



Astronium graveolens

Family: Anacardiaceae

Goncalo Alves

Other Common Names: Palo de cera, Palo de culebra (Mexico), Gusanero (Colombia), Gateado (Venezuela), Guarita (Brazil), Guasango (Ecuador).

Distribution: Goncalo Alves is a common tree in the upland forests of many regions from Mexico and Central America through to Colombia, Venezuela, Brazil, and Ecuador.

The Tree: Attains diameters of 24 to 40 in. or more and a maximum height of 120 ft. Except for narrow buttress flanges 4 to 6 ft tall, it has a clear cylindrical trunk for two thirds or more of its height. The logs are typically sound throughout.

The Wood: General Characteristics: When fresh, the heartwood is russet brown, orange brown, or reddish brown to red with narrow to wide irregular stripes of medium to very dark brown. After exposure it becomes brown, red, or dark reddish brown with nearly black stripes. The dingy grayish or brownish-white sapwood, 2 to 4 in. wide, is sharply demarcated. Grain variable, straight to roey; texture fine to medium, uniform; no distinctive odor or taste. The wood often has a striking figure caused by irregular dark longitudinal bands.

Weight: Basic specific gravity (ovendry weight/green volume) averages 0.84 for timber from Honduras and Venezuela; material from Brazil and Colombia averages 0.75. Average air-dry density is about 60 pcf from these four sources.

Mechanical Properties: (First set of values based on 2-in. standard; second set based on 2-cm standard.)

Moisture content (%)	Bending strength (Psi)	Modulus of elasticity (1,000 psi)	Maximum crushing strength (Psi)
Green (74)	12,140	1,940	6,580
12%	16,620	2,230	10,320
Green (30)	17,170	2,000	8,930
15%	19,670	NA	11,100

Janka side hardness 1,910 lb for green material and 2,160 lb for dry. Forest Products Laboratory toughness average for green and dry material from Honduras and Venezuela is 139 in.-lb (5/8-in. specimen).

Drying and Shrinkage: Moderately difficult to season. Some crook and bow accompanied by a slight tendency to twist, checking slight. Air-dries at a fast to moderate rate. A kiln schedule similar to T3-C2 has been suggested. Shrinkage green to ovendry: radial 4.0%; tangential 7.6%; volumetric 10.0%; slightly higher for Brazilian material.

Working Properties: it is not difficult to work in spite of its high density, finishes very smoothly, and takes a high polish. The wood weathers well and is highly resistant to moisture absorption. It is reported to be difficult to glue.

Durability: Laboratory tests indicate the heartwood to be very durable in resistance to both white-rot and brown-rot organisms. These results substantiate the reputed high durability of this species.

Preservation: Using either hot and cold bath or pressure-vacuum systems, sapwood absorbs only 2 to 4 pcf of preserving oils; heartwood absorbed one-half of this amount.

Uses: Among the most outstanding heavy, durable construction timbers, also highly favored as a fine furniture and cabinet wood. Cut for decorative veneers. It is used for specialty items such as knife handles, brush backs, archery bows, billiard cue butts, turnery, and carving.

Additional Reading: (30), (71), (74)

30. Instituto de Pesquisas Tecnológicas. 1956. Tabelas de resultados obtidos para madeiras nacionais. Bol. Inst. Pesqu. tec. Sao Paulo No. 31.

71. Villamil G., F. (Editor). 1971. Maderas colombianas. Proexpo, Bogota.

74. Wangaard, F. F., and A. F. Muschler. 1952. Properties and uses of tropical woods, III. Tropical Woods 98:1-190.

From: Chudnoff, Martin. 1984. Tropical Timbers of the World. USDA Forest Service. Ag. Handbook No. 607.

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM
LISTING SERVICE



Page 1 of 1

LISTING No. 8110-2077:0100

CATEGORY: Decking For Wildland Urban Interface (W.U.I)

LISTEE: Tiger Deck, LLC, P.O. Box 830, Wilsonville, OR 97070
Contact: Bob Hafner (503) 625-1747 Fax (503) 625-7342
Email: bob@tigerdeck.com

DESIGN: "Tiger Deck" hardwood decking materials including grooved and non-grooved deck board. Nominal 1" x 4", 5/4" x 4", 1" x 6", and 5/4" x 6". Deck may employ finish components as described in the product data sheet. Refer to the manufacturer's installation instructions.

