REPORT NUMBER SY 4201

SLIP RESISTANCE CLASSIFICATION
OF NEW PEDESTRIAN SURFACES
APPENDIX A: WET PENDULUM TEST
TO AS/NZS 4586:2004

SY 4201-1
Concrete Paver 600mm x 400mm
Untreated

SY 4201-2
Concrete Paver 600mm x 400mm
Sealed with “Enhance Plus”

SY 4201-3
Concrete Paver 600mm x 400mm
Sealed with “Stainproof”

In Confidence to:
Drytreat Pty Ltd
December 2007
**Industrial Research Services**

Manuf. & Materials Technology, 14 Julius Ave (Riverside Corp. Park), North Ryde, NSW, 2113, Australia

Telephone: 61 2 9490 5444 Facsimile: 61 2 9490 5555 Email: tiles@csiro.au Web: http://www.cmmt.csiro.au

Registered Testing Authority - Building Code of Australia

*8 December 2007*  
Our Ref. ES13 / 1000 03/0212

**TEST REPORT No. SY4201-1**

<table>
<thead>
<tr>
<th>Requested by:</th>
<th>DryTreat</th>
</tr>
</thead>
<tbody>
<tr>
<td>On (date):</td>
<td>18 December 2007</td>
</tr>
<tr>
<td>Manufacturer:</td>
<td>Unknown</td>
</tr>
<tr>
<td>Product Desc.:</td>
<td>Concrete Paver 600mm x 400mm Unsealed</td>
</tr>
</tbody>
</table>

**Sampling details:**
- Where: Delivered
- Date: 18 December 2007
- By whom: Courier
- How (methods): N/A

The results reported relate only to the sample(s) tested and the information received. No responsibility is taken for the accuracy of the sampling unless it is done under our own supervision. CSIRO cannot accept responsibility for deviations in the manufactured quality and performance of the product. While CSIRO takes care in preparing the reports it provides to clients, it does not warrant that the information in this particular report will be free of errors or omissions or that it will be suitable for the client's purposes. CSIRO will not be responsible for the results of any actions taken by the client or any other person on the basis of the information contained in the report or any opinions expressed in it. The reproduction of this test report is only authorised in the form of a complete photographic facsimile. Our written approval is necessary for any partial reproduction.

This test report consists of **3** pages

### SUMMARY OF SLIP RESISTANCE TESTS PERFORMED:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
<th>Result</th>
<th>Class</th>
</tr>
</thead>
</table>

In order to interpret the classifications, please refer to Standards Australia Handbook 197, An Introductory Guide to the Slip Resistance of Pedestrian Surface Materials, which recommends minimum classifications for a wide variety of locations.

It is important to realise that test results obtained on unused factory-fresh samples may not be directly applicable in service, where proprietary surface coatings, contamination, wear and subsequent cleaning all influence the behaviour of the pedestrian surface.
SLIP RESISTANCE CLASSIFICATION OF NEW PEDESTRIAN SURFACE MATERIALS

WET PENDULUM TEST METHOD

TEST CARRIED OUT IN ACCORDANCE WITH
AS/NZS 4586:2004 (Appendix A)  
Test Date: 18 December 2007

RESULTS:  
Location: North Ryde Slip Resistance Laboratory  
Rubber slider used: Four S  
Conditioned with grade P400 paper, dry

Sample: Unfixed  
Cleaning: Acetone  
Temperature: 23°C

Pendulum Friction Tester: Stanley (S/N: 9234, calibrated 13/6/05)  
Test conducted by: Hugh McMullen

<table>
<thead>
<tr>
<th>Specimen</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last 3 swings</td>
<td>70</td>
<td>68</td>
<td>69</td>
<td>65</td>
<td>66</td>
</tr>
<tr>
<td>Averages</td>
<td>70</td>
<td>67</td>
<td>69</td>
<td>65</td>
<td>66</td>
</tr>
</tbody>
</table>

Mean BPN : 67
CLASS : V

Where products are to be used in wet barefoot areas, it is more appropriate to test to Appendix C of AS/NZS 4586 (which is technically equivalent to DIN 51097).
Consulting services are available if further detailed analysis of the test results are required.

