GLOBAL
PRODUCT TESTING LABORATORIES
" TEST FIRST "

DATE:	April 04, 2016
LAB. No.:	16-1673
CLIENT:	Chu & Son
	Room 108, Hollywood Plaza
	610 Nathan Road, Mongkok
	Kowloon, Hong Kong
ATTENTION:	Shiu Ming Chu
CLIENT'S ORDER NO.:	Pending
MATERIAL:	DragonBoard/MSB 18MM
MARKED:	No Markings
SUBMITTED FOR:	ASTM E84 Standard Method of Test for Surface Burning Characteristics of Building Materials, modified.

1.0 INTRODUCTION:
This report is a presentation of results of a surface flammability test on DragonBoard/MSB as submitted by Client.

The test was conducted in accordance with the American Society for Test and Materials fire test response standard E 84, *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 sample in the ceiling position with the surface to be evaluated exposed face down to the ignition source. The method, which is similar to NFPA No. 255 and UL No. 723, is an American National Standard (ANSI) and has been approved for use by agencies of the department of Defense for listing in the DoD *Index of Specifications and Standards.*

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 conditions.

2.0 PURPOSE:
The purpose of the test is to provide only the surface flame spread and smoke development of the submitted sample material under specific fire exposure conditions. The test exposes a nominal 24-foot long by 20-inch wide test sample to a controlled air flow and flaming fire along the entire length of the sample. During the 10-minute test duration, flamespread over the specimen surface and density of the resulting smoke are measured and recorded. The results are calculated relative to reinforced cement board, which has a rating of 0. However, this test was performed on a much smaller scale for practicality, using a 2 foot long by 20 inch sample.

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 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 ¼-inch reinforced cement board.

3.0 TEST SAMPLE:
The submitted test samples were identified by client as composition construction panels and were physically self-supporting. The panels were conditioned to equilibrium in an atmosphere with the temperature maintained at 71±2°F and relative humidity at 50±5%. For testing, the test was conducted with no auxiliary support mechanism, as none were required.

4.0 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.

Test Specimen	Flame Spread Index	Smoke Developed Index
Reinforced Cement Board (reference)	0	0
DragonBoard/MSB 18MM	0	0

5.0 OBSERVATIONS:
No sample ignition occurred over the burners. No flame spread was observed

6.0 CLASSIFICATION:
The Flame Spread Index and Smoke Developed Index values obtained by ASTM E84 tests are frequently used by code officials and regulatory agencies in the acceptance of 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	FLAME SPREAD INDEX	SMOKE DEVELOPED INDEX
A	0-25	0-450
B	26-75	0-450
C	76-200	0-450

Class A, B, and C correspond to Type, 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 E84 TEST DATA, MODIFIED

Parameter	Result
Time to ignition	No ignition occurred.
Maximum Flamespread Distance	None
Time to Maximum Flame Spread	None
Flame Spread Index	0
Smoke Developed Index	0

The tested DragonBoard panels were found to have a Class A rating.

7.0 CERTIFICATION AND SIGNATURES:

We certify that this report is a true report of results obtained from tests of this material.

Respectfully submitted,
Global Product Testing Laboratories

Al Barbera, Laboratory Manager

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DATE:	April 04, 2016
LAB. No.:	16-1673-1
CLIENT:	Chu & Son
	Room 108, Hollywood Plaza
	610 Nathan Road, Mongkok
	Kowloon, Hong Kong
ATTENTION:	Shiu Ming Chu
CLIENT'S ORDER NO.:	Pending
MATERIAL:	DragonBoard/MSB 18MM
SUBMITTED FOR:	Fungus resistance

1.0 PROCEDURE:
The test sample, as well as a control sample, were inoculated with fungus spore suspension for five (5) types of fungi in accordance with ASTM G21.The samples were maintained in a humidity chamber for 28 days. At the conclusion of 7 days, the samples were visually examined for evidence of fungus growth, as well as verification of fungus growth on the control sample. The chamber was the locked for 21 days to complete the 28 day test.

2.0 RESULTS:
There was no visual evidence of fungus growth on the test samples. Fungus growth on the control sample was verified. The test samples conform to the fungus test requirements.

3.0 CERTIFICATION AND SIGNATURES:
We certify that this report is a true report of results obtained from tests of this material.

