Checking Report
for
Wi Column
by
Wembley Innovation Limited

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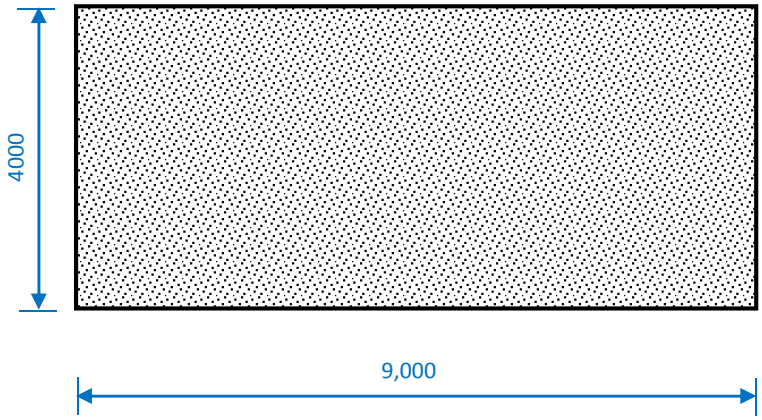
Comparison of Lateral Supports: Ancon WP2 Windpost vs Wi Beam

Introduction

This study compares a stainless steel 130 x 70 x 6 WP2 Ancon windpost against a Wi Beam. For this case, the windpost and Wi Beam are required to support a 140mm blockwork wall 9m long and 4m high, subjected to a lateral pressure of 1.0kPa.

Panel Design



Wall Panel Dimensions

Windpost sub-panel capacity calculation

Refer to CADS wall panel calculation sheet W140/MaxL/01:

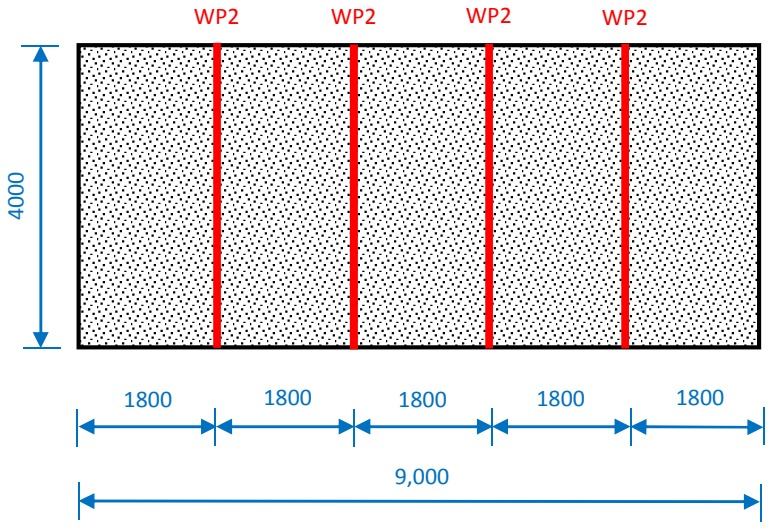
For a 140mm wall, 4m height and load pressure = 1.0kPa, the maximum sub-panel length = **2750mm**

Windpost calculation

From Table 1, which is based on Ancon windpost load capacities, select 130 x 70 x 6 WP2 section, which is the largest capacity windpost suitable for a 140mm wall.

For a 140mm wall, 4m height and load pressure = 1.0kPa, the maximum allowable panel length = **1860mm** (i.e. maximum windpost spacing)

Therefore, if the wall is restrained by the primary structure at either end and along the head, the number of panels formed are: 9,000/1860 = 5no. with 4no. windposts, spaced at 1800mm centres, as below:



Ancon WP2 windpost and panel layout

Wi Beam calculation

Refer to Wi Design Program page WiB/01:

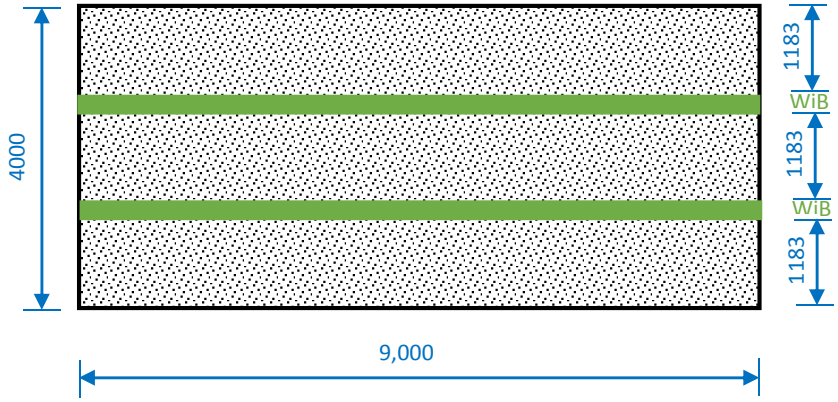
For 140mm wall, 4m height, load pressure = 1.0kPa, if the wall is split into three sub-panels vertically (1183mm high), the Wi Beam is satisfactory, with a **Utilisation Ratio = 0.71**.

