure to sunlight; they are lightly tinted with either gray or brown pigments, which mute the natural coloration and accelerate the weathering process

Clear Grades

Western red cedar products that are visually clean and free from defects and usually graded for smooth face exposure; there are only a few, if any, characteristics, which could include an occasional knot or minor imperfections

Dimensional stability

The resistance of wood to swelling and shrinkage when it gains or loses moisture

Knotty Grades

Western red cedar products graded to allow more inclusions, meaning there will be knots and other characteristics; they have a more casual, rustic appearance than clear cedar grades

Pitch

An accumulation of resinous material

Solid-color stains

Stains that are available in a wide spectrum of hues which obscure the wood's true color but allow some of the cedar's natural characteristics and texture to remain; these finishes are non-penetrating and form a film

Solvent borne semi-transparent stain

Solvent borne, oil-based, semi-transparent, penetrating stains penetrate the wood surface, are porous, and do not form a surface film like paints

Surfaced One Side, Two Edges (S1S2E)

A surfacing process that results in a rough sawn face and a smooth back that provides uniform width and thickness tolerances; typically graded from the rough face, it may in some instances be reversible to the smooth back

Surfaced Four Sides (S4S OR PAR, D4S)

A smooth surface on all four sides that presents a uniformly sized product with a quality appearance; this surface finish is most commonly found on clear grades

Transparent stains

Sometimes referred to as water-repellant preservatives, these stains do not alter the appearance of the cedar; they only slightly modify the color (tone) of the wood

Designers can choose lumber with one side smooth and the other side rough if a variety of textures is desired.

Many profiles can also be found in engineered cedar siding, which is a category of newer products that is increasingly becoming more popular. Engineered cedar is made of smaller pieces of cedar end cuts that have been finger joined and glued together. These boards come primed and ready for a surface coating. Other products have a cedar substrate or backing with a veneer of clear western red cedar glued on top. Both of these products are extremely stable, durable, and come in long lengths.

Real cedar is pitch- and resin-free so it takes stains and oils very well. What's more, there are some stunning new ways to finish western red cedar now on the market. Products like bleaching stains and weathering products create the gorgeous silvery gray look of aged cedar but add protection from UV rays and the elements. Texturing techniques and finishes can provide a weathered or antique look to the siding. Transparent and semi-transparent stains let the incredible natural luster of the wood shine through and highlight the grain. These stains penetrate the wood and won't flake off or peel like surface coatings. A host of solid-colored stains can also be used to provide excellent protection against UV rays and water but still allow the natural beauty and warmth of the wood to shine through. We will go through each of these options in more detail in a bit.

Trim

Western red cedar trim boards are generally used in applications such as corner boards, fascia, skirting, and detail around windows and doors. They are available in a variety of grades and textures to complement the home's style. Clear boards have a limited number of natural characteristics and are specified when a "clean," fine appearance of the highest quality is desired. They are available kiln dried. Knotty boards present a more rustic appearance and may be specified seasoned or unseasoned. If unseasoned, they must be dried prior to finishing.

Western Red Cedar boards may be specified in one of three surface textures to



Western red cedar provides a beautiful soffit that can coordinate with exterior cedar siding but can also create a seamless aesthetic with interior cedar ceilings. Ridgewood Residence. Architect: Matt Fajkus Architecture.

enhance design flexibility: rough; surfaced one side, two edges (S1S2E); or surfaced four sides (S4S). Surfaced one side, two edges is a versatile product that is the most popular choice for trim boards. The surfacing process results in a rough sawn face and a smooth back that provides uniform width and thickness tolerances. Typically graded from the rough face, it may be reversible to the smooth back.

Soffits

Soffits are the underside of an exterior element and are typically not an area that designers give much consideration. Vented soffits are often made of vinyl, aluminum, or steel and provide ventilation and protection from pests, but they are often unattractive. Wood soffits, on the other hand, provide high style and can be used in areas where ventilation is not needed, such as interiors, or outdoors if adequate spacing is provided for proper air circulation. Western red cedar provides a beautiful soffit that can coordinate with exterior cedar siding but can also create a seamless aesthetic with interior cedar ceilings. What's more, the longevity of

transparent stains is significantly greater on soffits (at least 7 to 8 years) because they are more protected from the elements.

Decking

This course will not focus on decking, as the application has different finish, maintenance, and installation considerations. But you should know that because western red cedar is naturally resistant to rot and decay, stable, cool under foot, and beautiful, it's an ideal choice for all types of decks from raised and ground level decks, which provide the simplest way of expanding living space outdoors, to roof decks and uphill sloping decks, which allow an easy way to access the upper levels of a property. Of course, cedar can be used in many more outdoor applications to tie elements together, such as pergolas, gazebos, covered walkways, fences, and garden benches.

FACTORS AFFECTING FINISH RETENTION

A number of factors affect the performance of finishes including western red cedar's natural properties, manufacturing characteristics, and construction practices.

Natural Properties

The most important natural properties of western red cedar are its outstanding dimensional stability, fine texture, pattern of growth, and freedom from pitch and resin. These characteristics contribute to its exceptional ability to accept and retain many different types of finishes.

