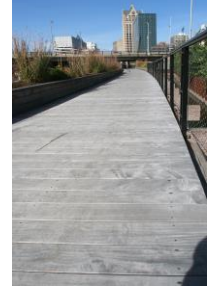
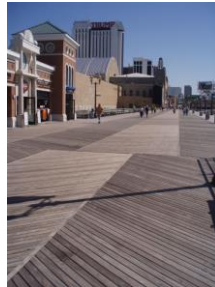


Boardwalk Bridge Pier Decking



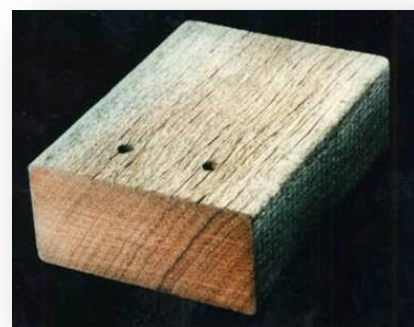
Boardwalks are an American Tradition, their look and feel standing as a sharp contrast to the concrete and pavement that make up our streets and roads. Boardwalks represent a literal bridge and natural connection between man and the environment providing access to our natural wonders while at the same time protecting and softening the landscape. Over the years little has changed in the construction of boardwalks other than an

increase in knowledge about those materials which extend their useful service life and Timber Holdings is proud to have supplied vast majority of the boardwalk decking used in the United States including but not limited to the reconstruction of the worlds most famous boardwalks post Hurricane Sandy.

The following is a summary of current materials suitable for commercial boardwalk specifications and design parameters which should be considered associated with their current availability. All of the materials discussed are readily available and certified under our comprehensive Green By Nature™ compliance program. Some of the wood species listed are available with FSC certification for LEED/USGBC based specifications. Naturally durable hardwoods have been considered the benchmark for boardwalk construction for over 40 years due to the combination of incredible structural characteristics combined with natural (chemical free) resistance to rot, wear, salt, fire, marine borer and termite attack. Additionally their performance life cycle exceeds the time it takes them to grow making them sustainable in application. To sum it up...Mother Nature Got Her Formula Right The First Time. Attempts at producing synthetic, chemically or heat enhanced products for exterior construction have to date, have not been able to produce the combined attributes associated with naturally durable hardwood products.



Treated Pine After 5 Years



Naturally Durable Hardwood After 30 Year

A recent memorandum by the U.S. Army Core of Engineers on the subject of the impracticality of Non-lpe lumber for boardwalk decking during the post Hurricane Sandy reconstruction summarized as follows;

“The purpose of this memo is to provide clear evidence and justification for the necessity of specifying lpe/Bethabara/Cumaru/Macaranduba tropical hardwood lumber species for boardwalk decking”

Additional studies by the U.S Naval Research Laboratory, US Forest Products Laboratory, Private Testing Laboratories and Independent Engineering Firms further supports the Army Core of Engineers conclusions.

A copy of these documents along with comprehensive specification language for the species discussed can be found on our website www.ironwoods.com

Ipe

Ipe – Taabeubia spp (Lapacho Group) remains the premier exterior hardwood species used in commercial decking construction having the highest natural resistance to termites and marine borers combined with a dimensional stability green to dry over any other species available.

Ipe continues to be readily available in a broad range of nominal and rough dimensions ranging from 1x4 all the way up to 4x12 and lengths up to 20', free of heart center and free of sapwood.

Residential Decking dimensions 1x4, 1x6, 5/4x4, 5/4x6 are available AD (Air Dried) 20% plus moisture content and KD (Kiln Dried) 12-18%. AD should be specified if face fastening, KD should be specified if the use of hidden fasteners is required. *** Do not specify Ipe as Kiln Dried in dimensions thicker than net 1"**

Sourcing large volumes of fixed dimensions and lengths in Ipe remains a challenge and virtually impossible in longer lengths. Designers should develop specifications that allow the use of random lengths 6' to 20' in order to facilitate reliable supply and lowest cost. Ipe may be specified in "even" length units, though "odd and even" length combinations will result in additional cost savings.

Optimal net dimensions for Ipe decking as follows:

KD .75x3.5, .75x5.5, 1x3.5, 1x5.5

AD .75x3.5, .75x5.5, 1x3.5, 1x5.5, 1.5x3.5, 1.5x5.5, 1.5x7.25, 2.5x5.5, 2.5x7.25, 2.5x11.25, 3.5x5.5, 3.5x7.25, 3.5x11.25.

Note: When specifying for poorly ventilated decks always specify greater thickness to width ratios such as 1x3.5, 1.5x3.5, 2.5x5.5, 3.5x5.5.



The supply of FSC certified Ipe is extremely limited and if available commands a price premium of at least 50%. ****We do not recommend the specification of FSC certified ipe for commercial boardwalk constructions.***

Delivery is typically starting from stock and completing with 120 -150 days subject to project volume requirements.

