ST0758/1 Rev. 1

Serviceability racking of the Ezpanel cavity wall system

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      - The date when the service should have been completed in the event of any alleged non-performance.

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c. Without limiting clause b above, the Client shall guarantee, hold harmless and indemnify BRANZ and its officers, employees, agents or subcontractors against all claims (actual or threatened) by any party for loss, damage or expense of whatsoever nature including all legal expenses and related costs arising out of:
   i. any failure by the Client to provide accurate and sufficient information to BRANZ to perform the Services;
   ii. any misstatement or misrepresentation of the Outputs, including Public Outputs;
   iii. any defects in the Products the subject of the Services; or
   iv. any changes, modifications or alterations to the Products the subject of the Services.

Serviceability racking of the Ezpanel cavity wall system

1. CLIENT

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2. OBJECTIVE

The test was performed to examine the damage to the Ezpanel cavity wall system when the walls were subjected to both serviceability level and ultimate level seismic racking deflections. These were taken to be ±8 mm and ±36 mm respectively.

This Report ST0758/1 Rev. 1 replaces ST0758/1 (Date of issue of 4 July 2008).

3. DESCRIPTION OF SPECIMENS

3.1 Product Description

The nominally 2.4 m x 2.4 m test specimen was made by the client to the details shown in Figure 1 as prepared by the BRANZ Appraisal section. The exterior wall cladding system includes a vented cavity through the use of battens fixed to the framing as shown in Figure 2.

Studs were at 600 mm centres and nogs at 800 mm centres. All framing timber was 90 x 45 grade MSG 8 Radiata Pine assembled using normal trade practice.

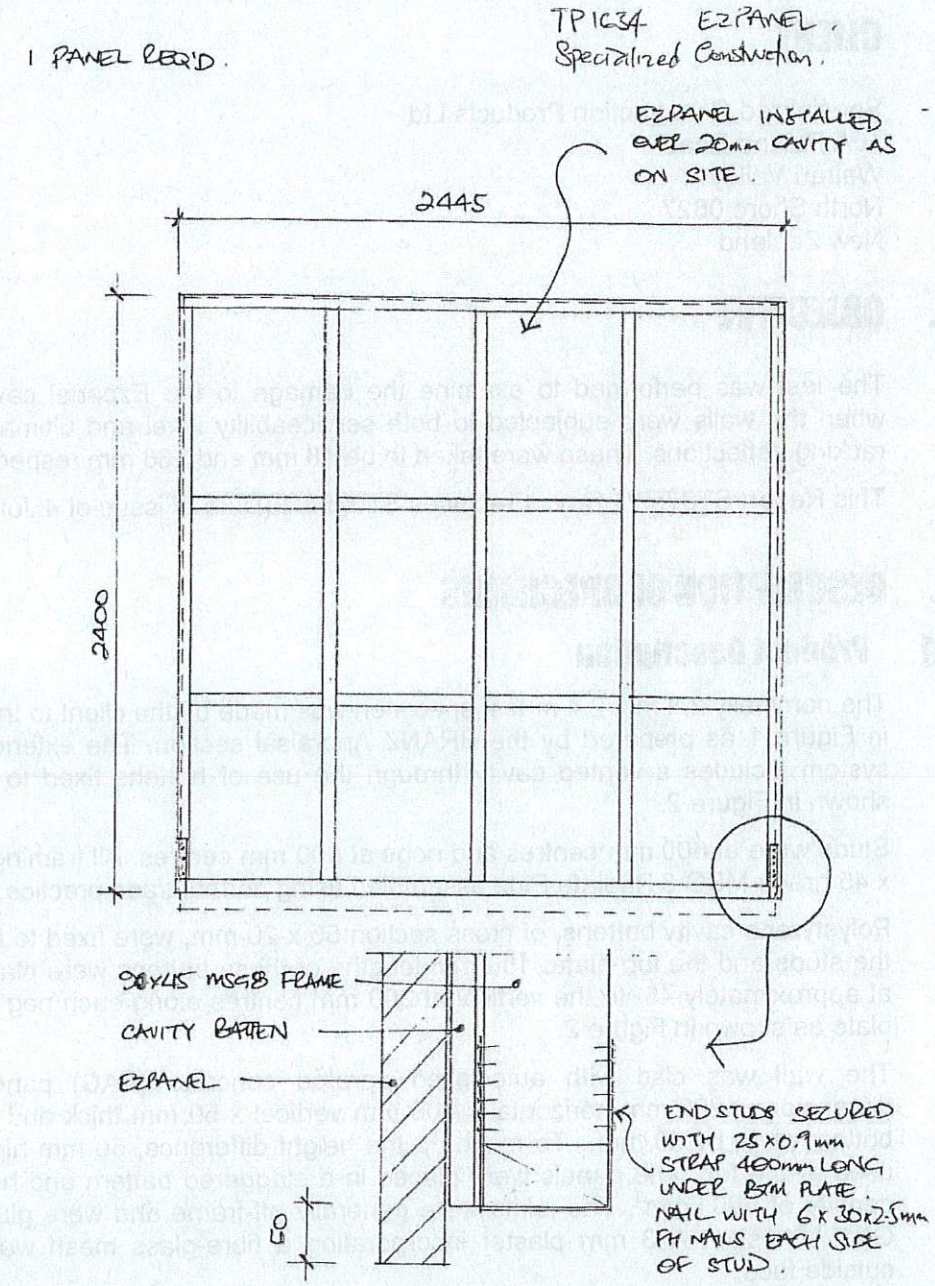
Polystyrene cavity battens, of cross section 55 x 20 mm, were fixed to the front face of the studs and the top plate. 150 mm lengths of these battens were placed as spacers at approximately 45° to the vertical at 300 mm centres along each nog and the bottom plate as shown in Figure 2.

