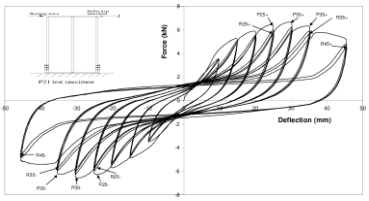
BUILDING ELEMENT ASSESSMENT LABORATORY LIMITED



Date of issue: 21 February 2023

Steve Allison
General Manager
Premier Building Products Ltd

BTS2230-3 CERTIFICATE OF TEST: SUMMAY OF TESTS

Ten P21 Type Panel Bracing Capacity Tests of 10mm Standard PBP Gypsum Board

1. Objective:

1.1 BEAL Testing Services were contracted by Premier Building Products Ltd to assess the bracing capacity of the 10mm Standard PBP Gypsum Board.

1.2 Testing was carried out on single sets of specimens of the 10mm Standard Gypsum Board fixed to two sizes of timber framing that were prepared for testing by BEAL staff.

2. Methodology:

2.1 BEAL TP-211 ver1.0, is based on the test methodology titled **P21 A Wall bracing test and Evaluation Procedure,** published by BRANZ, updated in 2011**.**

2.2 The objective of this test procedure, is to evaluate the bracing capacity of walls and or wall panels, including Structural Insulated Panels (SIPs). After measurement and treatment of the data in accordance with the specified evaluation procedure, the wall or floor element can be assessed as contributing to the requirement of Clause B1.3.1 of the New Zealand Building Code.

2.3 A key requirement of this test procedure is an accurate description of all components used to construct the test specimen, including how the specimen is intended to be fixed or held down to the floor – usually to a bottom plate.

3. Test Equipment:

3.1 To evaluate the bracing capacity of walls and or wall panels, a special mechanical test rig including a fast-acting hydraulic ram with calibrated load cell and displacement measuring device, with controls, is required.

4. Test Specimens:

4.1 Where BTS were not able to select the samples from a manufacturer or able to prepare the specimens, sampling shall follow the BEAL TP115 (BEAL Standard sampling procedure).

4.2 For this test, 10mm Gypsum Boards were supplied by the client, then fixed to two sizes of LVL timber framing, then installed into the BEAL mechanical test rig, by BEAL staff.

5. Specimen Conditioning – if any:

5.1 Specimens were installed at room conditions.

6. Test Criterion:

6.1 Unless specified by the client or selected by BEAL, the results obtained from this test procedure are to be assessed by a structural engineer with appropriate experience and skills.

7. Specimen Preparation:

7.1 The test methodology titled P21 A Wall bracing test and Evaluation Procedure, describes the requirements for the preparation and installation of the test panels into the mechanical test jig.

7.2 Generally, test specimens will be either 2,400mm, or 1,200mm, or 600mm or 400mm wide by 2,400mm in height. Timber frames of 1,200mm and 400mm wide were used.

7.3 For these tests, Premiere Building Products Gypsum board was tested one side. 400 mm panel length x 2400 mm panel height. 32mm x 6g GIB® Grabber® High Thread Screws at 50,100,150, 225, 300mm maximum from each corner and 150mm thereafter around the perimeter of the bracing element, 300mm maximum spacing to intermediate studs. No dwangs.

7.4 Pairs of hand driven 100 x 3.75mm nails at 600mm centres to baseplate with 20 mm particle board over 90x90 joist. Restrained block with three 100x4 mm nails to end studs.the specified Gypsum Board was fixed to the timber frames on one side only.

7.5 To the end of the hydraulic ram, an attachment device is fixed onto the top plate of the test specimen. Refer photos.

8. Test Data:

The following information was provided by the client:
a) Size of the panel:
b) Overall thickness of the panel:
c) description of each component:
d) description of each type of fixing:
e) description of any adhesives and or tapes used:
f) description of fixing spacings:
g) description of specified end of wall hold-down(s):
h) Title of the technical and installation literature – with version / date:

9. **Analysis of the resulting test data:**

9.1 An analysis of the force versus displacement data in csv format and converted into a scatter data graph with smooth lines, was made.

