# TEST REPORT

No. : GZMR091117906
Date : Jan 05, 2010


PT. LATRADE BATAM INDONESIA
LATRADE INDUSTRIAL PARK BLOCK E NO.3, SEI-BINTI, TANJUNG UNCANG.BATAM – INDONESIA

The following sample(s) was/ were submitted and identified on behalf of the client as:

| | | |
|---|---|---|
| Sample Name | : | GRM PROFILE |
| SGS Ref No. | : | GP091102179 |
| Test Performed | : | Selected test(s) as requested by applicant |
| Date of Receipt | : | Nov 25, 2009 |
| Test Period | : | Nov 25, 2009 to Dec 21, 2009 |

Test result(s) : Please refer to the following page(s)

********To be continued********

Signed for and on behalf of
SGS-CSTC Ltd.

Cathy Peng
Technical Supervisor





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SGS

# TEST REPORT

No. : GZMR091117906
Date : Jan 05, 2010
Page: 2 of 3

Test Result(s):

Sample description: Board

| No. | Test Item | Test method | Test condition | Result |
|---|---|---|---|---|
| 1 | Tensile strength | With reference to ASTM D638-08 | Specimen: Type I<br>Specimen thickness: 8.59mm<br>Testing speed: 5mm/min | 11.1MPa |
| 2 | Elongation at break | | | 2.0% |
| 3 | Modulus of Elasticity | ASTM D6109-05 Method A | Specimen: 302×65×16.0mm<br>Testing speed: 7.6mm/min | 1930MPa(see note 2) |
| 4 | Rupture in bending | | | 30.4MPa(see note 2) |
| 5 | Compressive strength | ASTM D695-08 | Specimen: 12.7×12.7×25.4mm<br>Testing speed: 1.3mm/min | 20.6MPa |
| 6 | Vicat softening temperature | With reference to ASTM D1525-07 and client's requirement | Specimen thickness: 16.1mm<br>Rate of temperature: 50℃/h<br>Load: 10N | 83.4℃ |
| 7 | Mechanical fastener holding test | With reference to ASTM D1037-06a Section 16 and client's requirement | Specimen: 152×65×16.0mm<br>Testing speed: 1.3mm/min<br>Diameter of screw: 3.5mm | 777.0N |
| 8 | Impact resistance | With reference to ASTM D4495-00(2005) and client's requirement | Specimen thickness: 16.0mm<br>Mass of the falling weight: 4.5kg | 47J |
| 9 | Specific gravity | ASTM D2395-07a$^{\varepsilon 1}$ Method A | ---- | 0.7415 |
| 10 | Moisture content | With reference to ASTM D1037-06a section 6 | Drying condition: 103℃, 3h | 0.27%<br>(see note 3) |

********To be continued********





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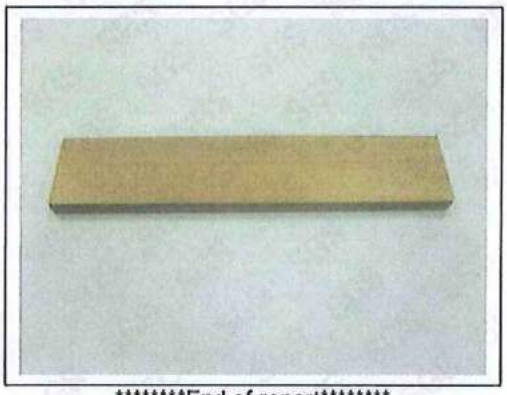
| No. | Test item | Test method | Test condition | Result |
|---|---|---|---|---|
| 11 | Water absorption | With reference to ASTM D1037-06a section 23 method A | Drying condition: 50℃, 24h<br>Immersion condition: 23±2℃, 24h | 2.0%<br>(see note 4) |
| 12 | Linear Thermal Expansion Coefficient | With reference to ASTM D696-08 | Temperature range: -30~30℃<br>Ramp: 10℃/min<br>Purge gas: $N_2$, Purity 99.995%,<br>Flow rate 100ml/min | 62.50μm/m.℃ |

Note: 1. All the test specimens were cut from sample.
2. Third point loading condition on a 256mm span using 25.4mm roller supports.
3. Moisture content, %=( Original weight–Weight after drying)/ Weight after drying×100.
4. Water absorption, %=(Weight after immersion 24h – Original weight)/ Original weight×100.

