

Installation Best Practices



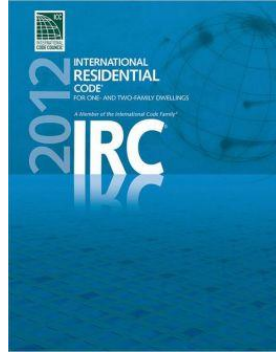
Iron Woods® hardwood decking products are naturally durable and truly Green By Nature each having their own unique appearance and time tested performance values. Whichever Iron Woods® product you choose, this guide is designed to outline current best practices and installation options. The use of Best Practices is 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 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 ipe, garapa, cambara or genuine mahogany.



<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)	Iron Woods, Brazilian Walnut	1	Yes
Garapa	Apuleia leocarpa	Garapa Gold, Brazilian Ash	1	Yes
Cambara	Erisma uncinatum	Cambara, Cedrino	2	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
Balau (Red)	Shorea spp. Balau Group	Mangaris, Batu	2	Yes

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.

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 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 18% or lower.

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.

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><u>Appearance Characteristics</u></p> <ol style="list-style-type: none"> 1) Color variation 2) Mixed grain 3) Drying checks 4) Reverse Grain 5) Birdseye 6) Pin knots 7) Water stain 8) Discoloration 9) Sticker marks 10) Molder knife marks 	<p><u>Physical Characteristics</u></p> <ol style="list-style-type: none"> 1) Bow 2) Crook 3) Cup 4) Twist <p><u>Milling Defects</u></p> <ol style="list-style-type: none"> 1) Skip 2) Torn grain 3) Non-compliant profiling 	<p><u>Sound Defects</u></p> <ol style="list-style-type: none"> 1) Pin holes 2) Sound knots <p><u>Unsound Defects</u></p> <ol style="list-style-type: none"> 1) Large borer holes 2) Splits 3) Unsound knots 4) Shake 5) Sapwood
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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 uninspected. 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. In the absence of industry established and defined quality control standards for tropical hardwood decking and lumber,

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.



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.

At Timber Holdings we provide our customers with quality and consistency by controlling our quality, at the source, based upon specific grading rules;

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 All Heart:

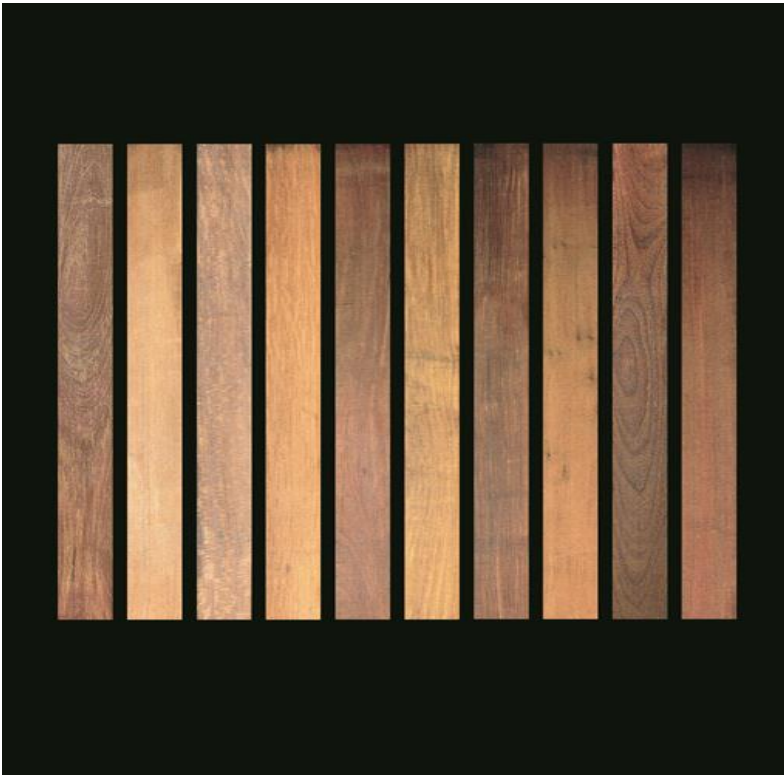
Include - Appearance Characteristics.