Dimensional stability

Dimensional stability is the resistance of wood to swelling and shrinkage when it gains or loses moisture. Light, low-density woods such as western red cedar shrink less than higher density woods. Its excellent dimensional stability is an important factor responsible for the longer life of paints on western red cedar in comparison to other woods.

Texture

Texture refers to the smoothness of the wood surface after sawing, planing, or sanding. According to the Forest Products Testing Lab, western red cedar is the best softwood species for primer and paint applications.

Pattern of growth

Pattern of growth refers to the alternating bands of low density, springwood and higher density, summerwood. Together, these two bands constitute one year of tree growth. Western red cedar has a much higher percentage of low-density spring wood than most other conifer species. In addition, pitch or resin, which can interfere with the adhesion or penetration of a finish, can be found in most softwoods but are absent in western red cedar.

Manufacturing Characteristics

Manufacturing characteristics that can affect finish performance are surface texture, moisture content, and construction practices.

Surface Texture

As we've noted, western red cedar products are available with a smooth (planed) or a textured (sawn or rough sanded) surface. As a rule, textured surfaces provide the best mechanical adhesion of the finish to the wood. For smooth-surfaced western red cedar, a two-coat finish system is preferred.

QUIZ

- Which of the following is a performance benefit of western red cedar?
 - Natural insect, rot, and decay resistance
 - Dimensional stability
 - High resistance to warping, twisting, and checking
 - Low density
 - All of the above
- _____ grades show the wood's natural features and are often used to provide a warm and rustic look.
 - Clear
 - Knotty
 - Rough
 - Inverted
- Products like _____ create the gorgeous silvery gray look of aged cedar but add protection from UV rays and the elements.
 - Semi-transparent stains
 - Transparent stains
 - Solid-colored stains
 - Bleaching stains
- Light, low-density woods such as western red cedar shrink _____ than higher density woods.
 - Less
 - More
 - At the same rate
 - Faster
- Which of the following manufacturing characteristics can affect finish performance?
 - Surface texture
 - Moisture content
 - Construction practices
 - All of the above
- As a rule, _____ surfaces provide the best mechanical adhesion of the finish to the wood.
 - Clear
 - Knotty
 - Textured
 - Smooth
- It is best to finish western red cedar when its moisture content has stabilized at the level that will prevail during the service life of the product, which in North America is approximately _____ percent moisture content.
 - 10
 - 12
 - 20
 - 25
- Sometimes referred to as water-repellant preservatives, these stains do not alter the appearance of the cedar; they only slightly modify the color (tone) of the wood.
 - Bleaching stains
 - Transparent stains
 - Semi-transparent stains
 - Solid-color stains
- Solvent borne _____ contain pigments that provide color—including cedar tones—and greatly increase the durability of the finish by partially protecting the cedar surface from the damaging effects of the sun's ultraviolet rays.
 - Bleaching stains
 - Transparent stains
 - Semi-transparent stains
 - Solid-color stains
- _____ are non-penetrating finishes available in a wide spectrum of hues which obscure the wood's true color but allow some of the cedar's natural characteristics and texture to remain.
 - Bleaching stains
 - Transparent stains
 - Semi-transparent stains
 - Solid-color stains

SPONSOR INFORMATION



The Western Red Cedar Lumber Association represents quality "Real Cedar" producers, distributors and retailers throughout North America. Founded in 1954 and known as "the voice of the cedar industry," WRCLA offers extensive resources to assist with selection, specification and quality standards. For more information, visit RealCedar.com.



The choice of an exterior wood finish for western red cedar depends upon the desired appearance and the degree of protection required. Bigwin Island Club Cabins. Architect: MacKay-Lyons Sweetapple Architects. Photography: Doublespace Photography.

Moisture Content

Western red cedar is indeed available unseasoned (or green), which means it hasn't gone through a drying process, but the moisture content of this wood can be up to 25 percent. Finishing wood that is wet (above 20% moisture content) will increase the risk of coating failure. It is best to finish western red cedar when its moisture content has stabilized at the level that will prevail during the service life of the product. In North America this level is approximately 12% moisture content.

The best product choice is western red cedar that is kiln-dried versus air-dried at the time of manufacture. Air drying is when product is placed on racks to dry naturally over time, while dry kilns can "dry the material to a targeted moisture content based on whether the product is clear or knotty." Kiln-dried clear material is typically dried to between 12 and 15 percent moisture content,

while kiln-dried knotty material is typically dried to between 15 and 19 percent. Knotty material is dried to a higher moisture content than clear material because knots are denser than the surrounding material and tend to star-check. If the material dries out too much, the knots can chip as the lumber runs through the planer, resulting in lower-grade material.⁶

Construction Practices

Construction practices also have a significant influence on the performance of cedar and finishes. Care should be taken from the time the western red cedar is delivered to the job site through to its installation and finishing. The moisture content of the wood (both prior to and during its service life), exposure to sunlight, and surface contaminants (dirt) are important factors affecting the performance of each finish.