Respectfully submitted,
Global Product Testing Laboratories

Al Barbera, Laboratory Manager

1525 Rocky Point Road • Middle Island, NY 11953
Phone: 631-448-7280 • Fax: 631-448-7281
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REPORT DATE:	April 04, 2016
LAB. No.:	16-1673-2
CLIENT:	Chu & Son
	Room 108, Hollywood Plaza
	610 Nathan Road, Mongkok
	Kowloon, Hong Kong
ATTENTION:	Shiu Ming Chu
CLIENT'S ORDER NO.:	Pending
MATERIAL:	DragonBoard/MSB 18MM
MARKED:	None
SUBMITTED FOR:	Smoke Density, Modulus of Elasticity, Shear Strength,
	Flexural Strength, Tensile Strength

1.0 PROCEDURE:

The submitted DragonBoard/MSB were sectioned as required and test coupons were prepared. The samples were tested in accordance with ASTM E662 and ASTM D6109.

2.0 RESULTS:

TEST PARAMETER	TEST DESIGNATION	RESULT (psi)
Smoke Density*	ASTM E662	None
Modulus of Elasticity	ASTM D6109	8.0 X 10*5
Shear Strength	ASTM D732	166
Flexural Strength	ASTM D6109	1440
Tensile Strength	ASTM D6109	200

(*) Three flaming and three non-flaming samples are required by ASTM E662. The samples did not burn so the required flaming samples are not applicable.

3.0 CERTIFICATION AND SIGNATURES:

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REPORT DATE:	April 04, 2016
LAB. No.:	16-1673-3
CLIENT:	Chu & Son
	Room 108, Hollywood Plaza
	610 Nathan Road, Mongkok
	Kowloon, Hong Kong
ATTENTION:	Shiu Ming Chu
CLIENT'S ORDER NO.:	Pending
MATERIAL:	DragonBoard/MSB 18MM
SUBMITTED FOR:	Four (4) hour fire resistance testing (using ASTM E119 as a reference*)

1.0 PROCEDURE:

A 2' wide x 2' high DragonBoard panel was suspended vertically. A gas torch was set-up at a right angle centrally situated to the suspended DragonBoard panel, (referenced as flame side hot-spot) Thermocouples were situated at the flame side hotspot and backside hotspot (side opposite flame application). Thermocouple readings were taken at 30 minute intervals.

2.0 RESULTS:

MINUTES	FLAME SIDE HOTSPOT (°F)	BACKSIDE HOTSPOT (°F)
0	----	72
30	1590	144
60(1 hr)	1660	195
90	1716	215
120(2 hrs)	1766	227
150	1810	275
180(3 hrs)	1836	349
210	1860	360
240(4 hr)	1873	374

* ASTM E119 test procedure was utilized for reference purposes only. The thermocouples utilized in this procedure are fewer in number than E119 requires, however, the temperature recording locations were situated at locations comparable to E119 at the most severe locations. Lastly, the test data gathered in this test procedure are for performance characteristics only, therefore, the water hose stream test was not performed.

3.0 STATEMENT:
No burn through occurred with only minor panel "deterioration" observed at the flame side hotspot location on the sample. Sample deterioration was less than 10% of the panel thickness and was confined to the immediate flame contact area.

4.0 CERTIFICATION AND SIGNATURES:
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REPORT DATE:	April 04, 2016
LAB. No.:	16-1673-4
CLIENT:	Chu & Son
	Room 108, Hollywood Plaza
	610 Nathan Road, Mongkok
ATTENTION:	Kowloon, Hong Kong
CLIENT'S ORDER NO.:	Shiu Ming Chu
MATERIAL:	DragonBoard/MSB 18MM
SUBMITTED FOR:	Smoke Toxicity per ASTM E662, (Modified, Gas Extraction Method)

1.0 PROCEDURE:
Smoke toxicity, reference ASTM E662, modified for gases as stated.

One (1) test specimen was cut from the submitted DragonBoard panel. The sectioned sample was placed in front of the specific heat source. Ten (10) minutes after the start of the test, the combustion products were collected in a gas collection tedlar bag. The combustion products were then, separately, injected into a gas chromatograph with a mass spectrometer. Results were recorded at 4 minutes after the start of the tests.

2.0 RESULTS:

COMBUSTION BY PRODUCT	RESULTS (PPM)
Hydrogen Chloride	<0.01
Hydrogen Bromide	<0.01
Hydrogen Cyanide	<0.01
Hydrogen Sulfide	<0.01
Vinyl Chloride	<1.0
Ammonia	<1.0
Aldehydes	<1.0
Nitrous oxides	<10
Carbon Dioxide	<10
Carbon Monoxide	<10

(<) denotes minimum detection limit was reached.
NOTE: No combustion occurred.