RATING: Class B Flame Spread

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee name, Model number, rating and SFM label.

APPROVAL: Listed as decking materials for use in the Wildland Urban Interface areas.

NOTE: Test Protocol 12-7A-4A

09-12-11 mt

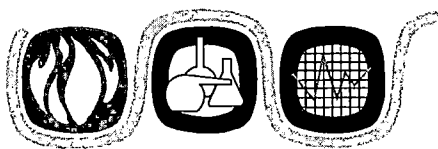


This listing is based upon technical data submitted by the applicant. CSFM Fire Engineering staff has reviewed the test results and/or other data but does not make an independent verification of any claims. This listing is not an endorsement or recommendation of the item listed. This listing should not be used to verify correct operational requirements or installation criteria. Refer to listee's data sheet, installation instructions and/or other suitable information sources.

Date Issued: **October 05, 2011**

Listing Expires **June 30, 2012**

Authorized By: **MIKE TANAKA**, Program Coordinator
Fire Engineering Division



COMMERCIAL TESTING COMPANY

1215 South Hamilton Street • Dalton, GA 30720
Telephone (706) 278-3935 • Facsimile (706) 278-3936

Standard Method of Test for
Surface Burning Characteristics of Building Materials

ASTM E 84-05

1 x 6 Tiger Wood Deck

Report Number 05-05061

Test Number 3676-6094
May 3, 2005

Tiger Deck, LLC
Wilsonville, Oregon

Commercial Testing Company is accredited for the ASTM E 84 test by the United States Department of Commerce, National Institute of Standards and Technology (NIST), through the National Voluntary Laboratory Accreditation Program (NVLAP) for compliance with criteria set forth in NIST Handbook 150:2001, all requirements of ISO/IEC 17025:1999, and relevant requirements of ISO 9002:1994.

Commercial Testing Company

(Authorized Signature)

This report is provided for the exclusive use of the client to whom it is addressed. It may be used in its entirety to gain product acceptance from duly constituted authorities. The test results presented in this report apply only to the samples tested and are not necessarily indicative of apparent identical or similar materials. Sample selection and identification were provided by the client. A sampling plan, if described in the referenced test procedure, was not necessarily followed. This report, or the name of Commercial Testing Company, shall not be used under any circumstance in advertising to the general public.

TESTED TO BE SURE®
Since 1974

INTRODUCTION

This report is a presentation of results of a surface flammability test on a material submitted by Tiger Deck, LLC, Wilsonville, Oregon.

The test was conducted in accordance with the American Society for Test and Materials fire test response standard E 84-05, *Surface Burning Characteristics of Building Materials*, sometimes referred to as the Steiner tunnel test. This test is applicable to exposed surfaces such as walls and ceilings. The test is conducted with the specimen in the ceiling position with the surface to be evaluated exposed face down to the ignition source. The method is technically the same as NFPA No. 255 and UL No. 723.

This standard is used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire-hazard or fire-risk assessment of materials, products, or assemblies under actual fire conditions.

PURPOSE

The purpose of the test is to provide only the comparative measurements of surface flame spread and smoke development of materials with that of select grade red oak and reinforced cement board under specific fire exposure conditions. The test exposes a nominal 24-foot long by 20-inch wide test specimen to a controlled air flow and flaming fire adjusted to spread the flame along the entire length of a red oak specimen in 5.50 minutes. During the 10-minute test duration, flamespread over the specimen surface and density of the resulting smoke are measured and recorded. Test results are calculated relative to red oak, which has an arbitrary rating of 100, and fiber-reinforced cement board, Grade II, which has a rating of 0.

The test results are expressed as Flame Spread Index and Smoke Developed Index. The Flame Spread Index is defined in ASTM E 176 as "a number or classification indicating a comparative measure derived from observations made during the progress of the boundary of a zone of flame under defined test conditions." The Smoke Developed Index, a term specific to ASTM E 84, is defined as "a number or classification indicating a comparative measure derived from smoke obscuration data collected during the test for surface burning characteristics." There is not necessarily a relationship between the two measurements.

