MAGNUM™ BOARD P21 BRACING TEST
2400 X 600

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Results

To:	Robin Curtis	**From:**	Doug Gaunt
Organisation:	New Zealand Sustainable Forest Products L.P	**Subject:**	P21:2010 600mm x 2.4m Wall 9mm Magnum board one side, No Hold Down Brackets
Location:	Christchurch	**Date:**	19 October 2016
Fax No.:	03 7328 415	**No. of Pages:**	5
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Robin

Please find below the results of your three 600mm x 2.4m 9mm Magnum board one side walls as tested on with no hold-downs.

1. BU wind = 46 (77 BU/m) as limited by the ultimate load capacity.
2. BU Earthquake = 41 (68 BU/m) as limited by the ultimate load capacity.

Figures 1, 2 & 3 show the load deflection plots, Figure 4 shows the P21:2010 calculations.

Wall Construction

- 90x45 SG8 studs (600 centres), plates, two rows of nogs
- 9mm Magnum board one side fixed vertically
- 32 mm screws@ 50, 250, then 300mm c/c to studs and 50, 250 to plates plus spot glued at approx 300 centres around edge
- No hold-down brackets
- Tested with M12 hold down bolts and 50x50x3mm washers

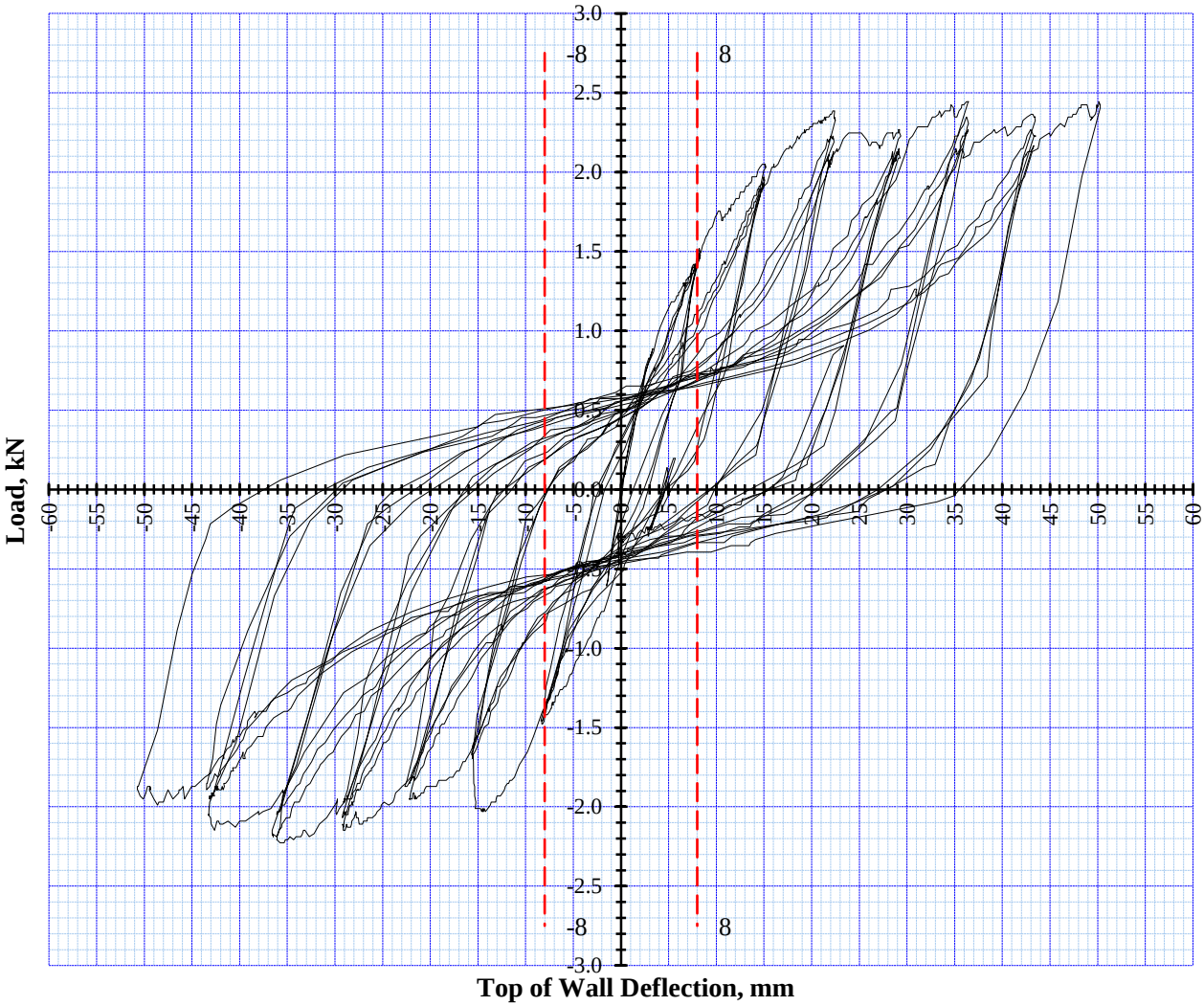

Figure 1: *Wall 276256*

Wall Condition after test

- The screws remained intact.
- No fractures were seen in the Magnum board for walls 276256 & 276257 however wall 276258 fracture along the bottom plate screw line
- For walls 276256 & 276257 the only apparent damage was a widening of the screw hole through the Magnum board predominantly around those screws on the bottom plate and on the bottom section on the end studs.
- No damage was seen in the timber framing.

