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Results

To:	Grant Meads	**From:**	Doug Gaunt
Organisation:		**Subject:**	P21:2010 1200mm x 2.4m 12mm MgO SIP with bracket and strap
Location:		**Date:**	20 June 2018
Fax No.:	021 898586	**No. of**	5
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Grant

Please find below your P21 bracing results for your three 1200mm x 2.40m 12mm MgO SIP walls as tested with a bracket and a strap.

1. BU wind = 236 (196 BU/m) as limited by the ultimate load capacity.
2. BU Earthquake = 213 (178 BU/m) as limited by the ultimate load capacity.

From the P21 test method, Clause 14.5 - Maximum bracing ratings notes;

> "Bracing ratings using this procedure are intended to be constructed in buildings within the scope of NZS 3604. Systems producing high ratings will require resistance to hold down reactions that may not be able to be provided by a typical timber-framed buildings. For this reason, ratings above 110 BU/m for timber floors or 150 BU/m for concrete floors should be published with caution. Refer to NZS 3604"

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

Wall Construction

- 12mm MgO Board both sides Polystyrene Foam core.
- 90x45mm H1.2 SG8 studs, 90x45mm H1.2 SG8 top & bottom plates
- 2.83 x 64mm Annual Grove Galv gun nails 4 @ 50mm then 150mm centers MgO to studs and plates
- Pryda Bracket one end & 25x0.9mm strap wrapped under plate to stud side fixed with 6 30x2.5 clouts each side stud and 3 30x2.5 clouts each side of bottom plate.
- Double studs at strap end only fixed together with 18 90x3.55 nails.
- M12mm + 50x50x3mm washer to strap end
- M12 to bracket (bracket on outside edge of wall)
- P21 supplementary restraints used

