

## Installation Best Practices



Iron Woods® hardwood decking products are naturally durable and truly Green By Nature each having their own unique appearance and time tested performance values. Whichever Iron Woods® product you choose, this guide is designed to outline current best practices and installation options and is not species specific. These Best Practices are an installer's guide to superior results and satisfied customers.

### **Best Practices**

To the best of our knowledge this information is accurate: however due to the variance of products grown in nature, it is the sole responsibility of the installer to select the appropriate product for any given installation and site condition, check and follow local building codes and apply Best Practices in handling and installing Iron Woods® brand products. Installers should follow manufacturers recommended application and maintenance instructions when using proprietary finish and fastening products. To maximize the performance and beauty of Iron Woods® products please read this installation guide before you begin.

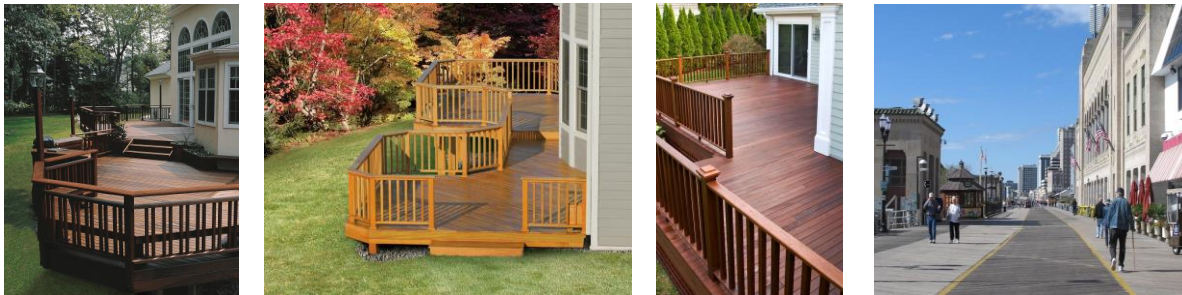
## Building Codes

Most Municipalities have adopted or included International Building and International Residential Codes into their own building codes as the benchmark for minimum standards in design and construction.



## Wood Selection

Not all wood is created equal. Species selection will have a significant impact on both the appearance and performance of any project. Select a wood species that meets the definition of “Naturally Durable” under International Building Code and International Residential Code compliance requirements like Iron Woods® Ipe, Garapa, Red Balau or Cumaru.



<u>Common Name</u>	<u>Botanical Name</u>	<u>Common/Market Names</u>	<u>Durability Class</u>	<u>IBC/IRC Compliant</u>
Ipe	Tabebuia spp (Lapacho Group)	Brazilian Walnut	1	Yes
Cumaru	Dipterix Odorata	Brazilian Teak	1	Yes
Teak	Tectona Grandis	Genuine Teak	1	Yes
Garapa	Apuleia leocarpa	Garapa Gold, Brazilian Ash	1	Yes
Balau (Dark Red)	Shorea spp	Red Balau	1	Yes
Genuine Mahogany	Swietenia macrophylla	Genuine Mahogany	2	Yes
Western Red Cedar	Thuja plicata	Cedar	2	Yes
Redwood	Sequoia spp	Redwood	2	Yes
Meranti (Dark Red)	Shorea spp	Meranti Batu, Blue Star, Mahogany	3	No
Meranti (Light Red)	Shorea spp	Duck Back, Mahogany	4	No

## Grade Selection

At Timber Holdings we believe that an informed consumer is our best customer and an educated customer is good for business. It's really very simple. We believe our customers have the right to select the quality of the products they order and that they are entitled to receive what they specify and we have an obligation to deliver quality consistent with a specified grade.

Grade selection will have a significant impact on both the appearance and performance of any project. Not all wood is created equal. Ipe is not a grade. Garapa is not a grade. The grade of the wood you use describes the quality through the designation of allowable and non-allowable characteristics including but not limited to sound and unsound defects accepted in the appearance of the lumber you buy. Iron Woods have established design values associated with our grading rules as per ASTM D 245 Allowable Design Values for Wood calculated from ASTM D143 Physical Properties Testing.

When tropical hardwoods are specified or purchased without clearly defining grade expectations, there is no assurance of the quality and consistency of the product delivered and no accountability standard set for a vendor. And since grade affects price, what looks like a good deal on paper might not look nearly as good on your project.

Timber Holdings developed and published grading rules and specification language for Architects and other specification professionals which have set the standards for over 40 years, the highest standard of which has become synonymous with the Iron Woods® brand.

*We strongly encourage specifiers and consumers to utilize these standards in their decision making process and to specifically reference these standards in their purchase orders. Consumers should not buy wood products without specifying grade requirements.*

## Grade Selection – Grading Rule Definitions

As with most natural wood products, tropical hardwoods possess natural "Appearance Characteristics" that add to their unique beauty. Those that are appreciated include color variation and distinctive grain patterns. Other characteristics in all types of lumber that develop naturally or through manufacturing are known as "Physical Characteristics", "Sound Defects", Unsound Defects and "Milling Defects". The following is a summary of the typical characteristics one might find in a wood grade specification.

<p><b><u>Appearance Characteristics</u></b></p> <ol style="list-style-type: none"> <li>1) Color variation</li> <li>2) Mixed grain</li> <li>3) Drying checks</li> <li>4) Reverse Grain (Un-torn)</li> <li>5) Birdseye</li> <li>6) Pin knots</li> <li>7) Water stain</li> <li>8) Discoloration</li> <li>9) Sticker marks</li> <li>10) Molder knife marks</li> </ol>	<p><b><u>Physical Characteristics</u></b></p> <ol style="list-style-type: none"> <li>1) Bow</li> <li>2) Crook</li> <li>3) Cup</li> <li>4) Twist</li> </ol> <p><b><u>Milling Defects</u></b></p> <ol style="list-style-type: none"> <li>1) Skip</li> <li>2) Torn grain</li> <li>3) Non-compliant profiling</li> </ol>	<p><b><u>Sound Defects</u></b></p> <ol style="list-style-type: none"> <li>1) Pin holes</li> <li>2) Sound knots</li> </ol> <p><b><u>Unsound Defects</u></b></p> <ol style="list-style-type: none"> <li>1) Large borer holes</li> <li>2) Splits</li> <li>3) Unsound knots</li> <li>4) Shake</li> <li>5) Sapwood</li> </ol>
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## FAS (First and Seconds) – Mill Run Grade

FAS represents the standard market export grade produced by the mills and offered by many importers and is typically Un-inspected. First and Seconds ratio is undefined. It is not uncommon to hear FAS qualities described as **Prime, #1, Select, First Quality** in the open market. These terms mean nothing if not backed up by clearly defined grading rules.