EXTERIOR FINISH OPTIONS

The choice of an exterior wood finish for western red cedar depends upon the desired appearance and the degree of protection required. Architects have hundreds of options when specifying finishes for western red cedar siding and trim, but in general, finishes can be grouped into three categories: (1) natural finishes such as transparent stains and oils; (2) semi-transparent stains; (3) and opaque coatings such as paints and solid-color stains. Wood preservatives and fire-

retardant coatings may also be classified as finishes in some respects but are not within the scope of this course. The expected service lives of different exterior finishes for western red cedar siding and trim are summarized in the chart below. In this course we'll move from the most minimal treatment, which honors the raw beauty of western red cedar, to the other end of the spectrum with opaque finishes that completely obscure the wood's grain.

NATURAL WEATHERING (RAW, UNFINISHED CEDAR)

The first and most simple, low-maintenance option is to leave the western red cedar unfinished. Without treatment, the wood will naturally turn gray over time, with climate conditions such as saltwater, UV, humidity, and moisture determining how quickly the cedar weathers. Western red cedar performs well as a decking and siding product if it is left unfinished to weather naturally like this. With natural weathering the wood itself will last a very long time, but the appearance will change as it ages. Because they are more exposed to sunlight, southern and western exposures will typically gray more rapidly, while northern and eastern facades and more protected areas such as gables and soffits will weather more slowly. It should be noted that uncoated, weathered western red cedar siding or trim can often be restored to its original color by applying commercial products called cleaners, brighteners, or restorers. But, this will add maintenance that homeowners who opt for the natural, no-finish look may not be up for.

It is important to understand that the choice not to apply a finish to the cedar product has long-term implications. This choice requires advance consideration before natural weathering is allowed to begin. As western red cedar weathers, it will lose its natural color and become gray. In very dry climates, it weathers to a silvery gray color, but in most other climates, because of varying moisture and sun exposure conditions, the wood does not weather uniformly and is likely to develop a dark, blotchy, gray appearance.

Although the natural weathering effect is usually only "skin deep" (less than 1-2mm), with the cedar largely unchanged beneath, extra care must be given to the design of the project, the installation of the cedar, and

While it is not within the scope of this course to describe in detail the many construction techniques necessary to maximize performance of western red cedar finishes, you should visit the following websites for more comprehensive information on installing western red cedar siding and finishing practices: <https://www.realcedar.com/siding/installation/> and <https://www.realcedar.com/siding/finishing-choices/>.

routine maintenance. Without the protection provided by a coating against moisture intrusion (especially end grain sealing), steps must be taken during the installation process to allow western red cedar to readily dry following exposure to moisture, otherwise the risk of decay increases. All cedar products used in exterior applications require a degree of maintenance to keep them looking their best. Even if the choice is made not to apply a finish, contaminants such as dirt and mildew should be removed regularly to maintain its beautiful, natural appearance.

A Life Cycle Assessment (LCA) of natural western red cedar siding and decking shows it has the most benign environmental impact of all the alternative product choices for similar building applications. Coatings, especially solvent borne finishes that require frequent reapplication, negatively impact the LCA of cedar siding and decking. This impact may influence a decision not to apply a finish. Fortunately, a new generation of more environmentally friendly, waterborne, coatings are emerging and these products should be considered. Even so, western red cedar siding outperforms all competitors in LCA studies.

To summarize, clients may choose the natural weathering option due to:

1. A preference for the silvery gray look of naturally weathered western red cedar;
2. A desire not to invest the time and effort required to maintain the finish on a cedar product;
3. Project inaccessibility, causing difficulty in maintaining the finish on a project such as siding on a very tall building; or,
4. A concern about the environmental impact of applying a finish.

These are all valid considerations, and the reality is that western red cedar siding and decking can have a long service life without a finish coating in many environments, as long as good design, installation, and maintenance practices are followed.

NATURAL FINISHES

Many users of western red cedar prefer a finish that preserves the wood's natural color and appearance, but to maintain the natural look of western red cedar that is exposed outdoors, regular maintenance will be required. If the client chooses to finish their



If a truly uniform gray appearance is desired, this effect can be achieved by using commercially prepared bleaching stains that accelerate the weathered, gray look faster and more evenly than if they were left to naturally weather. Bank Barn. Architect: Birdseye. Photography: Jim Westphalen Photography, Birdseye.

western red cedar siding or trim, it should not be left unfinished and exposed to direct sunlight and moisture for any significant period prior to finish application. Weathered surfaces, even if only exposed to the elements for a few weeks, will compromise western red cedar's ability to hold finishes. The longer the western red cedar is left to weather, the more rapidly the finish may fail.

Natural coloration of newly milled cedar can be retained by applying finishes that contain ultraviolet blockers. Penetrating oil-based stains or light-pigmented natural tones can also be applied to provide uniform color and wood protection. The following products provide varying degrees of protection against weathering while maintaining the cedar's natural beauty.

Bleaching and weathering products

If a truly uniform gray appearance is desired, this effect can be achieved by using commercially prepared bleaching or weathering products. These are essentially water repellent finishes containing pigments and other additives. Bleaching stains accelerate the weathered, gray look faster and more evenly than if they were left to naturally weather. After bleaching, the western red cedar can be left in its natural state or given a coat of clear sealer. To maintain this look, bleaching or weathering products may need to be re-applied periodically.