9.2 The resulting data file was forwarded to the structural engineer for further assessment.

9.3 The result of the engineers analysis is shown in Appendix A (at the back of this report).

9.4 The following were arrived at:

"All PBP bracing elements using the standard 10mm Gypsum Board with timber framing as per NZS3604 shall have fixing spacings at 50, 100, 150, 225, 300mm maximum from each corner and 150mm thereafter around the perimeter of the bracing element, with 300mm maximum spacing to intermediate stud or dwang.

Bracing elements with no HandiBrac® hold-down system, with bottom plate fixed as per NZS3604, can be used as a bracing element with the following bracing ratings:

Minimum length (m)	BU/m W	BU/m EQ
0.4	11.5	14.9
1.2	30.3	34.8

When the Gib HandiBrac® hold-down system is used in conjunction with 10mm PBP Standard Gypsum Board, it can be used as a bracing element with the following bracing ratings:

Minimum length (m)	BU/m W	BU/m EQ
1.2	75	64

"

10. Observations / Comment:

10.1 Graph TR221111-1 representing a 1,200mm wide x 2,400mm high specimen in KN vs mm, while Graph TR221111-2 representing a 400mm wide x 2,400mm high specimen in KN vs mm.

11. Attachments:

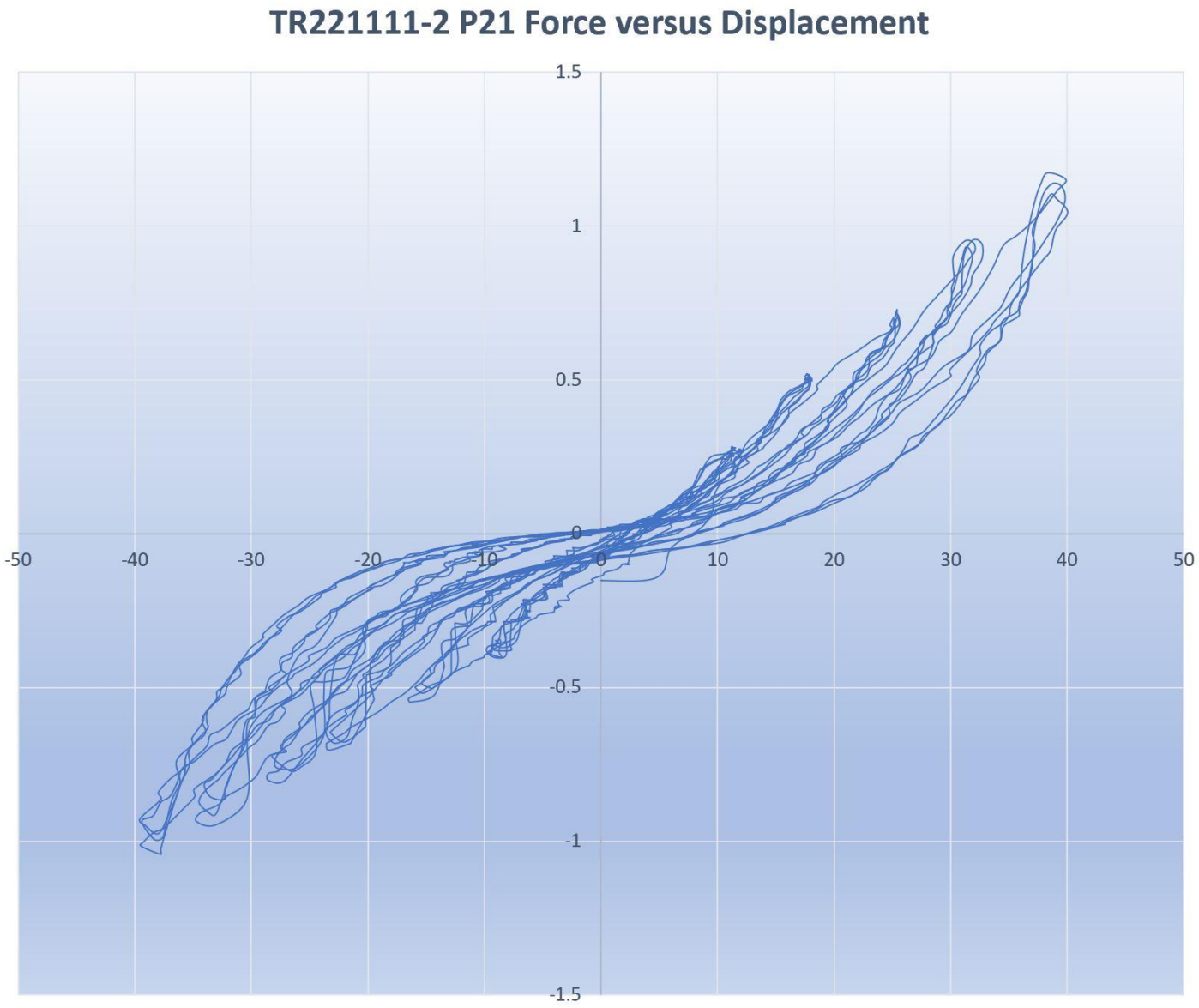
11.1 Report of representative graphs and resulting analysis.