Include - Appearance Characteristics.

Include - Physical Characteristics which can be removed using normal installation methods, tools, or sanding.

Include - Sound Defects

Include - Unsound Defects

Include - Milling Defects.

For Structural Application – Not Allowed...knots bigger than  $\frac{3}{4}$ " at narrow face or edges, centerline knots bigger than 1-3/4" at wide face, edge knots bigger than  $\frac{3}{4}$ " at wide face, Maximum permitted slope of grain 1" in 6", length of end split and surface split shall be as per ASTM D245 (5.4.3)



The image to the left represents what is visually allowable and what you might receive within an FAS grade. As there are no specific grading rules and no first to second quality ratio percentage requirements, inconsistency is the general rule.

In the absence of industry standards for the grading of tropical hardwood decking, Timber Holdings established our own grading rules which have become synonymous with the Iron Woods brand.

Iron Woods Premium Select Architectural Grade



IRON WOODS PREMIUM SELECT- *Architectural Grade ... Hand Selected for Special Appearance on 4 Sides and 4 Edges.*

Grading Face, Back Face, and Edges – Clear of Open Heart, Clear of Sapwood

Include - Appearance Characteristics.

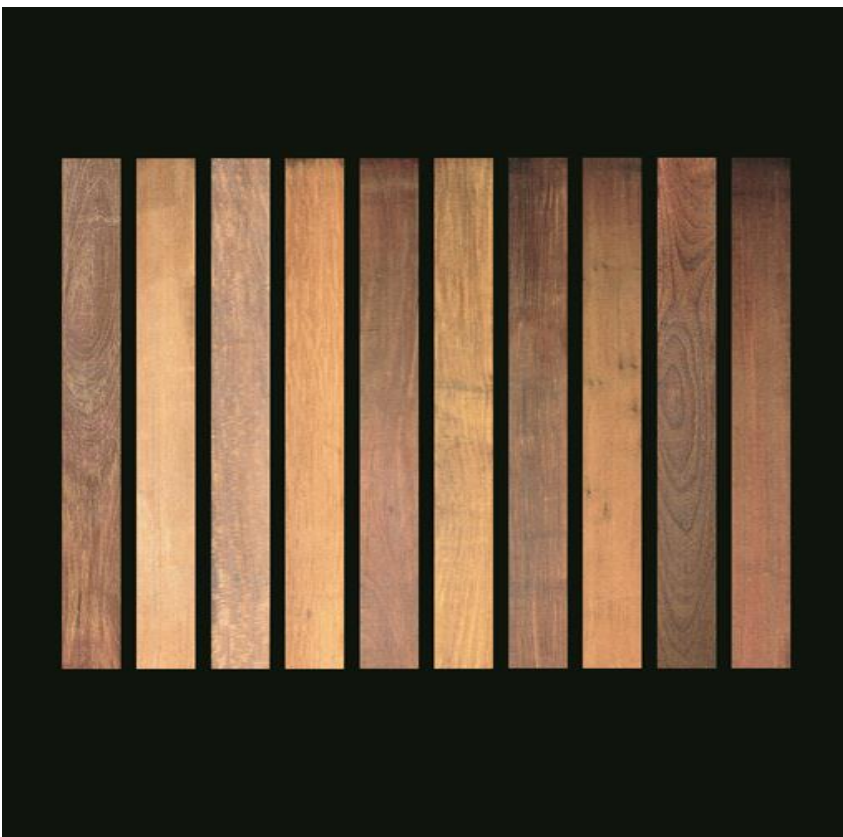
Include - Physical Characteristics which can be removed using normal installation methods, tools, or sanding.

Exclude - Sound Defects

Exclude - Unsound Defects

Exclude - Milling Defects.

For Structural Application – Not Allowed...pin knots bigger than ½" at any face and/or edge, Maximum permitted slope of grain 1" in 10", length of end split and surface split shall be as per ASTM D245 (5.4.3)



This image gives a general idea of the appearance that can be expected in Iron Woods Premium Select Architectural Grade. Graded for premium visual appearance on 4 faces and 4 edges.

**Timber Holdings FEQ Commercial Grade**



**TIMBER HOLDINGS FEQ (First Export Quality) - Commercial Grade...Free of Heart Center, Free of Sapwood on 1 Face and 2 Edges.**

Include - Appearance Characteristics

Include - Physical Characteristics that can be removed using normal installation methods, tools, or sanding.

Include - Sound Defects

**Grading Face – Clear All Heart:**

Exclude - Unsound Defects

Exclude - Milling Defects

**Back Face and Edges:**

Include – Unsound Defects

Include – Milling Defects

For Structural Application – Not Allowed...knots bigger than 3/4" at narrow face or edges, centerline knots bigger than 1-3/4" at wide face, edge knots bigger than 3/4" at wide face, Maximum permitted slope of grain 1" in 8", length of end split and surface split shall be as per ASTM D245 (5.4.3)



This image gives a general idea of the appearance that can be expected in Iron Woods FEQ Grade. Graded for consistency and a serviceable visual appearance on 1 faces and 2 edges. Second Quality boards with non-allowable defects on both faces are completely removed during the grading process.

**GRADE NOTES**

**AD** - Lumber is air dried to have moisture content of 18% and higher.

**KD** - Lumber will be kiln dried to have moisture content of 12-14%.

**SUBGRADE ALLOWANCES** – Industry standards allow for any grade to include up to 5 percent of the next lower grade to be included in any volume supplied to allow for human error in the grading process.

**Color and Grain Variation**

Color and Grain Variation is typical of materials created by nature and recognized as part of the beauty that sets natural products apart from manufactured products. This is particularly true where wood products are concerned though some species have more or less color variation than others. This should always be considered when looking at wood samples as Iron Woods are supplied mixed grain and are not sorted for color. Some consistency in color can be achieved through either staining wood or allowing wood to weather or grey out naturally.



