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Results

To:	John Woodman	**From:**	Doug Gaunt
Organisation:	Prowood	**Subject:**	5920mm PLX20 Portal, 360/290
Location:	Motueka	**Date:**	30 March 2023
Mob No.:	021 2241385	**No. of Pages:**	3
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John, Daniel, Andrew

Please find below your P21 bracing results for your three 5920mm PLX20 Portal, 360/290.

1. BU wind = 163 BU as limited by the service load capacity.
2. BU Earthquake = 196BU as limited by the ultimate load capacity.

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

Portal Construction

- 5920mm, long PLX portal,
- Legs 360x90x2550mm GL12 Douglas fir
- Beam PLX20 290x90x5200mm
- M12 rods top and bottom connected to 40x8 steel PLX reinforcement + Spax screw at rod/40x8 connection.
- 12mm curved backing plate outside columns 50mm rebate to columns
- Prowood shear brackets + two VGZ7x200 screws
- VGS 9x200mm screws two at M12 bolts inner face of column
- Prowood base bracket, ten VGS9x160 Rothoblass screws to fix to base of timber column
- M12 hold down rods bracket to reaction beam,
- P21 Supplementary restraints used

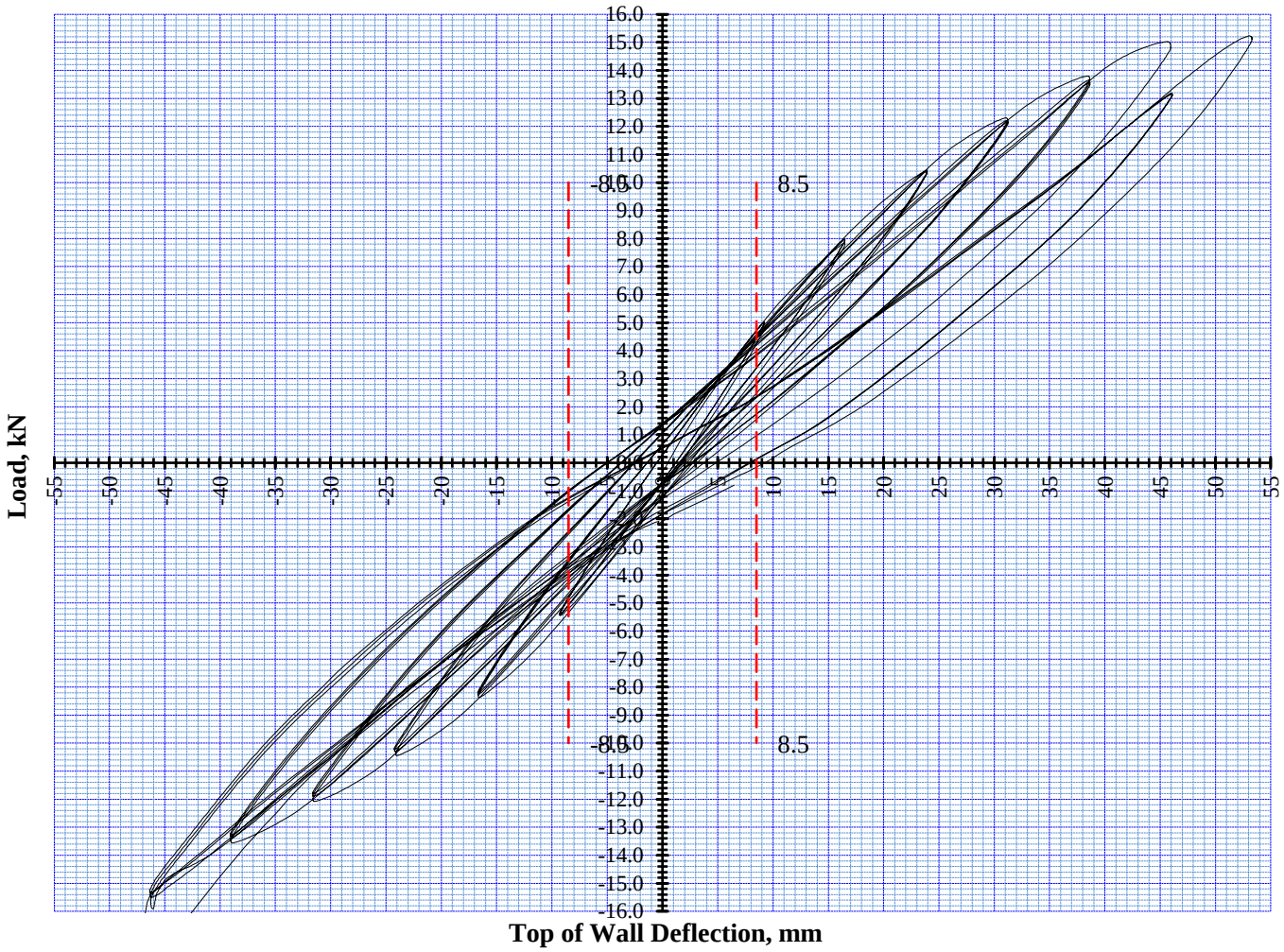

Figure 1: *Portal 290704*

Observations

- Beam/Column joint opening up on top side
- Columns rotating at base
- Prowood base fitting distorting

