STRUCTURES TEST REPORT

ST11498-001-01

PURLIN SCREW TESTING FOR BUILDING KING

CLIENT
Building King Limited
1/126 Cuba Street
Te Aro
Wellington 6011

All tests and procedures reported herein, unless indicated, have been performed in accordance with the BRANZ ISO9001 Certification

branz.nz | 1222 Moonshine Rd, RD1, Porirua 5381, Private Bag 50 908, Porirua 5240, New Zealand | Phone +64 4237 1170 | branz@branz.co.nz

LIMITATION

The results reported here relate only to the items tested.

TERMS AND CONDITIONS

This report is issued in accordance with the Terms and Conditions as detailed and agreed in the BRANZ Services Agreement for this work.

SIGNATORIES

Author

David Carradine
Senior Structural Engineer
BRANZ

Reviewer

Roger Shelton
Senior Structural Engineer
BRANZ

DOCUMENT REVISION STATUS

ISSUE NO.	DATE ISSUED	DESCRIPTION
01	20/08/2019	Initial Issue

branz.nz | 1222 Moonshine Rd, RD1, Porirua 5381, Private Bag 50 908, Porirua 5240, New Zealand | Phone +64 4237 1170 | branz@branz.co.nz

CONTENTS

branz.nz | 1222 Moonshine Rd, RD1, Porirua 5381, Private Bag 50 908, Porirua 5240, New Zealand | Phone +64 4237 1170 | branz@branz.co.nz

FIGURES

TABLES

branz.nz | 1222 Moonshine Rd, RD1, Porirua 5381, Private Bag 50 908, Porirua 5240, New Zealand | Phone +64 4237 1170 | branz@branz.co.nz

1. OBJECTIVE

Testing was conducted to determine the uplift capacity of 14-gauge x100 mm long purlin screws provided by the client

2. DESCRIPTION OF SPECIMENS

2.1 Product description

The client provided 14-gauge x 100 mm long batten screws with a Type 17 self-drilling tip. These screws had a recessed hex drive and bugle head with an approximate diameter of 14 mm and outer thread diameter of approximately 6.4 mm.

2.2 Specimen construction

Thirty specimens were constructed by BRANZ technical staff where the provided screws were used to connect 300 mm long sections of 45 mm x 70 mm battens to 300 mm long sections of 90 mm x 45 mm SG8 Radiata Pine timber. Typical test specimens are shown in Figure 1 along with provided screws and packaging.

Figure 1. Typical Batten-to-Purlin Connection Specimens and Screw Packaging (Right)

3. DESCRIPTION OF TESTS

3.1 Date and location of test

Testing was conducted during April 2019 in the BRANZ Structures Laboratory located in Judgeford, Porirua, New Zealand.

3.2 Test set-up

Batten-to-purlin specimens were tested using the fixtures shown in Figure 2. The tests were undertaken in a Dartec Universal testing machine. A downward displacement was applied using loading blocks which transferred the load to the battens on either side of the 90 mm x 45 mm purlin segment. The battens transferred the load through the screw to the purlin as would occur during a wind uplift scenario.

branz.nz | 1222 Moonshine Rd, RD1, Porirua 5381, Private Bag 50 908, Porirua 5240, New Zealand | Phone +64 4237 1170 | branz@branz.co.nz