The method does not provide for measurement of heat transmission through the surface tested, the effect of aggravated flame spread behavior of an assembly resulting from the proximity of combustible walls and ceilings, or classifying a material as noncombustible solely by means of a Flame Spread Index.

The zero reference and other parameters critical to furnace operation are verified on the day of the test by conducting a 10-minute test using 1/4-inch fiber-reinforced cement board. Periodic tests using NOFMA certified 23/32-inch select grade red oak flooring provide data for the 100 reference.

TEST SAMPLE

The test sample, selected by the client, was identified as **1 x 6 Tiger Wood Deck**. The tiger wood was provided by the client in the form of 1 x 5-1/2 x 3/4 x 72-inch long planks. The planks were assembled into four 72-inch long decks using four planks per deck and batten strips made of the same wood. The planks were joined to the battens using 1-1/4 inch long #8 screws, two per plank. The assembled decks were similar in appearance to the decks shown in Figure A1.1 of the E 84 Standard. The prepared decks were transferred to storage racks and conditioned to equilibrium in an atmosphere with the temperature maintained at 71 ± 2°F and the relative humidity at 50 ± 5 percent. For testing, the panels were placed end-to-end on the ledges of the tunnel furnace to make up the necessary 24-foot test sample, and the test conducted with no auxiliary support mechanism.

TEST RESULTS

The test results, calculated on the basis of observed flame propagation and the integrated area under the recorded smoke density curve, are presented below. The Flame Spread Index obtained in E 84 is rounded to the nearest number divisible by five. Smoke Developed Indices are rounded to the nearest number divisible by five unless the Index is greater than 200. In that case, the Smoke Developed Index is rounded to the nearest 50 points. Flame spread and smoke development data are presented graphically in the computer print-out at the end of this report.

Test Specimen	Flame Spread Index	Smoke Developed Index
Fiber-Reinforced Cement Board	0	0
Red Oak Flooring	100	100
1 x 6 Tiger Wood Deck	45	70

OBSERVATIONS

Specimen ignition over the burners occurred at 0.67 minute. Surface flame spread was observed to a maximum distance of 9.88 feet beyond the zero point at 8.72 minutes. The maximum temperature recorded during the test was 759°F.

CLASSIFICATION

The Flame Spread Index and Smoke Developed Index values obtained by ASTM E 84 tests are frequently used by code officials and regulatory agencies in the acceptance of interior finish materials for various applications. The most widely accepted classification system is described in the National Fire Protection Association publication NFPA 101 *Life Safety Code*, where:

Class A	0 - 25 Flame Spread Index	0 - 450 Smoke Developed Index
Class B	26 - 75 Flame Spread Index	0 - 450 Smoke Developed Index
Class C	76 - 200 Flame Spread Index	0 - 450 Smoke Developed Index

Class A, B, and C correspond to Type I, II, and III respectively in other codes such as SBCCI, BOCA, and ICBO. They do not preclude a material being otherwise classified by the authority of jurisdiction.