**Photo:**



********End of report********





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**Plastics Technology Group**
**Advanced Polymer & Composites Programme**
**SIRIM Berhad**
(Company No. 367474-V)
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*CONFIDENTIAL*

**TEST REPORT**

| | |
|---|---|
| Title: | **Evaluation of "GRM Profile"** |
| Report No.: | PTC/ER09/395 |
| Date: | 29 December 2009 |
| Project No.: | P09533 |
| Sample: | "GRM Profile" |
| Company Name: | PT Latrade Batam Indonesia |
| Address: | Latrade Industrial Park<br>Block E<br>No. 3, Jl. Sei Binti – Tanjung Uncang<br>Batam 29422<br>Indonesia |

Evaluated by:

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Moh Siew Ling

Checked by:

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Salina Sharifuddin

Approved by:

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Dr Ahmad Fuad Md. Yusuf
Head of Programme
Plastics Technology Group

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**Specifications/Test Methods:**

a) ASTM D 792: 2000 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.

b) ASTM D 635: 2006 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

c) ASTM D 256: 2003 – Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.

d) ASTM D 638: 2003 – Standard Test Method for Tensile Properties of Plastics.

e) ASTM D 790: 2003 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

f) ASTM D 570: 1998 - Standard Test Method for Water Absorption of Plastics.

g) ASTM D 6117: 1997 – Standard Test Methods for Mechanical Fasteners in Plastic Lumber and Shapes.

h) ASTM D 4060: 2001 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.

i) ASTM D 6341: 1998 – Standard Test Method for Determination of the Linear Coefficient of Thermal Expansion of Plastic Lumber and Plastic Lumber Shapes Between -30 and 140°F (-34.4 and 60°C).

j) ASTM D 1525: 2006 - Standard Test Method for Vicat Softening Temperature of Plastics.

k) ASTM E 831: 2006 - Standard Test Method for Linear Thermal Expansion of Solid Materials by Thermomechanical Analysis.

l) ASTM D 695: 2002 - Standard Test Method for Compressive Properties of Rigid Plastics

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**Sample Identification:**

Details of test specimens received on 26 November 2009 with regards to each type of test are listed as below:

| No. | Type of Test | Dimension of Test Specimen | Quantity |
|---|---|---|---|
| 1 | Water Absorption | 25 mm x 25 mm x thickness | 5 pieces |
| 2 | Density & Specific Gravity | 25 mm x 25 mm x thickness | 5 pieces |
| 3 | Coefficient of Linear Thermal Expansion (ASTM E 831) | 20 mm x 15 mm x thickness | 10 pieces |
| 4 | Coefficient of Linear Thermal Expansion (ASTM D 6341) | 300 mm x 58 mm x thickness | 5 pieces |
| 5 | Nail & Screw Withdrawal (ASTM D 6117) | 300 mm x 58 mm x thickness | 6 pieces |
| 6 | Compressive Strength (ASTM D 695) | 12.7 mm x 12.7 mm x 25.4 mm | 10 pieces |
| 7 | Linear Burning Rate (ASTM D 635) | 250 mm x 13 mm x thickness | 10 pieces |
| 8 | Abrasion Resistance (ASTM D 4060) | 100 mm x 100 mm x thickness | 5 pieces |
| 9 | Vicat Softening Temperature (ASTM D 1525) | 20 mm x 20 mm x thickness | 10 pieces |
| 10 | Chemical Test | 20 mm x 20 mm x thickness | 50 pieces |
| 11 | Tensile Test | Dumbbell shape test specimens | 10 pieces |
| 12 | Flexural Test | 250 mm x 13 mm x thickness | 10 pieces |
| 13 | Izod Impact Test | 64 mm x 13 mm x thickness | 20 pieces |
| 14 | Compressive Test | 12.7 mm x 12.7 mm x 25.4 mm | 10 pieces |