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

Exclude - Sound Defects

Exclude - Unsound Defects

Exclude - Milling Defects.



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...Hand Selected for Serviceable Appearance 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



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.

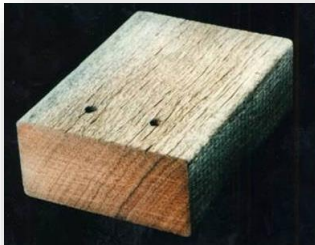
Handling and Storage

Iron Woods® are supplied as either Air Dried or Kiln Dried lumber depending on species selection and dimension and are typically used for decking and other exterior applications. Air Dried decking is packaged for export with drying sticks between layers which may or may not leave marks on the timber.



These sticker marks are normal and can be removed by light sanding, or by weathering over time. Kiln Dried decking is packaged for export dense packed and as such will not be subject to sticker marks. It is important to note that ipe as a wood species is incredibly stable green to dry which is why it is sold in both Air Dried and Kiln Dried conditions. All other naturally durable hardwood species must be kiln dried to achieve stability in residential deck dimensions.

Iron Woods® should be stored out of direct sunlight, kept clean, dry and off the ground prior to installation. Allow Iron Woods® decking to acclimate and stabilize to equilibrium humidity levels prior to installation to reduce post installation movement. Surface checking is a normal characteristic of all wood decking though much more limited in hardwood decking verses softwood decking as evidenced by these pictures of 25 year old Iron Woods verses 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.



Wood Acclimation

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 dimensional change is often nearly twice that of radial movement for most wood species and (longitudinal) dimensional change 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 consult the US Forest Products Laboratories website, www.fpl.fs.fed.us. Search for the document titled, "Equilibrium Moisture Content of Wood in Outdoor Locations".

Kiln Dried vs 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.

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 40% and 50% when run to decking profile.

Some mills are finishing mills who buy their sawn moulding 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 40%.

Some finishing 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 moulding.

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.



Kiln Dried 1x6 Ipe Decking at 16% Equilibrium



Air Dried 1x6 Ipe Decking at 16% 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 KD. Kiln Dried decking has the added benefit of being free from the sticker marks which are normal in Air Dried decking. Air Dried and Kiln Dried Ipe both service well. We leave it to our customers to determine the value between pre-installation stabilized KD or post- installation stabilized AD Ipe decking. It is important to note that KD decking can shrink when the equilibrium on site is below 16%. It will however shrink much less than AD. KD which is over dried will equally be subject to expansion if the equilibrium is higher at the time of installation.

Cutting, Drilling, Fastening

Use carbide tipped finish cut saw blades and course open bits. Seal all ends immediately after cutting with clear aqueous wax based end sealer in order to reduce end checking. 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 drills that maintain consistent drilling speeds (corded) along with course open bits. "Smart Bit and Depth Setter Driver, available from Starborn Industries, reduce furring around drilled holes and over torquing of screws. For a cleaner look consider the use of Pro Plugs, also from Starborn Industries. Auger style bits are recommended for heavy timber drilling.



End Sealing

It is recommended that an aqueous wax end sealer such as Anchor Seal™ be applied immediately after cutting to reduce end checking.



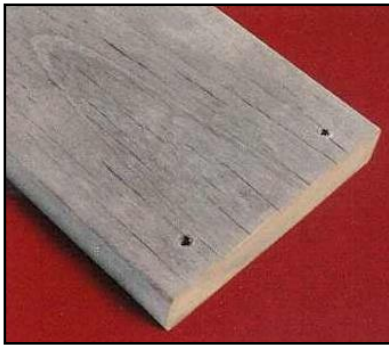
Preparation, Finishing, Maintenance, Cleaning and Restoration

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.

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.



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.

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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.



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 its 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.