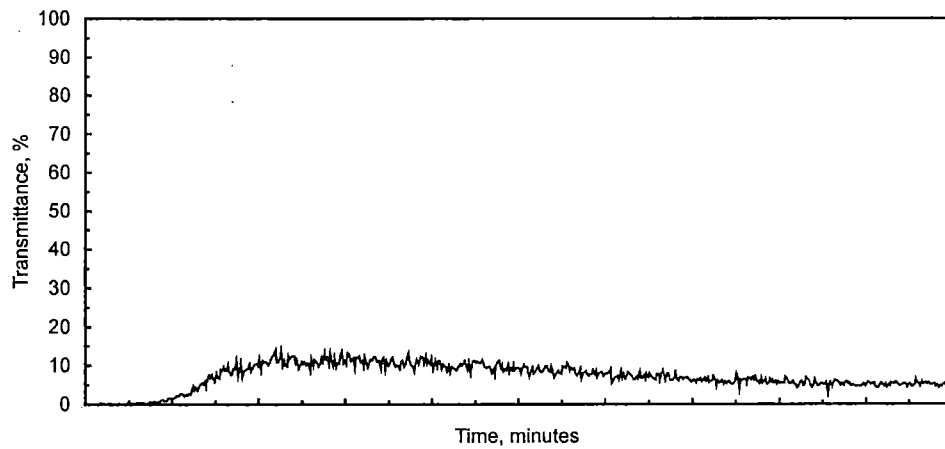
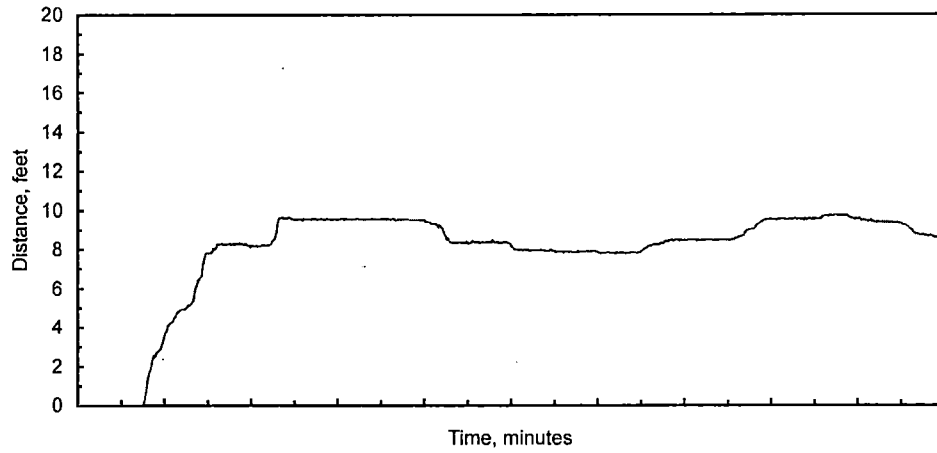
ASTM E 84 TEST DATA

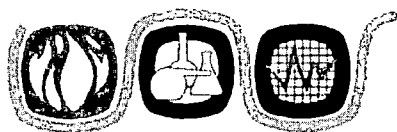
Client: Tiger Deck, LLC
Test Number: 3676-6094
Material Tested: 1 x 6 Tiger Deck
Date: May 3, 2005

Test Results:

Time to Ignition = 00.67 minutes
Maximum Flamespread Distance = 09.88 feet
Time to Maximum Spread = 08.72 minutes

Flame Spread Index = 45
Smoke Developed Index = 70





COMMERCIAL TESTING COMPANY

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Standard Method of Test for
Critical Radiant Flux of Floor-Covering Systems
Using a Radiant Heat Energy Source

ASTM E 648-03

Imported Hardwood, Astronium Graveolens

Report Number 04-07216

Test Number 3585-1879

July 19, 2004

Tiger Deck, LLC
Wilsonville, Oregon

The ASTM E 648 flooring radiant panel operated by Commercial Testing Company is accredited by the United States Department of Commerce, National Institute of Standards and Technology (NIST), through the National Voluntary Laboratory Accreditation Program (NVLAP) for compliance with criteria set forth in NIST Handbook 150:2001, all requirements of ISO/IEC 17025:1999, and relevant requirements of ISO 9002:1994.

Commercial Testing Company

(Authorized Signature)

This report is provided for the exclusive use of the client to whom it is addressed. It may be used in its entirety to gain product acceptance from duly constituted authorities. The test results presented in this report apply only to the samples tested and are not necessarily indicative of apparent identical or similar materials. Sample selection and identification were provided by the client. A sampling plan, if described in the referenced test procedure, was not necessarily followed. This report, or the name of Commercial Testing Company, shall not be used under any circumstance in advertising to the general public.

TESTED TO BE SURE®

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INTRODUCTION

This test report is a presentation of results of a flammability test on a material submitted by Tiger Deck, LLC, Wilsonville, Oregon. The test was conducted in accordance with the American Society for Test and Materials fire test response standard E 648-03, *Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source*. This method is sometimes referred to as the flooring radiant panel.

