PERFORMANCE-BASED TIMBER ENGINEERING RESEARCH AT BRANZ

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Every year BRANZ invests the Building Research Levy for the benefit of the New Zealand building and construction industry. The Building Research Levy is an activity-based levy that is collected in proportion to the value of all work that is subject to a Building Consent. Part of this funding pays for the research programme that BRANZ conducts. This overall research programme includes a stream of work in the area of performance-based timber engineering. In this article a brief description is provided of current research projects in this subject area.

MULTI-FUNCTION TIMBER JOINTS

With the growing use of medium-rise residential apartment buildings being constructed from light timber framing, this project was instigated in 2006 to address concerns about timber-framed wall-to-floor details providing an appropriate level of fire, acoustic and structural performance. The project consisted of an extensive programme of theoretical and experimental research which drew upon international experience as well as trialling a range of products available in the New Zealand market.

The overall project is nearing a conclusion with a BRANZ Design Guide expecting to be published within the next three months – this document will provide guidance to designers on what methods of construction to specify in multi-tenancy buildings where ongoing issues with acoustic performance have been a problem for tenants. BRANZ has worked closely with industry during the course of this project to ensure that the outputs from the work are aligned with current industry practice, as well as being complementary to any review by DBH of the Compliance Document for clause G6 *Airborne and Impact Sound* of the NZBC.

Figure 1. Acoustically-isolated test chamber under construction for the Multi-Function Timber Joints Project.

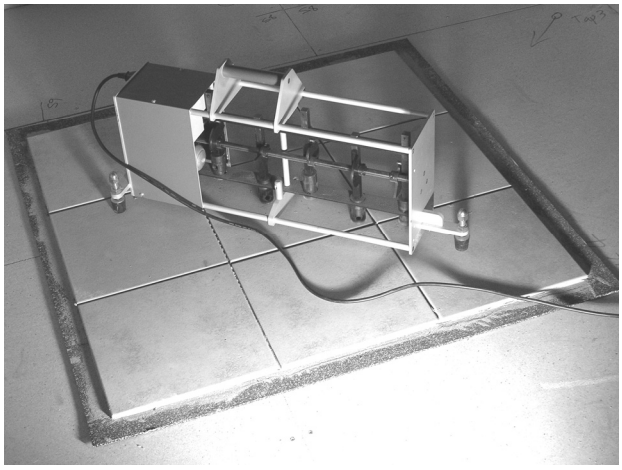

Figure 2. Impact noise test equipment.

SPECIFIC DESIGN OF LIGHT TIMBER-FRAMED BUILDINGS

In a similar vein to the main driver for the Multi-Function Timber Joints project, there has been a growing need for a document to assist in the design of medium rise light timber-framed buildings. The aim of this project therefore is to develop a BRANZ Design Guide that provides structural engineers with a basis for verifying the compliance of light timber-framed buildings, that fall outside the scope of NZS 3604, with the serviceability and safety performance requirements of Clause B1 *Structure* of the NZBC. The document would be suitable for citation as an Acceptable Solution for Clause B1 for such structures.

This latter project compliments the Multi-Function Timber Joints project in that it focuses on the main

structure of the building, rather than internal construction details. The project commenced in mid 2009 and is scheduled for completion in early 2013 with the publication of a BRANZ Design Guide.

PROBABILISTIC APPROACH TO DETERMINING THE EFFECTS OF WIND ON BUILDINGS

This research started in 2009 and is a contributor to the much larger FRST-funded NIWA/GNS *Riskscape* project. The BRANZ component of the overall research project is aimed at providing probabilistic data on the behaviour of a range of typical roof constructions under wind loading so that this information can be fed into the Riskscape model in order to calculate the likely economic impact on the community of such an event.

In the research, roofing products and connection details for the products and the associated timber framing will be selected, and their performance determined, so as to match typical techniques used in older buildings. Account will be taken of the influencing factors on performance, including the strength and stiffness of the roofing products, corrosion of fixings, spacing of fixings, and the size of timber-framed elements. This project is scheduled for completion in early 2011.

Figure 3. Roof fixings test specimen for the Probabilistic Approach to Determining the Effects of Wind on Buildings project.

INSTALLATION OF DOMESTIC WINDOWS

Based on feedback from industry and in view of the trend of building on more exposed sites, coupled with the move towards heavier double glazed units driven by higher insulation demands, a new research project was started in 2009 to determine whether current installation procedures for new and retrofitted windows are deficient. Installation of domestic windows is not covered by any nationally-recognised standard, although some weathertightness details are provided in the Compliance Document for clause E2 *External Moisture* of the NZBC. Also, retrofit of new double glazed units in existing houses seldom receives detailed structural assessment.

Working closely with the window industry, the research will critically examine current practice, including proposed amendments to the WANZ WIS system, and verify all critical structural details. When the project is completed in mid 2010, the final outcome will be assurance for window installations and information being available to allow residential windows (new and retrofitted) to be safely installed into new and existing buildings, taking account of present and future trends in New Zealand construction.

NZS 3604 ROOF FIXINGS

BRANZ has had an ongoing project over the last two years which has formed the technical basis for the contribution by BRANZ to the current revision of NZS 3604 by SNZ. The last part of this project is a relatively small piece of work to investigate the content of NZS 3604 relating to roof fixings. The impetus for this work is the fact that damage to roofs of timber buildings in windstorms is relatively common in New Zealand. Associated damage reports indicate that the most common failure point is the fixing of tile battens and purlins to rafters or trusses while less common failure points are roof sheets to purlins and rafters to top plates of walls.

At the same time, details in the current version of NZS 3604 do not follow current practice, and the published capacities are not based on sound test data. Combined with this is the fact that the latest version of NZS 3604, currently under preparation, will include an additional higher wind zone to accommodate increasing numbers of dwellings being constructed on more exposed sites.

The project is being conducted collaboratively between BRANZ and the New Zealand Metal Roof Manufacturer's Association. A range of small and large-scale testing of fixings and roofs will be conducted and the results will feed directly into the revised version of NZS 3604. The project is currently underway and will be completed by mid 2010.