

EXPOSURE SITE UPGRADE

BRANZ recently upgraded its 40-year-old materials exposure site and digitalised its test records. Not only has this made the invaluable information easier to use, it's helping improve understanding of how materials respond to our climate.

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While continuous improvements and changes to building products expand the possibilities of how we design and build, the requirement that products and components are functional for a reasonable service life remains. Outdoor exposure sites are used to test materials to see if they meet these requirements.

Real-world testing

Outdoor exposure testing generally involves fixing test samples to a sample rack facing 45° north and leaving them in the elements to age. This provides real-world testing of products against New Zealand's climatic conditions. Sometimes, natural exposure testing can continue for several decades before a sample breaks down, while some materials such as polymers and metals will deteriorate in months.

The breakdown of samples on the BRANZ exposure site is tracked with routine photographs and test measurements. Over time, enough measurements are collected to confidently characterise the degradation type and likely underlying degradation process, enabling assessment of the material durability and expected product life. Incompatibilities between materials, maintenance requirements and significant in-use problems may also be identified. The material type, formulation and processing of a product also affects how a product ages.

The most obvious deterioration effects are fading and colour change. These aesthetic changes are easy to see by comparing before and after photographs. Quantitative measurements of colour shifts are calculated from colour spectrophotometer measurements. Imaging with light and electron microscopes shows surface effects of ageing such as chalking, micro-cracking and erosion.

Chemical and structural changes are not easily seen, but changes in mechanical strength and impact resistance can be measured to give

indications on sample performance. These measurements can indicate how long something is likely to last before becoming brittle or breaking under load.

Rapid ageing useful starting point

Other rapid ageing or advanced ageing tests allow manufacturers to quickly assess their products' UV tolerance. BRANZ uses Q-Sun xenon arc and QUV fluorescent weatherometers that simulate the effects of outdoor exposure on samples with cycles of UV and moisture. Q-Fog tests corrosion from salt spray.

Although these can provide valuable results and useful comparisons in a comparatively short length of time, results are not directly comparable to complex real-life exposure and are often used with outdoor exposure.

Our climate different from other countries

Building materials that are suitable overseas may break down quickly in New Zealand's high UV radiation and moisture. Even within New Zealand, geographical climate variation provides regionalised intensities and durations of sun, wind, rain and snow, so that building materials are subjected to a range of vastly different weathering conditions.

BRANZ has studied geographical effects using nine natural exposure sites throughout the North and South Islands and mapped degradation rates for different geographical locations. Understanding the outdoor weathering data ensures suitable building materials are specified for use in building and construction.

Upgrade at BRANZ exposure site

The BRANZ Judgeford exposure site was established in 1973. After nearly 40 years' service, BRANZ's well used exposure racks had aged and needed an upgrade.



Building products on the upgraded exposure site racks at BRANZ include claddings, coatings, pipes, flashings, membranes, roofing products and even different nails and screws in treated timbers.

A new rack design, fabricated using hot-dip galvanised steel, will ensure continued performance and successful testing well into the future. User-friendly features such as pivoting panels allow easy installation of samples and removes the need for ladders while taking measurements.

BRANZ's exposure racks are stocked with a representative range of current building products that may be used in buildings, including claddings, coatings, pipes, flashings, membranes, roofing products and even different types of nails and screws in treated timbers. This testing helps remove uncertainties while transitioning from proven products to new materials and technologies.

The new purpose-built location is fenced and landscaped. Weed matting and a compressed chip surface reduce maintenance and provide a weed-free and grass-free environment. Concrete slabs have been laid to accommodate new racks, positioning them due north and free from shading. Additional new racks will be installed over time to increase testing capacity and maintain a growing database of new materials.

Test data goes digital

Forty years of testing has produced a vast volume of records, ranging from typewritten reports, volumes of lab books, handwritten sample registry cards, black and white photos and slides to, more recently, digital photographs, Excel spreadsheets and pdf reports.

Collected records, results and measurements are a valuable knowledge base for objectively providing accurate advice on the durability of new building products. They also serve as an important source of information feeding into research topics and informative bulletins.

However, it can be difficult and time-consuming to find relevant information when it is handwritten and spread across several locations.

Changing to a digitalised content management system solves these problems. The old paper records have been converted into electronic records and are stored on a computer server.

Sample data stored on the server can be retrieved and updated outside of the office, on location, using smart phones or tablets over the WiFi network or using 3G data. Multiple users can access data at the same time, as it is no longer tied to a single record or lab book.

Improved access helps understanding

Once records are digitalised, the text is searchable and new uses become possible. Descriptive information contained within sample records allows filtering of records to display only records a scientist is interested in, for example, applying the filters 'material type: plastic' and 'colour: clear' will display only information relating to clear plastics that have been tested.

Flexible record display allows previously separated records to be grouped together. Being able to see photographs, test results and related reports together can provide further understanding of the degradation processes.

Quick read barcodes – QR codes – have been used for labelling exposure rack samples. Codes can be read using mobile devices and detail what a sample is, when it was originally placed out for exposure and why. Accessing this information previously required printing out the entire list of samples.

The BRANZ exposure site is an important resource rich in heritage. Upgrading to a digital content management system ensures we can continue to learn from previous and future testing and results. ♣