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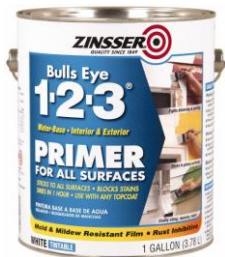
If you wait for the finish to deteriorate beyond the capabilities of deck cleaner and wood brighteners, all is not lost. Simply remove the old finish using a finish stripper like Penofin Pro-Tech Stripper followed by cleaner, wood brightener and oil based finish just like you did when you first installed 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 difficult to paint. If your project requires painting, the latex based formulas, which allow the wood to breathe, 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, dirt or other conditions that may interfere with adhesion. Use a galvanizer metal primer similar to: "Zinzer 1,2,3 Primer" or "XIM Bonder" followed by two coats of a high quality 100% acrylic latex paint.



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.

Gluing

Iron Woods® are somewhat difficult to glue. It has been reported that marine grade epoxy, Polyurethane, PVA type III, and 2 part resorcinol glues have been successfully used with success in non-structural applications. Typically, in any gluing 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. When gluing lumber it is incumbent of the Architect / Engineer / Specifier to recognize the potential impact of the acclimation process to the appearance of the completed project.

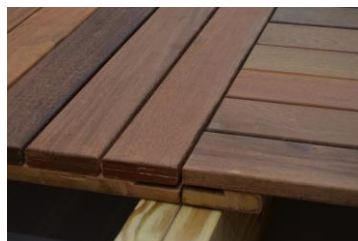
Timber Holdings USA makes no specific recommendations or warranties related to painting or gluing wood products. When using any type of glue we recommend that samples from a few different boards be made and tested before use in any project. Always consult and follow the manufacturer's recommendations when using proprietary products.

Stringer Spacing

When deciding stringer spacing there are other issues to consider beyond allowable deck spans.

For new construction with conventional decking or Elevations Deck Tiles we recommend using double stringers 24" on center. The use of double stringers allows decking to rest on a full stringer width at butt joints. For re-decking where or decks where single stringers are used 12" or 16" on center we recommend splicing a block at butt joint locations to allow decking to rest on a full stringer width at butt joints.

Note - Elevations Deck Tiles combine cost savings benefits associated with using our prefabricated deck tiles, with the labor costs associated with using a modular deck tile which requires 1 screw per square foot attachment verses the 4 to 6 screws per square foot required for conventional deck installation.



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.

STRUCTURAL DESIGN INFORMATION - Simple Span with Snow Load					
Iron Woods® Decking- IPE Species					
MODULUS OF ELASTICITY		3010000	3010000	3010000	3010000
BENDING - Allowable		3750	3750	3750	3750
SHEAR - Allowable		425	425	425	425
SPECIES		IPE	IPE	IPE	IPE
WEIGHT PER CUBIC FOOT		75	75	75	75
DECKING THICKNESS (Net Inches)		0.75	1	1.5	2.5
Decking SPAN (Net Inches)		16	24	36	48
DEAD LOAD-Decking		0.0326	0.0434	0.0651	0.1085
DEAD LOAD- <i>Assumes Snow Load 300lb.</i>		2.0834	2.0834	2.0834	2.0834
LIVE LOAD/PSF	200	1.3889	1.3889	1.3889	1.3889
TOTAL LOAD	W	3.5048	3.5157	3.5374	3.5808
SHEAR	V	28.0387	42.1883	63.6731	85.9391
MAXIMUM MOMENT	M	112.1549	253.1298	573.0577	1031.2692
AREA	A	0.7500	1.0000	1.5000	2.5000
SECTION	S	0.0938	0.1667	0.3750	1.0417
INERTIA	I	0.0352	0.0833	0.2813	1.3021
	Fb	1196.3191	1518.7788	1528.1538	990.0184
	Fv	56.0775	63.2825	63.6731	51.5635
Deflection (inches)		0.028	0.061	0.091	0.063
		<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>
ASHTO Standard	L/360	0.044	0.067	0.100	0.133
DEFLECTION		OK	OK	OK	OK

