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Results

To:	Jeff Price	**From:**	Doug Gaunt
Organisation:	ITI Timspec	**Subject:**	P21:2010 600mm x 2.4m 7.0mm Plywood with Brackets
Location:	Manukau	**Date:**	18 November 2021
Mob No.:	0277 880005	**No. of**	5
Tel No.:		**Pages:**	

Please call +64 7 343 5763 if transmission incomplete

Jeff

Please find below your P21 bracing results for your three 600mm x 2.40m 7.0mm Plywood walls as tested with brackets.

1. BU wind = 47 (79 BU/m) as limited by the serviceability load capacity.
2. BU Earthquake = 61 (86 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 H1.2 SG8 framing, Studs at 600mm centres, no nogs
- 7.0mm 5-ply Plywood one side,
- Plywood fixed 50x2.8mm Galv steel nails at 150mm centres to plates and end studs
- GIB Handibracs hold down brackets each end.
- M12 hold down rods to bottom plate and brackets.

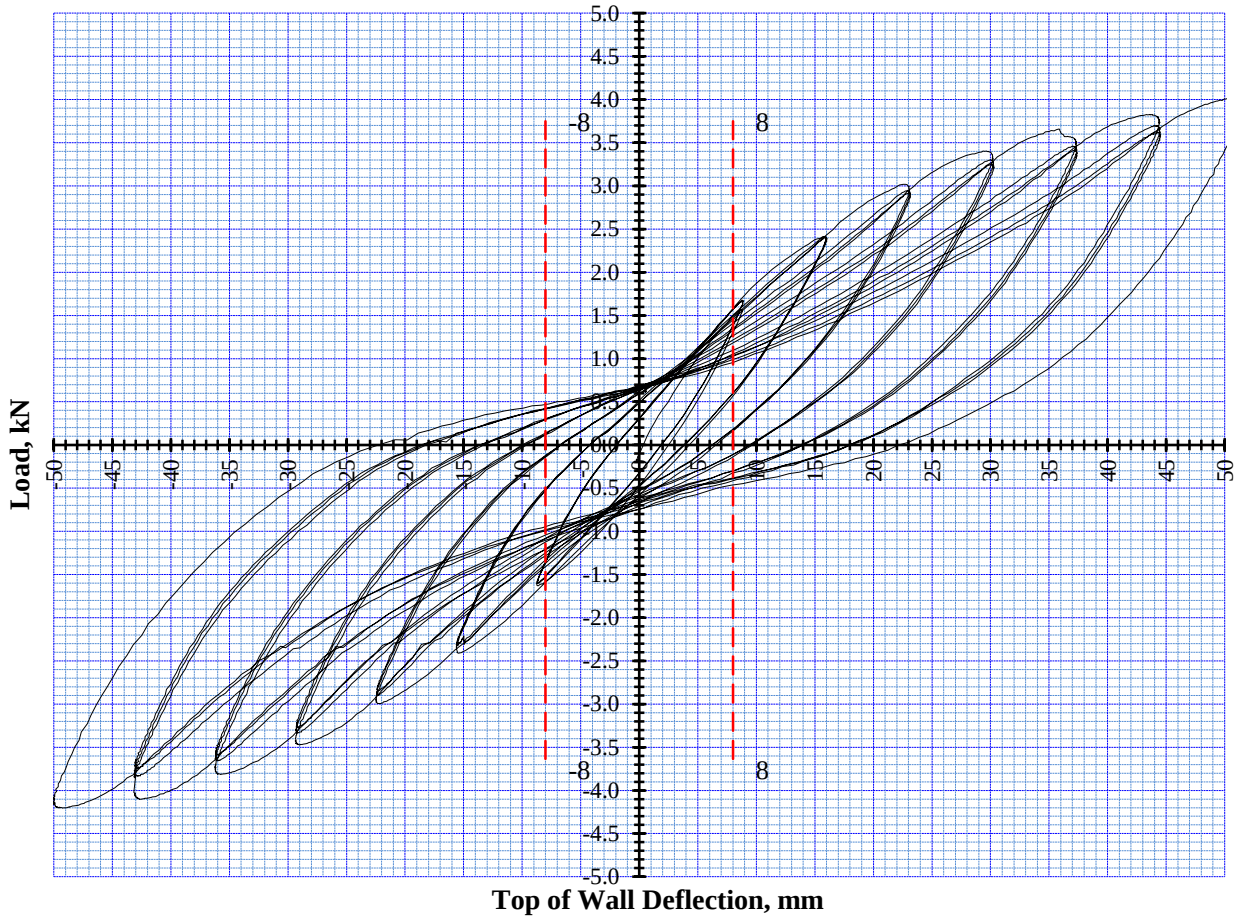

Figure 1: *Wall 288268*

Observations

- Nails along bottom plate moving in plywood
- No obvious damage seen to plywood

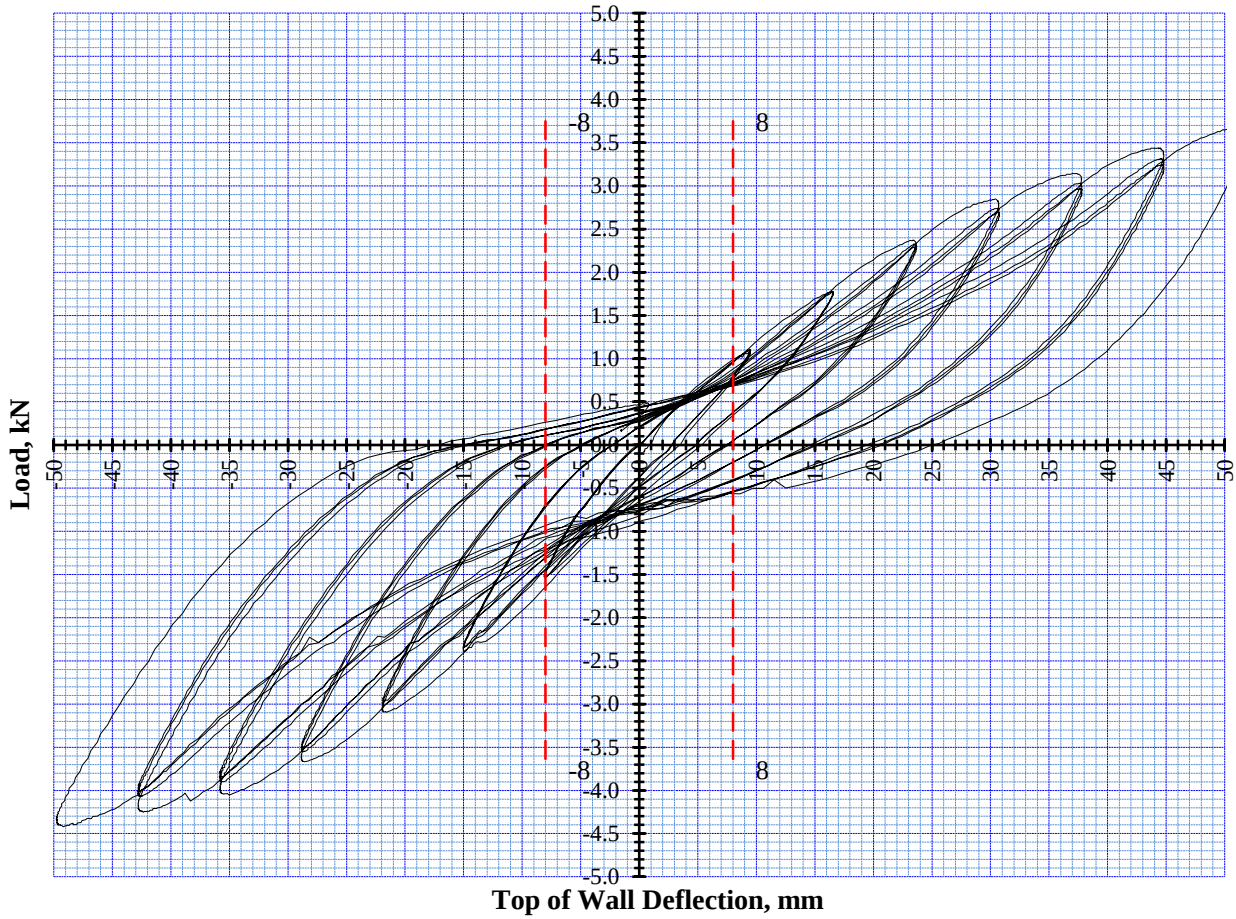

Figure 2: *Wall 288269*

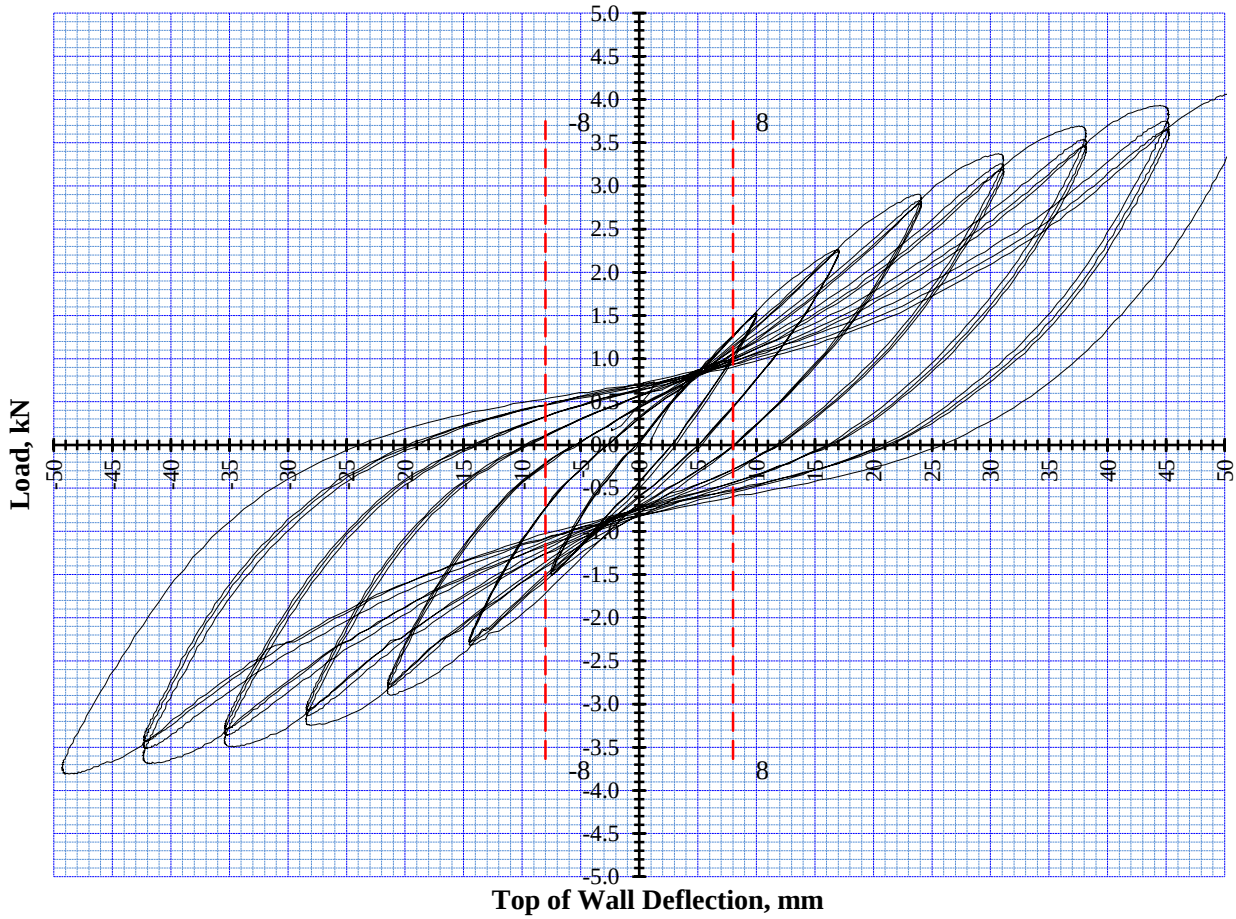

Figure 3: *Wall 288270*

P21:2010 BRACING RACKING TEST RESULT EVALUATION

Wall Construction

600mm, 7.0mm 5-ply Plywood one side

90x45 H1.2 SG8 framing, studs at 600mm centres, no nogs

Plywood fixed 50mmx2.8mm Galv Steel Nails at 150mm centres to plat | **Summary**

and external studs | **Earthquake** | **86 (U)** | **BU/m**

7mm min edge distances all around. GIB Handibracs used each end | **Wind** | **79 (S)** | **BU/m**

M12 hold down bolts to bottom plate & brackets

P21 Supplementary restraints used

Date of test:-	**17-Nov-21**	Ship No.	**3218**		Tested by	Jamie Agnew	
