BRANZ

ST0758/4

Shear tests on the Ezpanel cavity wall system

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Shear tests on the Ezpanel cavity wall system

1. CLIENT

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2. OBJECTIVE

To determine the shear strength of the Ezpanel Cavity System under gravity loading to ensure there is adequate reserve for the fixings to carry the panel self weight to the support framing.

This report is to be read in conjunction with BRANZ test reports ST0758/1 Rev. 1 ST0758/2 Rev. 1 and ST0758/3. It pertains to the samples provided only.

3. DESCRIPTION OF SPECIMENS

3.1 Product Description

The exterior wall cladding system with vented cavity through the use of battens fixed to the framing is described in BRANZ test report ST0758/1 Rev. 1.

A test specimen is shown in Figure 1. Specimens were made by the client. Each specimen consisted of a single 650 mm long timber stud with battens on either side and 650 x 195 mm x 49 mm thick autoclaved aerated concrete (AAC) panels screwed through the battens to timber studs. A total of 4 screws were used per test specimen.

Studs were 90 x 45 grade MSG 8 Radiata Pine timber.

Polystyrene cavity battens, of cross section 55 x 20 mm and length 650 mm, were fixed to each 45 mm wide face of the studs.

The AAC panels had a measured density of 690 kg/m^3. 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.

Each AAC panel was screwed through the polystyrene and into the timber framing using stainless steel screws at two locations. 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.

4. DESCRIPTION OF TESTS

4.1 Date and Location of Tests

The tests were carried out in August 2008 in the Structures Laboratory of BRANZ Ltd, Judgeford, New Zealand.

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4.2 Test Arrangement and Equipment

The tests were undertaken in a Dartec Universal testing machine. A view of the test setup is given in Figure 1.

The test load was measured with a 10 kN loadcell calibrated to International Standard EN ISO 7500-1 1999 Grade 1 accuracy. The loadcell output was recorded by datalogger.

4.3 Test Procedure

Axial deflection was imposed on the top of the stud at a cross head displacement rate of 20 mm per minute until failure.

5. OBSERVATIONS

The battens and AAC panels locally crushed at screw locations and the screw deformed as shown in Figure 2 until it was stripped from the timber stud.

6. RESULTS

Individual test results are shown in Appendix A. The characteristic strength, determined using the procedure outlined in BRANZ Evaluation method EM1 [1] as shown in Appendix A, was 7.5 kN for the test specimen which incorporated four screws. The design strength per screw is taken as 0.7 times the characteristic strength = 0.7 x 7.5/4 = **1.3** kN where 0.7 is the strength reduction factor.

For screws at 300 mm vertical spacing and studs at 600 mm spacing, and taking into account the panel thickness of 50 mm and density of 690 kg/m^3, the demand shear force per screw due to panel self weight = 690 x 0.05 x 0.3 x 0.6 = 6.2 kg = **0.061** kN.

The ratio of (screw strength)-to-(screw demand load) = 1.3/0.061 = 21. If the cavity thickness is increased from 20 mm to 40 mm, it is expected that there is sufficient reserve that the panels connections would still be adequate to carry the panel self weight.

7. CONCLUSIONS

It is expected that the screws used to fix the Ezpanel AAC panels to the timber framing are adequate to carry the panel self weight for both 20 mm and 40 mm wide cavities provided the screws on average only carry a maximum area of 300 x 600 = 180,000 mm^2 of AAC panel per screw and the screw embedment into the timber is not reduced from that used in the tests described herein.

8. REFERENCES

(1) BRANZ, 1990. Evaluation Method No. 1 (1999). Structural joints – strength and stiffness evaluation. BRANZ Evaluation Method No 1.

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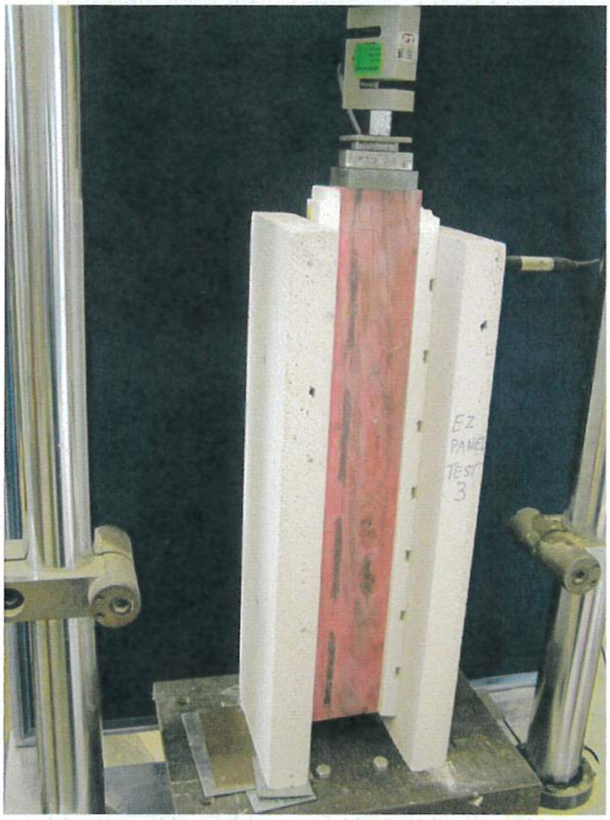

Figure 1.Typical specimen test setup

Figure 2.Typical failure

Appendix A. Test results

Ez panel shear connection tests	Peak load (kN)
Specimen 1	8.90
Specimen 2	10.23
Specimen 3	9.04
Pmin	8.90
Mean	9.39
Std dev	0.728
CoV (Std dev/mean)	0.0776

Calculation of Characteristic Strength for Ultimate Limit State Design
The characteristic strength determined from BRANZ Evaluation Method EM1

n = number of samples 3

Rk = Characteristic Strength = 7.505 kN

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