Wi Beam sub-panel capacity calculation

Refer to CADS wall panel calculation sheet WiB/W1:

For a 140mm sub-panel, 1.183m in height and 9.0m in length, subject to a load pressure = 1.0kPa, the sub-panel is satisfactory with a **utilisation ratio of 0.435**.

Therefore, the Wi Beam and sub-panel layout is:

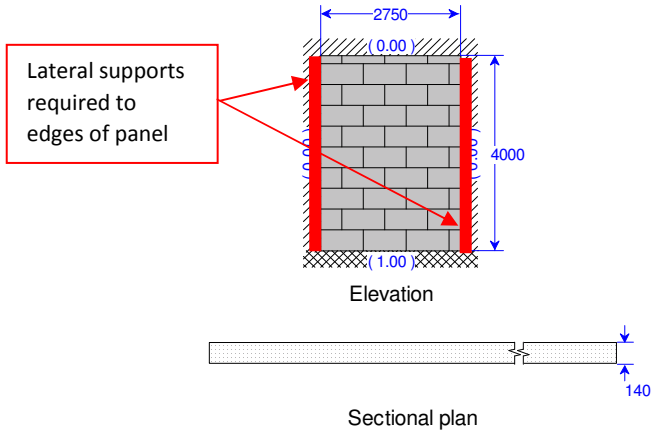


Wi Beam and panel layout

Conclusions

1. For the same conditions, 4no. 130 x 70 x 6 WP2 Ancon windposts are required versus 2no. Wi Beams.
2. The 4no. Ancon WP2 windposts are at maximum capacity, whilst the 2no. Wi Columns are at a utilisation of only 71%.
3. The adopted Ancon WP2 windpost capacity is based on creating a fully mortared joint against the blockwork panels on both sides of the windpost. If a movement joint is required, the capacity will be **reduced**.
4. The comparison is for a standard 140mm Wi Beam and the highest capacity Ancon WP2 windpost that can be accommodated within a 140mm blockwork wall.
5. Note that there are 4no. vertical joints at the Ancon WP2 windpost positions. No joints are required for the Wi Beam option
6. The provision of the Wi Beams, which incorporate vertical shear transfer rods, eliminates the need for any shrinkage crack-control bedjoint reinforcement within the sub-panels

WEMBLEY INNOVATION™	**SUSTAINABILITY CHECK** **Wi Beam vs Windpost Check** **Maximum Panel Length Calculation** **140mm Wall 4000 high x 2750 long** **Wind load = 1.0kPa**	Job No : Job Ref : Designed By : TS Checked By : Date : 09/07/15 Revision No : Calc No : W140/MaxL/01 Page No : 1



Data item	*Near*
Bed joint reinforcement	No
DPC - top	No
DPC - bottom	No

Note:
1.For details of masonry units, bed joint reinforcement and damp proof course refer to 'Material and design data'
2.For details of wall ties (if specified) refer to 'Concise' or 'Detailed' report.
3.Figures in brackets eg: (1.00) shown in elevation indicate user defined proportional fixity/continuity factor applied before allowing for openings.

Masonry characteristic strengths

Description	*Near*	*Units*	*Description*	*Near*	*Units*
Design code	EN 1996-1-1:2005		Shear		
Compression			Shear without compression	0.15	N/mm²
Factor for collar joint	1.00	-	Shear friction coefficient	0.40	-
Compression on bed joints	5.73	N/mm²	Limiting shear	0.65	N/mm²
Compression // bed joints	5.73	N/mm²	Vertical shear- bonded		N/mm²
Flexure			Elastic modulus		
Horizontal span	0.53	N/mm²	Short term	5.73	kN/mm²
Vertical span	0.22	N/mm²	Long term	2.29	kN/mm²

Characteristic vertical loads

Load category name	Near	
	Load (kN/m)	Ecc. mm

Characteristic lateral wind pressure

Category name	Dyn. pr. kN/m²	Coeff. Near	Coeff. Far	Net coeff.	Res. pr. kN/m²
Wind near	1.000	0.700	-0.300	1.000	1.000

Characteristic lateral line load

Category name	Load kN/m	Height from bottom mm

Note: For details of more than two loads please refer detailed report

Summary results (critical load combinations)