The wall was clad with autoclaved aerated concrete (AAC) panels of nominal dimensions 1200 mm horizontal x 600 mm vertical x 50 mm thick and overlapped the bottom plate by 50 mm. To make up the height difference, 50 mm high panels were used at the top. The panels were placed in a staggered pattern and had a measured density of 690 kg/m^3. The joints were generally off-frame and were glued with Gorilla Grip Adhesive. A 3 mm plaster incorporating a fibre-glass mesh was used on the outside face.

A steel mesh with bars at nominal spacing of 150 mm in both directions and having a 3.2 mm diameter was embedded in the lightweight concrete.

The AAC panels were screwed through the polystyrene and into the timber framing using stainless steel screws at 300 mm centres to all framing (starting 150 mm above the bottom of the panel). The screws were 100 mm long with a 14 mm diameter head and were placed so that the screw head was flush with the outside face of the AAC. They had a shank of 5.1 mm diameter, with the bottom 50 mm threaded with an outside thread diameter of 6.4 mm. The screws were designed to be self drilling in timber.

SJT RHS



BRANZ	SERVICEABILITY RACKING TEST.			
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Figure 1. BRANZ Appraisal supplied drawing of wall construction

SJT RHS

Figure 2. Back face of wall construction

Figure 3. Cross section of wall construction

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RHS

Figure 4. cross section on larger scale

Figure 5. General view of test specimen

SJT

RHS

3.2 Construction of the Specimens

The specimen was provided by the client.

The end studs of the specimen were fixed to the bottom plate with a 25 mm x 1 mm thick steel strap wrapped under the timber plate and nailed to the stud and plate with galvanised flat head nails of nominal length 30 mm and 2.5 mm shank diameter. Six nails were installed into each side of the stud and three into the side faces of the plate.

4. DESCRIPTION OF TESTS

4.1 Date and Location of Tests

The tests were carried out in Juy 2008 at the Structural Engineering Laboratory of BRANZ Ltd, Judgeford, New Zealand.

4.2 Test Arrangement and Equipment

The racking test specimen was installed in a rigid steel loading frame. P21 end restraints were installed in accordance with the recommendations of BRANZ P21:1988. "A Wall Bracing Test and Evaluation Procedure".

The bottom plate was fixed through a strip of 20 mm thick particle board floor and the timber foundation beam to the steel test rig using M12 threaded rods at 100 mm from the outside face of the end studs and at 100 mm from one side of the middle stud. A 50 mm x 50 mm x 3 mm washer was installed between the nut on each rod and the bottom plate.

Horizontal load was applied to the centre of the specimen top plate with a 30 kN closed loop electro-hydraulic ram and measured with a 25 kN load cell.

Nylon rollers were used to prevent out-of-plane movement of the top plate as close as possible to the ends of the specimen.

Linear potentiometers were used to measure the horizontal displacement of the top plate, vertical uplift of the studs at either end of the specimen, and horizontal displacement of the bottom plate.

The test load and displacement measurements were recorded using a PC running a software program to record the data. The load cell was calibrated to International Standard EN ISO 7500-1 1999 Grade 1 accuracy and the linear potentiometers were calibrated to an accuracy of 0.2 mm.

4.3 Test Procedure

The loading sequence consisted of 3 displacement controlled cycles of the specimen to displacements of approximately ±8, ±16, ±24, ±30, ±36, ±44 mm.

5. OBSERVATIONS

By looking at pencil marks placed on the intersections it was observed that the Ezpanel panels slipped relative to the battens and the battens slipped relative to the timber framing even in the early stages of testing.

The panel rocked as the end studs lifted and this contributed approximately 5% to the racking deflection.

However, the plaster system did not crack or show signs of damage for the entire test program except that one screw "popped" in the ±24 mm cycle and another had "popped" by the end of the test. The screw "popping" was visible only as a slight lifting of the plaster above a screw head.

6. CONCLUSIONS

In an earthquake, the Ezpanel Cavity System can "ride" out the expected deflections of the light timber frame to which they are attached with no damage at Serviceability Limit State deflections and only minor damage at Ultimate Limit State deflections.