Date of calc's:-	**17-Nov-21**	Job No.	**TE21-023**		Analysed by	Doug Gaunt	

Calculated to BRANZ P21:2010, AS/NZS1170.2&5, NZS3604:2011 *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	2410
		(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
288268	**+**	**1.60**	**1.90**	**3.61**	**36.0**	1.81	**9.5**	**3.32**
	-	**1.58**	**1.80**	**3.61**	**36.0**			**3.50**
288269	**+**	**1.01**	**2.50**	**3.13**	**36.0**	1.57	**13.5**	**2.84**
	-	**1.52**	**2.50**	**4.05**	**36.0**			**3.85**
288270	**+**	**1.41**	**1.70**	**3.68**	**36.0**	1.84	**13.3**	**3.33**
	-	**1.45**	**1.00**	**3.49**	**36.0**			**3.28**
		(P_8)	(C)	(P)	(y)	P/2 (kN)	(d)	(Ry)
Averages		1.43	1.90	3.60	36.00	1.74	12.10	3.35
Coefficient of Variation %		13.91	27.01	7.55	0.00	7.04	15.21	8.94

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 2.98

Ductility Modification factor | K4 = 0.77

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**
288268	(BU)	1.00	52.4	69.4	72.2	53.7
	(BU/m)		87	116	120	90
288269	(BU)	1.00	51.4	55.2	71.8	42.8
	(BU/m)		86	92	120	71
288270	(BU)	1.00	50.8	62.4	71.7	48.3
	(BU/m)		85	104	120	81
		288268	*2% Ok result*	*66.2*	*1% Ok result*	*51.3*
<20% Result Check		*288269*	*0% Ok result*	*-19% Ok result*	*0% Ok result*	*-19% Ok result*
		288270	*-2% Ok result*	*0% Ok result*	*0% Ok result*	*0% 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 =	**52**	(P8 x K1) x (K2/0.55) =	**61**
	86	**BU/m**	**Limited by**	**Ultimate limit state**
Average Wind BR		**Ultimate**		**Serviceability**
Wind (BU's)	20 * P =	**72**	(P8 x K1) x (K2/0.71) =	**47**
	79	**BU/m**	**Limited by**	**Serviceability limit state**

Figure 4: *P21:2010 calculations for the 600mm x 2.4m, 7.0mm Plywood with brackets*

Please feel free to contact me to discuss this information.

Doug Gaunt