Description	*Wall*	*Status*	*Units*	*Description*	*Near*	*Status*	*Units*
Lateral load capacity	1.610		kN/m²	Max. slenderness ratio	27		
Design uniform load	1.500		kN/m²	Actual	9.821		
Utilisation	**0.932**	**Pass**		Utilisation	0.364	Pass	
Load combination	0.90D+1.50Wn						
Limiting dimension / area							
Allowable	90		mm				
Actual	140		mm				
Utilisation	0.643	Pass					

Notes:

- **This is an example calculation to determine the maximum panel length for a 140mm block wall 4m in height and 9m in overall length , subject to a wind load of 1.0kPa**
- **The maximum panel length is 2750 and will require structural supports to its edges if it is an internal panel to a continuous wall**

Comparison of Ancon WP2 Windpost vs Wi Beam

TABLE 1

Note: Values will be based on full restraint of long leg of angle i.e. no provision of movement joint. If MJ is required, values are likely to be considerably reduced

Design spacings of WP2 windposts

	Max Total Design UDL (kN) per Post (from Ancon Tables)							
130x70x6	15.83	11.93	9.3	7.42	6.03	4.98	4.17	3.53
	Height (m)							
Wind kPa	**2.50**	**3.00**	**3.50**	**4.00**	**4.50**	**5.00**	**5.50**	**6.00**
0.25	25.33	15.91	10.63	7.42	5.36	3.98	3.03	2.35
0.50	12.66	7.95	5.31	3.71	2.68	1.99	1.52	1.18
0.75	8.44	5.30	3.54	2.47	1.79	1.33	1.01	0.78
1.00	6.33	3.98	2.66	**1.86**	1.34	1.00	0.76	0.59
1.25	5.07	3.18	2.13	1.48	1.07	0.80	0.61	0.47
1.50	4.22	2.65	1.77	1.24	0.89	0.66	0.51	0.39
1.75	3.62	2.27	1.52	1.06	0.77	0.57	0.43	0.34
2.00	3.17	1.99	1.33	0.93	0.67	0.50	0.38	0.29
2.25	2.81	1.77	1.18	0.82	0.60	0.44	0.34	0.26
2.50	2.53	1.59	1.06	0.74	0.54	0.40	0.30	0.24
2.75	2.30	1.45	0.97	0.67	0.49	0.36	0.28	0.21
3.00	2.11	1.33	0.89	0.62	0.45	0.33	0.25	0.20

Figure in red used to compare against Wi Beam design

Figures in grey are uneconomic / impractical spacings

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Ancon WP2 vs Wi Beam		Job No:	
		Revision	
Prepared By:	**TS**	Page:	**WiB/01**
Wall Ref.: **Comparison with Ancon 130x70x6 WP2**	Checked By:	Date:	**09/07/2015**

GENERAL DATA

Element type:	**Wi Beam**
Design approach:	**Standard**

SUMMARY OF RESULTS

Wi Beam utilisation ratio = 0.71

...ADOPT: 140mm thk Wembley Innovation Wi Beam

ELEMENT ARRANGEMENT

Wi Beam height:	**Single**
Upper section construction type:	**Standard**
Lower section construction type:	**Standard**
Wall thickness 't' *[mm]* =	**140**
Panel length 'L' *[m]* =	**9.00**
Distance to top support's face 'w_1' *[m]* =	**1.18**
Distance to bottom support's face 'w_2' *[m]* =	**1.18**

DESIGNER'S NOTES

Use Wi Beams to span 11m long panel

4m high Panel is split into 3, giving sub-panels = 1.183m high

Colour coding not required colour coding

UNFACTORED LOADING

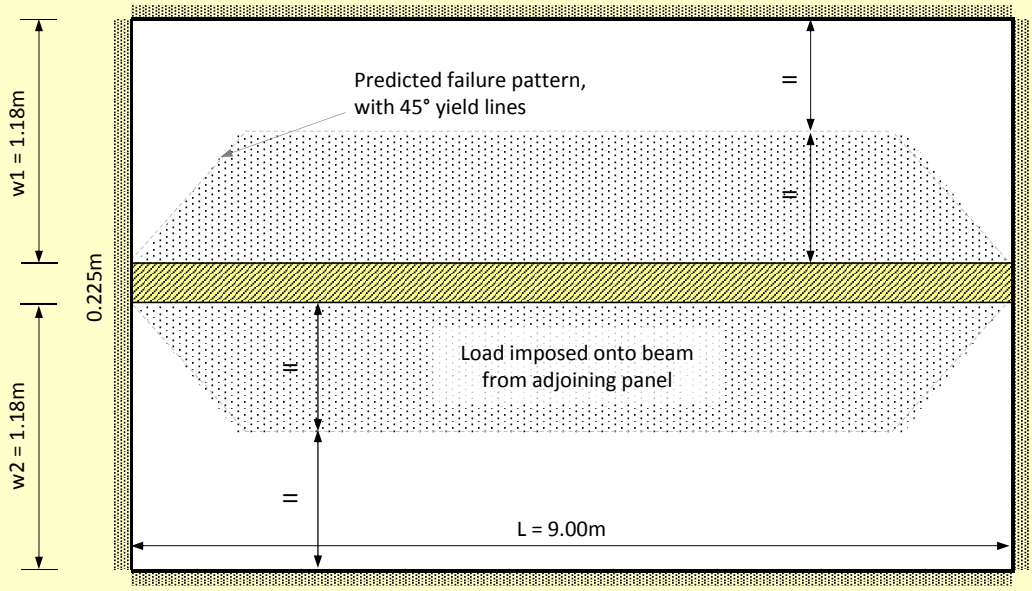
Lateral wind load 'W_k' *[kN/m²]* =	**1.00**
Barrier distributed load 'W_{b_UDL}' *[kN/m²]* =	**0.00**
Barrier line load 'W_{b_line}' *[kN/m]* =	**0.00**
Barrier height 'h_b' *[m]* =	**0.00**
Partial load factor for wind load 'γ_f' =	**1.50**
Partial load factor for barrier load 'γ_f' =	**1.50**
Partial material factor 'γ_M' =	**2.00** (?)