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**Results:**

**'GRM Profile'**

| No. | Property | Result | Test Method |
|---|---|---|---|
| 1 | Tensile Strength# MPa | 14.8 | ASTM D 638<br>Crosshead speed: 5 mm/minute<br>Gauge length: 50 mm |
| 2 | Modulus of Elasticity, MPa<br>(strain value $\varepsilon_1 = 0.0005$ to $\varepsilon_2 = 0.0025$) | 1,570 | |
| 3 | Elongation at Break, % | 3.3 | |
| 4 | Flexural Strength, MPa | 27.5 | ASTM D 790<br>Crosshead speed: 3 mm/minute<br>Support span distance: 112 mm |
| 5 | Flexural Modulus, MPa | 1,970 | |
| 6 | Izod Impact Strength, J/m | 20.4+ | ASTM D 256<br>Pendulum used: 2 Joule |
| 7 | Water Absorption, % | 1.5 | ASTM D 570<br>(immersed in distilled water at room temperature for 24 hours) |
| 8 | Specific Gravity | 0.9682 | ASTM D 792 (water displacement technique) |
| 9 | Density, g/cm$^3$ | 0.9659 | |
| 10 | Linear Burning Rate | HB* | ASTM D 635 |

Notes:

* indicates that flame front does not pass the 25 mm reference mark
+ indicates that the recorded energy is less than 10% of the full scale of the pendulum. 2 Joule is the lowest available pendulum.
# indicates that test specimens were further milled into dumbbell shape Type 1 of ASTM D 638.

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|---|---|
| TOTAL NO. OF PAGES: 6 | PAGE: 5 |



**Results (cont'd):**

**'GRM Profile'**

| No. | Property | Result | Test Method |
|---|---|---|---|
| 11 | Coefficient of Linear Thermal Expansion, x /$10^{-5}$ mm/mm /°C | 6.5 (see Fig. 1 to Fig. 3) | ASTM E 831<br>• Test temperature: -30°C to 100°C<br>• Heating rate: 5°C/minute<br>• Atmosphere: Helium |
| 12 | Coefficient of Linear Thermal Expansion, x $10^{-5}$ cm/cm/°C | 6.8 | ASTM D 6341 |
| 13 | Screw Withdrawal, N | 775 | ASTM D 6117<br>Crosshead speed: 2.5 mm/minute |
| 14 | Nail Withdrawal, N | 73 | |
| 15 | Compressive Strength, MPa | 8.29 | ASTM D 695<br>Crosshead speed: 1.3 mm/minute |
| 16 | Vicat Softening Temperature, °C<br>• At 1 kg weight<br>• At 5 kg weight | <br>82<br>69 | ASTM D 1525<br>Heating rate: 50°C /hour |
| 17 | Abrasion Resistance (Weight Loss), mg | 24 | ASTM D 4060<br>Type of abrader used: CS-10<br>No. of cycles: 1,000 times |

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| TOTAL NO. OF PAGES: 6 | PAGE: 6 |



**Results (cont'd):**

**'GRM Profile'**

| No. | Property | Result |
|---|---|---|
| 18 | Chemical Test# | |
| | Detection of Detection of heavy metal traces of cadmium, lead, mercury, chromium III, chromium VI using ICP Technique | Please refer to attached test report no.: 2009KD0935 |
| | Detection of halogenated substance (annion) – Floride, chloride, nitrite, nitrate, sulphate & phosphate using Ion Chromatography | |
| | Detection of formaldehyde emission (in-house method using GC-MS) | |

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Note:

