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Results

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Organisation:	Enviro square Ltd	**Subject:**	P21:2010 1200mm x 2.4m Wall 6mm KAPO board one side
Location:	Auckland	**Date:**	10 September 2015
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Soon

Please find below your P21 bracing results for your three 1200mm x 2.40m 6mm KAPO board one side walls as tested with M12 hold down rods & washers.

1. BU wind = 79 (66 BU/m) as limited by the ultimate load capacity.
2. BU Earthquake = 68 (57 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, no nogs
- 6mm Envirosquare KAPO board one side
- 40mm x 2.8mm galvanised clouts @ 150mm centres
- M12 hold down rods with 50x50x3 washers to bottom plate.

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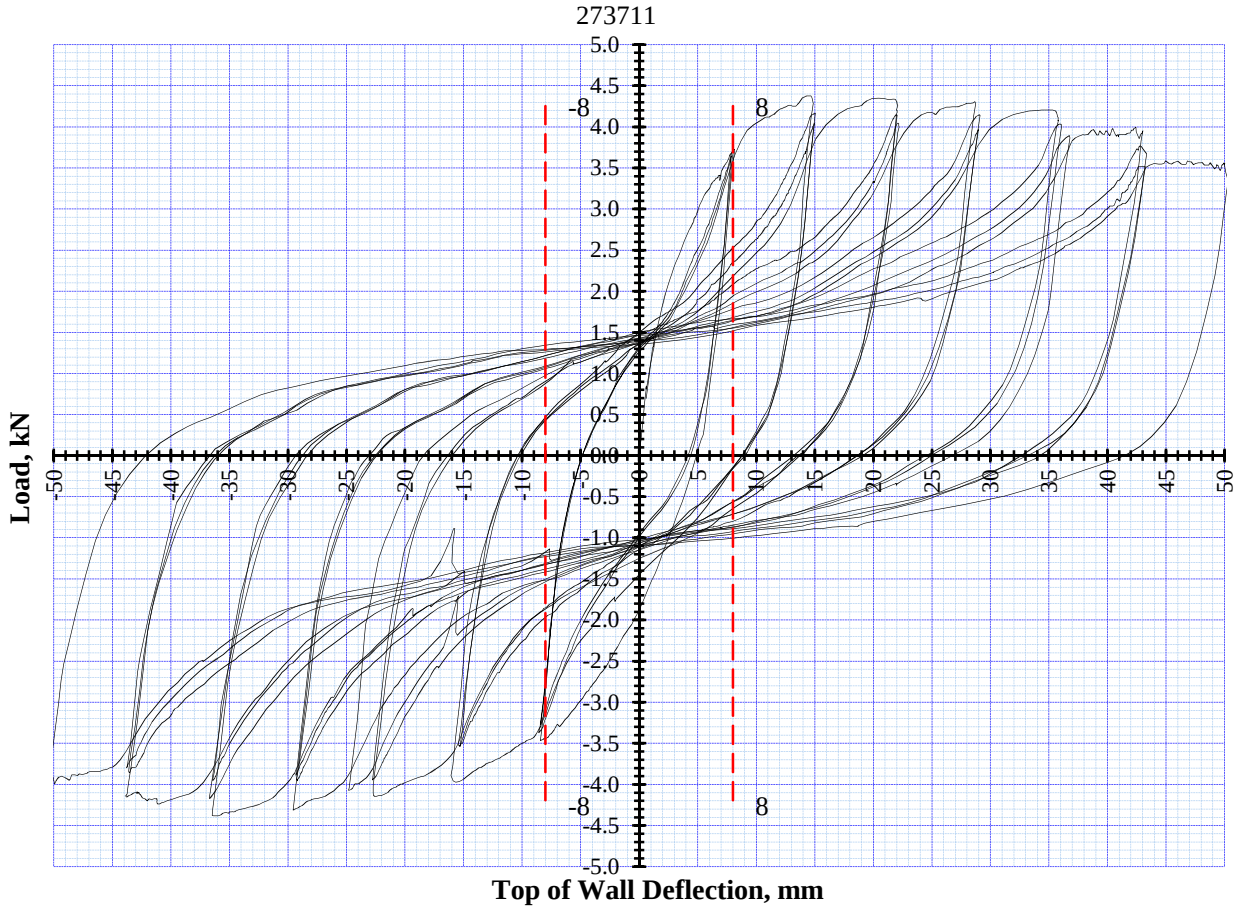