Transparent stain

Sometimes referred to as water-repellent preservatives, these stains do not alter the appearance of the cedar; they only slightly modify the color (tone) of the wood. Transparent stains are similar in composition to semi-transparent stains, but they contain fewer pigments. Transparent stains formulated with a fungicide that inhibits the future growth of mildew and decay-causing fungi will further increase the wood's durability. Waterborne and solvent borne formulations are available; however, these unpigmented or lightly pigmented finishes provide limited protection against the sun's ultraviolet light and moisture related damage. As such, they require frequent refinishing. Transparent stains are, however, easily refinished with minimal surface preparation. Quality products should include UV filters, which are achieved by adding transoxides to the products.

Note: Transparent, non-flexible, film-forming finishes such as lacquer, shellac, urethane, and varnish are not recommended for exterior use on western red cedar. Ultraviolet radiation can penetrate the transparent film and damage the wood. Regardless of the number of coats, the finish will eventually become brittle, develop cracks in the coating film, and then fail.

Solvent borne semi-transparent stain

Solvent borne, oil-based, semi-transparent stains penetrate the wood surface, are porous, and do not form a surface film like paints. These finishes are the best choice for western red cedar that is fully exposed to the weather, when a natural look is desired. Although these stains can be used on both smooth and textured western red cedar, they will perform much better and last longer when applied to a textured surface.

Solvent borne semi-transparent stains contain pigments that provide color — including cedar tones — and greatly increase the durability of the finish by partially protecting the cedar surface from the damaging effects of the sun's ultraviolet rays. The service life on siding applications may vary from 3 to 6 years depending on the cedar surface texture, quantity of stain applied, and the intensity of the sunlight on the wood surface.

Latex semi-transparent stain

Latex semi-transparent stains are similar in appearance to the solvent borne stains, but their look is achieved by the formation of a thin film with little penetration. This film is often not thick enough to provide the same durability as solvent borne stains and tends to degrade by flaking from the wood's surface. Refinishing cedar that has been coated with a latex semi-transparent stain may require more substantial surface preparation.

Currently, efforts are underway by many stain manufacturers to develop waterborne stains that penetrate cedar. However, to date, moderate success has been experienced in duplicating the properties of traditional oil-based, solvent borne, stains. As increasingly restrictive environmental standards reduce the availability of solvent borne stains, ongoing research suggests that penetrating, erodible latex semi-transparent stain finishes for cedar will be available in the near future.

OPAQUE FINISHES

If it's not important to the client that the color and natural grain of the western red cedar remain, opaque finishes such as solid stains and paints can be used to protect the wood.

Importance of primer

Western red cedar contains water-soluble extractives that are responsible for its attractive color, exceptional stability, and natural decay resistance. However, these extractives may discolor latex paints and solid-color stains unless a primer coat is used that is specifically formulated to help control extractive bleeding. These stain-blocking primers are available in alkyd-oil and water-based formulations. Alkyd-oil based primers usually offer the best shield against discoloration by water-soluble extractives. The label on the container should indicate that the coating is recommended for use as stain-blocking primer for western red cedar.

Primer and solid stain

Primers with a solid stain are opaque finishes with fewer volume solids than paint. But, like paints, solid-color stains protect western red cedar against ultraviolet light degradation and moisture. They are available in a wide spectrum of hues which obscure the wood's

CASE STUDY 1

RUBY RIDGE HOUSE: WANAKA, SOUTH ISLAND, NEW ZEALAND



The rounded exterior walls of the Ruby Ridge House are clad in a dramatic dark-stained western red cedar siding, which was specified because it's very resistant to the high UV radiation levels found in New Zealand. Ruby Ridge House. Architect: Condon Scott Architects, Photography: Simon Devitt.

Elevated on a prime location that overlooks Lake Wanaka and the surrounding mountains, this New Zealand property offers stunning vistas. But it's also subject to climatic extremes including hot summers, cold winters and onshore winds across the water. So, the challenge for the Condon Scott Architects team was to design a family retreat that capitalizes on the extensive views while ensuring the home is comfortable to live in during all seasons. One of the ways they addressed this goal was through choice of material. The rounded exterior walls are clad in a dramatic dark-stained western red cedar siding. Strong and durable, yet very easy to work with, cedar checked a lot of boxes. "We chose to specify western red cedar as the exterior siding because it's a very stable product against the high UV levels here in this region," explains lead architect Barry Condon. "Plus, the vertical lines of the western red cedar gave us the ability to clad the curved elements of the design seamlessly."

The clients also wanted privacy as well as "architectural flare." "The house is located in quite a prominent corner lot, bordered by two suburban streets," says the award-winning architect. "The cedar walls wrap around the home and create a sense of privacy from the street frontage. The sweeping curved forms, accentuated with the vertical cedar cladding, has certainly been the most talked about aspect of the design."

true color but allow some of the cedar's natural characteristics and texture to remain. These finishes are non-penetrating and, like paints, form a film. A stain-blocking primer should be applied first, before applying the solid color stain. Solid color stains are available as latex or oil-based formulations. Oil-based solid color stains should not be applied over latex primers.