# Test was conducted by the Chemical Testing Section, SIRIM QAS International Sdn. Bhd.

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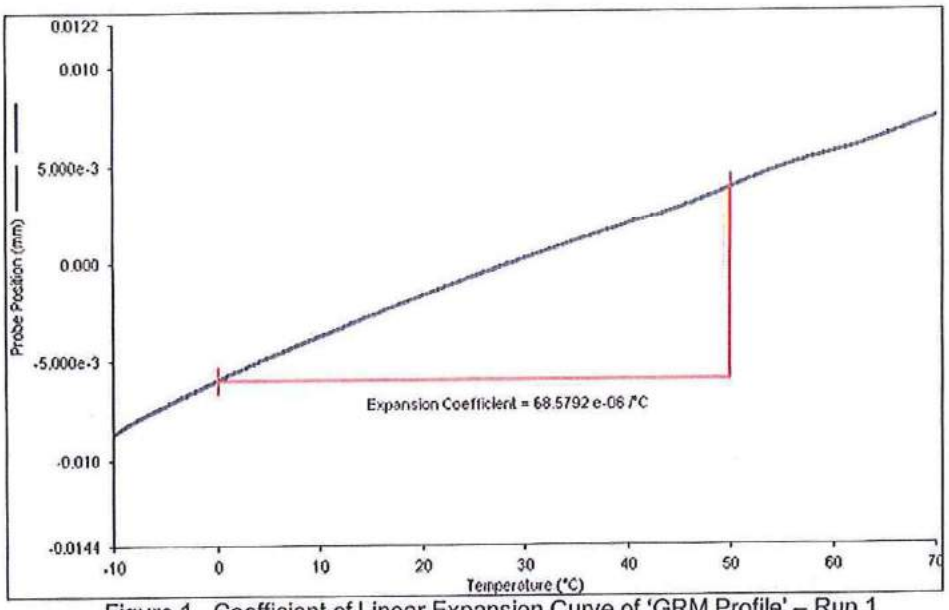