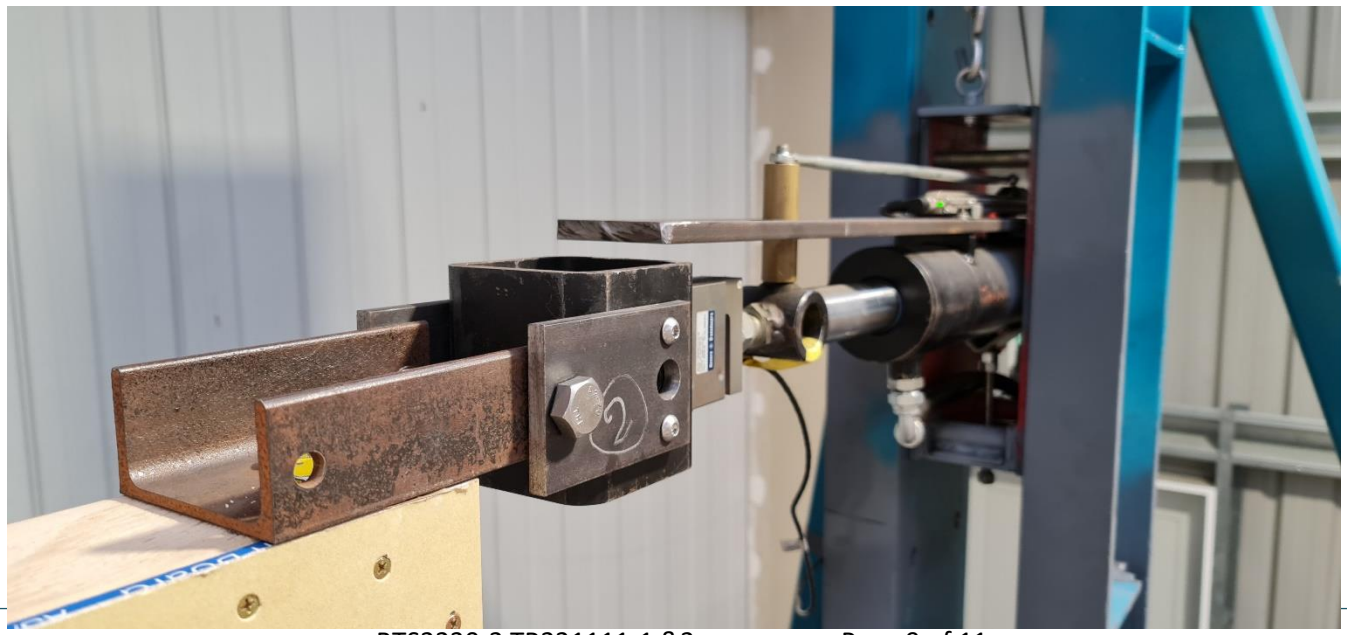
11.2 Relevant Photos.