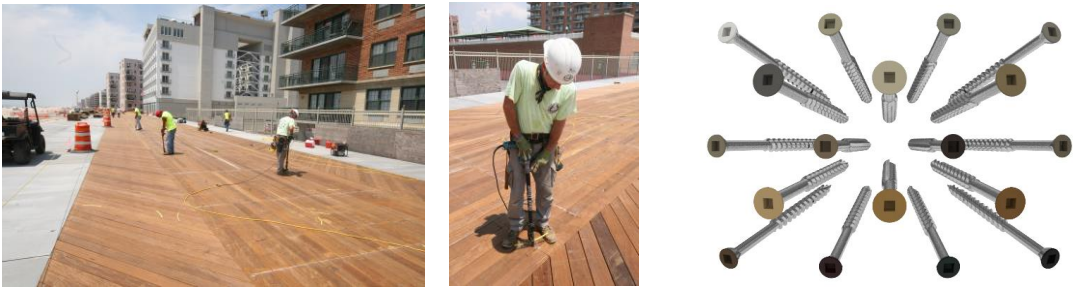
This Span calculator is designed to assist in the specification process only and carries no warranty of fitness or liability.
 It is the responsibility of the end user to consult local building codes to verify compliance.

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.

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. 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 from Starborn Industries and other manufactures in both natural stainless which can be used if you intend to let the deck weather naturally or with color coated heads to matched finished deck colors.



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. The same can happen if you over torque your screws when you do pre drill and pre counter sink. There is 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. There are many collated and non-collated self-drilling/self-countersinking screws and screw systems available to the market today. 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, though the clip can be seen between the boards, this method requires either grooving or biscuit cutting the decking down the side of the board. Good results have been seen with the Ipe Clip® Extreme4. This method creates a mechanical connection between the deck and stringer on one side of the board only. 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. For poorly ventilated decks the manufacturer suggests the use of the Extreme KD clip to provide additional ventilation.



Alternative Methods of Fastening

There are new systems entering the market each year. Some work like floor nail guns, some screw at angles through the board sides. We leave it up to the installers to determine the methods they will stake their reputations on.

Ledger Joist and Stringer Flashing

Apply ledger joist and stringer flashing/membrane 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.



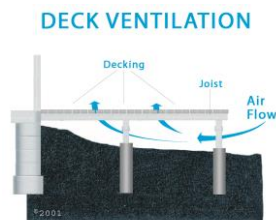
End Matching and Butt Joints

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 at butt joints to maintain consistent gapping and prevent shifting as shown below. Butt joints, either face, or blind fastened, need to be blocked by adding a sister joist allowing for proper fastener placement and to avoid 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.



Poor Ventilation Solutions, Roof Decks

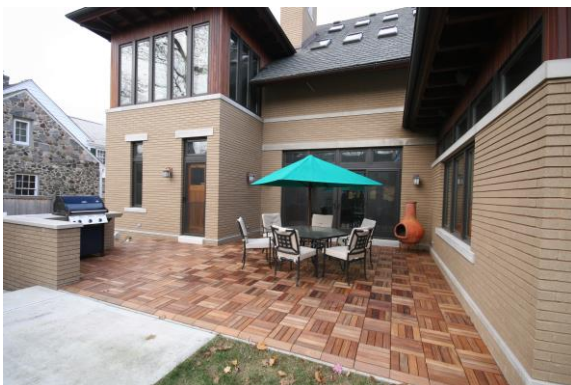
The stress that high moisture under a deck combined with the impact of sun and heat to the surface of a deck causes stress that can result in increased checking, cup and twist. This being said there are applications that simply cannot avoid the reduction of ventilation by design. Decks at grade or on 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 provides the most stable performance in poorly ventilated residential decks.



You may also wish to consider products such as Iron Woods® Deck Tiles and Iron Woods® Elevations Roof Deck Tile, Decking and Pedestal Systems which are specifically designed for less well ventilated applications. Our deck tile 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 12" x 12" Deck Tiles made of Iron Woods® slats set into plastic trays that click together and allow for drainage can be applied directly to roof or concrete surfaces. 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.

