SHOULD WE RECOGNISE FOREIGN SLIP RESISTANCE TEST RESULTS?

There has been considerable recent controversy as to whether architects can or should rely upon published slip resistance classifications, or whether they must insist on local testing. We asked Richard Bowman for guidance, and now have a better framework for making decisions. It is worth remembering that, while beauty lies in the eye of the beholder, first appearances can be deceptive.

Whether or not merchants and architects should recognise foreign slip resistance results is an extremely important question. While it requires a consideration of several issues, one must first recognise any real or perceived conflicts of interest. CSIRO derives income from slip resistance testing. While we strictly observe the government's Competitive Neutrality Policy, we unfortunately have a monopolistic situation with respect to oil wet ramp testing. Any insistence on local testing would obviously be of some benefit to CSIRO. However, in the broader scheme of things, such income is only a partial contribution to, or investment in, slip resistance research and the evolution of improved Standards and industry guidance. This paper seeks to present some pertinent facts so that individuals can determine what is appropriate for them.

HISTORICAL BACKGROUND

CSIRO invested in a ramp tester for research purposes. AS/NZS 3661.1:1993, *Slip resistance of pedestrian surfaces: Requirements*, recognised that the adopted tests were not well suited for assessing the slip resistance of resilient products or heavily profiled surfaces. In seeking to overcome these problems in 1997, a member of Standards Australia Committee BD/94 proposed the adoption of the ramp tests, although it was recognised that CSIRO had the sole test facility. In March 1999, shortly before publication of AS/NZS 4586:1999, *Slip resistance classification of new pedestrian surface materials*, it became apparent that there was a supply problem with the specified boots, although the Germans indicated that it should be solved in a few months. Knowing that they had solved earlier problems, a decision was made to proceed with publication, since any change in the footwear could be addressed by means of an amendment.

CSIRO has, at its own expense, been collaborating with BIA in Germany in an effort to identify suitable replacement boots in order to enable other laboratories to conduct the oil-wet ramp test. While we are satisfied with the comparative performance of a specific type of Swiss boots, it is important that any change in AS 4586 should be made in harmony with the technically equivalent German standard, DIN 51130. Given the high cost of the specified calibration board tiles, and the imminent exhaustion of the reserved stock, a decision also needs to be made with respect to the possible adoption of new calibration boards. The Germans have also been considering deletion of class R9. As stated in SA HB 197, *An introductory guide to the slip resistance of pedestrian surface materials*, this class is too broad. The 3 to 6 degree range contains slippery products that are inappropriate for some locations.

Germany is a major export market for many tile manufacturers and since companies must comply with mandatory slip resistance requirements for specific work areas, many products have been ramp tested. Any significant amendments to AS 4586, in isolation to DIN 51130, would certainly inhibit local merchants and architects in the use of foreign test reports. The availability of such reports was perceived to be a desirable feature when adoption of the ramp tests was being considered.

CSIRO FUNDED PROFICIENCY TESTING

In 1998, CSIRO contacted all known Australian pendulum users and invited them to participate in a comparative study using six sets of tiles and two types of rubber slider. While some laboratories declined to participate, 26 accepted the opportunity to confidentially find out how well they performed. Most performed reasonably well, where the majority were able to obtain results that fell within 10% of the mean results for each set of tiles. This confirmed that too much emphasis was being placed on the absolute accuracy of the instrument and its operation. In practice, this supported the move away from having a sole pass/fail criterion of a wet coefficient of friction of 0.40 (in AS 3661.1) to having a classification system (in AS 4586). Committee BD/94 recognised that due to some inherent limitations of

THIS THOUGHT PROVOKING ARTICLE BY RICHARD BOWMAN IS ESSENTIAL READING FOR INDUSTRY MEMBERS AND SPECIFIERS ALIKE.

the Pendulum when testing certain surfaces, some of the products that were passing were not as slip resistant as others that were failing. While supporters of cheaper test devices have tried to use this open recognition of the limitations of the Pendulum to condemn it, other portable devices are subject to the same or similar limitations.

It is important to recognise that two competent laboratories may give slightly differing results. It is obviously preferable to rely upon accredited laboratories that use test methods that have been recognised in Australia.

