



DEPARTMENT OF THE ARMY  
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS  
WANAMAKER BUILDING, 100 PENN SQUARE EAST  
PHILADELPHIA, PENNSYLVANIA 19107-3390

CENAP-EC-EM

Apr 30, 2014

MEMORANDUM FOR RECORD

SUBJECT: Impracticality of non IPE lumber for Boardwalk Decking

1. The purpose of this memo is to provide clear evidence and justification for the necessity of specifying IPE/Bethabara/Cumaru/Macaranduba tropical hardwood lumber species for Boardwalk decking.

2. The following is a list of alternatives to IPE/Bethabara/Cumaru tropical hardwood for boardwalk decking used along the Jersey Shore:

- a. Southern Yellow Pine
- b. Black Locust
- c. Heat-treated pine
- d. Lyptus
- e. Angelique
- f. Angelim Vermelho/Dinizia Excelsa
- g. Teak
- h. Greenheart
- i. Composites made from plastic bags & woodchips
- j. Textured concrete decking
- k. Recycled plastic lumber

3. Of the alternatives listed above, none have the density of the IPE/Bethabara/Cumaru tropical hardwoods from Latin America. Ipe species have thick-walled fiber cells that produce extremely dense and strong wood. The Janka hardness test, the industry standard for measuring the hardness of wood, determines the pressure required to embed a small steel ball into the surface of a wood board. At 3,680 pounds of pressure, ipe's Janka score is three and a half times greater than teak, and nearly nine times that of second-growth redwood, according to the U.S. Department of Agriculture making Ipe/Bethabara /Cumaru highly resistant to wear.

4. Of the alternatives listed above, none have the resistance to rot as the IPE/Bethabara/Cumaru tropical hardwoods from Latin America. Ipe is among the most durable lumbers on earth, with exceptional resistance to decay, rot, and insect attack. Ipe has a natural oil that keeps bugs and borers out; it is resistant to mildew and decay and unaffected by sea or salt air, making it ideal for coastal construction. In addition, Ipe is easily maintained. Ipe can be easily cleaned with a pressure washer and lightly coated with tropical deck finishes to maintain its natural appearance. Ipe can be left to naturally weather to a consistent light silver appearance. Since it contains no added harmful chemicals it can be used near any body of water without the risk of contamination.

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5. Of the alternatives listed above, none have the durability of the IPE/Bethabara/Cumaru tropical hardwoods from Latin America. As an example, IPE has typically lasted decades despite the salt air and harsh conditions along the coast. The tropical wood lasts longer than it takes to grow. Ipe lasts a minimum of 25 years in ground, although with proper maintenance above ground it can last up to a century. In contrast, southern yellow pine typically only lasts five to eight years. Also Ipe has a Class A1 fire rating; the same fire rating as concrete and steel, meaning it resists flames much longer than softer woods. Ipe also has a lower heat retention than Recycled plastics or composites, a higher resistance to screw pull out, meets ADA requirements for slip resistance, requires no chemical or heat treatments or coatings to improve durability and is safe for human and animal contact.

5. The specifications for IPE/Bethabara/Cumaru tropical hardwoods from Latin America are extremely well suited for boardwalk decking. The specifications are listed below:

**Average Dried Weight:** 69 lbs/ft<sup>3</sup> (1,100 kg/m<sup>3</sup>)

**Specific Gravity (Basic, 12% MC):** .91, 1.10

**Janka Hardness:** 3,510 lb<sub>f</sub> (15,620 N)

**Modulus of Rupture:** 25,660 lb<sub>f</sub>/in<sup>2</sup> (177.0 MPa)

**Elastic Modulus:** 3,200,000 lb<sub>f</sub>/in<sup>2</sup> (22.07 GPa)

**Crushing Strength:** 13,600 lb<sub>f</sub>/in<sup>2</sup> (93.8 MPa)

**Shrinkage:** Radial: 5.9%, Tangential: 7.2%, Volumetric: 12.4%, T/R Ratio: 1.2

6. For any questions, comments or concerns, I can be reached by email at [Ravineel.r.francis@usace.army.mil](mailto:Ravineel.r.francis@usace.army.mil) or contacted by phone at 215-656-6928.

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