Figure 1: *Wall 273711*

Observations

- No damage to timber framing
- Board pulling off bottom plate

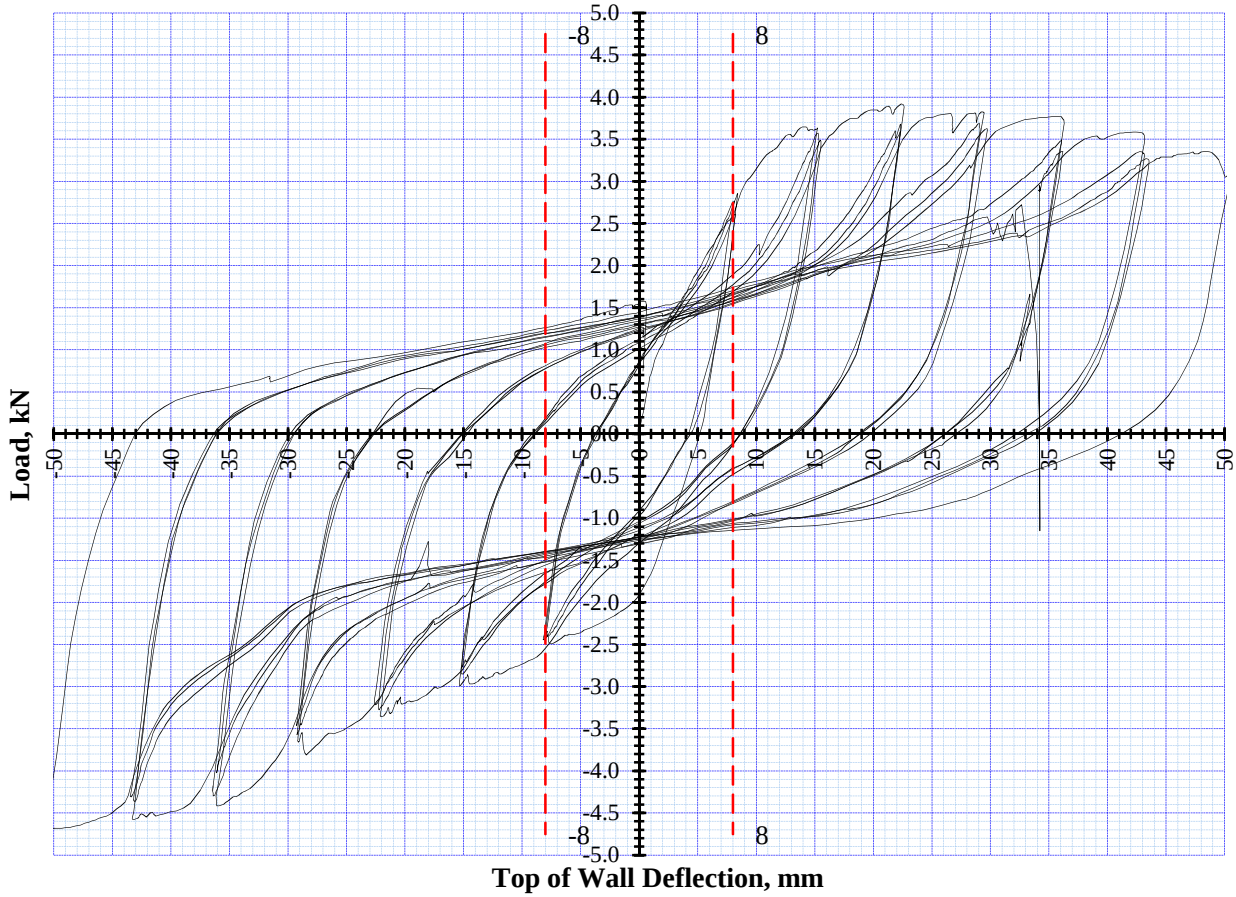

Figure 2: *Wall 273712*

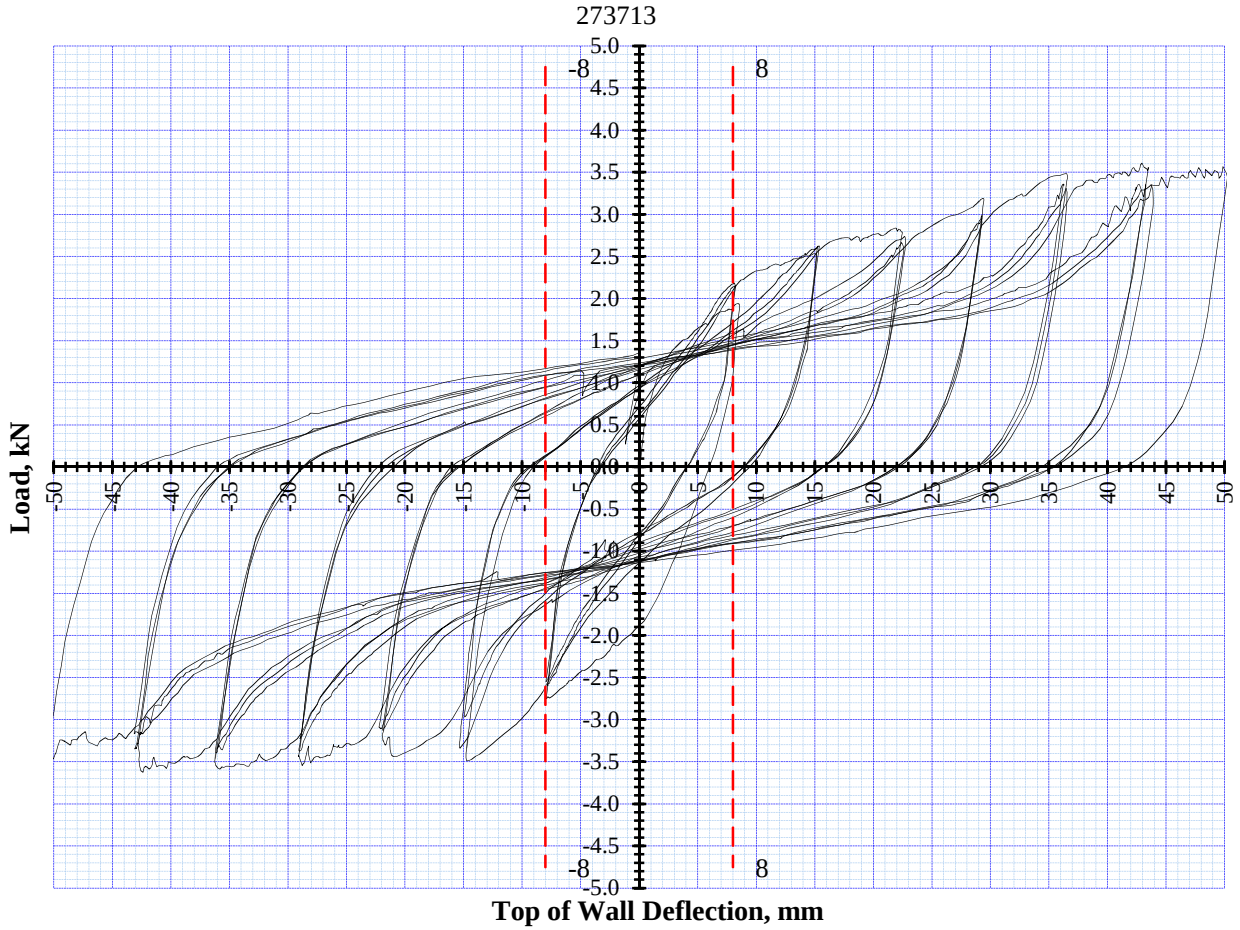

Figure 3: *Wall 273713*

P21:2010 BRACING RACKING TEST RESULT EVALUATION								
Wall Construction								
1200mm, 6mm KAPO RAB board one side, 90x45 SG8 (600mm c/c), no nogs								
40mm x 2.8mm galvanised clouts @ 150mm centres								
No Hold Down brackets						**Summary**		
M12 restraint rods & 50x50x3mm washers to bottom plate						**Earthquake**	**57 (U)**	**BU/m**
Calculated to BRANZ P21:2010, AS/NZS1170.2&5, NZS3604:2010						**Wind**	**66 (U)**	**BU/m**
Scion, Private Bag 3020 Rotorua. Timber Engineering Lab								
Date of test:-		**10-Sep-15**	Ship No.	**2835**		Tested by	Doug Gaunt	
Date of calc's:-		**10-Sep-15**	Job No.	**TE15-014**		Analysed by	Doug Gaunt	

		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			1200	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
273711	**+**	**3.71**	**4.20**	**4.20**	**36.0**	2.10	**2.2**	**3.55**
	-	**3.44**	**4.90**	**4.39**	**36.0**			**3.63**
273712	**+**	**2.75**	**4.30**	**3.77**	**36.0**	1.89	**5.0**	**3.24**
	-	**2.50**	**3.70**	**4.42**	**36.0**			**3.80**