PR:M181207-16:40:25
REPORT NO: 4201-1
ISSUE DATE: 18 December 2007
MANUFACTURER: Unknown
PRODUCT DESC: Concrete Paver 600mm x 400mm
Unsealed

DETERMINATION OF Rz SURFACE ROUGHNESS
(Using a Taylor-Hobson Surtronic 10 Rz roughness meter using a 0.8mm cut off length)

Test Date: 18 December 2007

RESULTS

Location: Slip Resistance Laboratory

Rz values

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>39.5</td>
</tr>
<tr>
<td>2</td>
<td>35.9</td>
</tr>
<tr>
<td>3</td>
<td>32.2</td>
</tr>
<tr>
<td>4</td>
<td>31.5</td>
</tr>
<tr>
<td>5</td>
<td>23.8</td>
</tr>
<tr>
<td>6</td>
<td>30.9</td>
</tr>
<tr>
<td>7</td>
<td>33.5</td>
</tr>
<tr>
<td>8</td>
<td>56.2</td>
</tr>
<tr>
<td>9</td>
<td>26.2</td>
</tr>
<tr>
<td>10</td>
<td>31.6</td>
</tr>
</tbody>
</table>

Surface Roughness (Rz) mean = 34.1 microns

BS 7976:2002, Pendulum Testers, requires a different test foot preparation (lapping paper) for pedestrian surfaces that have a Rz roughness of less than 15 microns. This lapping paper tends to reduce the pendulum result, sometimes appreciably. CSIRO recommends the use of this procedure (CSIRO COF1) as an adjunct to AS/NZS 4586. It helps to discriminate among products that have marginal wet slip resistance and to identify those that may be dangerous if wet.

The measurement of the various aspects of surface roughness is complex given the number of potential roughness parameters. While there is still some uncertainty as to exactly what type of roughness needs to be measured, peak-to-trough roughness (Rz) gives a useful guide to the likely slip resistance in wet conditions. Research has suggested that hard floors need to have a slightly higher Rz roughness than polymeric floors for the same degree of safety in wet conditions, but whatever flooring material is used an Rz roughness value of at least 10 microns is required where wet slip resistance may be required. In circumstances where wetness is normal or expected, this figure should be increased by a factor of 2 or more.

Greater peak surface roughnesses are likely to be required where floors slope or where the floor is likely to become contaminated with high viscosity liquids.
TEST REPORT No. SY4201-2

REQUESTED by: DryTreat
Date: 18 December 2007
Manufacturer: Unknown
Product Desc.: Concrete Paver 600mm x 400mm
Sealed with "Enhance Plus"

Sampling details:
Where: Delivered
Date: 18 December 2007
To whom: Courier

The results reported relate only to the sample(s) tested and the information received. No responsibility is taken for the accuracy of the sampling or testing done under our own supervision. CSIRO cannot accept responsibility for deviations in the manufactured quality and performance of the product. While CSIRO takes care in preparing the reports it provides to clients, it does not warrant that the information in this particular report will be free of errors or omissions or that it will be suitable for the client’s purposes. CSIRO will not be responsible for the results of any actions taken by the client or any other person on the basis of the information contained in the report or any opinions expressed in it. The reproduction of this report is only authorised in the form of a complete photographic facsimile. Our written approval is necessary for any partial reproduction.

This test report consists of 3 pages

SUMMARY OF SLIP RESISTANCE TESTS PERFORMED:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
<th>Result</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS/NZS 4586:2004</td>
<td>Slip resistance classification of new pedestrian surface materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appendix A: WET Pendulum (Four S slider):</td>
<td>Mean BPN: 66</td>
<td>V</td>
<td></td>
</tr>
</tbody>
</table>

In order to interpret the classifications, please refer to Standards Australia Handbook 197, An Introductory Guide to the Slip Resistance of Pedestrian Surface Materials, which recommends minimum classifications for a wide variety of locations.

It is important to realise that test results obtained on unused factory-fresh samples may not be directly applicable in service, where other factors, such as surface coatings, contamination, wear and subsequent cleaning all influence the behaviour of the pedestrian surface.
SLIP RESISTANCE CLASSIFICATION OF NEW PEDESTRIAN SURFACE MATERIALS

WET PENDULUM TEST METHOD

TEST CARRIED OUT IN ACCORDANCE WITH
AS/NZS 4586:2004 (Appendix A)  
Test Date: 18 December 2007

RESULTS:
Location: North Ryde Slip Resistance Laboratory
Rubber slider used: Four S
Conditioned with grade P400 paper, dry
Sample: Unfixed
Cleaning: Acetone
Temperature: 23°C

Pendulum Friction Tester: Stanley (S/N: 9234, calibrated 13/6/05)
Test conducted by: Hugh McMullen