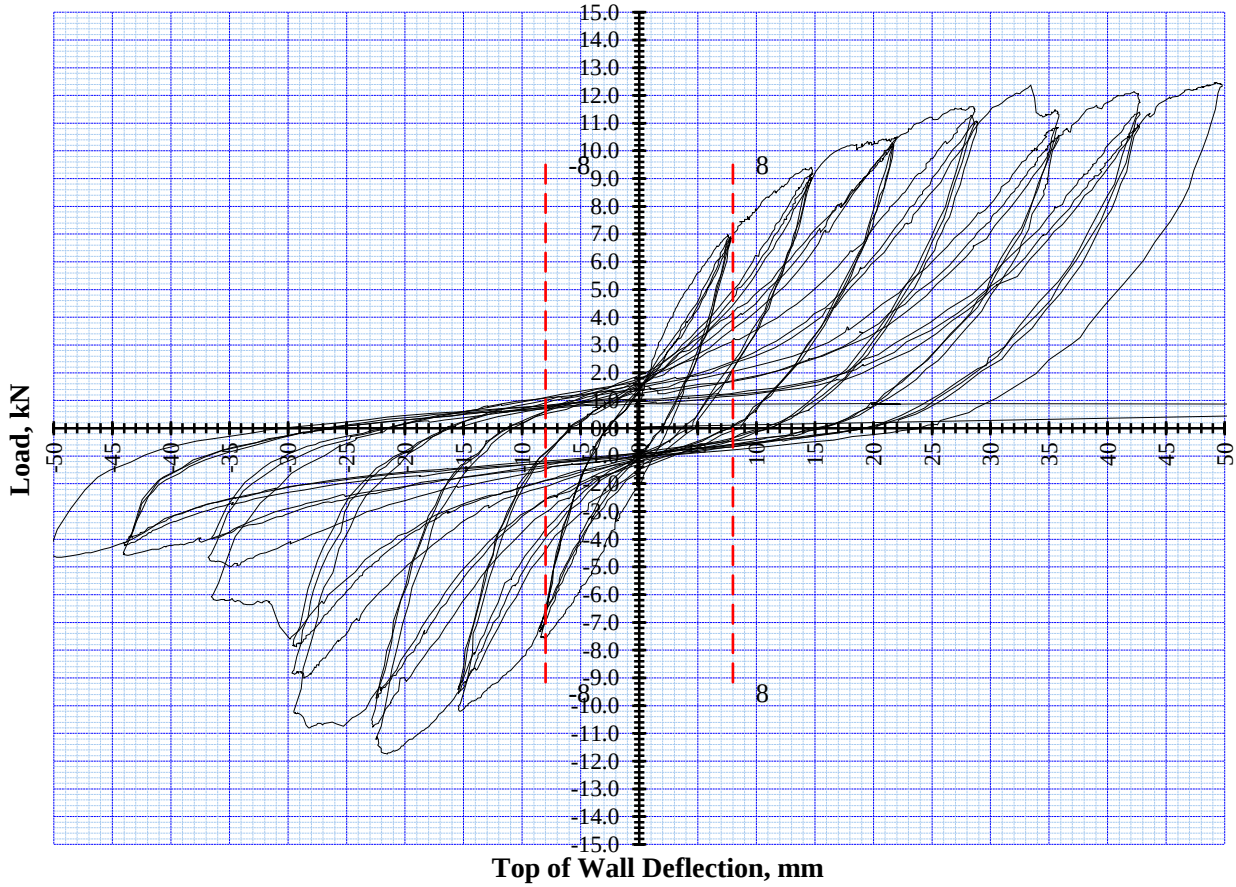

Figure 1: *Wall 279238*

Observations

- Pryda Bracket screws to stud snapped, then MgO bottom plate tearing off

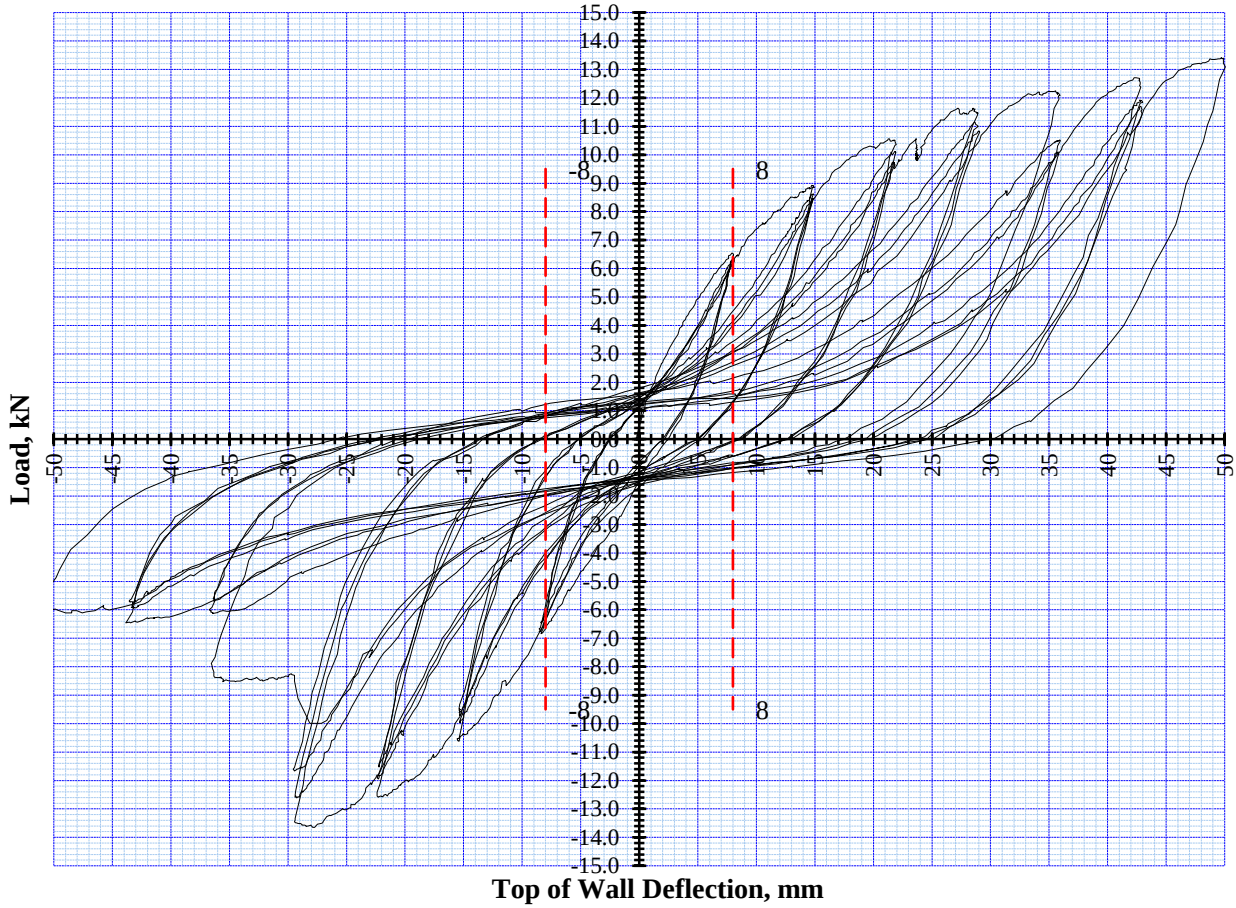

Figure 2: *Wall 279239*

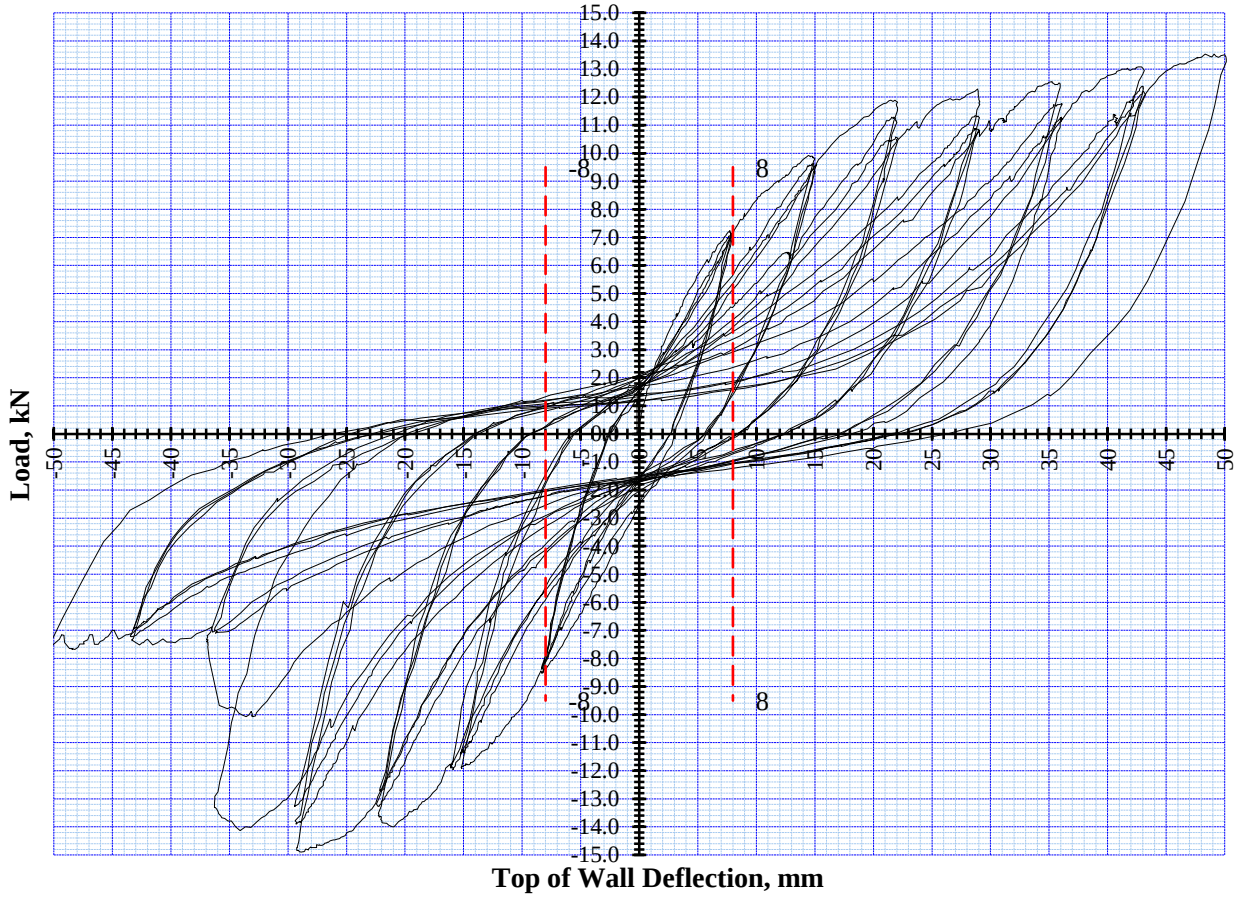

Figure 3: *Wall 279240*

P21:2010 BRACING RACKING TEST RESULT EVALUATION								
Wall Construction								
1200mm, 12mm MgO Board both sides Polystyrene Foam core								
90x45mm H1.2 SG8 studs, 90x45mm H1.2 SG8 top & Bottom plates 2.83 x 64mm Annual Grove Galv								
gun nails 4 @ 50mm then 150mm Centers to studs and plates						**Summary**		
Pryda Bracket one end & 25x0.9 strap under plate to studs other end						**Earthquake**	**178 (U)**	**BU/m**
Double studs (strap end only) fixed 18 90x3.55 nails connecting to 1st stu						**Wind**	**196 (U)**	**BU/m**
M12mm + 50x50x3mm washer to strap end M12 to bracket (bracket outside edge of wall)								