Solid-color stains have been developed that reveal the wood's grain.

Primer and paint

The most-opaque finish available is paint over primer. Paint provides the most surface

protection against weathering and wetting by water, while providing color and concealment of some of the wood's characteristics. Therefore, a lower grade of cedar could be used because any inclusions will be hidden. Although paint can reduce wood's absorption of water, paint itself is not a preservative. Paints of all types such as water-based paints, acrylic (latex), acrylic enamel, and solvent-based paints (alkyd and oil-modified) are suitable for western red cedar. However, test results show that good quality latex paint maintains its mechanical adhesion through dimensional changes of the wood during wet and dry moisture cycles. For this reason,

LONGEVITY OF EXTERIOR FINISHES

Finish	On Planed Smooth WRC		On Textured WRC	
	Suitability	Expected Life (yrs)	Suitability	Expected Life (yrs)
Paint	High	Up to 10	High	Up to 12
Solid-color stain	Moderate	3 to 5	High	4 to 6
Bleaching and weathering products	Moderate	3 to 5	High	5 to 6
Semi-transparent stain	Moderate	1 to 3	High	2 to 4
Water-repellent preservative and oil	High	1 to 2	High	1 to 2

finishes with high elasticity generally maintain adhesion better than brittle finishes during extended periods of exposure to outdoor weathering.

INTERIOR APPLICATIONS

We've learned how western red cedar is an ideal building material for exterior applications. Not only is it beautiful, but it's naturally resistant to rot, decay, and insects, making this versatile building material the perfect choice for siding, trim, soffits, and

decking. But more and more architects and homeowners are starting to appreciate cedar's stunning appearance and ability to beautify interior spaces. Western red cedar introduces warm, natural beauty into interiors and will last the lifetime of the home if cared for properly. Regardless of a room's style or size, cedar's unique look, feel, and smell can enhance the living experience in a home.

In terms of versatility, no other building material compares. Whether it's an expansive ceiling and soffit system, a feature wall, or



Western red cedar paneling is a showstopper that works well in both contemporary and traditional homes — especially when it's fanned out in a natural range of colors and used in paneling, ceilings, and soffits. The Poolhouse Addition. Architect: Propel Studio Architecture. Photography: Carlos Rafael Photography.

CASE STUDY 2

PINE STREET DUPLEX: PORTLAND, OREGON



Architect Webster Wilson tempered the modern clean lines of the Pine Street duplex by cladding it in a beautiful knotty grade of western red cedar finished with a semi-solid stain. Pine Street Duplex. Architect: Webster Wilson Architect. Photography: Caitlin Murray, Builtphoto.

When designing two homes for a client on one 50'x50' infill lot, there are some inherent restraints — especially in a dense urban area where sprawling out is not an option. The design response had to be vertical, but it also had to be warm and inviting, which as lead architect Webster Wilson explains, was no easy feat. "The biggest challenge on such a tight site was to provide high quality spaces and meet the program for two separate family units, but also maintain privacy from each other and other neighbors," says Wilson. "The result is a 4-story wood structure, with the units separated by a green roof 'canyon,' and carefully crafted and choreographed fenestration locations."

Wilson tempered the modern clean lines of the duplex by cladding it in a beautiful knotty grade of western red cedar finished with a semi-solid stain. "There is a lovely texture and unique character that comes with a knotty grade, which also happens to still be cost-effective," says the award-winning architect. "There is visual interest up close, so the building is not just appreciated from across the street. Wood siding in general, evokes the tangible craftsmanship and timeless connection to the past and nature, that you can never get with machined metals or cement boards."

exposed posts and beams, bringing cedar inside is the best way to add visual appeal and create a greater connection to nature.

PANELING

Nothing enriches a home's interior quite like tongue-and-groove paneling. Whether it's just one dramatic feature wall in a strikingly modern setting or an entire room with rustic charm, tongue-and-groove paneling, feature walls, and room dividers will elevate the beauty and vivacity of the living space. Like all cedar products, tongue-and-groove is incredibly versatile. For example, you can specify tongue-and-groove paneling with a rough face for a more textured look or smooth face for a more polished look. The pieces can be joined with V-shaped, flush, reveal, or radial joinery and the desired shadowing effect can be achieved by combining one of these joinery techniques with select surface textures.

CEILING AND SOFFITS

As for ceilings, western red cedar paneling is a showstopper that works well in both contemporary and traditional homes – especially when it's fanned out in a natural range of colors. Cedar beams with a hint of wrought iron can infuse an urban edge, while cedar soffits can carry from the exterior to the interior for a look that connects the indoors to the out.

INTERIOR FINISH OPTIONS

Western Red Cedar used indoors for paneling, posts, beams, and joinery requires less protection than exterior siding, trim, and soffits and consequently different types of finishes are used. The exception to this general rule is when the western red cedar may be subjected to high moisture levels, for example in bathrooms. In such situations, finishes should have excellent water-repellency properties.

