



March 2017

*Pedestrian slip resistance testing in the wet condition:
AS/NZS 3661.1: 1993*

Timspec – Uncoated Acoya – Band-sawn face.



Testing and reporting by Iain McIver

Review by Richard Jackett

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527920.47 | Uncoated Acoya
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| WET CONDITION PEDESTRIAN SLIP RESISTANCE TESTING | |
|--|--|
| DESCRIPTION | UNCOATED ACOYA – BAND-SAWN FACE |
| Sampling | Five specimens were prepared and supplied by the client. The samples were uncoated Acoya timber with one band-sawn face. The samples were approximately 300 x 150 x 20 mm. Testing was performed both across and along the samples. Testing along the samples ran perpendicular to the striations left by the band-sawing, while the across testing ran parallel to these markings. The timber grain generally runs along the length of the samples, and is therefore perpendicular to the band-sawn striations. |

| TESTING | | | |
|---|---|--------------|-----------------------|
| Method | AS/NZS 3661.1: 1993 Slip resistance of pedestrian surfaces, Part 1: Requirements Appendix A (A4 for laboratory testing) | | |
| Test and report | Iain McIver | Prepared for | Timspec |
| Review | Richard Jackett | Contact | Jonathan Rugg |
| Date of testing | 01 March 2017 | Location | Opus Research, Petone |
| Slider | 4S rubber slider (#96) | Conditions | 20°C, 45% RH |
| Information on the pedestrian slip resistance testing and requirements is on following pages. | | | |

| AS/NZS 3661.1: 1993 REPORTING |
|--|
| AS/NZS 3661.1: 1993 requires each specimen's mean BPN value is converted to a coefficient of friction using an equation given in that Standard. AS/NZS 3661.1: 1993 requires reporting of the sample mean coefficient of friction. When tested in accordance with the method set out in Appendix A, the surface is considered to be "slip resistant" in the wet if the sample mean coefficient of friction is not less than 0.4 and no specimen mean coefficient of friction in that sample shall be less than 0.35. |

| RESULTS: UNCOATED ACOYA WITH BAND-SAWN FACE - ALONG | | | | | |
|--|------|------|------|------|------|
| Test | 1 | 2 | 3 | 4 | 5 |
| BPN | 43.7 | 46.2 | 48.5 | 47.5 | 49.5 |
| Mean coefficient of friction (μ) | 0.46 | 0.49 | 0.48 | 0.48 | 0.54 |

| RESULTS: UNCOATED ACOYA WITH BAND-SAWN FACE - ACROSS | | | | | |
|---|------|------|------|------|------|
| Test | 1 | 2 | 3 | 4 | 5 |
| BPN | 43.8 | 46.3 | 45.3 | 45.7 | 50 |
| Mean coefficient of friction (μ) | 0.46 | 0.49 | 0.48 | 0.48 | 0.54 |

SAMPLE MEAN μ IS 0.50 (ALONG) AND 0.49 (ACROSS)
AND ACCORDING TO AS/NZS 3661.1: 1993 IS CONSIDERED SLIP RESISTANT IN THE WET CONDITION

| COMMENTS |
|---|
| These results are only valid for the specimens for the condition in which they were received and tested. Factors such as pedestrian or other trafficking, wear, contamination, dirtying, and/or maintenance procedures may alter the in-service friction characteristics. |
| Testing was conducted in different directions along and across the specimens. |

The following information is provided to direct users of this test report on some of the more relevant documents. It does not necessarily represent all slip resistance requirements potentially applicable and it is not intended to replace reading of the documents referred to.

New Zealand Building Code Clause D1: Access Routes

An “access route” is defined in the New Zealand Building Code (NZBC) as “a continuous route that permits people and goods to move between the apron or construction edge of the building to spaces within a building, and between spaces within a building.” NZBC Clause D1 section 2.1.1 states level access routes to which the public has access shall have a mean coefficient of friction, “ μ ”, of not less than 0.4 when tested in accordance with AS/NZS 3661.1: 1993 under expected conditions of use. Conditions are described as “dry” for those parts of the access route intended to remain dry under normal usage or “wet” for those parts that may become wet during normal usage, such as where water may be tracked by footwear.