Example - Ipe Color Variation



Example – Ipe After Oil Application



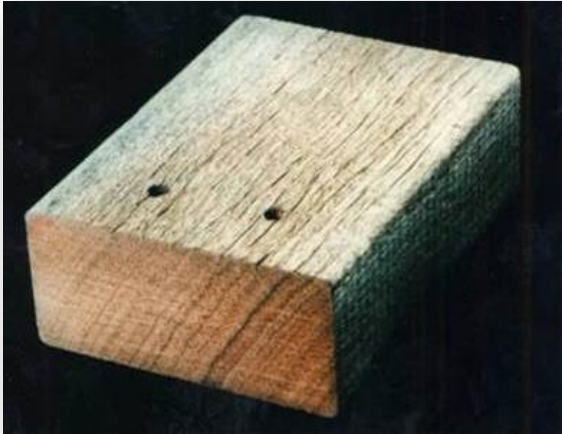
Example – Ipe Weathered Grey

**Handling and Storage / Wood Acclimation**

Iron Woods® should be stored out of direct sunlight, rain or snow, kept clean, dry and off the ground prior to installation. A moisture barrier should be placed on the ground under the Iron Woods® to prevent Water Cycle inside the packaging while stored on site. Allow Iron Woods® decking to acclimate and stabilize to equilibrium humidity levels prior to installation to reduce post installation movement.

Wood dries by movement of free water through fiber cavities, fiber walls and movement of water vapor through wood. Because wood is not homogeneous, it shrinks more along the growth rings (radial) than across the rings (tangential). Tangential (width) dimensional change is often nearly twice that of radial (thickness) movement for wood species and (longitudinal) dimensional change in wood is almost always negligible. These shrinkage variations cause drying defects like warping and checking. Shrinkage and swelling cease as the moisture content of wood approaches equilibrium to its environment. Species of wood vary in the rate and amount of shrinkage. To minimize shrinkage, warping, checking and splitting in the finished product, lumber must be acclimated to the middle of the range of expected in-use moisture content. This can occur by either air drying or kiln drying the lumber. The extent of drying defects depends on the species and the rate at which the lumber dries. For much of the United States, the point of equilibrium in an exterior environment is between 12% to 18%. For the seasonal EMC levels in your region a copy of the US Forest Products Laboratories document titled, "Equilibrium Moisture Content of Wood in Outdoor Locations" is available in our pdf library.

Surface checking is a normal characteristic of all wood decking though much more limited in hardwood decking versus softwood decking as evidenced by these pictures of 25 year old Iron Woods versus 5 year old treated pine.



Larger dimensional lumber sizes and timbers may show deeper checks during the acclimation process which typically reduce once the wood reaches equilibrium. Kiln Dried Decking having been pre-acclimated tends to be less subject to checking than Air Dried Decking.

### **Kiln Dried Verses Air Dried Decking**

Kiln Drying is the method in which most wood species are stabilized by removing the free moisture in the lumber by accelerating the lumber drying process to what would be the natural ambient equilibrium moisture level of the woods service environment. As an example lumber used for flooring and indoor furnishings is typically kiln dried to a moisture content between 6% and 8% as equilibrium is typically controlled through heat and air conditioning to this range. Lumber for outdoor use is typically kiln dried to a moisture content between 12% and 18% as the natural ambient equilibrium levels in outdoor climates fall somewhere within this range. This is why virtually all wood decking species require kiln drying to create dimensional stability; with one exception...Ipe. Ipe Tabebuia spp – Lapacho group is unique as a wood species in that it is incredibly stable as it acclimates to ambient equilibrium which is why Ipe is sold as both Air Dried and Kiln Dried Decking. Ipe is very difficult to Kiln dry which is why lumber 2 inches and thicker is only available Air Dried.

Air Dried decking is packaged for export with drying sticks between layers which may or may not leave sticker marks and dirt stain on the decking. These sticker marks are normal in air dried decking and can be removed by light sanding, or by weathering over time. Kiln Dried decking is dense packed and plastic wrapped for export and as such will not be subject to sticker marks or dirt stains.





## So if Ipe is so stable why should I buy Kiln Dried Ipe Decking?

Some mills saw their own logs and process their own decking. This means that their Air Dried decking is in fact what we call green and has a moisture content typically between 30% and 40% when run to decking profile.

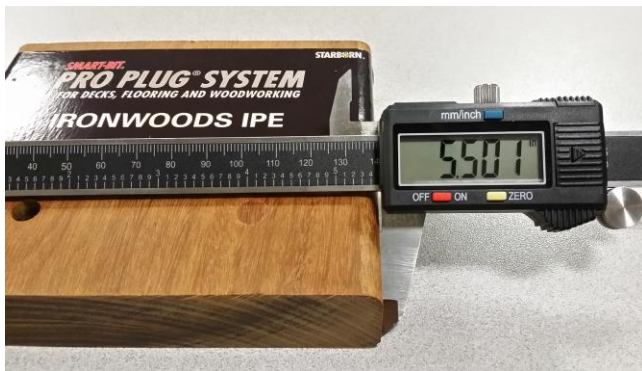
Some mills are finishing mills who buy their sawn molding blanks from a saw mill, which means their decking will be run from partially air dried lumber that could have a moisture content between 25% and 35%.

Iron Woods mills provide the option of Kiln drying the rough sawn decking blanks to 16-18 percent or pre-stabilizing the decking blank to equilibrium before molding.

As an example all three mills have run 1x6 deck board to net .75" inches in thickness and 5.5" in width.

The Kiln Dried decking has the advantage of being pre-stabilized at the top end of the equilibrium moisture content for outdoor applications. It will roughly maintain its starting thickness and width before during and after installation or experience minor shrinkage in a climate with an extremely low equilibrium.

The Air Dried decking will typically reach equilibrium after installation, the partially air dried decking shrinking less than the green decking. By experience this shrinkage runs between 1/8 and 3/8 inches in width. This is typically not a problem when face fastening Ipe but can become problematic when using hidden fastening systems. This becomes even more problematic in extremely dry climates where equilibrium may be in the 12% range. 40% to 12% is significant particularly when installed using hidden fasteners as decking may shrink beyond the clips ability to hold the decking.



