



Test Reports

Selected ASTM Tests on Riceland Parboiled Rice Hulls

Prepared For:

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and

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Formatted: Spanish (Spain-Modern Sort)

R & D Services, Inc.
P.O. Box 2400
Cookeville, Tennessee 38502-2400

Report: RD03168R

Reviewed by: _____

Ronald S. Graves
Vice President

June 2, 2003

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 Phone: 931-372-8871
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Design Density Test Report

R&D Test Number: RD031318DD Date of Test: April 10, 2003

Specimen Number: 1234030318-1 Date of Manufacture: N/A

Description of test specimen: Riceland Parboiled Rice Hulls

Test Method: Samples were subjected to vibration at 15 cycles per second with an amplitude of 0.1 inch for twenty-four hours.

Report prepared for: ESR, LLC / Paul Olivier

| | Sample A | | Sample B | | |
|----------|---------------|---------------|---------------|---------------|------------------------|
| | Before | After | Before | After | |
| Wt. | <u>6086</u> | <u>6086</u> | <u>5734</u> | <u>5734</u> | (grams) |
| Area | <u>0.1621</u> | <u>0.1621</u> | <u>0.3155</u> | <u>0.3155</u> | (m ²) |
| Depth | <u>304</u> | <u>245</u> | <u>152</u> | <u>144</u> | (mm) |
| | <u>303</u> | <u>228</u> | <u>152</u> | <u>140</u> | |
| Ave. | <u>303</u> | <u>226</u> | <u>152</u> | <u>122</u> | (mm) |
| | <u>303</u> | <u>236</u> | <u>150</u> | <u>86</u> | |
| Ave. | <u>303.2</u> | <u>235.0</u> | <u>151.4</u> | <u>115.6</u> | (mm) |
| Set. Den | <u>123.8</u> | <u>159.8</u> | <u>120.0</u> | <u>157.1</u> | (kg/m ³) |
| Set. Den | <u>7.729</u> | <u>9.972</u> | <u>7.488</u> | <u>9.807</u> | (lb/ft ³) |

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Settled Density 9.89 (lb/ft³)

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Test results reported apply only to the specimen tested.



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Critical Radiant Flux (Gas) Test Report

R&D Test Number: RD031317CR Date of Test: April 1, 2003

Specimen Number: 1234030318-1 Date of Manufacture: N/A

Description of test specimen: Riceland Parboiled Rice Hulls

Test Method: ASTM E 970

Report prepared for: ESR, LLC / Paul Olivier

| Density (lb/ft ³) | Length of Burn (cm) | Critical Radiant Flux (W/cm ²) | Pass / Fail |
|-------------------------------|---------------------|--|-------------|
| <u>7.49</u> | <u>53.0</u> | <u>0.31</u> | <u>Pass</u> |
| <u>7.28</u> | <u>55.6</u> | <u>0.28</u> | <u>Pass</u> |
| <u>7.31</u> | <u>54.6</u> | <u>0.29</u> | <u>Pass</u> |

The average CRF is 0.29 W/cm²
The standard deviation is 0.015.
The coefficient of variation is 0.05.

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Date: _____

Test results reported apply only to the specimen tested.



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Smoldering Combustion Test Report

R&D Test Number: RD031316SC Date of Test: April 2, 2003

Specimen Number: 1234030318-1 Date of Manufacture: N/A

Description of test specimen: Riceland Parboiled Rice Hulls

Test Method: ASTM C 739, Section 14

Report prepared for: ESR, LLC / Paul Olivier

| Density (lb/ft ³) | Initial Weight (grams) | Final Weight (grams) | % loss | |
|-------------------------------|--------------------------|------------------------|-------------|-------------|
| <u>8.04</u> | <u>557.20</u> | <u>556.80</u> | <u>0.07</u> | <u>Pass</u> |
| <u>8.54</u> | <u>547.16</u> | <u>547.00</u> | <u>0.03</u> | <u>Pass</u> |
| <u>8.42</u> | <u>515.05</u> | <u>514.90</u> | <u>0.03</u> | <u>Pass</u> |

Reviewed By: _____

Date: _____

Test results reported apply only to the specimen tested.



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Corrosiveness Test Report

R&D Test Number: RD031321CO

Date of Test: April 17, 2003

Specimen Number: 1234030318-1

Date of Manufacture: N/A

Description of test specimen: Riceland Parboiled Rice Hulls

Test Method: ASTM C 739, Section 9.

