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Results

To:	Jeff Price	**From:**	Doug Gaunt
Organisation:	ITI Timspec	**Subject:**	P21:2010 1200mm 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 1200mm x 2.40m 7.0mm Plywood walls as tested with brackets.

1. BU wind = 133 (111 BU/m) as limited by the serviceability load capacity.
2. BU Earthquake = 146 (122 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, 300mm to middle stud
- GIB Handibracs hold down brackets each end.
- M12 hold down rods to bottom plate and brackets.

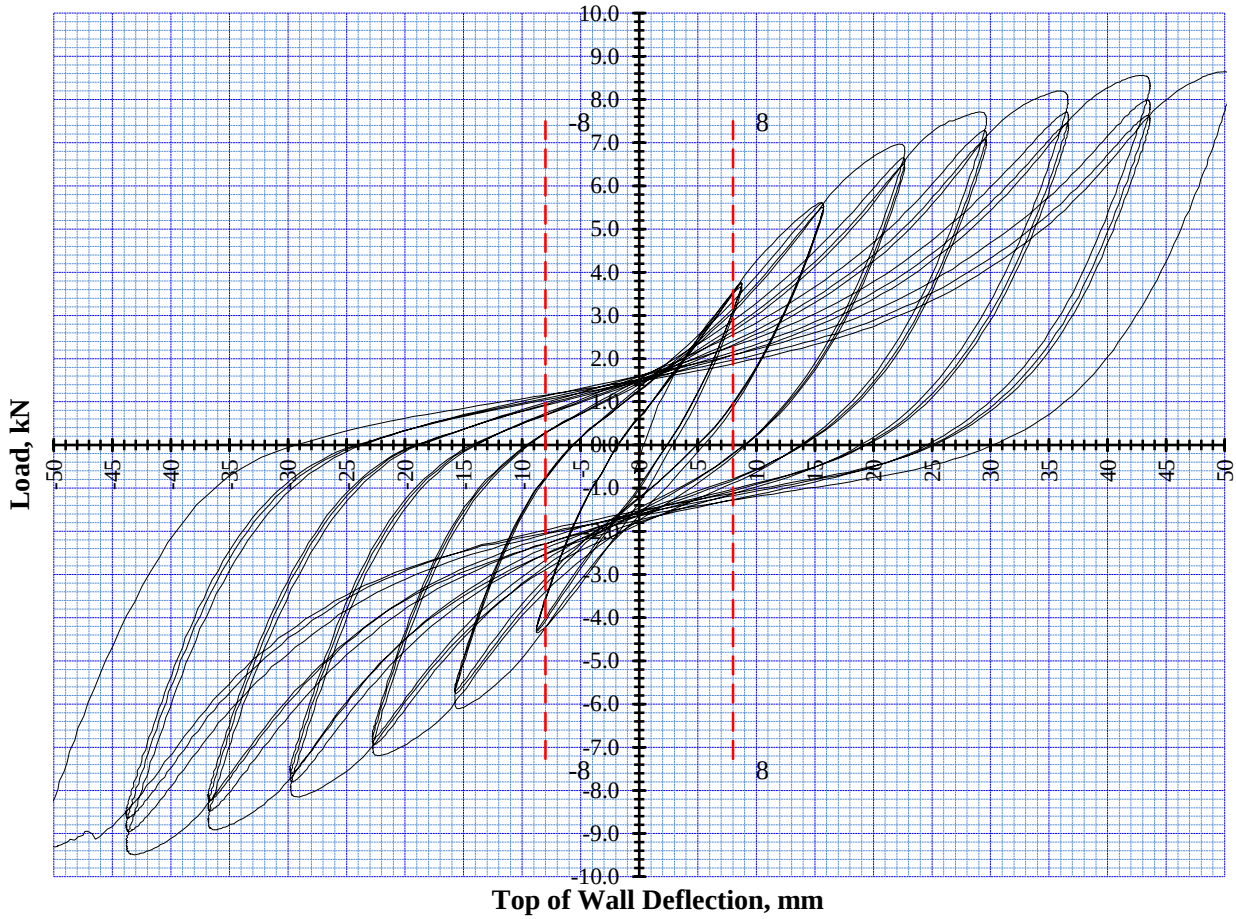

Figure 1: *Wall 288265*

Observations

- Nails along bottom plate moving in plywood
- No obvious damage seen to plywood
- Minor bending of brackets