Figure 1. Coefficient of Linear Expansion Curve of 'GRM Profile' – Run 1

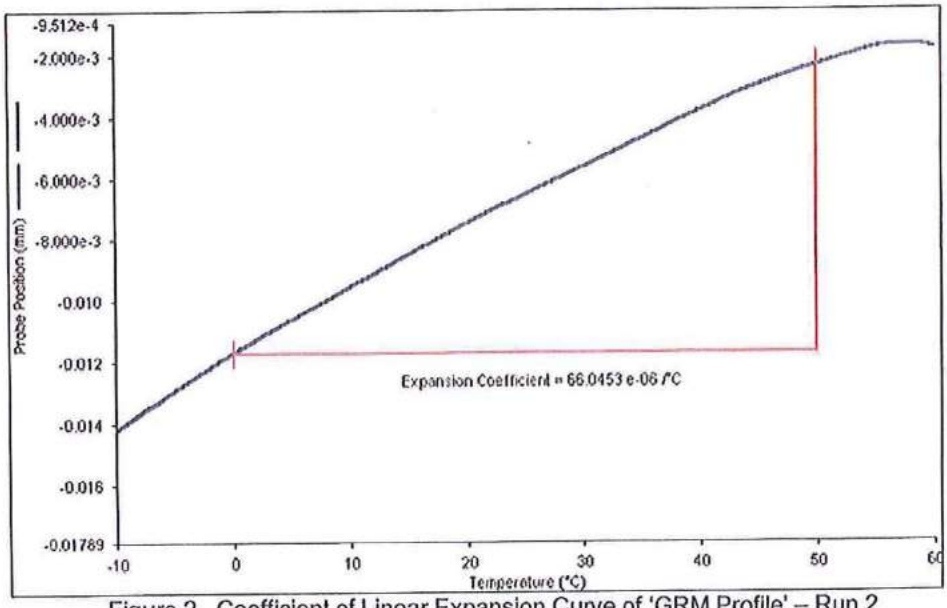


Figure 2. Coefficient of Linear Expansion Curve of 'GRM Profile' – Run 2

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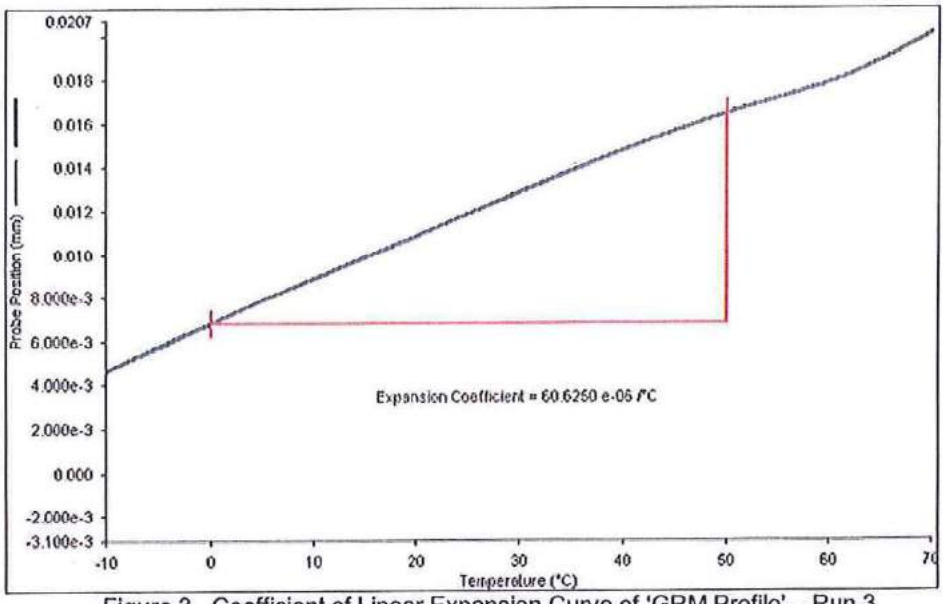


Figure 3. Coefficient of Linear Expansion Curve of 'GRM Profile' – Run 3

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# Test Report No. 7191172647-MEC17/01-LAS
**dated 20 OCT 2017**

PSB Singapore

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**SUBJECT:**

Testing of Wood Plastic Composite

**TESTED FOR:**

PT. Latrade Batam Indonesia
Blk E3 Latrade Industrial Park
Jalan Sei Binti
Tanjung Uncang Batam 29422
Indonesia

Attn: Mr. David Zhang

**SAMPLES DESCRIPTION:**

The following samples were submitted by PT. Latrade Batam Indonesia on 25 August 2017 for testing.

Sample Reference : WP06516 (W-65mm x H-16mm) - Wood Plastic Composite

| S/No. | Test Items | Approximate Dimensions | Quantity | Photograph |
|---|---|---|---|---|
| 1 | Density | 152 mm x 65 mm x 16 mm | 6 pcs |  |
| 2 | Shore D Hardness | 70 mm x 65 mm x 16 mm | 2 pcs |  |

TÜV SÜD PSB

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Singapore 118221

**SAMPLES DESCRIPTION (CONT'D):**

| S/No. | Test Items | Approximate Dimensions | Quantity | Photograph |
|---|---|---|---|---|
| 3 | Water Absorption | 152 mm x 65 mm x 16 mm | 6 pcs |  |
| 4 | Flexural Properties | 620 mm x 65 mm x 16 mm | 7 pcs |  |
| 5 | Compressive Properties | 12.7 mm x 12.7 mm x 16 mm | 8 pcs |  |
| 6 | Coefficient of Thermal Expansion | 6 mm x 6 mm x 8 mm | 4 pcs |  |
| 7 | Linear Coefficient of Thermal Expansion | 300 mm x 65 mm x 16 mm | 10 pcs |  |
| 8 | Vicat Softening Temperature | 12 mm x 12 mm x 7 mm | 4 pcs |  |

**TEST METHOD (AS PER CLIENT'S SPECIFICATION) :**

1. **Density**
   ASTM D2395 : 2014
   Density and Specific Gravity (Relative Density) of Wood and Wood-Based Materials

| | | |
|---|---|---|
| Nominal Specimen Dimensions | : | 152 mm x 65 mm x 16 mm |
| No. of Determinations | : | 3 |