For all other interior cedar applications, most homeowners simply want to retain and enhance the wood's natural appearance. This is best achieved using transparent finishes such as waxes, shellac and other clear finishes. These "interior" finishes provide some protection to the cedar from minor abrasion and liquids (less so with wax) and make cleaning easier.

Western red cedar used indoors can also be coated with a variety of finishes such

CASE STUDY 3

BIGWIN ISLAND CLUB CABINS: BAYSVILLE, ONTARIO, CANADA

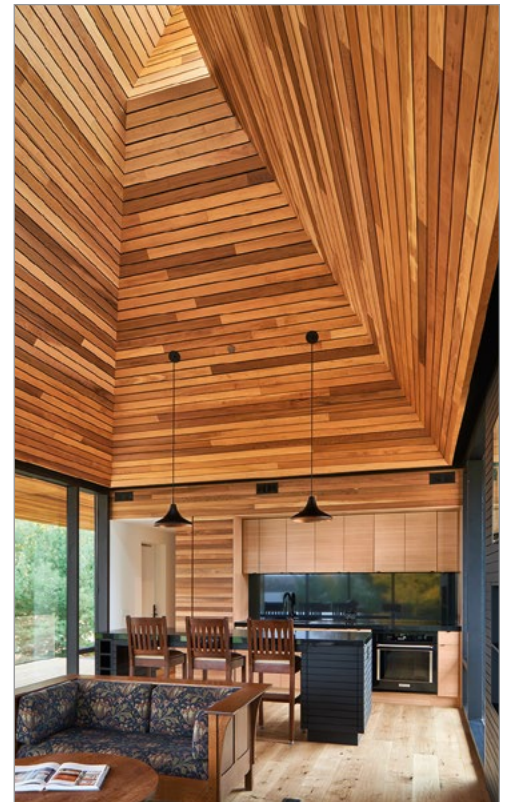
MacKay-Lyons Sweetapple Architects beat out five other firms with their proposal for this standout golf course project on an island in the middle of a lake in the Muskoka region, on the Canadian Shield landscape. Their award-winning design uses a modernist stylistic vocabulary to express archetypal concepts. The exterior is understated, and the interior is sensuously dramatic, airy, and gracious. The main living space of each exquisitely crafted pavilion rises to a showstopping peak and is naturally lit from above via a periscope window in the gable. The bedrooms and bathrooms — two of each — are spare and elegant.

To enhance a seamless connection between indoors and out, western red cedar with a transparent latex stain was used throughout the cabins. Inside, they used nature's most versatile material on the ceiling, walls, cabinets, bedbox and hearth. Outside, each cabin is clad in cedar shiplap and topped with a distinguished monolithic, cedar-shingled roof. No strangers to WRC's beauty and superior performance in harsh weather, MacKay-Lyons Sweetapple Architects knew they found the right building material for the job.

"We chose Western Red Cedar for its natural, warm appearance, its aromatic characteristics as well as its durability; to stand up to the demanding climate of their location," explains lead architect Brian MacKay-Lyons. "We often use natural materials such as western red cedar to create a connection with the surrounding landscape."

as bleach, oils, semi-transparent and solid body stains, and opaque finishes that can be used to change the wood's appearance to complement a decorative theme. Note: Always ensure that the coating is recommended for interior use.

The rich beauty of western red cedar's natural color can be enhanced or modified by applying any number of commercial finishes. If left in its natural state, some darkening of the wood can be expected as it ages and the color variation will become less pronounced. Application of some transparent finishes will also darken western red cedar to some degree, but they form a protective coating that is easier to maintain.



The main living space of each exquisitely crafted pavilion rises to a showstopping peak; western red cedar with a transparent latex stain was used throughout the cabins to enhance a seamless connection between indoors and out. Bigwin Island Club Cabins. Architect: MacKay-Lyons Sweetapple Architects. Photography: Doublespace Photography.

CLEAR WAX

Clear wax is a finish option for smooth surfaced cedar. Few finishes bring out its inner luster so well. There are also unpigmented liquid waxes on the market that incorporate a penetrating vehicle.

CLEAR FINISHES

Clear finishes or water-based acrylic, polyurethane, or acrylic/polyurethanes can be brushed on to produce a non-yellowing coating that does not mask the natural appearance of cedar. These finishes contain very low levels of solvents and other compounds that can reduce indoor air quality. They are available in flat (matte), satin (semi-



Charcoal noir is a very popular look for siding and was traditionally done by charring the wood, a technique used in Japan called Shou Sugi Ban. Ruby Ridge House. Architect: Condon Scott Architects. Photography: Simon Devitt.