273713	**+**	**2.17**	**5.00**	**3.47**	**36.0**	1.74	**6.0**	**2.98**
	-	**2.74**	**3.30**	**3.57**	**36.0**			**3.20**
		(P_8)	(C)	(P)	(y)	P/2 (kN)	(d)	(Ry)
Averages		2.89	4.23	3.97	36.00	1.91	4.40	3.40
Coefficient of Variation %		18.38	14.28	9.66	0.00	7.86	36.55	8.30

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	8.18
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**
273711	(BU)	0.83	71.8	129.7	85.9	100.5
	(BU/m)		60	108	72	84
273712	(BU)	0.90	70.4	103.1	81.9	79.9
	(BU/m)		59	86	68	67
273713	(BU)	0.88	61.8	94.4	70.4	73.1
	(BU/m)		52	79	59	61
		273711	*8% Ok result*	*113.3*	*11% Ok result*	*87.8*
<20% Result Check		*273712*	*5% Ok result*	*-9% Ok result*	*5% Ok result*	*-9% Ok result*
		273713	*-15% Ok result*	*-23% Ok result*	*-19% Ok result*	*-23% Ok result*

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 =	**68**	(P8 x K1) x (K2/0.55) =		**104**
	57	**BU/m**		**Limited by**	**Ultimate limit state**
Average Wind BR		**Ultimate**			**Serviceability**
Wind (BU's)	20 * P =	**79**	(P8 x K1) x (K2/0.71) =		**80**
	66	**BU/m**		**Limited by**	**Ultimate limit state**

Figure 4: *P21:2010 calculations for a 1200mm x 2.4m, 6mm KAPO board one side*

Please feel free to contact me to discuss this information.

Doug Gaunt