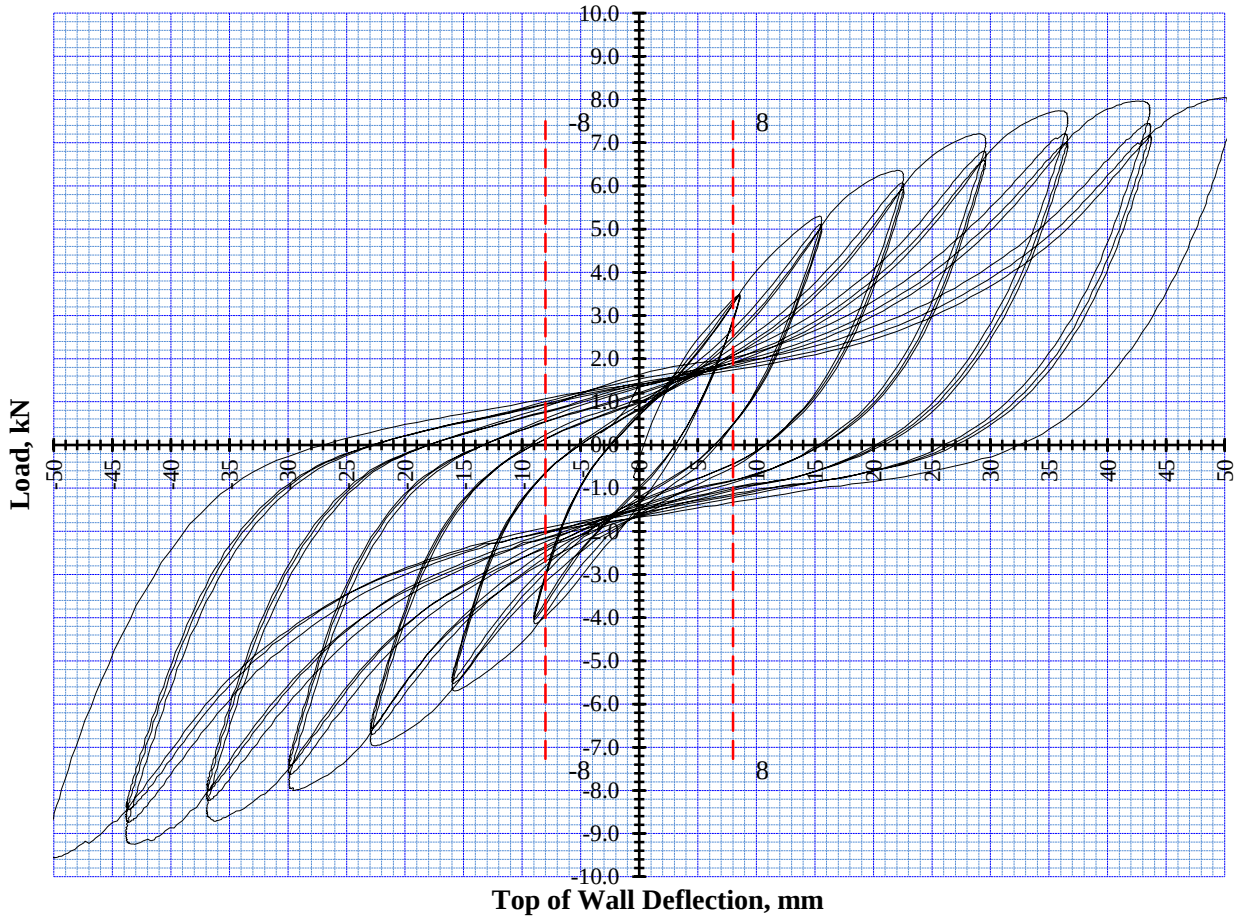

Figure 2: *Wall 288266*

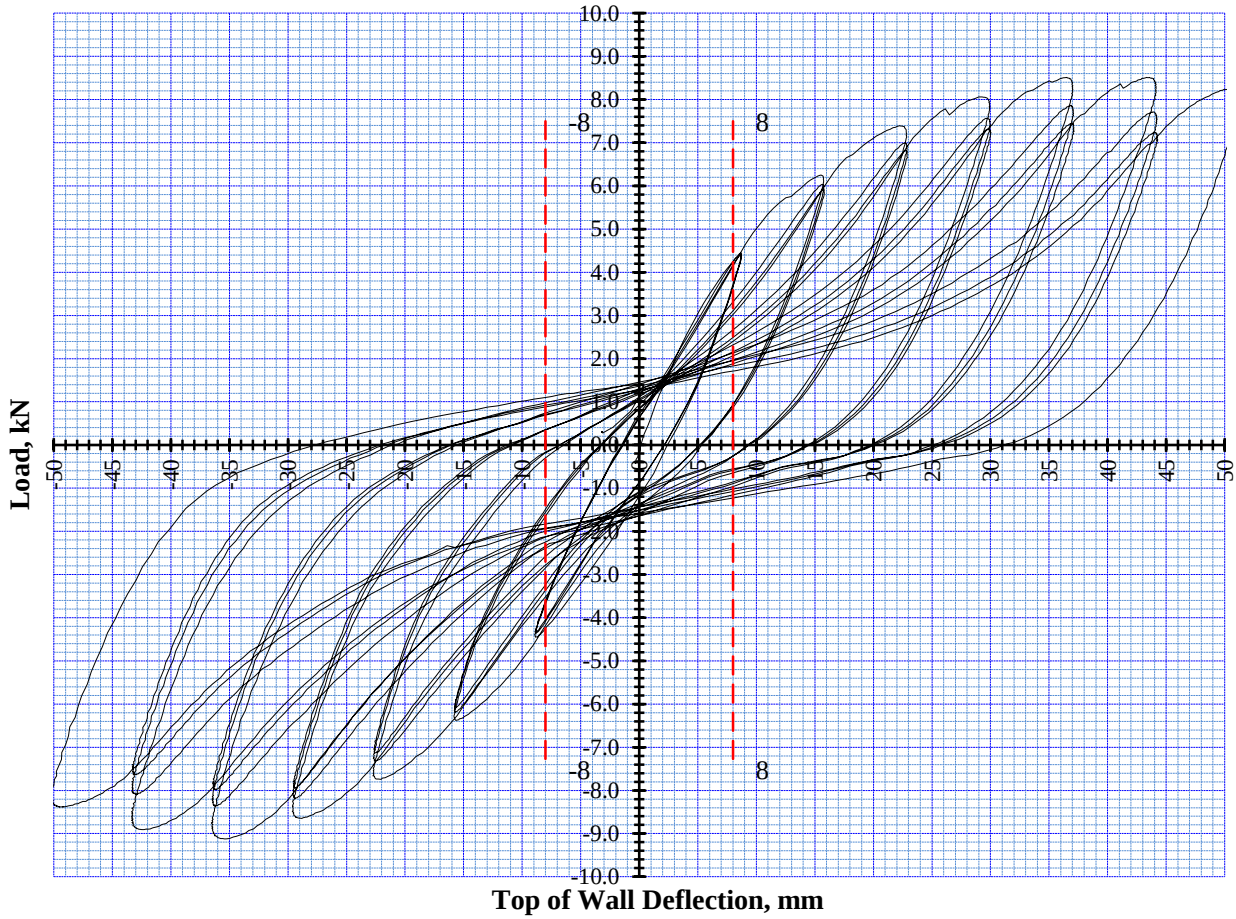

Figure 3: *Wall 288267*

P21:2010 BRACING RACKING TEST RESULT EVALUATION

Wall Construction

1200mm, 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 plates and external studs, 300mm to internal studs, 7mm min edge distances all around. GIB Handibracs used each end

M12 hold down bolts to bottom plate & brackets

P21 Supplementary restraints used

						Summary	
						Earthquake	**122 (U) BU/m**
						Wind	**111 (S) BU/m**
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			1200	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
288265	**+**	**3.55**	**2.40**	**8.20**	**36.0**	4.10	**9.4**	**7.32**
	-	**4.20**	**1.70**	**8.90**	**36.0**			**8.00**
288266	**+**	**3.35**	**3.10**	**7.72**	**36.0**	3.86	**9.4**	**6.80**
	-	**3.95**	**2.40**	**8.70**	**36.0**			**7.75**
288267	**+**	**4.23**	**2.10**	**8.50**	**36.0**	4.25	**8.3**	**7.08**
	-	**4.30**	**1.40**	**9.10**	**36.0**			**7.80**
		(P_8)	(C)	(P)	(y)	P/2 (kN)	(d)	(Ry)
Averages		3.93	2.18	8.52	36.00	4.07	9.03	7.46