BUILDING CODE OF AUSTRALIA

Every part of a building must be constructed in an appropriate manner to achieve the requirements of the BCA, using materials that are fit for the purpose intended. Evidence of product suitability can be provided in a number of ways but is normally achieved in the form of a report issued by a Registered Testing Authority. A Registered Testing Authority means CSIRO BCE; an authority registered by the National Association of Testing Authorities (NATA) to test in the relevant field; or an organisation outside Australia recognised by NATA through a mutual recognition agreement.

NATA is recognised as the largest and most diverse laboratory accreditation body in the world. NATA has established mutual recognition agreements with over 33 other laboratory accreditation bodies in 24 countries. These agreements are crucial in the recognition of Australian test and calibration data overseas, and in the acceptance of Australian goods in foreign markets. The Commonwealth Government recognises NATA as the sole national accreditation body for establishing competent laboratory practice. NATA accreditation is provided by classes and sub-classes of test. Eleven Australian laboratories (about 25% of pendulum users) are accredited to determine the wet pendulum slip resistance of pedestrian surfaces, with seven offering a public testing service.

If someone wants to recognise a foreign test report, they should determine which laboratory conducted the testing, and whether that laboratory was accredited to conduct that specific test.

DOES CSIRO RECOGNISE EUROPEAN TEST REPORTS?

I have visited several independent laboratories in Europe and elsewhere in the world, which are capable of issuing test reports, where many of the laboratories are accredited by bodies that have mutual recognition agreements with NATA. I respect the technical competence and understanding of their staff, and particularly in the case of CERLABS (the European Network of National Ceramic Laboratories) members, who include Centro Ceramico in Italy, AICE in Spain, and CERAM Research in the UK. SFV is the German member, but BIA is recognised as the German authority for oil-wet ramp testing.

However, there is a vast difference between recognition of the competence of a laboratory and recognition of their test reports. With several different types of testing, we have found products that have failed to achieve the same results reported by a respected laboratory. This is probably due to

differences in the batches of product being tested, particularly since some test reports are very old. There are also significant differences between the depth of material given in original laboratory test reports and manufacturers' published data. Test reports may include the sampling details, but certainly include the date of testing and the ramp angle that was achieved. Product literature generally only indicates the designated class, and not the angle achieved. When oil-wet ramp testing, laboratories should be able to achieve results that are within 3 degrees of the true mean. Such a difference is sufficient to have a product being assessed as being at the top end of a classification, or at the bottom end of the classification above.

SA HB 197 indicates that some of the recommended classifications for specific areas may be lenient while others may be onerous. Some latitude is given to modifying these recommendations based on a consideration of factors that are relevant to the specific area and its intended usage. Wherever someone considers permitting a material with a lower classification to be used, it would be most advisable to check that the intended product is at the top rather than at the bottom of that classification. This requires publication of the mean overall acceptance angles.

It is not up to CSIRO to recognise other laboratories' reports. CSIRO will not assume any liability for testing that has been conducted by a laboratory where we have not been involved in the sampling or testing.

TEST REPORTS – CAN THEY BE TRUSTED?

CSIRO has been asked to interpret some European test reports and have had to conclude that they are either incorrect or have been falsified. Test houses may occasionally received tiles that have been treated where someone fails to advise them of the treatment. They are forced to rely upon whoever is commissioning the work for a description of the product that is being tested. Stone is a natural product subject to a degree of inherent variation, where its processing can also result in a range of surface finishes. We have seen European slip resistance test reports that have poorly identified the source of the stone and that have provided no indication of the surface finish. Merchants and architects would do well to obtain guarantees that they are receiving the product that was tested if they choose to rely upon such reports.

Many foreign manufacturers recognise that Australian architects are reassured by test reports from trusted local laboratories. It may also be more cost effective for them to outsource specialised testing to recognised authorities rather than investing in expensive testing facilities. The cost of testing in Australia also tends to be far less than testing in Europe.