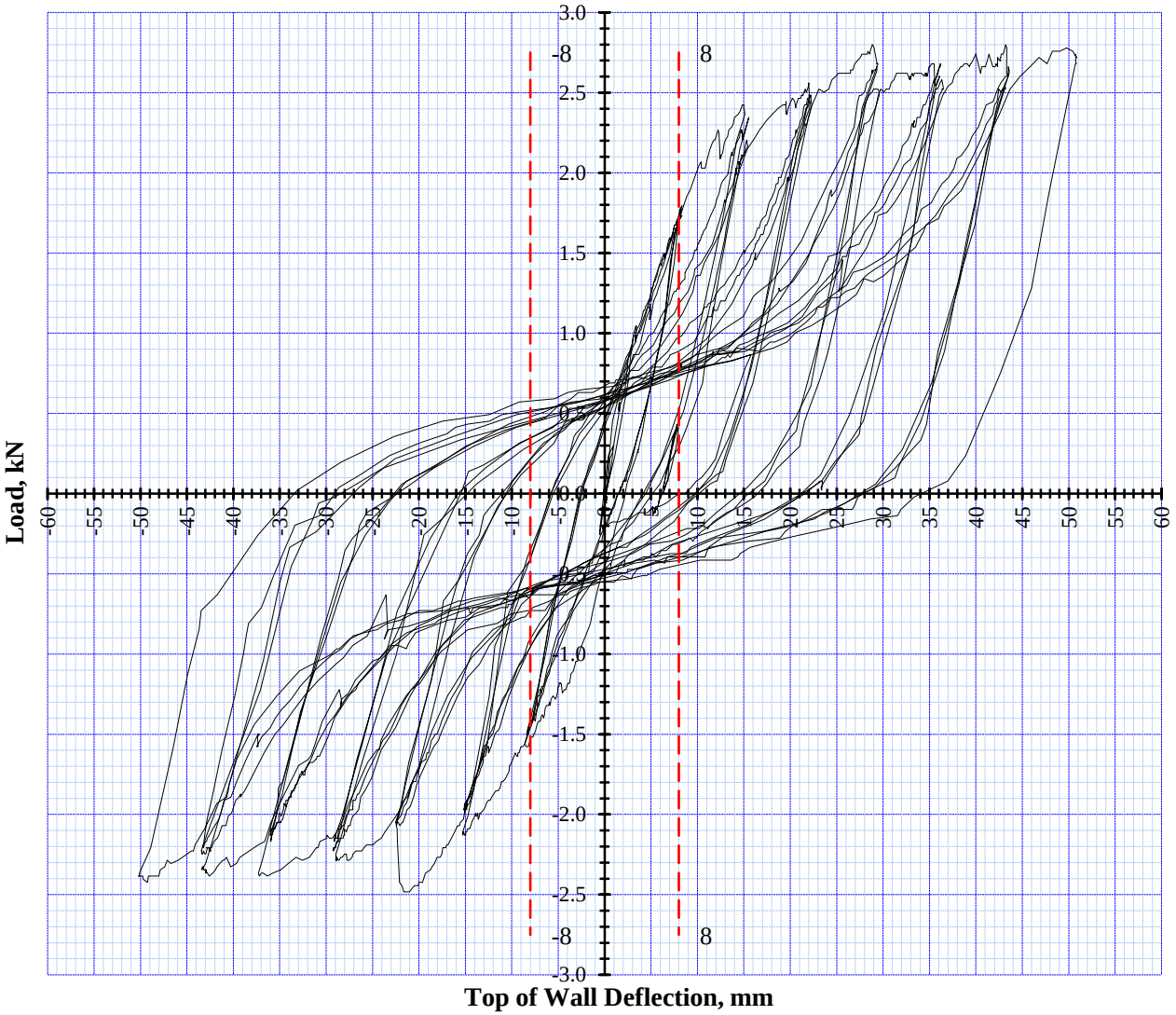

Figure 2: *Wall 276257*

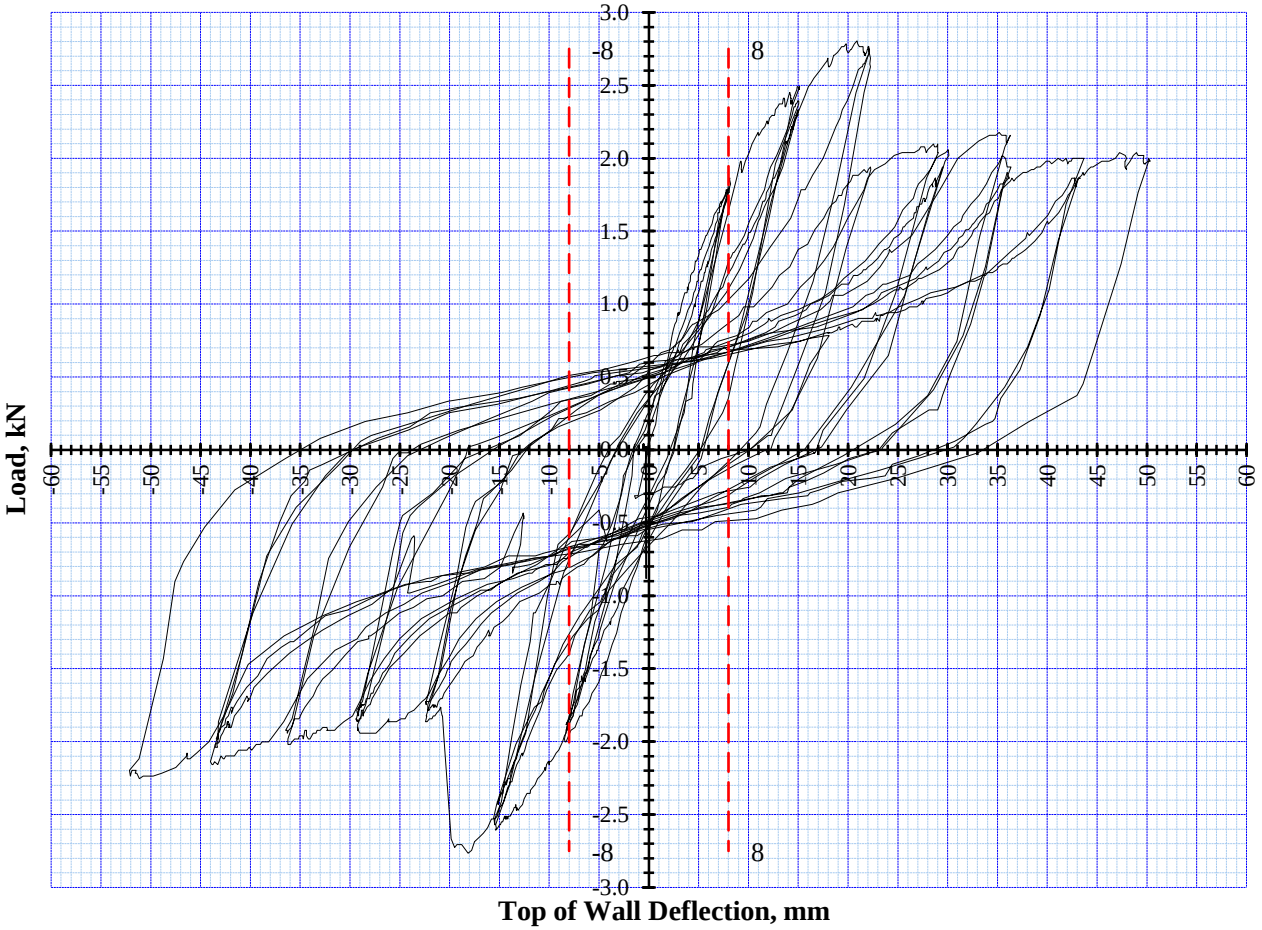

Figure 3: *Wall 276258*

P21:2010 BRACING RACKING TEST RESULT EVALUATION								
Wall Construction								
600mm, 9mm Magnum board one side using 32mm screws @ 50, 250, then 300mm c/c to studs and 50, 250 to plates plus spot glued at approx 300 centres around edge								
90x45 H1.2 SG8 top and bottom plates, studs 600mm c/cs, two rows of no						**Summary**		
2 x 12mm Hold downs one each end with 50x50x3mm flat washers to						**Earthquake**	**68 (U)**	**BU/m**
bottom plate						**Wind**	**77 (U)**	**BU/m**