Coefficient of Variation %		9.18	25.01	5.37	0.00	3.95	5.74	5.72

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 3.99

Ductility Modification factor K4 = 0.98

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**
288265	(BU)	1.00	149.9	169.1	171.0	131.0
	(BU/m)		125	141	143	109
288266	(BU)	1.00	142.4	159.3	164.2	123.4
	(BU/m)		119	133	137	103
288267	(BU)	1.00	145.6	186.1	176.0	144.2
	(BU/m)		121	155	147	120
		288265	*4% Ok result*	*-2% Ok result*	*1% Ok result*	*-2% Ok result*
<20% Result Check		*288266*	*-4% Ok result*	*-12% Ok result*	*-6% Ok result*	*-12% Ok result*
		288267	*0% Ok result*	*12% Ok result*	*5% Ok result*	*12% 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 =	**146**	(P8 x K1) x (K2/0.55) =	**171**
	122	**BU/m**	**Limited by**	**Ultimate limit state**
Average Wind BR		**Ultimate**		**Serviceability**
Wind (BU's)	20 * P =	**170**	(P8 x K1) x (K2/0.71) =	**133**
	111	**BU/m**	**Limited by**	**Serviceability limit state**

Figure 4: *P21:2010 calculations for the 1200mm x 2.4m, 7.0mm Plywood with brackets*

Please feel free to contact me to discuss this information.

Doug Gaunt