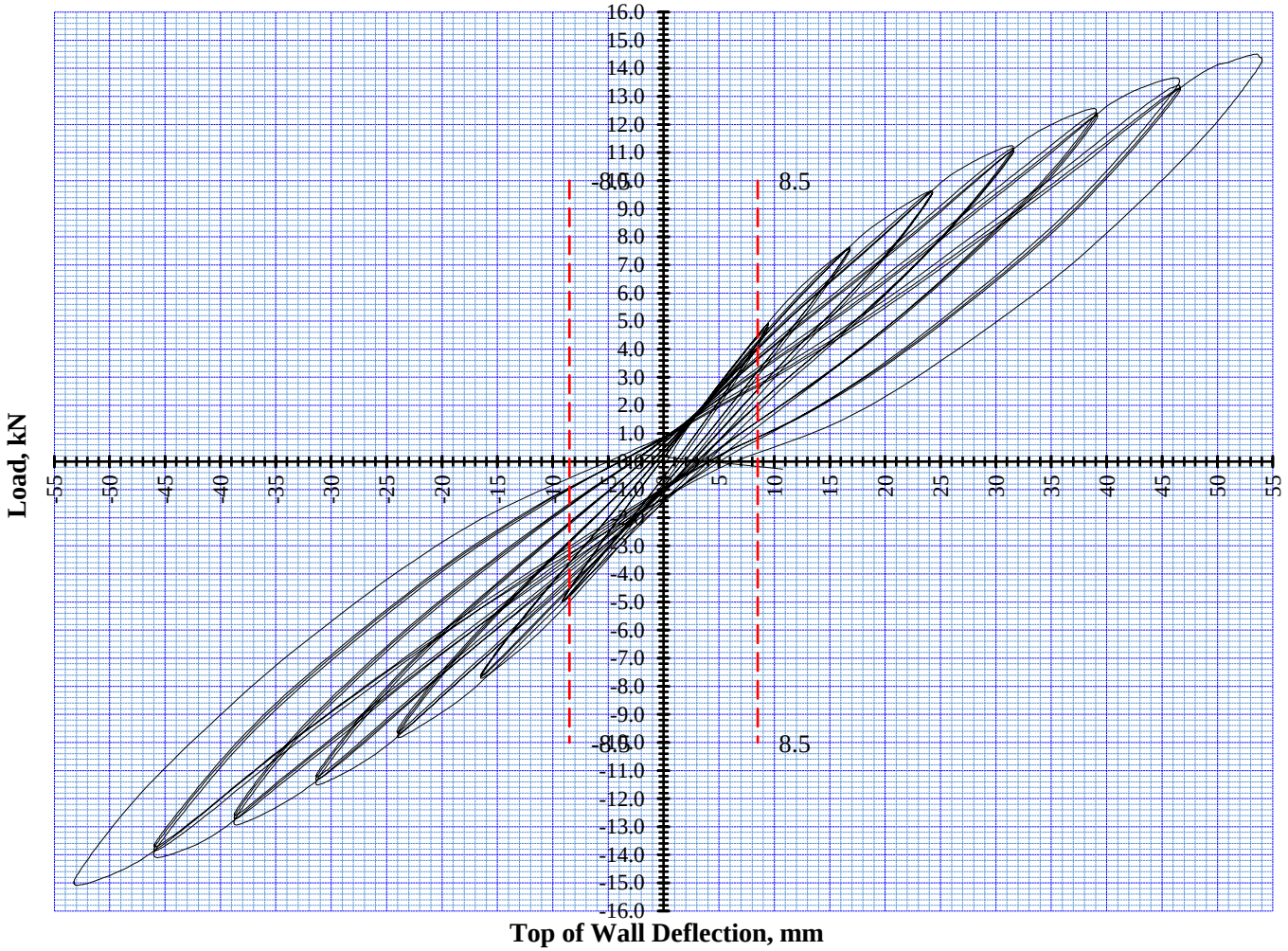

Figure 2: *Portal 290705*

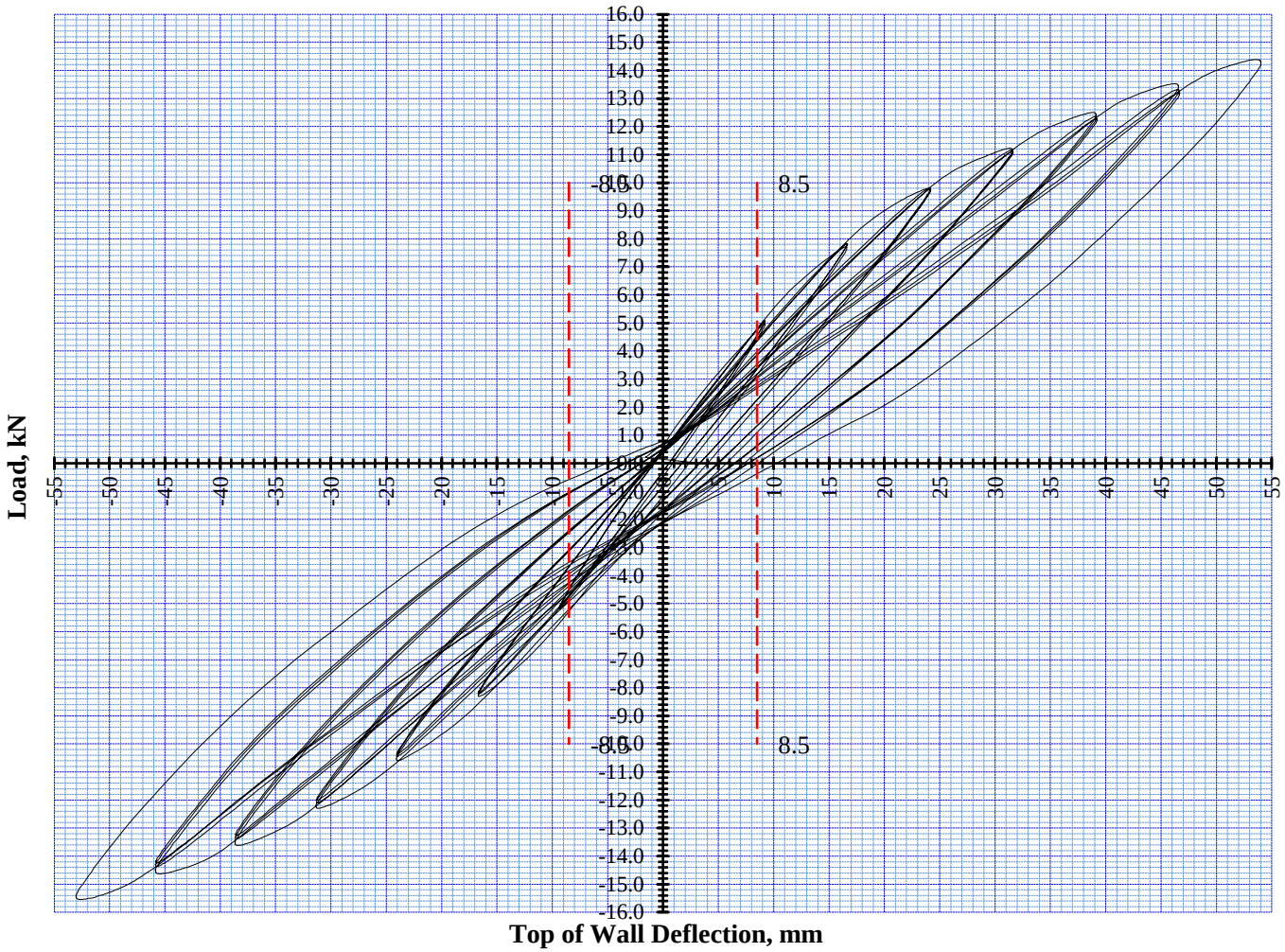

Figure 3: *Portal 290706*

P21:2010 BRACING RACKING TEST RESULT EVALUATION								
Wall Construction								
5920mm, long PLX portal , Legs 360x90x2550mm, Beam PLX20 290x90x5200mm								
M12 rods top and bottom connected to 40x8 steel PLX reinforcement + spax screw								
12mm curved backing plate outside columns 50mm rebate to columns						**Summary**		
Prowood shear brackets + two VGZ7x200 screws						**Earthquake**	**196 (U)**	**BU**
VGS 9x200mm screws two at M12 bolts inner face of column						**Wind**	**163 (S)**	**BU**
Prowood base bracket, ten VGS9x160 rothoblass screws to fix to base of timber column								
M12 hold down rods bracket to reaction beam, P21 Supplementary restraints used								
Date of test:-		**28-Mar-23**	Ship No.	**3287**		Tested by	Doug Gaunt	