Kiln Dried 1x6 Ipe Decking at 14% Equilibrium



Air Dried 1x6 Ipe Decking at 14% Equilibrium

Again, Ipe is dimensionally very stable green to dry so warp, twist, and bow are not significantly impacted by selecting Air Dried vs Kiln Dried Ipe decking. Width consistency and reduced potential for cupping are the benefits to kiln dried decking. It is important to note that Kiln Dried decking can shrink when the equilibrium on site is below 12%. It will however shrink much less than Air Dried. Kiln Dried which is dried below the equilibrium of the installation site will equally be subject to expansion at the time of installation unless the wood has been allowed to acclimate.

## Drilling

Holes should be drilled as far from the board ends as allowable to reduce end splits from over torque of screw heads. The use of high speed (2500-4000 rpm) drills that maintain consistent drilling speeds (corded) along with course open bits. Heavy duty drills (0 -1000 rpm) drills with auger style bits are recommended for heavy timber drilling.



Pro-Plug Smart Bit



Auger Bit

## Cutting End Sealing

Use carbide tipped finish cut saw blades to reduce tear. Seal all ends immediately after cutting with clear aqueous wax based end sealer in order to reduce end checking. You can typically expect to seal between 200 and 300 board ends per can.



Iron Woods – End Sealer

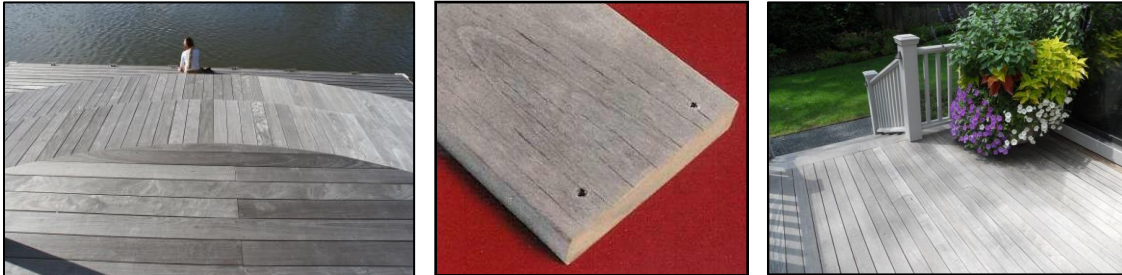
## Sanding

Removing natural characteristics like reverse, raised or torn grain as well as scratches, sticker stain, water spots, finishes or other discolorations can typically be easily removed using an orbital or belt sanders with 80 to 100 grit sand paper. You may have to try a few different grits to determine what will work best for the wood species you are sanding.



## Natural Weathering

Left unfinished or over time without cleaning and refinishing, Iron Woods® will weather naturally to a silver grey patina.



A first coat on all faces prior to installation with an oil or water based finish is not necessary but recommended even if you intend to let the deck weather. Application of even an inexpensive oil based finish slows moisture absorption and release during seasonal moisture transitions, reduces surface checking and improves stability during the initial acclimation process. This can significantly improve project outcome if you are installing air dried decking in arid dry conditions and direct sunlight. It is important to remember that you can apply water based finishes over oil based finishes but you cannot apply oil based finishes over water based finishes so make sure you take this into consideration when selecting finishes.

## Preparation, Finishing, Maintenance, Cleaning and Restoration

When specifying wood products for exterior construction it is important to have realistic appearance expectations. When used outdoors wood products will not retain the appearance associated with their use in interior applications like furniture or flooring. Wood will not hold its original color over time without cleaning and reapplication of finishes. Wood by its nature will be subject to some limited amount of natural reaction as it cannot be predicted how a natural product like wood will behave in any given environment or conditions.

## New Deck Preparation

Always clean your deck using a Sodium Bicarbonate deck cleaner like Penofin Pro-Tech Cleaner to remove dirt and debris from the wood surface. Follow the deck cleaning with an application of wood brightener to remove any stains or discolorations from weathering. Oxalic Acid based wood brighteners also improve finish penetration. Make sure you allow for wood to dry thoroughly before and between any and all cleaner, brightener or finish applications.



*If you are sealing to maintain the color of your deck consider using cleaners from the same manufacturer as the sealer. Caution should be exercised when using Wood Brighteners containing Oxalic Acid, and only used if the deck will be refinished after brightening. Oxalic Acid converts lignin in natural wood species to sugar and can accelerate the mold process if left raw after cleaning.*

## Finishing

To maintain natural color use high quality oil based outdoor finishes with UV inhibitor, fungicide and pigmented tint. Test finishes on decking to determine their compatibility and appearance. Before application, brush and clean decking surfaces to remove dirt, dust and other airborne contaminants. Iron Woods® are dense, so apply thin coats allowing each coat to dry thoroughly or a sticky surface may result. Decking, pre-finished with a First Coat, may or may not, be available in your market. Check with your local dealer for availability of this service. Grain, density and moisture content can all affect finishing. Every piece of wood will accept finish differently, even pieces from the same tree. Sampling finishes is always recommended prior to full application. Timber Holdings does not warrant the performance of finishes. Warranties if available are the responsibility of the finish manufacturer.



## Finished Deck Maintenance and Weathering

Periodically cleaning and reapplication of finish (as needed), will enhance the appearance of your deck. The lowest maintenance approach we have found for maintaining finished decks is to treat them like you would a piece of furniture in your home. Simply clean your deck when it is dirty and wipe-on wipe-off a fresh coat of finish before the finish deteriorates from UV exposure and the greying out or other forms of discoloration begin to take place.



After

Before

## Spotting, Staining and Discoloration

From time to time we get calls asking about black spots that appear on wood decking. These spots are caused either by mold or by a reaction of iron with the natural tannic acid found in all wood.

Mold and Mildew will grow on any surface on which a food source has accumulated. This includes plastic and glass surfaces. Mold or Mildew can be cleaned with deck cleaner containing Sodium Bicarbonate.