P21 supplementry restraints used								
Date of test:-		**18-Jun-18**	Ship No.	**2996**		Tested by	Bruce Davy	
Date of calc's:-		**19-Jun-18**	Job No.	**TE17-035**		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			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
279238	**+**	**7.00**	**2.00**	**10.45**	**22.0**	5.23	**4.7**	**10.40**
	-	**7.55**	**2.80**	**11.70**	**22.0**			**9.40**
279239	**+**	**6.52**	**2.20**	**10.40**	**22.0**	5.20	**5.7**	**9.80**
	-	**6.60**	**2.50**	**12.55**	**22.0**			**11.60**
279240	**+**	**7.20**	**2.80**	**11.83**	**22.0**	5.92	**5.5**	**10.40**
	-	**8.40**	**2.70**	**13.80**	**22.0**			**12.40**
		(P_8)	(C)	(P)	(y)	P/2 (kN)	(d)	(Ry)
Averages		7.21	2.50	11.79	22.00	5.45	5.30	10.67
Coefficient of Variation %		8.81	12.22	10.01	0.00	6.08	8.15	9.66
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	4.15	
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**
279238	(BU)	1.00	198.0	317.5	221.5	245.9
	(BU/m)		165	265	185	205
279239	(BU)	1.00	214.0	286.3	229.5	221.7
	(BU/m)		178	239	191	185
279240	(BU)	1.00	228.0	340.4	256.3	263.7
	(BU/m)		190	284	214	220
		279238	*-12% Ok result*	*1% Ok result*	*-10% Ok result*	*1% Ok result*
<20% Result Check		*279239*	*0% Ok result*	*-15% Ok result*	*-4% Ok result*	*-15% Ok result*
		279240	*10% Ok result*	*11% Ok result*	*12% Ok result*	*11% 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 =	**213**	(P8 x K1) x (K2/0.55) =		**315**
	178	**BU/m**		**Limited by**	**Ultimate limit state**
Average Wind BR		**Ultimate**			**Serviceability**
Wind (BU's)	20 * P =	**236**	(P8 x K1) x (K2/0.71) =		**244**
	196	**BU/m**		**Limited by**	**Ultimate limit state**

Figure 4: *P21:2010 calculations for the 1200mm x 2.4m, 12mm MgO SIP with bracket and strap*

Please feel free to contact me to discuss this information.

Doug Gaunt