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3.0 CERTIFICATION AND SIGNATURES:
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REPORT DATE:	April 04, 2016
LAB. No.:	16-1673-5
CLIENT:	Chu & Son
	Room 108, Hollywood Plaza
	610 Nathan Road, Mongkok
	Kowloon, Hong Kong
ATTENTION:	Shiu Ming Chu
CLIENT'S ORDER NO.:	Pending
MATERIAL:	DragonBoard/MSB 18MM
MARKED:	None
SUBMITTED FOR:	Impact Testing, Reference ASTM D5628

1.0 PROCEDURE:

A 15" x 15"sample was sectioned from the submitted DragonBoard/MSB Panel. The sample was placed on top of a 12" x 12" (inside dimension) square fixture constructed of standard 2" x 4" framing lumber. A 10 lb. dart (tup) with a hemispherical nose was dropped, free-fall style, directed to strike the center of the test sample. A test was performed at drop heights of 48", 24", 12", and 6". At each drop height, the sample was first tested normally resting on the fixture (loosely), and secondly, rigidly clamped to the test fixture. A visual inspection was performed at the conclusion of each impact. The sample was inspected for evidence of cracking.

2.0 RESULTS:

DROP HEIGHT (inch)	UNCLAMPED	CLAMPED
48	Complete Penetration	Complete Penetration
24	Complete Penetration	Complete Penetration
12	Hairline Cracking	Hairline Cracking
6	Superficial Cracking	Superficial Cracking

3.0 CERTIFICATION AND SIGNATURES:

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REPORT DATE:	April 04, 2016
LAB. No.:	16-1673-6
CLIENT:	Chu & Son
	Room 108, Hollywood Plaza
	610 Nathan Road, Mongkok
	Kowloon, Hong Kong
ATTENTION:	Shiu Ming Chu
CLIENT'S ORDER NO.:	Pending
MATERIAL:	DragonBoard/MSB 18MM
SUBMITTED FOR:	Nail pull out resistance testing

1.0 PROCEDURE:

A 9mm "Luan" surfaced plywood containing 4 ply's of laminations, was adhered to the submitted DragonBoard/MSB panel. The test panel was placed into an environmental chamber at 70°F for 24 hours to allow the test panel to stabilize. Four different types of nails, as indicated below, were driven into the panels approximately spaced 4" between each nail. Each test was repeated 3 times. The nails were placed as to allow for continuity in their location on the panels. Immediately following the driving of each nail, the panel with nail was subjected to tensile to determine the pull-out strengths.

2.0 RESULTS:

NAIL# TYPE and DESCRIPTION	**NAILABLE DRAGONBOARD pull-out strength,(lbs.)**
#1-Electro-galv. steel ring type	Test #1,2,3; (225,230,235) **Average (230)**
#2-#10D x 2 7/8" coated sinker type	Test #1,2,3; (75, 55, 80) **Average (70)**
#3-#10D X 3" hot galv. spiral thread patio/deck	Test #1,2,3; (110,100,85) **Average (98)**
#4-#10D x 3" bright common	Test #1,2,3; (105, 90, 100) **Average (98)**

3.0 CERTIFICATION AND SIGNATURES:

We certify that this report is a true report of results obtained from tests of this material.

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REPORT DATE:	April 04, 2016
LAB. No.:	16-1673-7
CLIENT:	Chu & Son
	Room 108, Hollywood Plaza
	610 Nathan Road, Mongkok
	Kowloon, Hong Kong
ATTENTION:	Shiu Ming Chu
CLIENT'S ORDER NO.:	Verbal
MATERIAL:	DragonBoard/MSB 18MM
SUBMITTED FOR:	Combustibility, Reference ASTM E136

The intention of this Report is to verify that the submitted DragonBoard/MSB composition panel material is non-combustible as manufactured, when tested in accordance with ASTM E136. The product does not support combustion, there is no flaming of the material, and weight loss during extreme heat application is negligible.

CERTIFICATION AND SIGNATURES:

We certify that this report is a true report of results obtained from tests of this material.

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REPORT DATE:	April 04, 2016
LAB. No.:	16-1673-8
CLIENT:	Dragonboard Technologies
	Room 108, Hollywood Plaza
	610 Nathan Road, Mongkok
	Kowloon, Hong Kong
ATTENTION:	Shiu Ming Chu
CLIENT'S ORDER NO.:	Pending
MATERIAL:	DragonBoard Composition Panel 18MM
MARKED:	None
SUBMITTED FOR:	Shear Strength,

1.0 PROCEDURE:

The submitted DragonBoard panel was sectioned as required and test coupons were prepared. The samples were tested in accordance with ASTM D732 for Shear Strength.

2.0 RESULTS:

TEST PARAMETER	TEST DESIGNATION	RESULT (psi)
Shear Strength	ASTM D732	166

3.0 CERTIFICATION AND SIGNATURES:

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