Report prepared for: ESR, LLC / Paul Olivier

| Coupon: | Pass / Fail | Comments: |
|----------|-------------|----------------------------------|
| Aluminum | <u>Pass</u> | <u>No holes or perforations.</u> |
| Copper | <u>Pass</u> | <u>No holes or perforations.</u> |
| Steel | <u>Pass</u> | <u>No holes or perforations.</u> |

Reviewed By: _____ Date: _____

Test results reported apply only to the specimen tested.

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Moisture Vapor Sorption Test Report

R&D Test Number: RD031315MS **Date of Test: April 18, 2003**

Specimen Number: 1234030318-1 **Date of Manufacture: N/A**

Description of test specimen: Riceland Parboiled Rice Hulls

Test Method: ASTM C 739, Section 12.

Report prepared for: ESR, LLC / Paul Olivier

| Initial Weight (grams) | Final Weight (grams) | % Gain | Pass / Fail |
|---------------------------------|-------------------------------|---------------|--------------------|
| <u>1175.1</u> | <u>1213.1</u> | <u>3.23</u> | <u>Pass</u> |

Reviewed By: _____ Date: _____

Test results reported apply only to the specimen tested.



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Odor Emission Test Report

R&D Test Number: RD031459OE

Date of Test: May 19, 2003

Specimen Number: 1234030318-1

Date of Manufacture: N/A

Description of test specimen: Riceland Parboiled Rice Hulls

Test Method: ASTM C 739, Section 13.

Report prepared for: ESR, LLC / Paul Olivier

- | | |
|--|-----|
| 1. Was a perceptible odor present? Yes / No | No |
| 2. Odor was objectionable, pleasant, or neutral? | N/A |
| 3. Was the odor weak or strong? | N/A |

Pass / Fail

Pass

Reviewed By: _____

Date: _____

Test results reported apply only to the specimen tested.

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Thermal Resistance Test Report

Date of Test: April 15, 2003

Date of Manufacture: N/A

Fox Number: 2235

Specimen Number: 1234030318-1

R&D Test Number: RD031314TR

Description of test specimen: Riceland Parboiled Rice Hulls; Tested at 9.01 PCF

Test Method: ASTM C 518

Report prepared for: ESR, LLC / Paul Olivier

The results in this report were obtained with a heat-flow meter built and operated in accordance with ASTM C 518. The test results in a value for the apparent thermal conductivity of the test specimen, k , in units W/m.K. The thermal resistivity, R-value per inch, in U.S. customary units is the reciprocal of the product of 6.933 and k .

| | |
|---|-------------------------------|
| Heat flow meter: <u>24 by 24</u> | inches x inches |
| Specimen thickness: <u>4.037</u> | inches |
| Specimen density: <u>9.01</u> | lb/ft ³ |
| Cold plate temperature: <u>52.54</u> | deg F |
| Hot plate temperature : <u>97.56</u> | deg F |
| Average specimen temperature: <u>75.05</u> | deg F |
| Apparent thermal conductivity: <u>0.3923</u> | Btu.in/ft ² .hr.1F |
| Thermal resistivity (R-per-inch): <u>2.549</u> | ft ² .hr.1F/Btu.in |
| Thermal resistance of specimen: <u>10.3</u> | ft ² .hr.1F/Btu |

Notes: Calibration factor used for manual calculation? NA EMF NA
Edge guards or cabinet temperature satisfactory? Yes
Excessive moisture on cold plate? No
Length of time for test (hours)? 8.6

Reviewed By: _____

Date: _____

Test results reported apply only to the specimen tested This test conforms to ASTM Test Method C 518 except for the report requirements. The report includes summary data but a full complement of data is available upon request.