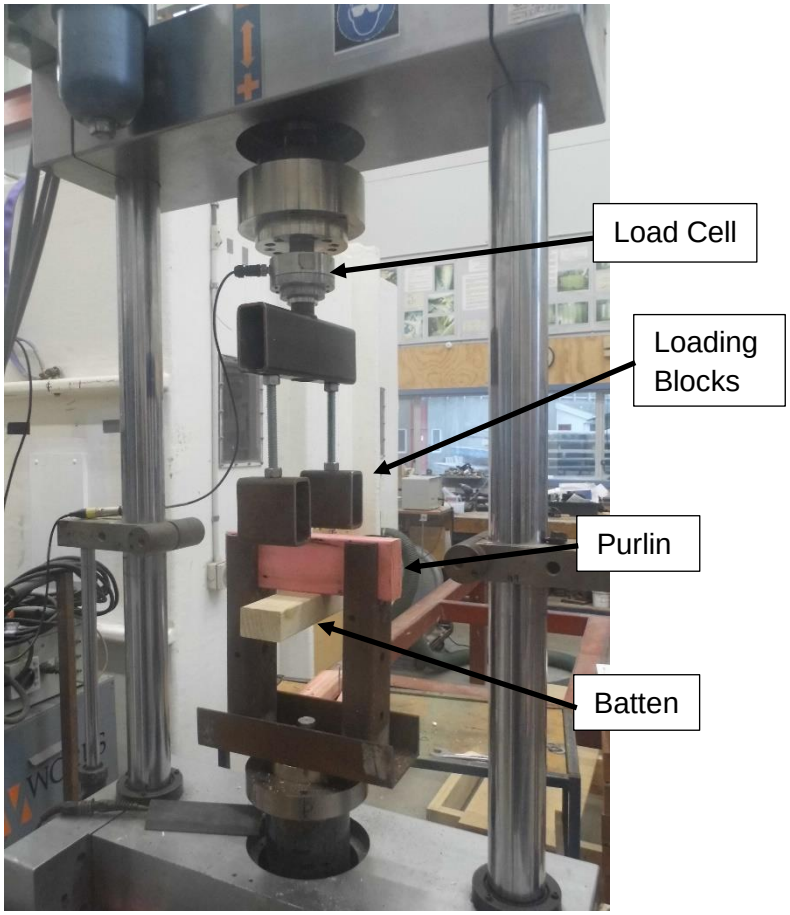

Figure 2. Batten-to-Purlin Test Set Up

3.3 Test procedure

The specimens were subjected to a 0.5 mm/second downward displacement until failure.

Test loads were measured with a 25 kN load cell calibrated to International Standard EN ISO 7500-1 [1] Grade 1 accuracy. The internal test frame displacement transducer was calibrated to within ±0.2 mm. The load cell and test machine deflection were recorded using a computer-controlled data acquisition system throughout testing.

4. OBSERVATIONS

Specimens failed due to a combination of the screw heads pulling through the battens and the screw threads withdrawing from the purlins, as shown in Figure 3. Some specimens were dominated by one or the other failure mode while others exhibited a combination of both.

branz.nz | 1222 Moonshine Rd, RD1, Porirua 5381, Private Bag 50 908, Porirua 5240, New Zealand | Phone +64 4237 1170 | branz@branz.co.nz

Figure 3. Examples of Screw Failures: Screw-Head Pulling Through Batten (Top) and Screw Thread Withdrawal from Purlin (Bottom)

5. RESULTS

Test results and analysis are provided in Table 1. The characteristic strength of a single screw, Rk, from the 30 test results was determined using the procedure outlined in BRANZ Evaluation Method EM1 [2]. The strength reduction factor, ϕ, was taken as 0.7 from NZS 3603 [3] for screwed connections.

branz.nz | 1222 Moonshine Rd, RD1, Porirua 5381, Private Bag 50 908, Porirua 5240, New Zealand | Phone +64 4237 1170 | branz@branz.co.nz

Table 1. Batten-to-Purlin Test Results and Analysis

Specimen	Max Load (kN)
1	8.3
2	7.3
3	7.8
4	7.0
5	8.6
6	7.6
7	7.6
8	12.2
9	7.9
10	12.3
11	8.7
12	7.5
13	8.6
14	12.8
15	9.4
16	9.7
17	8.7
18	12.1
19	7.3
20	7.7
21	9.2
22	9.9
23	7.3
24	9.5
25	7.1
26	7.7
27	7.8
28	8.3
29	10.9
30	7.8
Average	8.8
St. Dev.	1.7
COV	19.1%
5thPerc.	6.0
Rk (char.)	5.5
phi	0.7
Design	3.8

branz.nz | 1222 Moonshine Rd, RD1, Porirua 5381, Private Bag 50 908, Porirua 5240, New Zealand | Phone +64 4237 1170 | branz@branz.co.nz

6. REFERENCES

1. International Organisation for Standardisation (ISO). 2015. *ISO 7500:2015 Metallic Materials – Verification of Static Uniaxial Testing Machines, Part 1: Tension/Compression Testing Machines – Verification and Calibration of the Force-Measuring System*. ISO, Geneva, Switzerland.

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

3. Standards New Zealand. NZS 3603:1993. *Timber structures standard.* SNZ, Wellington, New Zealand.