If deck cleaners do not remove the black stains your spots are likely caused by iron reaction. Iron spots are often seen as black rings around galvanized steel or low grade stainless fasteners. Small black dots on the deck may also be caused by filings from iron railings, shingle granules, fertilizers, or any particle containing iron that sits on the deck surface.

This type of black staining on the deck can be removed with wood brighteners. Generally they are supplied in a powder or a concentrated solution form and are mixed with water. Multiple applications may be necessary to remove the stain. To prevent the problem from returning the fastener may have to be removed and replaced with a higher grade stainless steel fastener.



If you wait for the finish to deteriorate beyond the capabilities of deck cleaner and wood brighteners, all is not lost. Simply remove the old finish using a finish stripper like Penofin Pro-Tech Stripper followed by cleaner, wood brightener and oil based finish just like you did when you first installed the deck. That's the beauty of wood. It can always be restored to its original appearance. Unlike PVC or Composite decking, even under the worst possible condition, a hardwood deck can simply be sanded just like a solid wood floor and restored to just like new condition by prepping them like you would a new deck. Iron Woods® truly are "The Outdoor Hardwood Floor"



*Use extreme caution when handling any of these chemicals and wear protective clothing and glasses. Do not mix these cleaners with ammonia or household cleaners. We recommend that tests in small areas on a few different boards be made before overall use on the project. Always consult and follow the manufacturer's recommendations when using proprietary products.*

## Painting

Iron Woods are extremely difficult to paint. If your application requires painting, the use of high quality acrylic latex based paints have been reported to be the most successful.

The wood should be allowed to acclimate and dry before painting. In addition the surface should be wiped down with a fast drying solvent such as alcohol or acetone to remove surface oils and surface lapachol powders that may interfere with adhesion.

Wood is an organic material, not manufactured, with variations from board to board. When painting wood it is incumbent on the architect/engineer/designer to recognize the potential impact of the acclimation process to the appearance of the completed application. Timber Holdings makes no specific recommendations or warranties related to painting wood products. Always consult and follow the manufacturer's recommendations when using proprietary products.

## Gluing

Iron Woods® are extremely difficult to glue. It has been reported that marine grade epoxy, Polyurethane, PVA type III, and 2 part resorcinol glues have been used with some success in non-structural applications. When Gluing Iron Woods, the wood should be dry and wiped with a solvent such as alcohol or acetone to remove surface oils, dirt or other conditions that may interfere with adhesion.

- Epoxy Types: similar to "West System Epoxy" or "G-2" Epoxy"
- Polyurethane Types: similar to "Gorilla glue"
- PVA Type III; similar to "Titebond III"



Wood is an organic material, not manufactured, with variations from board to board which may impact adhesion. When gluing Iron Woods it is incumbent on the architect/engineer/designer to evaluate the potential impact of the acclimation process on glue connections and the appearance of the completed application. Timber Holdings USA makes no specific recommendations or warranties related to painting or gluing wood products. When using any type of glue we recommend that samples from different boards be made and tested before use in any application. Timber Holdings makes no specific recommendations or warranties related to gluing products. Always consult and follow the manufacturer's recommendations when using proprietary products.

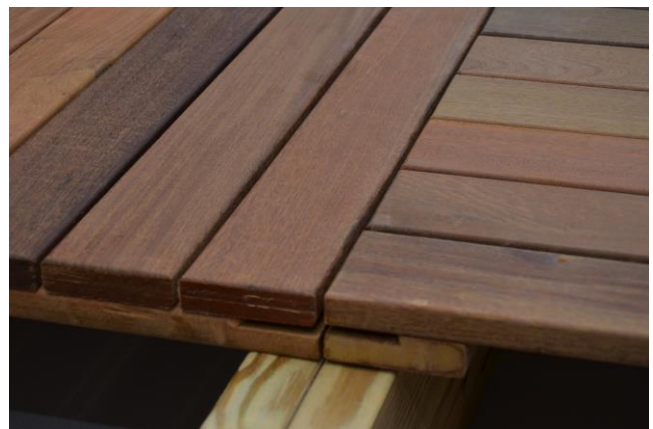
## Stringer Spacing

When deciding stringer spacing there are other issues to consider beyond allowable deck spans. A minimum of 1.5" of support under each board at butt joints is critical for proper deck to stringer connection. Providing sufficient ledge allows for fasteners to sit back  $\frac{3}{4}$ " from the butt joint or in the case of hidden fasteners allows for the proper use of two hidden fasteners properly secured through the deck boards (to prevent movement) at the but joints.



For new construction with conventional decking and hidden fasteners we recommend doubling stringers or a stringer with a sister stringer applied to provide 3" of attachment surface. Stringers can be spaced 24" on center when using even length (2' multiples) Iron Woods decking or 12" on center when using random length (1' multiples) though 16" has been the historical standard. The additional cost of a few extra pressure treated stringers or sister stringers and some extra fasteners will significantly reduce decking trim waste while increasing the service life of the decking.

For new construction utilizing Iron Woods® Elevations Deck Tiles we recommend using doubled stringers 24" on center. This system combines the cost savings benefits associated with using our prefabricated tile system (lower sq. ft. material cost), fewer fasteners (1 Pro Plugs per square ft.) with reduced labor cost and also increases the overall load capacity of the deck.



## Posts, Beams and Stringers.

When selecting sub structure materials it is important to select a material that will last as long as Iron Woods decking, Timber Holdings recommends using Iron Woods or Pressure Treated Softwoods which are rated for ground contact and preferably dried after treatment.



## Deck Spans

For residential applications, the live load requirement by most building codes is between 50 and 100 pounds per square ft. Based on this criteria Iron Woods® decking achieves minimal deflection at 16 to 24 inch stringer centers for nominal 1 inch (net .75 inch) thick decking, 24 to 36 inch stringer centers for nominal 5/4 inch (net 1 inch) thick decking, 36 to 48 inch stringer centers for nominal 2 inch (net 1.5 inch) thick decking, 48 to 72 inch stringer centers for 3 inch (net 2.5 inch) thick decking and 72 to 96 inch spans for 4 inch (net 3.5 inch) thick decking. The following span calculations indicate the maximum allowable spans based on 200 lbs of live load and 300 pounds of snow load as a “worse case” residential deck scenario.