A partial list of projects currently using

Ipe boardwalks include... Long Beach, Atlantic City, Far Rockaway, Jones Beach, Coney Island Boardwalk, Robert Moses State Park, Avon, Freedom Park, Strawberry Plains Audubon, Swamp Creek Sanctuary Audubon, Hudson River Park, High Line, Liberty Island Ferry Concourse, Disney, Sea World, Green Bay AND Milwaukee Riverwalk.....The truth is that will find Ipe in boardwalk constructions throughout the United States and the rest of the world.

As the worlds premium boardwalk decking Ipe also commands the highest market price.

Cumaru

Cumaru (*Dipterix odorata*) continues to be readily available in a broad range of nominal and rough dimensions ranging from 1x4 all the way up to 12x12 and lengths up to 20', free of heart center and free of sapwood.

Cumaru is an excellent alternative to Ipe for commercial applications where it is not in direct contact with marine borers. Less dimensionally stable than Ipe, greater thickness to width ratios improve performance.

Residential Decking dimensions 1x4, 1x6, 5/4x4 and 5/4x6 should only be specified as KD (Kiln Dried) 12-16% to assure dimensional stability in application. ****Do not specify Cumaru as KD in dimensions thicker than net 1"***

Optimal net dimensions for decking as follows:

KD .75x3.5, 1x3.5, 1x5.5

AD 1.5x3.5, 1.5x5.5, 2.5x5.5, 2.5x7.25, 3.5x5.5, 3.5x7.25, 3.5x11.25.

Note, When specifying for poorly ventilated decks always specify greater thickness to width ratio's, such as 1x3.5, 1.5x3.5, 2.5x5.5, 3.5x5.5.

Cumaru is one wood species where it is still possible to specify large volumes of single dimensions and lengths which make it ideal for large commercial constructions. Designers are advised to develop specifications that allow the use of random lengths, 6' to 20', in order to facilitate reliable supply and lowest possible cost.

Cumaru prices typically fall 10-20% below Ipe prices.

Delivery is typically starting 60 days and completing with 120 -150 days subject to project volume requirements.

Some projects currently using Cumaru include Atlantic City, Coney Island, Beidler Forest Audubon, Absecon, Disney....This list is growing due to the price advantage associated with Cumaru.

Cumaru is available as an FSC certified product with associated price premium.

Massaranduba (Manilkara bidenata)

Massaranduba continues to be readily available in a broad range of nominal and rough dimensions ranging from 1x4 all the way up to 4x8 and lengths up to 20', free of heart center and free of sapwood.

Massaranduba is an excellent alternative to Ipe for commercial applications where it is not in direct contact with marine borers. Harder than Ipe, Massaranduba may have a higher propensity towards splitting than Ipe or Cumaru. Less dimensionally stable than Ipe, greater thickness to width ratios improve performance.

Residential Decking dimensions 1x4, 1x6, 5/4x4 and 5/4x6 should only be specified as KD (Kiln Dried) 12-14% to assure dimensional stability in application. ***Do not specify Massaranduba as KD in dimensions thicker than net 1".**

Optimal net dimensions for decking as follows:

KD 1x4, 5/4x4, 5/4x6

AD 1.5x3.5, 1.5x5.5, 1.5x7.25, 2.5x5.5, 2.5x7.25, 3.5x7.25, 3.5x11.25.

Note, When specifying for poorly ventilated decks always specify greater thickness to width ratio's such as 1x3.5, 1.5x3.5, 2.5x5.5, 3.5x5.5.

Massaranduba remains one wood species where it is still possible to source large volumes of fixed dimensions and lengths. Designers should develop specifications that allow the use of random lengths, 6' to 20', in order to facilitate reliable supply and lowest cost.

Massaranduba prices typically fall 20-30% below Ipe prices.

Delivery is typically starting 60 days and completing with 120 -150 days subject to project volume requirements.

Some projects currently using Massaranduba include Atlantic City....Massaranduba is still a relatively new species to the boardwalk market.

Massaranduba is available as an FSC certified product with associated price premium.

While not referenced in the Army Core of Engineers report there are a few other species that should be referenced and considered for Commercial Deck and Boardwalk Construction.

Greenheart

Greenheart (*Clorocardium rodiei*) has a long history in marine and boardwalk constructions, primarily as a rough sawn structural and piling material. Decking use has been more limited due to its dimensional instability. Greenheart is commonly used for piles, stringers and structural members in marine constructions due to its high resistance to marine borer attack without preservative treatment.

Greenheart is readily available in a broad range of rough dimensions ranging from 2x4 all the way up to 4x12, free of heart center and free of sapwood with lengths up to 20'

Square piling (boxed heart) is available up to 12x12 and lengths up to 20'. Round piling is available in lengths to 60'.

Greenheart as a species has a lot of tension in the fiber and is more prone than Ipe or Cumaru to movement in service and surface checking. ***When specifying greenheart you must consider that the longer the length specified the greater the chance for movement.** Because of this tension greenheart does not store well and should be installed as soon as practicable after milling. ***Greenheart Is Not Recommended For Residential Decking.**

Optimal net dimensions for Commercial decking as follows,
AD 1.5x3.5, 2.5x5.5, 3.5x7.25

Greenheart is one species where it is still possible to source large volumes in fixed dimensions and lengths but at a premium price. Designers should develop specifications that allow the use of random lengths, 6' to 20', in order to facilitate reliable supply and lowest cost. Greenheart is one of the lowest cost naturally durable hardwood species.