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Thermal Resistance Test Report

Date of Test: April 17, 2003

Date of Manufacture: N/A

Fox Number: 2236

Specimen Number: 1234030318-1

R&D Test Number: RD031313TR

Description of test specimen: Riceland Parboiled Rice Hulls; Tested at 8.70 PCF

Test Method: ASTM C 518

Report prepared for: ESR, LLC / Paul Olivier

The results in this report were obtained with a heat-flow meter built and operated in accordance with ASTM C 518. The test results in a value for the apparent thermal conductivity of the test specimen, k , in units W/m.K. The thermal resistivity, R-value per inch, in U.S. customary units is the reciprocal of the product of 6.933 and k .

| | |
|---|-------------------------------|
| Heat flow meter: <u>24 by 24</u> | inches x inches |
| Specimen thickness: <u>4.161</u> | inches |
| Specimen density: <u>8.70</u> | lb/ft ³ |
| Cold plate temperature: <u>52.54</u> | deg F |
| Hot plate temperature : <u>97.56</u> | deg F |
| Average specimen temperature: <u>75.05</u> | deg F |
| Apparent thermal conductivity: <u>0.3307</u> | Btu.in/ft ² .hr.1F |
| Thermal resistivity (R-per-inch): <u>3.024</u> | ft ² .hr.1F/Btu.in |
| Thermal resistance of specimen: <u>12.6</u> | ft ² .hr.1F/Btu |

Notes: Calibration factor used for manual calculation? NA EMF NA

Edge guards or cabinet temperature satisfactory? Yes

Excessive moisture on cold plate? No

Length of time for test (hours)? 120.0

Reviewed By: _____ Date: _____

Test results reported apply only to the specimen tested This test conforms to ASTM Test Method C 518 except for the report requirements. The report includes summary data but a full complement of data is available upon request.

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Thermal Resistance Test Report

Date of Test: May 16, 2003

Date of Manufacture: N/A

Fox Number: 4948

Specimen Number: 1234030318-1

R&D Test Number: RD031461TR

Description of test specimen: Riceland Parboiled Rice Hulls

Test Method: ASTM C 518

Report prepared for: ESR, LLC / Paul Olivier

The results in this report were obtained with a heat-flow meter built and operated in accordance with ASTM C 518. The test results in a value for the apparent thermal conductivity of the test specimen, k, in units W/m.K. The thermal resistivity, R-value per inch, in U.S. customary units is the reciprocal of the product of 6.933 and k.

| | | |
|------------------------------------|-----------------|-------------------------------|
| Heat flow meter: | <u>24 by 24</u> | inches x inches |
| Specimen thickness: | <u>4.160</u> | inches |
| Specimen density: | <u>9.70</u> | lb/ft ³ |
| Cold plate temperature: | <u>52.56</u> | deg F |
| Hot plate temperature : | <u>97.56</u> | deg F |
| Average specimen temperature: | <u>75.06</u> | deg F |
| Apparent thermal conductivity: | <u>0.3418</u> | Btu.in/ft ² .hr.1F |
| Thermal resistivity (R-per-inch): | <u>2.926</u> | ft ² .hr.1F/Btu.in |
| Thermal resistance of specimen: | <u>12.2</u> | ft ² .hr.1F/Btu |

Notes: Calibration factor used for manual calculation? NA EMF NA
 Edge guards or cabinet temperature satisfactory? Yes
 Excessive moisture on cold plate? No
 Length of time for test (hours)? 90.3

Reviewed By: _____ Date: _____

Test results reported apply only to the specimen tested This test conforms to ASTM Test Method C 518 except for the report requirements. The report includes summary data but a full complement of data is available upon request.



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Thermal Resistance Test Report

Date of Test: May 23, 2003
Manufacture: N/A

Date of

Fox Number: 4957

Specimen Number: 1234030318-1

R&D Test Number: RD031460TR

Description of test specimen: Riceland Parboiled Rice Hulls

Test Method: ASTM C 518

Report prepared for: ESR, LLC / Paul Olivier

The results in this report were obtained with a heat-flow meter built and operated in accordance with ASTM C 518. The test results in a value for the apparent thermal conductivity of the test specimen, k , in units $W/m.K$. The thermal resistivity, R -value per inch, in U.S. customary units is the reciprocal of the product of 6.933 and k .

| | | |
|------------------------------------|-----------------|-------------------------------|
| Heat flow meter: | <u>24 by 24</u> | inches x inches |
| Specimen thickness: | <u>4.026</u> | inches |
| Specimen density: | <u>9.21</u> | lb/ft ³ |
| Cold plate temperature: | <u>52.56</u> | deg F |
| Hot plate temperature : | <u>97.56</u> | deg F |
| Average specimen temperature: | <u>75.06</u> | deg F |
| Apparent thermal conductivity: | <u>0.3394</u> | Btu.in/ft ² .hr.1F |
| Thermal resistivity (R-per-inch): | <u>2.946</u> | ft ² .hr.1F/Btu.in |
| Thermal resistance of specimen: | <u>11.9</u> | ft ² .hr.1F/Btu |

Notes: Calibration factor used for manual calculation? NA EMF NA
Edge guards or cabinet temperature satisfactory? Yes
Excessive moisture on cold plate? No
Length of time for test (hours)? 92.0

Reviewed By: _____ Date: _____

Test results reported apply only to the specimen tested This test conforms to ASTM Test Method C 518 except for the report requirements. The report includes summary data but a full complement of data is available upon request.