11.3 **The csv and video files are available on request.**

Colin Prouse – Senior Building Scientist

Building Element Assessment Laboratory Limited





12. APPENDIX A:

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P21 Test Result Analysis. *1200 mm PBP Panels* (with handi-bracs)

Sample description: Sample length 1.2 m

Premiere Building Products Gypsum board one side. 1200 mm panel length x 2400 mm panel height. 32mm x 6g GIB® Grabber® High Thread Screws at 50,100,150, 225, 300mm maximum from each corner and 150mm thereafter around the perimeter of the bracing element, 300mm maximum spacing to intermediate studs. No dwangs.
Pairs of hand driven 100 x 3.75mm nails at 600mm centres to baseplate with 20 mm particle board over 90x90 joist. Handi-brac brackets to stud each end of panel with screw bolt to 90x90 joist.
Restrained block with three 100x4 mm nails to end studs.

y value Nominate a target displacement (from the range 15 mm, 22 mm, 29 mm and 36 mm)

y 36 mm

P_8 values Loads associated with 8 mm displacement

Sample		
TR230117-2	2.59	kN
TR230117-3	2.5	kN
TR230117-1	2.92	kN
		kN

K1 value C - Average residual displacement after first cycle (cycle to min 8mm displacement)

Sample	C+ (mm)	C- (mm)	Average	K1
TR230117-2	2	-4.24	**3.12**	**1.0**
TR230117-3	1.93	-3.12	**2.53**	**1.0**
TR230117-1	3.03	-1.57	**2.30**	**1.0**
			0.00	**1.0**

$K1 = 1.4 - C/8 \leq 1.0$ *Note, reject sample if K1 < 0.8*

Py and Ry values Py - Average of absolute values of first cycle loads

	+Py (kN)	-Py (kN)	
TR230117-2	5.17	-4.81	**4.99**
TR230117-3	5.03	-4.18	**4.60**
TR230117-1	5.44	-4.77	**5.11**

Py **4.90**

Ry - Average of absolute values of fourth cycles

	+Ry (kN)	-Ry (kN)	
TR230117-2	4.24	-3.52	**3.87**
TR230117-3	4.25	-3.34	**3.67**
TR230117-1	4.52	-3.61	**3.97**

Ry **3.84**

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P21 Test Result Analysis. *1200 mm PBP Panels*

d value Displacement corresponding to load of P/2

	di	
TR230117-2	7.44	mm
TR230117-3	7.59	mm
TR230117-1	7.27	mm
		mm
d	**7.43**	

Ductility Ductility of set of specimens.

μ	4.8	μ = y/d
K4	1.00	
K2	1.2	

μ	1	2	3	3.5	4
K4	0.35	0.6	0.74	0.87	1

Sample Ratings

EQ 3.839 kN EQ = K4*Ry

BR_{EQ} is equal to the following: $BR_{EQ} = 20 * \min\left(EQ, \frac{P8 * K1 * K2}{0.55}\right)$

BR_W is equal to the following: $BR_W = 20 * \min\left(P_y, \frac{P8 * K1 * K2}{0.71}\right)$

	BR_{EQ}	Result	BR_W	Result
TR230117-2	76.8	76.8	87.5	87.5
	76.8	76.8	84.5	84.5
	76.8	76.8	98.0	98.0
min	76.8		84.5	

Bracing Ratings based on the average sample ratings with all ratings capped at 1.2 x min

Bracing Unit Rating

BR_{EQ}	76.8	BU	BR_{EQ}	64.0	BU/m
BR_W	90.0	BU	BR_W	75.0	BU/m