This test method is technically identical to the method described in NFPA Number 253. It measures the critical radiant flux at flame-out of horizontally mounted complete floor-covering systems that duplicate or simulate accepted installation practices. Tests on individual components are of limited value and are not valid for certification purposes.

This standard is used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire-hazard or fire-risk assessment of materials, products, or assemblies under actual fire conditions.

PURPOSE

The flooring radiant panel test measures the level of incident radiant heat energy at flame-out of a floor-covering system. It provides a basis for estimating one aspect of fire behavior of systems installed in corridors or exitways. Imposed radiant flux simulates thermal radiation levels likely to impinge on the floors of a building whose upper surfaces are heated by flames or hot gases, or both, from a fully developed fire in an adjacent room or compartment.

TEST PROCEDURE

A gas and air fueled radiant heat energy panel is mounted in the test chamber at a 30° angle to the horizontal plane of the specimen. The panel generates an energy flux distribution ranging along the length of the test specimen from a nominal maximum of 1.0 W/cm² to a minimum of 0.1 W/cm². Air flow through the chamber is controlled at a velocity of 250 feet per minute. The test is initiated using a gas pilot burner brought into contact with the specimen and extinguished after a specified time.

The floor-covering system, fully described in Table I, is tested in triplicate, each specimen measuring 20 cm wide by 100 cm long. Prepared specimens are conditioned a minimum of 96 hours in an atmosphere maintained at 71 ± 2°F and 50 ± 3% relative humidity. Chamber operating conditions are verified on the day of the test by measuring the flux level at the 40 cm mark. An incident flux level of 0.50 ± 0.02 W/cm² indicates proper operation and calibration of the test chamber.

Specimens are placed in the chamber and allowed to preheat for 5.0 minutes followed by a 5.0-minute application of the pilot burner. The specimens are allowed to burn until they self-extinguish, at which time they are removed from the test chamber and the farthest point of flame propagation measured. The critical radiant flux is determined from the flux profile determined during calibration of the test instrument.

TEST RESULT

The test result is presented as the average value of the three specimens tested expressed in terms of Critical Radiant Flux in units of W/cm². All pertinent individual specimen data are presented in Table II. The flux profile shown in the figure is typical of that determined during calibration of the flooring radiant panel instrument used for this test.

The general classification for the floor-covering system identified in this report is based on the NFPA 101 *Life Safety Code*. However, care must be exercised in its use as a material may be otherwise classified by the authority having jurisdiction.

TABLE I. FLOORING SYSTEM

Flooring:

Identification: Imported Hardwood, Astronium Graveolens
 Type Flooring: Hardwood Tongue/Groove Flooring
 Color: Natural
 Plank Size: 5-1/2 inches wide by 3/4 inch thick

Flooring System:

Installation: The flooring planks were assembled into T/G decks using three (3) 1/2-inch by 1-inch battens attached with 4d coated nails, two per plank.
 Subfloor: Simulated Concrete (Reinforced Cement Board)