AS/NZS 3661.1: 1993

The testing that was applied was in accordance with the joint Australian and New Zealand Standard AS/NZS 3661.1: 1993 "Slip Resistance of Pedestrian Surfaces - Requirements".

In New Zealand, AS/NZS 3661.1: 1993 has been superseded by two standards, AS/NZS 4586: 2004 and AS/NZS 4663: 2004¹. However, AS/NZS 3661.1: 1993 is currently cited in the New Zealand Building Code as providing the method for verification of slip resistance performance.

AS/NZS 3661.1: 1993 provides test methods stated as appropriate to determine the characteristics of surface materials either in the laboratory, under conditions in which the surface materials are intended to be installed, or in situ following installation; and provides those test methods for either testing for the wet condition or the dry condition.

The test method for the wet condition is set out in Appendix A “Wet Pendulum Test Method”. Testing for the wet condition uses a pendulum friction tester.

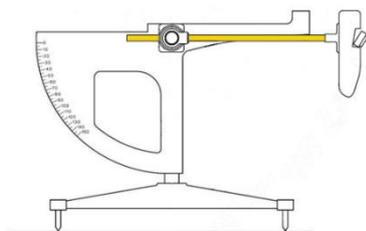
AS/NZS 3661.1: 1993 states the relationship between BPN (with the 4S rubber slider) and coefficient of friction is

$$\mu = \frac{3 \times BPN}{330 - BPN} \text{ where } \mu \text{ is the coefficient of friction and } BPN \text{ is the British Pendulum Number.}$$

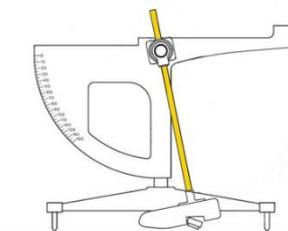
¹ In Australia, these standards have been further superseded so that the standards current in Australia are AS 4586: 2013 and AS 4663: 2013.

The British Pendulum Tester

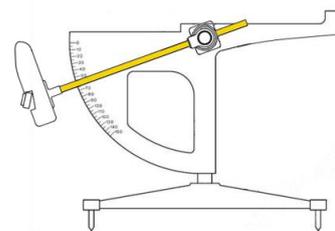
The British Pendulum Tester has a rigid swinging arm, approximately 450 mm long, which contacts the test surface with a spring loaded rubber slider (about 75 mm by 20 mm) mounted on a weighted foot. The pendulum arm swings the foot downwards through 90°, so the foot strikes the test surface when the pendulum arm is near vertical. The pendulum arm length is set so the rubber slides along the test surface for a distance of between 125 and 127 mm, losing energy as it does so, and that energy loss being related to the frictional resistance of the test surface. After sliding the rubber along the test surface, the pendulum arm then swings upwards alongside a British Pendulum Number (BPN) scale to provide a direct reading of the BPN. A higher BPN implies the surface has higher friction.



Pendulum arm horizontal ready to start swing



Rubber slider on pendulum arm about to contact ground



Height of pendulum arm swing against numerical scale

For AS/NZS 3661.1: 1993, the British Pendulum Tester uses a rubber slider known as the Four S rubber slider (Slider #96) which is made of a standard simulated shoe sole rubber. With this rubber slider, the British Pendulum Tester delivers, as far as possible, a response that is representative of a “typical” pedestrian wearing suitable footwear. The test speed of the rubber slider over the test surface is approximately 2 m/s. People typically walk at speeds of 65 to 90 m/minute, about 1.0 to 1.5 m/s, so the instrument is regarded as equating the action of pedestrians walking in unconstrained level spaces, possibly hurrying a little or turning abruptly.

Ramps/sloping surfaces

The wet pendulum test results represent the slip resistance for the test surface in the horizontal plane.

AS/NZS 3661.1: 1993 and the NZBC Verification Method D1/VM1 each relate slip resistance required in the horizontal plane to that required on a sloped plane using the following relationship:

$$\mu = 0.4 + 0.0125 S \quad \text{where } S \text{ is the slope of the walking surface expressed as a percentage.}$$

The original documents should be referred to for background and explanation of how this relationship is applied.