<table>
<thead>
<tr>
<th>Specimen</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last 3 swings</td>
<td>69</td>
<td>66</td>
<td>65</td>
<td>65</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>69</td>
<td>66</td>
<td>65</td>
<td>65</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>69</td>
<td>66</td>
<td>64</td>
<td>65</td>
<td>62</td>
</tr>
<tr>
<td>Averages</td>
<td>69</td>
<td>66</td>
<td>65</td>
<td>65</td>
<td>63</td>
</tr>
</tbody>
</table>

Mean BPN: 66
CLASS: V

For products are to be used in wet barefoot areas, it is more appropriate to test to Appendix C of AS/NZS 4586 (which is technically equivalent to DIN 51097).
Industrial Research Services
Manuf. & Materials Technology, 14 Julius Ave (Riverside Corp. Park), North Ryde, NSW, 2113, Australia
Telephone: 61 2 9490 5444 Facsimile: 61 2 9490 5555 Email: tiles@csiro.au Web: http://www.cmmt.csiro.au

REPORT NO: 4201-2
Issue Date: 18 December 2007
Manufacturer: Unknown
File Desc: Concrete Paver 600mm x 400mm
Sealed with "Enhance"

Date and Place 18 December 2007, North Ryde, NSW

Name, Title and Signature:

Hugh McMullen
Laboratory Manager
Telephone: 61 2 94905414
Fax: 61 2 94905555
Email: Hugh.McMullen@csiro.au

Consulting services are available if further detailed analysis of the test results are required.
DETERMINATION OF Rz SURFACE ROUGHNESS

(Using a Taylor-Hobson Surtronic 10 Rz roughness meter using a 0.8mm cut off length)

Test Date: 18 December 2007

RESULTS

Location: Slip Resistance Laboratory

Rz values

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>31.2</td>
</tr>
<tr>
<td>2</td>
<td>34.1</td>
</tr>
<tr>
<td>3</td>
<td>32.0</td>
</tr>
<tr>
<td>4</td>
<td>25.3</td>
</tr>
<tr>
<td>5</td>
<td>22.6</td>
</tr>
<tr>
<td>6</td>
<td>33.6</td>
</tr>
<tr>
<td>7</td>
<td>27.8</td>
</tr>
<tr>
<td>8</td>
<td>37.7</td>
</tr>
<tr>
<td>9</td>
<td>24.6</td>
</tr>
<tr>
<td>10</td>
<td>27.1</td>
</tr>
</tbody>
</table>

Surface Roughness (Rz) mean = 29.6 microns

While there is still some uncertainty as to exactly what type of roughness needs to be measured, peak-to-trough roughness (Rz) gives a useful guide to the likely slip resistance in wet conditions. Research has suggested that hard floors need to have a slightly higher Rz roughness than polymeric floors for the same degree of safety in wet conditions, but whatever flooring material is used an Rz roughness value of at least 10 microns is required where wet slip resistance may be required. In circumstances where wetness is normal or expected, this figure should be increased by a factor of 2 or more.

Greater peak surface roughnesses are likely to be required where floors slope or where the floor is likely to become contaminated with high viscosity liquids.
**Industrial Research Services**  
**Manuf. & Materials Technology**, 14 Julius Ave (Riverside Corp. Park), North Ryde, NSW, 2113, Australia  
Telephone: 61 2 9490 5444 Facsimile: 61 2 9490 5555 Email: tiles@csiro.au Web: http://www.cmmt.csiro.au

**Registered Testing Authority - Building Code of Australia**

**TEST REPORT No. SY4201-3**

- **Requested by:** DryTreat  
  - **Date:** 18 December 2007
- **Manufacturer:** Unknown  
- **Product Desc.:** Concrete Paver 600mm x 400mm Sealed with "Stainproof"  
- **Sampling details:**  
  - **Where:** Delivered  
  - **Date:** 18 December 2007  
  - **By whom:** Courier  
  - **Sample methods:** N/A

Results reported relate only to the sample(s) tested and the information received. No responsibility is taken for the accuracy of the sampling or any other person on the basis of the information contained in the report or any opinions expressed in it. The reproduction of this test report is authorised in the form of a complete photographic facsimile. Our written approval is necessary for any partial reproduction.