<b>STRUCTURAL DESIGN INFORMATION - Simple Span with Snow Load</b>						
Iron Woods® Decking- IPE Species						
MODULUS OF ELASTICITY		3010000	3010000	3010000	3010000	3010000
BENDING - Allowable		3750	3750	3750	3750	3750
SHEAR - Allowable		425	425	425	425	425
SPECIES		IPE	IPE	IPE	IPE	IPE
WEIGHT PER CUBIC FOOT		75	75	75	75	75
<b>DECKING THICKNESS ( Net Inches)</b>		<b>0.75</b>	<b>1</b>	<b>1.5</b>	<b>2.5</b>	<b>3.5</b>
<b>Decking SPAN (Net Inches)</b>		<b>16</b>	<b>24</b>	<b>36</b>	<b>48</b>	<b>72</b>
DEAD LOAD-Decking		0.0326	0.0434	0.0651	0.1085	0.1519
DEAD LOAD- <i>Assumes Snow Load 300lb.</i>		2.0834	2.0834	2.0834	2.0834	2.0834
LIVE LOAD/PSF	<b>200</b>	1.3889	1.3889	1.3889	1.3889	1.3889
TOTAL LOAD	<b>W</b>	3.5048	3.5157	3.5374	3.5808	3.6242
SHEAR	<b>V</b>	28.0387	42.1883	63.6731	85.9391	130.4712
MAXIMUM MOMENT	<b>M</b>	112.1549	253.1298	573.0577	1031.2692	2348.4807
AREA	<b>A</b>	0.7500	1.0000	1.5000	2.5000	3.5000
SECTION	<b>S</b>	0.0938	0.1667	0.3750	1.0417	2.0417
INERTIA	<b>I</b>	0.0352	0.0833	0.2813	1.3021	3.5729
	<b>Fb</b>	1196.3191	1518.7788	1528.1538	990.0184	1150.2763
	<b>Fv</b>	56.0775	63.2825	63.6731	51.5635	55.9162
<b>Deflection (inches)</b>		<b>0.028</b>	<b>0.061</b>	<b>0.091</b>	<b>0.063</b>	<b>0.118</b>
		<i>Fb OKAY</i>	<i>Fb OKAY</i>	<i>Fb OKAY</i>	<i>Fb OKAY</i>	<i>Fb OKAY</i>
		<i>Fv OKAY</i>	<i>Fv OKAY</i>	<i>Fv OKAY</i>	<i>Fv OKAY</i>	<i>Fv OKAY</i>
ASHTO Standard	L/360	0.044	0.067	0.100	0.133	0.200
<b>DEFLECTION</b>		<b>OK</b>	<b>OK</b>	<b>OK</b>	<b>OK</b>	<b>OK</b>
This Span calculator is designed to assist in the specification process only and carries no warranty of fitness or liability.						
It is the responsibility of the end user to consult local building codes to verify compliance.						



## Fastening

Not all fasteners are created equal. There are many fastening options and systems available in the market today. Whatever system you chose it is important to remember that once selected liability for fastening performance shifts to the fastener company, so consider your options carefully and follow the manufacturer's instructions. The use of high quality T305 or T316 stainless steel fasteners is recommended to provide superior service life and avoid potential galvanic reaction issues related to the connection of naturally durable wood products with treated softwood substructures. If screws are to be left exposed on the face of the boards it is best to use T305 or T316 stainless on darker woods like Ipe and T316 stainless on lighter woods like Garapa to avoid staining which may result from the interaction between the natural tannins in the wood and non stainless fasteners. Regardless of the fastening system selected, performance evaluation and selection is the responsibility of the specifier or installer.

## Selecting Screw Length

The general rule of thumb is that a screw should penetrate 1.5 times the thickness of the decking into the stringer. Example: 5/4x6 decking with a net thickness of 1 inches will require a minimum screw length of 2.5 inches. Screw Diameter is typically determined by screw length, the longer the screw the larger the diameter.

## Pre-Drill, Countersink and Screw Method

Pre-drill and countersink two holes per deck stringer intersection. Install self-drilling trim head screws. Screw penetration to joist should be a minimum of 1-1/2 times the thickness of the deck board. Drilling and screwing through the face of the deck boards provides the strongest mechanical connection. It is always recommended that you pre-drill and pre counter sink the ends of the boards when using any types of system as the ends of the boards are the most susceptible to splitting. Pre-drill and countersink followed by screw application. Be sure not to over torque the screws as the head may cause the board to split. There are tools like the Smart-Bit System that prevent over countersinking and over torqueing. Typically all commercial decks are constructed using this method. The images below show one installer predrilling and countersinking followed by another installer setting screws in a two stage operation. Stainless steel fasteners are now available in color head coated to match your finished wood color or natural stainless which can be used if you intend to let the deck weather naturally.



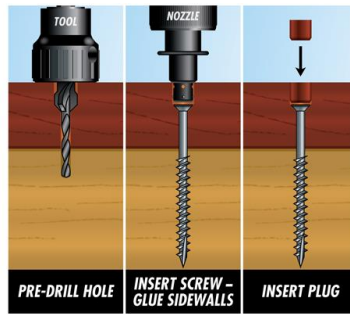
### Self-Drilling/Self-Countersinking Screw Method

Iron Woods® are very hard. The use of self-drilling, self-countersinking screws without pre drilling creates tension or pressure on the wood fibers and increases the possibility of splitting. This doesn't mean that you can't use self-drilling finish head screws... it just means that you will likely split some boards especially if you over torque the self-countersinking screw heads. There is also one collated self-drilling screw system that has had good results. The Muro™ Ejector™ Screw and Driver System. is designed to remove fiber from the hole as the screw penetrates the deck board reducing pressure on the wood fiber. Ejector™ Screws are not available with color coated heads.



### Drill, Screw and Plug Method

Drill, screw and plug has all the mechanical benefits of the drill and screw method, however the countersinks are deeper to allow the application of a wood plug and adhesive to cover the screw head. Typically used in wood boat construction this method offers a unique appearance. Drill Screw and Plug systems like Starborn™ Pro Plug™ provide the drill bits and plugs in a system that facilitates quick installation.