Test Report for Resistance to the Growth of Fungi

Report Summary

Manufacturer: Riceland Foods, Inc.
Material Description: Riceland Parboiled Rice Hulls
ASTM Test Method: C 1338
Project Number: 1234
Specimen Number: 1234030318-1
Report Number: RD031319FR
Date of Report: April 29, 2003
Period of Test: March 28, 2003 – April 25, 2003
Test Result: Pass
Number of Specimens Observed: 3
Comparative Material: Southern Yellow Pine
Fungi Checked for Viability: Yes
Regular or Extended Test: Regular

Background

The ASTM Standard Specification for many thermal insulations requires a test for the resistance of the insulation to the growth of fungi. Section 10 of C 1497, ASTM C 1338, Section 6.6 of ASTM C 1149, or Section 11 of ASTM C 739 are commonly used in the case of building materials. Evaluations for fungi growth are based on visual examinations at 40X magnification. The examinations at 40X magnification compare fungal growth on the material being evaluated with the fungal growth on an untreated comparative material that is exposed to the same environment as the test specimens. Both the material being tested and the comparative material are inoculated with a mixed spore suspension containing five specific fungal species to start the test. Since most fungi thrive in a relatively narrow range of temperature and humidity, inoculated specimens and comparative materials are maintained within temperature

and relative humidity ranges specified in the test method for the 28-day growth period. The purpose of the test is to provide an evaluation of the potential for fungal growth present in the insulation material relative to common types of wood used in

building construction. The fungal species used in the tests for thermal insulation are listed below.

Aspergillus niger ATCC 9642
Aspergillus flavus ATCC 9643
Aspergillus versicolor ATCC 11730
Penicillium funiculosum ATCC 11797
Chaetomium globosum ATCC 6205

A mixed spore suspension is produced from the above five species in accordance with the test method being followed. The viability of each of the five species is verified with each test as required by the test method being used. The ASTM test methods for resistance to fungal growth require a 40X visual comparison of test material and comparative materials 28 days after inoculation. The criteria for a pass/fail result at the end of the 28-day test period depends on the test method being followed.

Test using ASTM C 1338

Each of the replicate test specimens shall be determined to have either no fungal growth, fungal growth not greater than the comparative material, or fungal growth greater than the comparative material.

| Results | Specimen | <u>Fungal Growth Comparison</u> |
|---------|----------|---|
| | 1 | <u>Greater than comparative material.</u> |
| | 2 | <u>Not greater than comparative material.</u> |
| | 3 | <u>Not greater than comparative material.</u> |

The pass/fail result: Pass

Basis for the pass/fail result: 2 out of 3 passed.

This R&D Services, Inc. test report and the evaluation contained in the report are limited to the material tested. The extent to which the material tested is representative of the product being manufactured is the sole responsibility of the manufacturer. The test results are not purported to predict the performance of the material in a building or installation.

Evaluation

Date

Review

Date

References:

ASTM C 739, "Standard Specification for Cellulosic Loose-Fill Thermal Insulation", 2002 Annual Book of ASTM Standards, Vol. 04.06, pp. 362-372.

ASTM C 1149, "Standard Specification for Self-Supported Spray Applied Cellulosic Thermal Insulation", 2002 Annual Book of ASTM Standards, Vol. 04.06, pp. 630-637.

ASTM C 1338, "Standard test Method for Determining Fungi Resistance of Insulation Materials and Facings", 2002 Annual Book of ASTM Standards, Vol. 04.06, pp. 721-723.

ASTM C 1497, "Standard Specification for Cellulosic Fiber Stabilized Thermal Insulation", 2002 Annual Book of ASTM Standards, Vol. 04.06, pp. 849-852.