Delivery typically starting 60 days and completing with 120 -150 days subject project volumes.

Some projects currently using Greenheart include Fire Island Saltair Boardwalk, Brooklyn Bridge, Coney Island

Greenheart is not readily available with FSC certification.

Purpleheart

Purpleheart (Peltogyne spp) has a long history in marine and boardwalk constructions. Purpleheart is in fact the second most stable naturally durable hardwood green to dry next to ipe. Purplehearts use has only been limited by its inconsistent availability of supply and some resistance to color though purpleheart is light sensitive and will darken to deep brown and weather grey quickly.

Greenheart is readily available in a broad range of rough dimensions ranging from 2x4 all the way up to 4x12, free of heart center and free of sapwood with lengths up to 20'

Optimal net dimensions for Commercial decking as follows,
AD 1.5x3.5, 1.5x5.5, 1.5x7.25.

Purpleheart when available is typically well valued and can be sourced in fixed dimensions and lengths. Designers should develop specifications that allow the use of random lengths, 6' to 20', in order to facilitate reliable supply and lowest cost. Purpleheart is one of the lowest cost naturally durable hardwood species. Delivery typically starting 60 days and completing with 120 -150 days subject project volumes.

Some projects currently using Purpleheart include Fall River Heritage Park MA.

Purpleheart is not readily available with FSC certification.

Ekki

Ekki (*Lophira alata*) has a long history of use in marine and bridge constructions and is often specified for structural and heavy decking applications due to its availability in large and long defect free dimensions.

Ekki is readily available in a broad range of nominal and rough dimensions ranging from 2x4 all the way up to 12x12, free of heart center and free of sapwood, and lengths up to 40'.

Ekki is considered highly stable in heavy dimensions which makes it attractive for structural work. Ekki is commonly used for square piling, fenders, stringers, structural members and heavy decking in marine constructions due to its high resistance to marine borer attack without preservative treatment.

***Ekki Is Not Recommended For Residential Decking.**

Optimal net dimensions for commercial decking as follows,
2.5x5.5, 2.5x7.25, 3.5x5.5, 3.5x7.25, 5.5x11.25

Ekki is one wood species where it is still possible to secure large volumes of fixed dimensions and lengths. Designers should develop specifications that allow the use of random lengths, 6' to 20', in order to facilitate reliable supply and lowest cost.

Ekki is priced in the middle of the naturally durable hardwood category.

Delivery typically starting 90 days and completing with 120 -150 days subject to project volume requirements.

Some projects currently using Ekki include South Street Seaport, Liberty Island, New York City Transit Authority, Batavia Bridge and Peach Tree Plaza Bridge.....Ekki should always be considered where you need large dimensions and long lengths.

Ekki is available with FSC certification on a limited basis.

NON WOOD DECKING OPTIONS

Iron Woods Boardwalk HCX



Boardwalk HCX is a 'Commercial Grade Structural Composite' manufactured utilizing an up to 80% post-industrial recycled polypropylene/hardwood fiber core combined with a polypropylene cap stock.

State of the art polypropylene technology provides significant technical and performance advantages over the polyethylene or PVC based technologies used in most residential composite decking products. Polypropylene has lower electrical conductivity and heat retention than polyethylene based products.

While not quite structurally equivalent to hardwood decking, HCX can be designed in as a structural member and is structurally superior to Polyethylene based composite, PVC or RPL (recycled Plastic) decking. HCX represents an excellent alternative to tropical hardwoods where for political reasons tropical hardwoods are not desirable.



Net dimensions for decking as follows,

1-1/8"x5.5", 1.5"x3.5"

Boardwalk HCX is available in two colors; Coastal Grey and Saratoga Brown.

****Boardwalk HCX has the advantage of being produced on a custom bases against project lengths specifications in any fractional length up to 20'.*** This translates into virtually zero construction waste cost.

Boardwalk HCX is priced comparatively to naturally durable hardwoods.

Delivery typically starting 14 days and completing with 60 days subject to project volume requirements.

Some projects currently using BoardwalkHCX include the Ballast Point Pier and Disney.... Designers looking for a non wood based commercial grade boardwalk product you must consider Boardwalk HCX as the premier option.

FASTENERS

The following is a sampling of fastener specifications we have seen used in boardwalk construction.

Atlantic City - #18x4" (one per stringer connection on 2x4 deck) T305 Stainless.

Jones Beach, Robert Moses, Far Rockaway, Long Beach - #12x4" (one per stringer connection on 2x4 deck) T316 Stainless.

Fire Island Saltair - #14x4" (one per stringer connection on 2x4 deck) T305 Stainless.

Avon - #12x3" (two per stringer connection on 5/4x6 deck) T305 Stainless.

Baidler Forest #10x2.5" (two per stringer connection on 1x6 deck) T305 Stainless.

Long Beach #10x3.25" (two per stringer connection on 2x6 deck) T305 Stainless.

BlackStone River Greenway #14x6" (three per stringer connection on 3x12 deck) T305 Stainless.