## Deck Clips

Typically referred to as hidden fasteners, this method requires either grooving or biscuit cutting the decking down the side of the board. Good results have been seen with the Eb-Ty Premium in 3/32" and 1/4" spacing options.

This method creates a mechanical connection between the deck and stringer. Avoid hidden fastening systems that do not require some kind of mechanical connection between decking and stringer as such systems allow decking to shift creating irregular and inconsistent deck spacing and end matching.

Pre-drilling is required. It is important to understand that hidden fasteners are not completely hidden. You will see the fastener and screw head between the boards. We recommend the use of Kiln Dried 5/4x4 or 5/4x6 decking when using hidden fasteners to reduce the shrinkage and visibility of fasteners that may occur if the wood has not been fully equalized prior to installation.



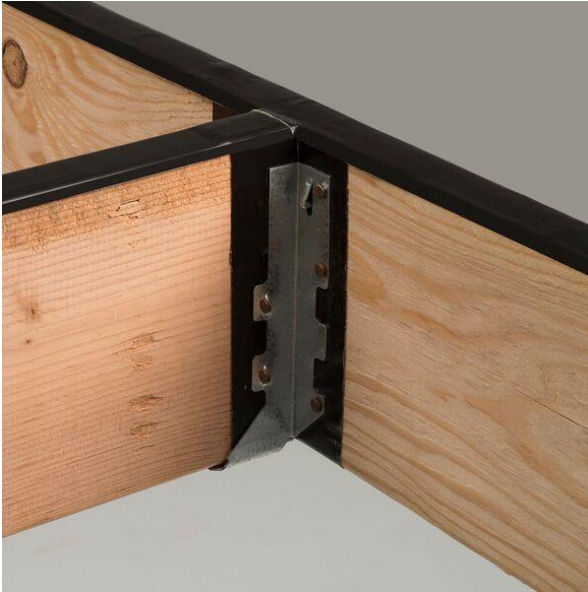
## Bow Removal

Bow is a natural characteristic of wood decking and can easily be removed during the decking installation process with the use of a deck wrench.



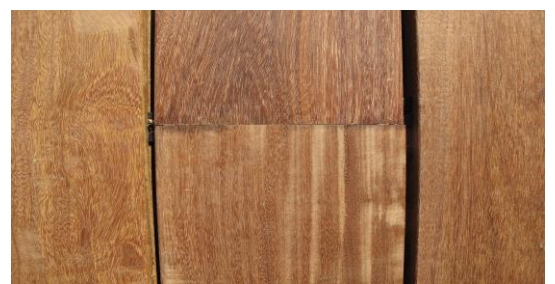
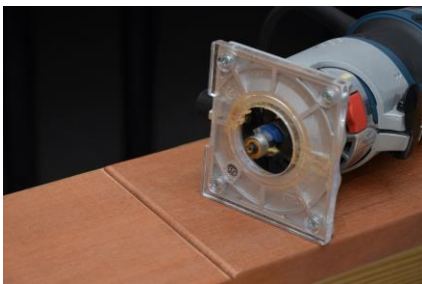
### Ledger Joist and Stringer Flashing

Apply ledger joist and stringer flashing/membrane tape to eliminate the harboring of moisture at wood contact points and corrosive reaction between treated stringers and joist hangers. Follow manufacturer's instructions for product selection and application techniques.



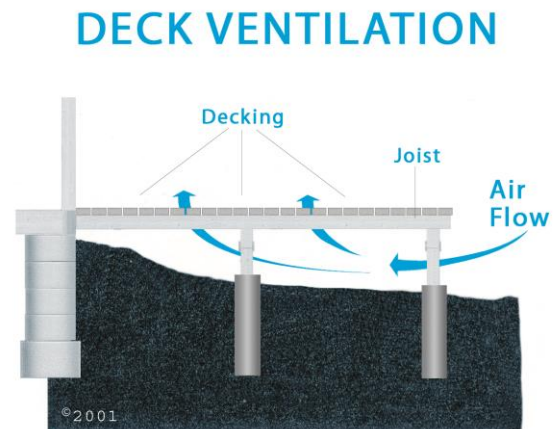
### End Matching and Butt Joints

For the best appearance we recommend routing the board ends with a 1/8" radius. It prevents a hard edge from developing where the boards butt, similar to engineered wood flooring. Taking it one step further we have also seen contractors use biscuits or dowels to eliminate any potential for movement at the butt joints. When using hidden fasteners with or without biscuits or dowels double up the clips at butt joints to make sure a mechanical connection is achieved between both pieces of decking to the stringers to maintain consistent gapping and prevent shifting as shown below right. Butt joints, either face or blind fastened, need to be blocked by adding a sister joist or double stringer. This allows for proper fastener placement and avoids placement of fasteners too close to a butt joint which occurs when attempting to attach both boards to a single joist.



## Deck Ventilation

The importance of ventilation and air flow under and around wood decking in improving product stability and performance has been well understood. Adequate ventilation of the deck is essential for long term stability, durability and to minimize cupping. Air should always be allowed to flow freely from outside and under the deck. Air Dried decking is typically delivered with a moisture content between 18% and 25% and is more prone to contraction immediately after installation if equalization has not been fully achieved. Air Dried decking may shrink up to 1/8" on 4" face and 1/4" on 6" face depending on the moisture content at time of installation, climate and site conditions. Iron Woods® Kiln Dried Decking is pre-stabilized to a moisture content typically between 14 and 18% which results in minimal shrinkage or expansion. Decking which is over dried to a moisture content under 12% will have the potential to expand and buckle so make sure you allow your decking to acclimate prior to installation. Assuming decking has been allowed to stabilize, allow gaps of between 1/8 and 1/4 inch to allow for drainage, airflow and expansion and contraction. These gaps are typically set automatically with hidden fastener systems. Face fastening systems usually provide an appropriate gapping tool. Follow manufacturer's instructions for fastener selection and applications. The importance of managing water cannot be overlooked. Roof water should be directed away from decks and water should shed out from underneath the deck and not be allowed to accumulate. Drainage should be addressed prior to joist installation.



By Experience we know that most deck claims have the following issues in common as per the image of the deck above..