2. **Shore D Hardness**
   ASTM D2240 : 2015
   Standard Test Method for Rubbery Property - Durometer Hardness

| | | |
|---|---|---|
| Nominal Specimen Thickness | : | 70 mm x 65 mm x 16 mm |
| No. of Plies | : | 1 ply |
| No. of Determinations | : | 7 |

3. **Water Absorption**
   ASTM D1037 : 2012, Section 23, Method A
   Standard Test Method for Evaluating Properties of Wood-Based Fiber and Particle Panel Materials

| | | |
|---|---|---|
| Nominal Specimen Thickness | : | 152 mm x 65 mm x 16 mm |
| Immersion Condition | : | a) 20 ± 1 °C for 2 hrs<br>b) 20 ± 1 °C for 24 hrs |
| No. of Determinations | : | 3 per test condition |

4. **Flexural Properties**
   ASTM D6109 : 2013
   Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastic Lumber and Related Products

| | | |
|---|---|---|
| Nominal Specimen Dimensions | : | 620 mm x 65mm x 16 mm |
| Support Span Length | : | 257 mm |
| Crosshead Speed | : | 7.6 mm/min |
| No. of Determinations | : | 5 |

5. **Compressive Strength**
   ASTM D695 : 2015
   Standard Test Method for Compressive Properties of Rigid Plastics

| | | |
|---|---|---|
| Nominal Specimen Dimensions | : | 12.7 mm x 12.7 mm x 16 mm |
| Crosshead Speed | : | 1.3 mm / min |
| No. of Determinations | : | 5 |

6. **Coefficient of Thermal Expansion**
   ASTM E831 : 2014
   Standard Test Method for Linear Thermal Expansion of Solid Materials by Thermomechanical Analysis

| | | |
|---|---|---|
| Nominal Specimen Dimensions | : | 6 mm x 6 mm x 8 mm |
| Test Condition | : | Ambient to 120°C |
| Heating Rate | : | 5 °C/min |
| Atmosphere | : | $N_2$ |

**TEST METHOD (AS PER CLIENT'S SPECIFICATION) CONTINUE :**

**7. Determination of Linear Coefficient of Thermal Expansion**

ASTM D6341 : 2016

Standard Test Method for Determination of the Linear Coefficient of Thermal Expansion of Plastic Lumber and Plastic Lumber Shapes Between -30 and 140°F (-34.4 and 60 °C)

| | | |
|---|---|---|
| Nominal Specimen Dimensions | : | 300 mm x 65 mm x 16 mm |
| Temperature range | : | a) -34.4 ± 2 °C for 48 hrs (min)<br>b) 23 ± 2 °C for 48 hrs (min)<br>c) 60 ± 2 °C for 48 hrs (min) |
| No. of Determinations | : | 5 |

**8. Vicat Softening Temperature**

ASTM D1525 : 2009

Standard Test Method for Vicat Softening Temperature of Plastics

| | | |
|---|---|---|
| No. of plies | : | 1 |
| Load | : | 1 kgf |
| Heat Transfer Medium | : | Silicone Oil |
| Heating Rate | : | 50 ± 5 °C/H |
| No. of Determinations | : | 2 |

**TEST RESULTS :**

| Characteristics | Unit | Results |
|---|---|---|
| 1. Density, average | $kg/m^3$ | 1178 |
| 2. Shore D Hardness, median | - | 68 |
| 3. Water Absorption, average<br>a) After 2 hours<br>b) After 24 hours | <br>%<br>% | <br>0.08<br>0.47 |
| 4. Flexural Properties, average<br>a) Flexural Strength<br>b) Flexural Modulus | <br>$N/mm^2$<br>$N/mm^2$ | <br>23.6<br>2251 |
| 5. Compressive Strength, average | $N/mm^2$ | 24.6 |
| 6. Coefficient of Thermal Expansion<br>a) α 1 (40 to 70 °C)<br>b) α 2 (95 to 105 °C) | <br>µm/m°C | <br>53.7<br>81.4 |
| 7. Linear Coefficient of Thermal Expansion | µm/m°C | 27.7 |
| 8. Vicat Softening Temperature | °C | 84 |