This test report consists of 3 pages

<table>
<thead>
<tr>
<th><strong>SUMMARY OF SLIP RESISTANCE TESTS PERFORMED:</strong></th>
<th><strong>Result</strong></th>
<th><strong>Class</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AS/NZS 4586:2004</strong> Slip resistance classification of new pedestrian surface materials Appendix A: WET Pendulum (Four S slider):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean BPN:</td>
<td>68</td>
<td>V</td>
</tr>
</tbody>
</table>

*For interpretation of the classifications, please refer to Standards Australia Handbook 197, An Introductory Guide to the Slip Resistance of Pedestrian Surface Materials, which recommends minimum classifications for a wide variety of locations.*  
*It is important to realise that test results obtained on unused factory-fresh samples may not be directly applicable in service, where surface coatings, contamination, wear and subsequent cleaning all influence the behaviour of the pedestrian surface.*
SLIP RESISTANCE CLASSIFICATION OF NEW PEDESTRIAN SURFACE MATERIALS

WET PENDULUM TEST METHOD

TEST CARRIED OUT IN ACCORDANCE WITH AS/NZS 4586:2004 (Appendix A) Test Date: 18 December 2007

RESULTS: Location: North Ryde Slip Resistance Laboratory
Rubber slider used: Four S
Conditioned with grade P400 paper, dry

Sample: Unfixed
Cleaning: Acetone
Temperature: 23°C

Friction Tester: Stanley (S/N: 9234, calibrated 13/6/05)

Test conducted by: Hugh McMullen

<table>
<thead>
<tr>
<th>Specimen</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last 3 swings</td>
<td>68</td>
<td>69</td>
<td>68</td>
<td>67</td>
<td>72</td>
</tr>
<tr>
<td>67</td>
<td>69</td>
<td>68</td>
<td>68</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>69</td>
<td>68</td>
<td>69</td>
<td>69</td>
<td></td>
</tr>
<tr>
<td>Averages</td>
<td>67</td>
<td>69</td>
<td>68</td>
<td>68</td>
<td>70</td>
</tr>
</tbody>
</table>

Mean BPN: 68

CLASS: V

Notes: products are to be used in wet barefoot areas, it is more appropriate to test to Appendix C of AS/NZS 4586 (technically equivalent to DIN 51097).
Concrete Paver 600mm x 400mm
Sealed with "Stainproof"

18 December 2007, North Ryde, NSW

Consulting services are available if further detailed analysis of the test results are required.

PR:M181207-16:37:43
Determination of Rz Surface Roughness

(Using a Taylor-Hobson Surtronic 10 Rz roughness meter using a 0.8mm cut off length)

Test Date: 18 December 2007

**Results**

Location: Slip Resistance Laboratory

Rz values

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>27.4</td>
</tr>
<tr>
<td>2</td>
<td>38.1</td>
</tr>
<tr>
<td>3</td>
<td>25.4</td>
</tr>
<tr>
<td>4</td>
<td>30.5</td>
</tr>
<tr>
<td>5</td>
<td>37.0</td>
</tr>
<tr>
<td>6</td>
<td>30.7</td>
</tr>
<tr>
<td>7</td>
<td>35.3</td>
</tr>
<tr>
<td>8</td>
<td>42.4</td>
</tr>
<tr>
<td>9</td>
<td>31.9</td>
</tr>
<tr>
<td>10</td>
<td>26.0</td>
</tr>
</tbody>
</table>

**Surface Roughness (Rz) mean** = 32.5 microns

**Note:** Pendulum Testers, requires a different test foot preparation (lapping paper) for pedestrian surfaces with Rz roughness of less than 15 microns. This lapping paper tends to reduce the pendulum result, sometimes more than 15 microns. CSIRO recommends the use of this procedure (CSIRO COF1) as an adjunct to AS/NZS 4586. It helps to differentiate among products that have marginal wet slip resistance and to identify those that may be dangerous if wet.

The measurement of the various aspects of surface roughness is complex given the number of potential roughness parameters. There is still some uncertainty as to exactly what type of roughness needs to be measured. Roughness (Rz) gives a useful guide to the likely slip resistance in wet conditions. Research has suggested that hard floors need to have a slightly higher Rz roughness than polymeric floors for the same degree of wet conditions, but whatever flooring material is used an Rz roughness value of at least 10 microns is recommended where wet slip resistance may be required. In circumstances where wetness is normal or expected, this Rz should be increased by a factor of 2 or more.

At times, surface roughnesses are likely to be required where floors slope or where the floor is likely to be contaminated with high viscosity liquids.