- 6" wide Deck Boards - 1x6 decking is more problematic than 5/4x6 decking. Air dried decking is more problematic than kiln dried decking.
- Hidden Fasteners - . Hidden fastening is more problematic than face fastening.
- Poor Ventilation - Close to grade, Cclosed perimeter and roof decks are by nature poorly ventilated.
- Shared stringer at Butt Joints – Not enough room to put one clip on each board at butt joints. Face fasteners too close to ends equals reduced holding power and end splitting.

## Poor Ventilation Solutions

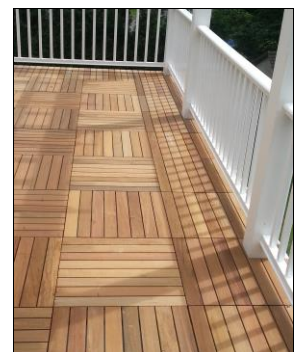
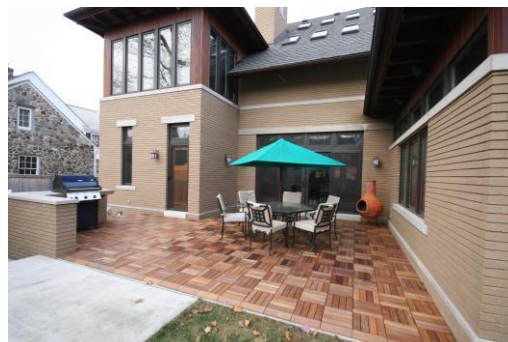
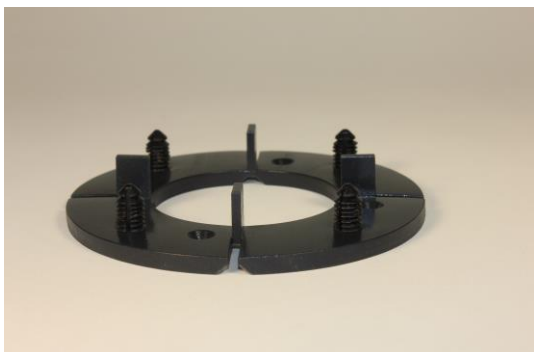
The stress that high moisture under a deck combined with the impact of sun and heat to the surface of a deck causes stress that can result in increased checking, cup and twist. This being said there are applications that simply cannot avoid the reduction of ventilation by design. Decks at grade or on roofs are not that uncommon, so how do we reduce problems in these applications.

First off it is important to understand that dimensional stability is directly related to decking thickness and width ratios. Instability increases as the board widens related to its thickness. As an example a 1x4 is more stable than a 1x6 and a 1x6 is much more stable than a 1x12. By experience we know that a 5/4x4 deck board, air dried or kiln dried, provides the most stable performance in poorly ventilated residential decks regardless of the fastening method



You may also wish to consider products such as Iron Woods® Roof Deck Tile, Decking and Pedestal Systems which are specifically designed for less well ventilated applications. Our roof deck systems were developed specifically for poorly ventilated commercial and residential deck construction. They are constructed of wood slats that have a stable thickness to width ratio. The use of shorter length components provides a highly cost effective and unique deck construction option.

**Iron Woods®** Commercial Grade Heavy Duty Deck Tile system available in 12"x12", 24"x24", 24"x48" and 24"x72" allows for drainage and can be applied directly to any flat surface using our Elevations EPDM pedestals. If you want to build a deck literally at grade, a cost effective solution is to pour a concrete slab and apply these tiles directly on top.



Iron Woods® Commercial Grade Elevations™ 24" x 24" Deck Tiles are another great option when building a poorly ventilated deck. They can be set on low profile EPDM rubber pedestals directly on a flat surface, attached to pressure treated landscape timbers set into the ground or installed using our slope compensating pedestal systems for roof applications.



Iron Woods® Elevations™ 24" x 24" Deck Tiles are a great option for conventionally constructed decks as well. Simply double your stringers 24" on center and fasten down at the corners with 4 Pro Plugs™ per tile. Iron Woods® deck tiles provide a unique appearance while at the same time significantly lowering overall construction costs. Deck tiles can be installed to create a wide range of designs and patterns.



Timber Holdings USA does not assume any liability other than those outlined in Iron Woods® product warranties. Finishing, cutting, drilling or installation of the product always confirms acceptability of material quality on the part of the installer at time of installation.

**Don't forget to check out the entire Iron Woods® family of products.**

Ipe Decking – Garapa Decking – Red Balau Decking – Vanish Rain Screen™ - Siding and Cladding – Porch Flooring – Ipe Deck Tiles – Roof Deck Systems – Hand Rail – Bridge Decking – Posts – Heavy Timbers.



## Environmental

An environmentally superior alternative to Treated Wood, PVC or Composites... products carrying the 'Green By Nature™ 'Build with Conscience' Certificate of Compliance meet a specific set of Controlled Wood, Chain of Custody, Life Cycle Impact and Due Diligence Standards, Policies and Procedures that support environmental sustainability initiatives as follows....

All Iron Woods® products have been third party NGO verified of legal origin and compliance as being, legally harvested, transported, exported, imported and documented in compliance with all country of origin, international and domestic laws, rules, regulations and treaties pertaining to the fair and legal trade of forest products including but not limited to the U.S. Department of Agriculture Lacey Act, ITTA (International Tropical Timber Trade Agreement), CITES (Convention On The International Trade of Endangered Species), and U.S. Buy American Act.

All Iron Woods® products are derived from forests which are naturally occurring, renewable and sustainable and are not harvested from forests or forest plantations where traditional or civil rights have been violated, forests having high conservation values which are threatened, forests that have been genetically modified or forests which have been converted to non-forest use.

All Iron Woods® products are 100% organic and grown without the use of chemical fertilization and are regenerated naturally or by seeding and replanting. The natural service life of Iron Woods®, exceed their natural growth cycle, trap and store carbon and are able to be reclaimed, reused or recycled. Iron Woods® do not require for service any petroleum based or inorganic chemical treatments adhesives or coatings. Iron Woods® do not require for service any specialized handling storage or disposal procedures and generate zero post-industrial or post-consumer non-biodegradable waste. Iron Woods® are also safe for human and animal contact, meet Low VOC emission standards and meet International Building Code and International Residential Code requirements for naturally durable wood.