We have been asked to comment on some of our own test reports, and have detected fraudulent changes (that appear to have been made by the foreign manufacturer rather than the local retailer who commissioned the testing). Representing a tile as being more slip resistant than it really is has always seemed to be a particularly stupid thing to do, as it is easily measured and there is normally a small percentage of unused tiles on each project that are stored for potential replacements. Testing these may indicate an unacceptable batch-to-batch variation, if the fraud is not detected, and would imply an unfavourable lack of quality control. In some circumstances, it may constitute false and misleading advertising. If the fraud is detected, it would obviously have originated within the supply chain, and the claimant is thus placed in a very strong position.

SUBSTITUTIONS AND VARIATIONS

We have found tiles being marketed with the aid of a CSIRO report that were quite different to the tiles that we tested some years previously (that were still held in our reserve).

We have found tremendous variations in the slip resistance within some manufacturers' product ranges. This has mainly been a colour to colour variation, but size to size variations have often been observed. Some variations have extended over three tile slip resistance classifications, where the difference in performance has been measured using a variety of devices.

Some manufacturers and tile merchants are testing composite sets of products to better detect such variations. While the Pendulum test is based on five specimens in order to ensure consistency within a production batch, a single test can also be used to assess the consistency between five different colours. Such a composite test will often precede ramp testing where the products that have the lowest Pendulum slip resistance are deliberately placed at the bottom of the board to ensure that they are walked on rather than being stood on at the start of each walk down the ramp. Another option is to segregate the tiles and to ramp test them in separate individual or composite batches as is deemed appropriate. A guiding principle is to try to determine the worst case scenario, as this is the best basis for assessing relative risk.

The amount of independent testing that is necessary is obviously a function of how much in-house testing is conducted. For example, an Australian manufacturer may test every production batch in-house, commission regular independent testing and publish conservative results such that 95% of production is likely to surpass the published results; a European manufacturer might rely on less reliable in-house testing and submit a small proportion of their range to independent testing; and a producer in a less developed economy may not undertake any in-house slip resistance testing and would commission independent testing as it is required by clients. There are tremendous variations throughout the world and some Asian manufacturers would have better quality control and more proficient testing regimes than some European manufacturers.

When products fail to achieve a desired result, we have observed instances of people commissioning tests in several laboratories in order to obtain results that comply with a client's requirements. When faced with several sets of variable results, some cultures encourage the reporting and promotion of the most favourable results. In countries like Australia where recourse to litigation is a common means of resolving problems, people tend to be more cautious.

It is likely that manufacturers will eventually place a greater emphasis on the statistical acceptance of results. One

European manufacturer claimed that they tested the slip resistance of their products daily and maintained that the results fell within a narrow band. However, after an accident occurred, an early Australian test report was discovered that indicated that the product had far greater slip resistance. This implied that the architect might have relied on an unreliable test report, which the architect would have expected to be reliable. However, other batches of unused product (manufactured at about the same time as that involved in the accident) were obtained. Testing revealed that some batches had slip resistance similar to that reported by the manufacturer, but one batch had much lower results. Looking at these results on a statistical basis, the discovery of a 'slippery' batch of product implies that there were substantial variations in the slip resistance of the product. If the slip resistance results were normally distributed about the reported median range, then it is possible that the 'unreliable' test report (with the high results) was reliable. Since the floor had been removed and another product laid, the inevitable conclusion was that the test house should be given the benefit of the doubt. However, it was impossible to determine the extent to which the slip resistance of the floor had contributed to the accident.

Such batch-to-batch variations make it hard for test houses to mutually recognise one another's test reports. While CSIRO might recognise that the other CERLABS members conduct tests in accordance with the required procedures, we cannot rely upon their test report to confirm that a different batch of product will have the same characteristics.

IN SUMMARY

It is up to the individual as to how much trust they place in the accuracy and relevance of existing test reports and published classifications with respect to the products that they are about to receive. Some specifiers advise tenderers to allow for the cost of slip resistance testing when proposing products for use, where acceptance of the product will be based upon the test results of the batches supplied. This effectively ensures that the products that are used will have been locally tested. While the building owner pays for this security, everybody can share a sense of security . . . as long as the slip resistance is sustainable . . . but that's another issue. ◆

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