Date of test:-	19-Oct-16	Ship No.	2921		Tested by	Doug Gaunt	
Date of calc's:-	19-Oct-16	Job No.	TE16-028		Analysed by	Doug Gaunt	

Calculated to BRANZ P21:2010, AS/NZS1170.2&5, NZS3604:2010 *Scion, Private Bag 3020 Rotorua.*

		Serviceability Cycles		Ultimate Cycles				
		Cycle to H/300 or DLQ or DLW		Cycle to Displacement			Wall dimensions	
		8.0	X mm	y=(mm)			L(mm)	H(mm)
Lab Number	Direction	Loads	Residual	Maximum			600	2400
		(P_8)	Defln, C	Load	def @ P		d at P/2	4th,R
		kN	mm	P(kN)	y (mm)	P/2 (kN)	d mm	kN
276256	**+**	**1.42**	**2.00**	**2.43**	**36.0**	1.22	**6.4**	**2.15**
	-	**1.43**	**2.00**	**2.23**	**36.0**			**1.95**
276257	**+**	**1.75**	**1.80**	**2.67**	**36.0**	1.34	**5.4**	**2.40**
	-	**1.55**	**2.60**	**2.37**	**36.0**			**2.06**
276258	**+**	**1.80**	**2.30**	**2.16**	**36.0**	1.08	**3.8**	**1.83**
	-	**1.93**	**1.50**	**2.02**	**36.0**			**1.78**
		(P_8)	(C)	(P)	(y)	P/2 (kN)	(d)	(Ry)
Averages		1.65	2.03	2.31	36.00	1.21	5.20	2.03
Coefficient of Variation %		11.68	17.19	9.01	0.00	8.61	20.59	10.28

y = average failure deflection or peak deflection of the three tests.			
d= average first cycle displacement at half peak, (the very first cycle wall reaches the load)			
R = Residual load, P = Peak Load, S = Serviceability load			
Displacement Recovery Factor (K1), (0.8 <= K1 <= 1.0)		Systems factor K2 =	1.2
Average Structural Displacement Ductility factor		u = y/d	6.92
Ductility Modification factor		K4 =	1.00
DLW = Selected deflection limit for wind forces	DLQ = Selected deflection limit for earthquake forces		

P21:2010 BR Calc's		**K1**	**EQ ultimate**	**EQ service**	**Wind Ultimate**	**Wind Service**
Lab Number		**(= 1.4 - C/X)**	**BU's**	**BU's**	**BU's**	**BU's**
276256	(BU)	1.00	41.0	62.2	46.6	48.2
	(BU/m)		68	104	78	80
276257	(BU)	1.00	44.6	72.0	50.4	55.8
	(BU/m)		74	120	84	93
276258	(BU)	1.00	36.1	81.4	41.8	63.0
	(BU/m)		60	136	70	105
		276256	*2% Ok result*	*-23% Ok result*	*1% Ok result*	*-23% Ok result*
<20% Result Check		*276257*	*14% Ok result*	*0% Ok result*	*12% Ok result*	*0% Ok result*
		276258	*-19% Ok result*	*74.6*	*-16% Ok result*	*57.8*

Note: Where the value of BR Wind or BR EQ for any specimen is more than 20% greater than either of the other two specimens, assign it a value of 1.2 times the lower value before averaging.

Average Earthquake BR		**Ultimate**			**Serviceability**
EQ (BU's)	20 x K4 x Ry =	**41**	(P8 x K1) x (K2/0.55) =		**70**
	68	**BU/m**		**Limited by**	**Ultimate limit state**
Average Wind BR		**Ultimate**			**Serviceability**
Wind (BU's)	20 * P =	**46**	(P8 x K1) x (K2/0.71) =		**54**
	77	**BU/m**		**Limited by**	**Ultimate limit state**

Figure 4: *P21:2010 calculations for a 600mm x 2.4m 9mm Magnum board one side wall*

Please feel free to contact me to discuss this information.

Doug Gaunt