Date of calc's:-		**29-Mar-23**	Job No.	**TE22-053**		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	
		8.5	X mm	y=(mm)			L(mm)	H(mm)
Lab Number	Direction	Loads	Residual	Maximum			5920	2550
		(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
290704	**+**	**4.70**	**1.40**	**13.75**	**38.3**	6.88	**13.4**	**13.40**
	-	**5.20**	**0.50**	**13.45**	**38.3**			**12.20**
290705	**+**	**4.50**	**1.00**	**12.50**	**38.3**	6.25	**12.5**	**12.00**
	-	**4.75**	**0.40**	**12.80**	**38.3**			**12.50**
290706	**+**	**4.60**	**1.00**	**12.35**	**38.3**	6.18	**12.0**	**11.85**
	-	**5.10**	**0.30**	**13.60**	**38.3**			**13.40**
		(P_8)	(C)	(P)	(y)	P/2 (kN)	(d)	(Ry)
Averages		4.81	0.77	13.08	38.30	6.43	12.63	12.56
Coefficient of Variation %		5.32	51.44	4.19	0.00	4.88	4.59	5.00

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	3.03	
Ductility Modification factor						K4 =	0.78	
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**
290704	(BU)	1.00	199.9	216.0	272.0	167.3
	(BU/m)		34	36	46	28
290705	(BU)	1.00	191.3	201.8	253.0	156.3
	(BU/m)		32	34	43	26
290706	(BU)	1.00	197.1	211.6	259.5	163.9
	(BU/m)		33	36	44	28
		290704	*3% Ok result*	*4% Ok result*	*6% Ok result*	*4% Ok result*
<20% Result Check		*290705*	*-4% Ok result*	*-6% Ok result*	*-5% Ok result*	*-6% Ok result*
		290706	*1% Ok result*	*1% Ok result*	*-1% Ok result*	*1% 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 =	**196**	(P8 x K1) x (K2/0.55) =		**210**
	196	**BU**		**Limited by**	**Ultimate limit state**
Average Wind BR		**Ultimate**			**Serviceability**
Wind (BU's)	20 * P =	**262**	(P8 x K1) x (K2/0.71) =		**163**
	163	**BU**		**Limited by**	**Serviceability limit state**

Figure 4: *P21:2010 calculations for the PLX 20 5920x360/290 Portal*

Please feel free to contact me to discuss this information.

Doug Gaunt