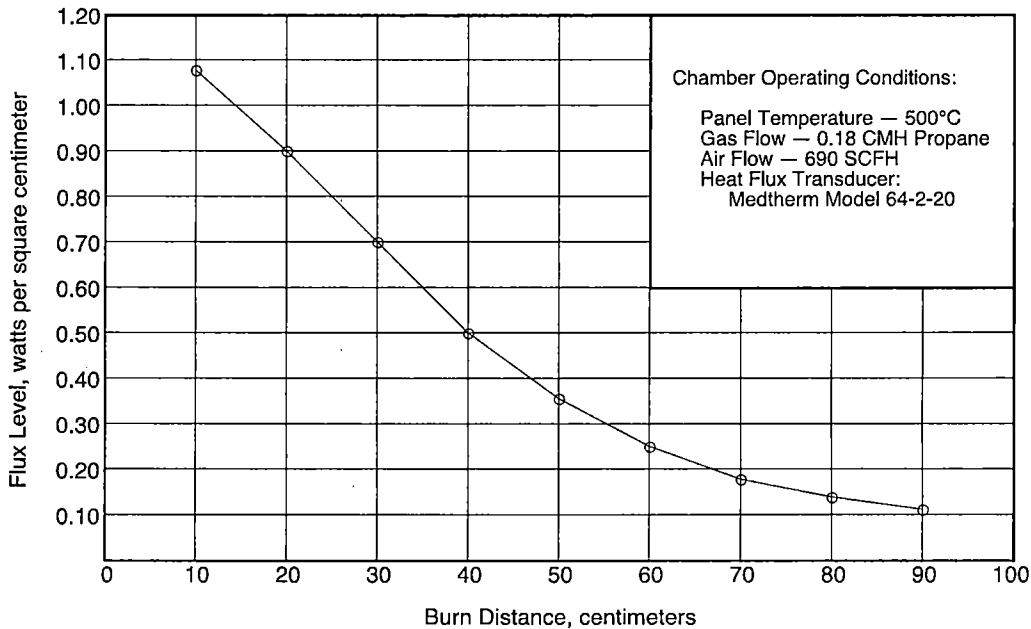
TABLE II. TEST RESULT

Test Data	#1	#2	#3
Maximum Burn Distance (cm)	8.0	11.1	9.6
Time to Flame Out (min)	10.5	10.5	10.6
Critical Radiant Flux (W/cm ²)	>1.08	1.06	>1.08

Average Critical Radiant Flux >1.08 W/cm²

NFPA 101 Classification Type I

TYPICAL FLUX PROFILE



PHYSICAL AND MECHANICAL PROPERTIES

Description	Source or Method	Value
Bending Strength (psi @ 12%)	USDA Forest Service	16,620
Modulus of elasticity (1000 psi @ 12%)	USDA Forest Service	2,230
Maximum crushing strength (psi @ 12%)	USDA Forest Service	10,320
Janka side hardness (dry)	USDA Forest Service	2,160
Weight (green)	USDA Forest Service	77 lbs/cu.ft.
Density (oven dry/green volume - air dry wt)	USDA Forest Service	.75 - 60 lbs/cu.ft.
Radial shrinkage (green to oven dry)	USDA Forest Service	4.0%
Tangential shrinkage (green to oven dry)	USDA Forest Service	7.6%
Volumetric shrinkage (green to oven dry)	USDA Forest Service	10.0%
Coefficient of friction (dry)	ASTM F1679	>0.96
Coefficient of friction (wet)	ASTM F1679	0.61
Tree size	USDA Forest Service	24"-40" dia. / 120' ht.
Fire Rating	UBC / NFPA	Class I / Class A

Solid Wood Decking Load Tables (tested by Stroh Engineering)
Tiger Deck 4/4 (net 23/32")

Joist Spacing inches	Allowable Load (PSF)	Maximum Deflection	Maximum Flexural Stress (psi)	Deflection L/Span
12	40	0.00043	58	L/27698
16	40	0.00137	104	L/11685
19.2	40	0.00284	149	L/6762
24	40	0.00693	233	L/3482
12	60	0.00065	87	L/18485
16	60	0.00205	155	L/7790
19.2	60	0.00426	224	L/4508
24	60	0.01040	350	L/2308
12	90	0.00097	131	L/12310
16	90	0.00308	233	L/5193
19.2	90	0.00639	336	L/3005
24	90	0.01560	524	L/1539

Solid Wood Decking Load Tables (tested by Stroh Engineering)
Tiger Deck 5/4 (net 15/16")

Joist Spacing inches	Allowable Load (PSF)	Maximum Deflection	Maximum Flexural Stress (psi)	Deflection L/Span
12	40	0.00022	37	L/54096
16	40	0.00070	66	L/22822
19.2	40	0.00145	95	L/13207
24	40	0.00355	148	L/6762
12	60	0.00033	58	L/38085
16	60	0.00105	99	L/15215
19.2	60	0.00218	143	L/6805
24	60	0.00532	224	L/4508
12	90	0.00050	84	L/24043
16	90	0.00158	149	L/10143
19.2	90	0.00327	215	L/5870
24	90	0.00799	335	L/3005