A NOTE ABOUT VOC REGULATIONS

Volatile organic compounds (VOCs) are chemicals emitted as gases from certain solids and liquids, including architectural finishes. VOCs are a cause of ground-level air pollution and indoor air pollution, which can adversely impact the health of building occupants. In the United States, the Environmental Protection Agency (EPA) regulates emissions of VOCs to the outdoors primarily to prevent the formation of ozone, a constituent of photochemical smog. They also limit the amount of volatile organic compounds that manufacturers and importers of architectural coatings can put into their products. But some states and regions have implemented more stringent rules to lower VOC emissions and therefore have stricter standards for VOC limits than those set by the Federal government.⁷ This is important because air quality concerns vary across the nation, with urban areas needing more stringent control of emissions. Regulatory agencies on the west coast, such as the California Air Resources Board (CARB) and the South Coast Air Quality Management District (SCAQMD), set the gold standard for aggressive VOC content limits.⁸ The Ozone Transport Commission (OTC) targets solutions to the ground-level ozone problem in the Northeast and Mid-Atlantic region.⁹

gloss), and gloss finishes from a number of manufacturers. When choosing a brand, it is important to specify a non-yellowing formula unless an amber tint is preferred. High-gloss polyurethanes provide the most durable finish, but the highly reflective surface may be objectionable to some. These products are not suitable for exterior use.

OILS

Oils such as Danish oil, tung oil, and boiled linseed oil are widely available and easily applied to smooth or textured western red cedar. However, they tend to darken the wood and should be tested on a sample before final application.

STAIN

Finally, all three types of stain—transparent, semi-transparent, and opaque—may be used indoors (if approved by the manufacturer) to provide decorative color accent. Since there is less need for protection, lightly pigmented products usually provide the required tone without hiding the natural grain of the wood. One brushed coat is normally sufficient.

SURFACE PREP

For optimal results, western red cedar needs to acclimate to the humidity conditions of the indoor space before installation. This will enable the cedar to achieve equilibrium moisture content with its surroundings. This is important because western red cedar is a natural material and as such tends to react to the humidity content of a new environment

either by shrinking or swelling. Typically speaking, kiln dried clear cedar will take 3 to 5 days, dry knotty cedar will take 7 to 10 days and green (unseasoned) cedar will take at least 30 days to acclimate.

Depending on its texture, cedar wood may require a light sanding with fine-grit sandpaper to remove any minor surface characteristics. It's also good practice to experiment with the proposed finish on a small sample of wood identical to the product to be finished. This will ensure that the coating will achieve the desired effect. Once a choice has been made about the finish, the same brand name should be used throughout to avoid incompatible formulations and color inconsistencies.

FACTORY PRIMING AND FINISHING

For optimum performance, it is recommended that western red cedar is pre-primed or pre-finished prior to job site delivery. Factory-priming, as the name implies, is performed in an industrial setting where a machine coating process applies a coating to all six sides of each board. The coated boards are then dried prior to shipment to the job sites. Factory-finishing is similar to the above process, but it allows for the additional application of one or two topcoats of acrylic latex paint, solid stains, or natural stains in job lot quantities and in the colors selected by the builder/homeowner. In certain cases, warranties on the finish may be available if factory applied—15 years on two-coat and 25 years on three-coat system (one coat primer, two top coats).

Properly done, factory priming/finishing provides:

- The application of a uniform coating at the recommended coverage of the primer/stain to all six surfaces of each piece (face, back, edges, and ends)
- A controlled environment to permit proper curing of the finish
- The wood with a coating to protect it from exposure to sunlight (UV degradation) and surface contamination by mildew and dirt
- An elimination of lap marks, streaks, and shrink lines after installation
- An ability to install products at any time of the year
- A product that often comes with a coating warranty

ON-SITE FINISHING

The surface condition of the wood on which the finish is applied can substantially affect the performance and life expectancy of the finish. New (not weathered) cedar siding and trim should be protected from the weather before, during, and after construction. It is seldom necessary to carry out extensive surface preparation providing the wood has not weathered for more than two weeks and is clean and dry. The moisture content should always be checked as a precaution. The moisture content cannot be above 20% and if the wood has been contaminated by dirt, oil, or other foreign substances, the contaminants must be removed. For smooth-planed, flat-grained cedar, some surface preparation may be desirable. On flat-grained wood, the surface should be scuff-sanded with 50–60 grit sandpaper. This procedure will greatly increase the coating's performance but will not detract from a smooth appearance. Surface preparation is not necessary for clean textured cedar.

Weathered cedar siding and trim that has been exposed to the elements for longer than two weeks may have a degraded surface that is unsuitable for painting. Preparing the surface by sanding, brushing (with a non-ferrous bristle brush), and washing before applying the finish is recommended.

APPLICATION TECHNIQUES FOR SIDING AND TRIM

The application of a finish on western red cedar is as important for durability and optimal performance as is the finish-substrate combination chosen for the job. Finishes can be brushed, rolled, sprayed, or applied by dipping depending on the type of finish. The application technique, the quality and quantity of finish applied, the surface condition of the substrate, and the weather conditions at the time of application can substantially influence the life expectancy of the finish. Paints are typically brushed on, while solid color stains can be applied with a brush, roller, or pad, although brush application is best. You have the option to apply semi-transparent stains by brush, spray, pad, or roller. Brushing will usually give the best penetration and performance.