CALCULATIONS

Unfactored reaction left / right 'R' *[kN]* =	5.97 / 5.97
Unfactored moment: wind load *[kNm]* =	14.16
Unfactored moment: barrier distributed *[kNm]* =	0.00
Unfactored moment: barrier line load *[kNm]* =	0.00
Total applied factored moment 'M_{Ed}' *[kNm]* =	21.24
Moment of resistance 'M_{Rd}' *[kNm]* =	30.00

...ADOPT: 140mm thk Wembley Innovation Wi Beam

DIAGRAM

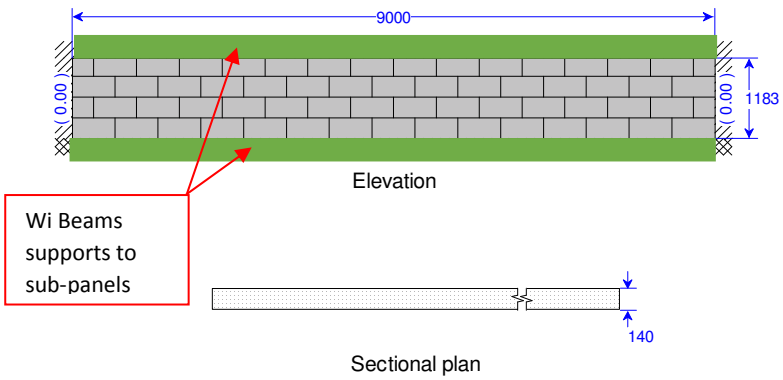


NOTE: This diagram is indicative only. It is not to scale.

NOTES:

1. Clear span between columns is edge-to-edge of columns (not centre-to-centre);
2. Panel is assessed as having simple support conditions to all 4 sides;
3. Classic "back of envelope" failure of the panel is assumed to occur with 45° yield lines at corners;
4. Sub-panels to be designed according to BS EN1996-1.1.

WEMBLEY INNOVATION™	**SUSTAINABILITY CHECK** **Wi Beam vs Windpost Check** **Panel Check Calculation** **140mm Wall 1183 high x 9000 long** **Wind load = 1.0kPa**	Job No : Job Ref : Designed By : TS Checked By : Date : 09/07/15 Revision No : Calc No : WiB/W1 Page No : 1



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Vertical span	0.22	N/mm²	Long term	2.29	kN/mm²

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Characteristic lateral wind pressure

Category name	Dyn. pr. kN/m²	Coeff. Near	Coeff. Far	Net coeff.	Res. pr. kN/m²
Wind near	1.000	0.700	-0.300	1.000	1.000

Characteristic lateral line load

Category name	Load kN/m	Height from bottom mm

Note: For details of more than two loads please refer detailed report

Summary results (critical load combinations)

Description	*Wall*	*Status*	*Units*	*Description*	*Near*	*Status*	*Units*
Lateral load capacity	3.452		kN/m²	Max. slenderness ratio	27		
Design uniform load	1.500		kN/m²	Actual	7.394		
Utilisation	0.435	Pass		Utilisation	0.274	Pass	
Load combination	0.90D+1.50Wn						
Limiting dimension / area							
Allowable	90		mm				
Actual	140		mm				
Utilisation	0.643	Pass					

Notes:

- **This is an example calculation to check sub-panels of a 140mm block wall 4m in height and 9m in overall length , subject to a wind load of 1.0kPa**
- **For 2no. Wi Beams, the 3no. sub-panels are 1183mm high**