**NOTE:**

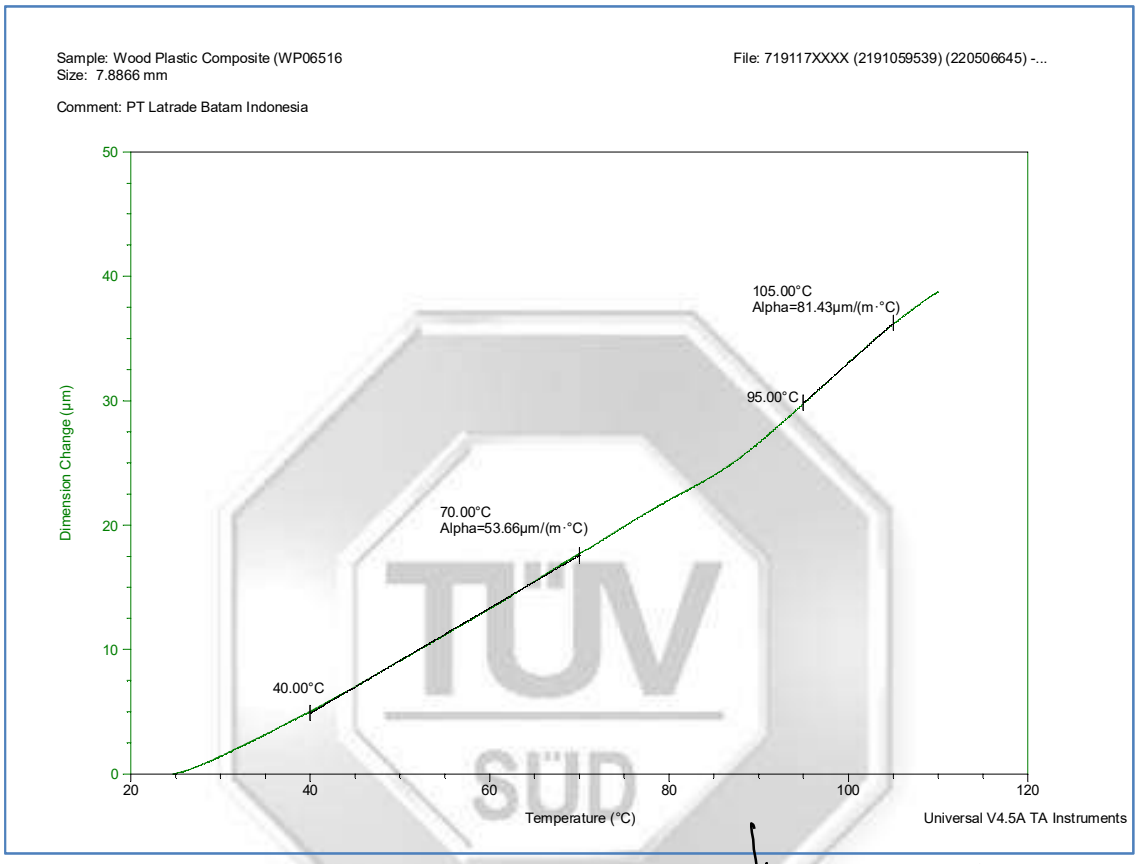
For Coefficient of Thermal Expansion, the result was based on the 3rd heating curve as shown in Figure 1.
The instrument is calibrated with Indium and Zinc.

Leong Ann Seow
Higher Associate Engineer

Kong Siew Yong
Product Manager
Polymer Products
Mechanical Centre

PSB Singapore

Figure 1 : TMA thermogram of sample labelled as “WP06516 (W-65mm x H-16mm) - Wood Plastic Composite“



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July 2011