CASE STUDY 4

BLUEBONNET: NORTH VANCOUVER, BRITISH COLUMBIA, CANADA

Tucked into a wedge-shaped, moderately sloping lot that backs onto a heavily treed ravine, Bluebonnet is subtle yet bold; unmistakable from the street, yet in no way ostentatious. "With this project, we struck a perfect balance of dark and light, opacity and transparency, and scale within the natural landscape," explains project lead, Mark Simone. "For the exterior cladding palette, we wanted something that would feel harmonious with the natural setting. We settled on a combination of black and clear stained shiplap cedar, punctuated with large, glazed openings and black brick accents." The effect is gorgeous, with the black stained cedar volumes bookending the façade and the clear stained cedar drawing you towards the entry. This strategic interplay of contrasting color is easy to achieve because western red cedar is pitch and resin free, which means it accepts and holds finishes beautifully. But that's not the only reason, Simone opted for nature's most versatile material. "We felt that the natural beauty of cedar was the perfect complement to the natural beauty of the forested site," he says.

To create even more texture and visual interest, Simone specified different grades. "We used KD Select Knotty and clear mixed grain with a shiplap profile throughout," he says. "Knotty cedar was suitable for the vertically oriented boards which were stained black. We liked the variation and warmth of the clear mixed grain for the clear coated horizontal boards and soffits."

"A home entirely clad in cedar is a very unique thing," concurs Simone. "Everyone who's seen it has been blown away by the final product and the response has been outstanding."



The strategic interplay of contrasting color at Bluebonnet is easy to achieve because western red cedar is pitch and resin free, which means it accepts and holds finishes beautifully. Bluebonnet. Architect: Shelter Residential Design. Photography: Sama Jim Canzian.

FINISHING TRENDS

To wrap up the course, let's explore trends in western red cedar finishing that can be used to achieve a wide variety of design aesthetics.

The Light Side

As we've discussed, you no longer have to wait years for western red cedar to achieve a silvery finish. Many clients are choosing the option of bleaching new western red cedar to achieve this sun-bleached driftwood look in no time at all. Once the desired color is achieved a protective topcoat is used to preserve the color.

The Dark Side

Charcoal noir is a very popular look for siding and was traditionally done by charring the wood, a technique used in Japan called

Shou Sugi Ban. According to a purveyor of authentic reproduction barnwood products, "Shou Sugi Ban is the traditional Japanese art of charring wood to create a blackened, charred finish with unique properties and characteristics. When traditionally applied, the Shou Sugi Ban process creates a layer of carbonization on the wood that offers a degree of natural resistance against water, fire, rot, and insects. This blackened surface ages with the elements, creating a stunning patina." Some companies offer Shou Sugi Ban treatments, but the charcoal look can also be achieved with ebony stains. Modern yet warm, this trend delivers the earthy quality of western red cedar with a contemporary finish. Even when it blends into the scenery, black-stained cedar siding still grabs the eye.



Black and natural siding finishes create a striking contrast in natural settings. Bluebonnet. Architect: Shelter Residential Design. Photography: Sama Jim Canzian.

A Striking Contrast

Black and natural siding finishes create a striking contrast in natural settings. Interestingly, this strategic interplay of black and natural siding finishes is easy to achieve because western red cedar is pitch and resin free, which means it accepts and holds a wide range of finishes beautifully. Designers are also using clear cedar and knotty in the same project to add visual interest, or they might specify a variety of textures.

Aged to Perfection

Western red cedar can also be aged using various techniques that create high quality contemporary finishes and rustic barn-style and old-world textures. Artificially aged products also help dissuade the use of reclaimed barnwood, which can harbor unknown chemicals and sometimes destroys historic buildings that have cultural value. The Western Red Cedar Lumber Association (WRCLA) has members that can reproduce

the aging process in a workshop environment. They start with mill-direct sustainably sourced lumber, and applying a proprietary non-toxic aging, distressing, and coloring process to create a new and wholly unique product.

Knot to be Outdone

The textured look of knotty cedar cladding and interiors enhances the symbiotic dynamic between a home's interior and exterior. Modern, knotty western red cedar ceilings add organic warmth and texture to a home, delivering a sophisticated earthiness with architectural punch. Designers are noticing the natural appeal of knotty cedar, in particular when it comes to ceilings. The knotty grade of cedar brought additional texture to the palette," Urban Design principal John Sage explained in Cedar Book 9, adding, "it grows with character as its grain, color variation, and subtle irregularity express an earthy authenticity unachievable with composite or synthetic products."

CONCLUSION

We hope you now have a better understanding of why western red cedar is prized for both exterior and interior applications and the various options for finishing the material, whether used as siding, trim, soffit, or interior ceilings and paneling. The numerous ways to finish western red cedar, from letting it naturally weather to bleaching, transparent stains, and paint, lends an incredible versatility to one of nature's most outstanding building materials. Thanks to these finish options, as well as a variety of textures and grades, western red cedar can be incorporated into buildings of any architectural style, from mountain rustic to thoroughly modern. ■

ABOUT THE WRITER

Paige Lozier is an experienced writer of digital and print publications, primarily within the design and construction industries. She received a Bachelor's degree in Interior Design and a Master's degree in Historic Preservation from the University of Georgia.

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