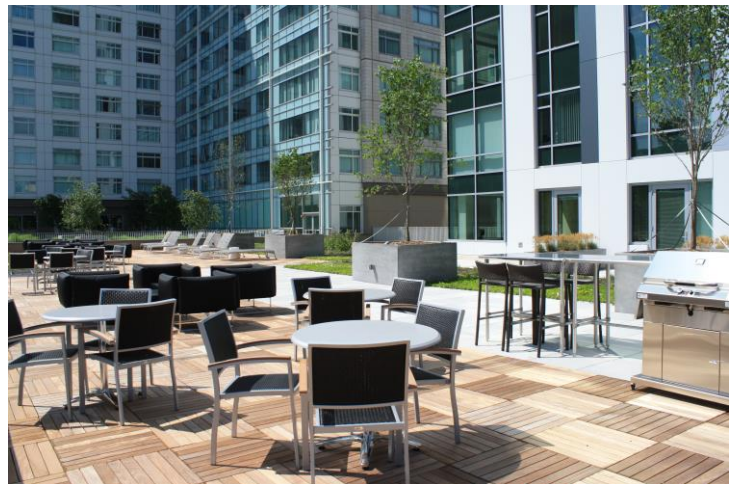


Poor Ventilation Solutions, Roof Decks

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.

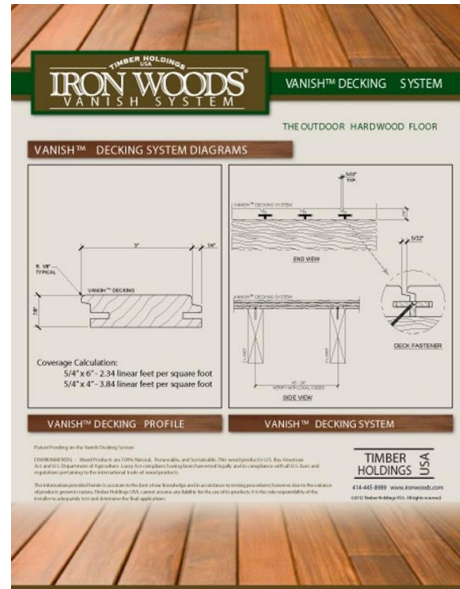
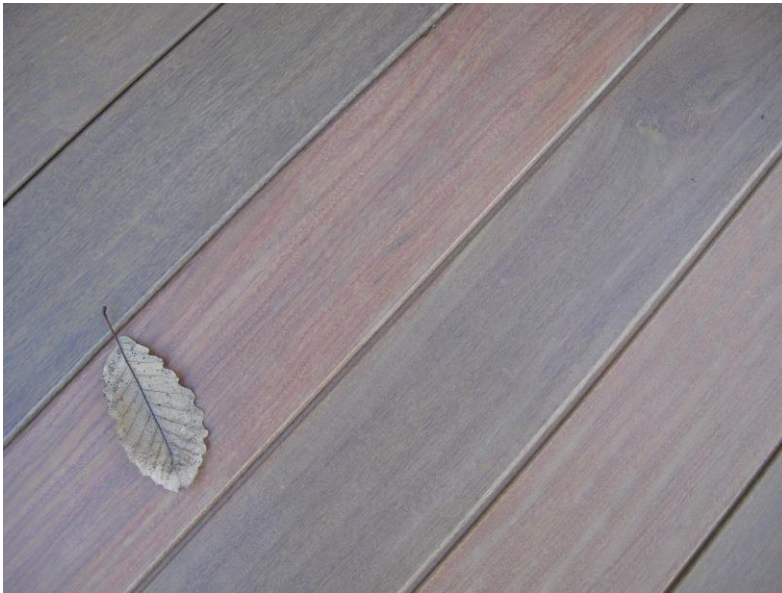


Don't forget to check out the entire Iron Woods® family of products.

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

State Of The Art

For a truly hidden fastener decking system where you don't see the fastener or the stringer between the boards you may want to consider the Iron Woods® Vanish Decking™ profile which allows for water flow and ventilation while making the clip and stringer literally vanish from view. As with Traditional side grooved hidden fastener decking, pre-drilling is required when installing clips. Kiln Dried 5/4x4 Vanish Decking truly results in an Outdoor Hardwood Floor appearance.



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.



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.



“More than just a piece of wood....Peace of Mind”