

**DAVID FRENCH PARTNERSHIP****Civil & Structural Consulting Engineers**The Mansion House, Wrest Park  
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Tel: 01582 708000  
Website: www.dfp.co.uk

Job No:

17636

Contract

Genwork Composite Panels

Drg Ref:

Calc Sheet No:

C1

Location

Genwork Ltd

Rev:

A

B

C

D

Date

Date:

Nov '24

By

By:

KJL

Chk

JAE

**Design Check for:**

Genwork Composite Panels

for

Genwork Ltd

**Prepared for:**Genwork Ltd  
Bromley Street  
Lye  
Stourbridge  
West Midlands  
DY9 8HU**Engineer**

K Love MEng BEng(Hons)

**Checked by:**

J A Evans BSc(Hons) MICE MIStructE

These calculations are © The David French Partnership Nov '24

These Calculations cover for the capacity of Genwork Noise panels encompassing the parameters defined herein. They are not valid for, and may not be used for any other structure.

<b>DAVID FRENCH PARTNERSHIP</b>		The Mansion House, Wrest Park Silsoe, Bedfordshire, MK45 4HR Tel: 01582 708000 Website: www.dfp.co.uk		Job No: <b>17636</b>	
<b>Civil &amp; Structural Consulting Engineers</b>				Calc Sheet No: <b>C2</b>	
Contract <b>Genwork Composite Panels</b>		Drg Ref:		Date: <b>Nov '24</b>	
Location <b>Genwork Ltd</b>		Rev: A B C D		By:	
		Date		Bv: <b>KJL</b> Chk <b>JAE</b>	
		By			
		Chk			

## General Information

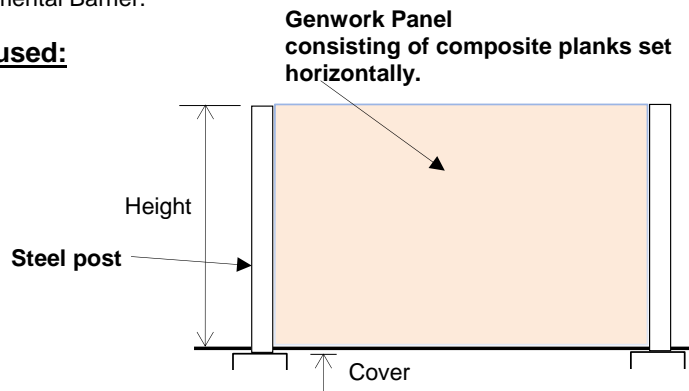
### Designed in Accordance with:

Design	BS EN 1990: Basis of structural design.
Dead Loads:	BS EN 1991-1-1 & NA: Actions on Structures: Densities, self weight and imposed Loads
Acoustic Barriers:	BS EN 1794-1: Road Traffic noise reducing devices - Non-acoustic performance

### Design Information:

Symbols used are those of the appropriate Code, unless noted otherwise.  
'EB' means Environmental Barrier.

### Symbols and Terms used:



### Design Basis Statement

This design is a check on the Genwork composite planks used for panels in Noise Barriers. The purpose of the design check is to establish the imposed pressure capacity of the planks spanning between posts at the typical spacings of 2.4 m and 3.0 m, so that the resistance of the completed panel to imposed forces can be established

The results can be compared with the wind load of a location and appropriate spans and planks can be selected and the CE Certificate marked appropriate if it is required.

### List of Contents

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Panel properties and load capacity calculation  
Steel Post Design

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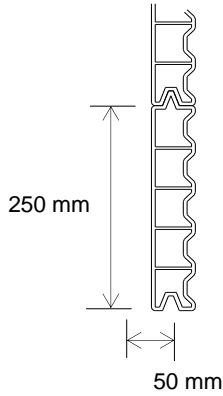
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 C3

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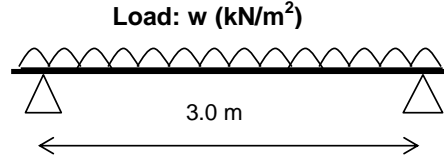
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Typical Genwork  
 Absorptive board  
 used in Panels

Note: These act  
 in horizontal  
 bending



The material has unknown characteristics, and, as it is a reconstituted material, minimum values for bending capacity and EI will be used, where E is the youngs modulus of the material and I is the second moment of area of the section.

Strength testing of these boards has been commisioned by Genwork and the results are reported below. These show the deflection and the ultimate load of the composite boards.

Testing was carried out to test the panels for a series of loading scenarios, including load from snow impacting the fence as ejected from a snow clearance machine and wind loading.

The intention of these calculations is to interpret the results to determine a value for EI and bending resistance that may be used in future calculations where the panels are used in scenarios that to not match the test conditions, varying spans etc.

### Absorptive Panels - With perforations in the road facing, profiled, side:

Boards with holes facing down      Panels loaded until design limits are reached

Load	1.1 kN/m <sup>2</sup>	Deflection under self weight	4.63 mm		
		Deflection under loading	48.02 mm	Change due to load =	43.39 mm
		Permanent deflection	5.89 mm		

Load is applied as a UDL, therefore:

$$\text{Deflection } (\gamma) = \frac{5}{384} \times \frac{w \times L^4}{EI} \quad \text{Treated as simply supported}$$

where I is calculated from section dimensions

$$I = 1096442 \text{ mm}^4$$

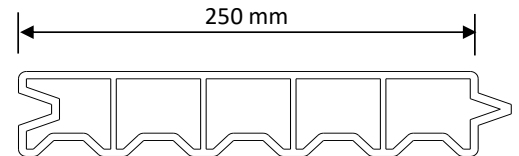
Thus:

$$E = \frac{5}{384} \times \frac{w \times L^4}{(\gamma) \times I}$$

$$= \frac{5}{384} \times \frac{(1.1 \times 0.25) \times 2970^4 \times 10^{-3}}{43.39 \times 1096442}$$

$$= \underline{\underline{5.86 \text{ kN/mm}^2}}$$

$$= \underline{\underline{\text{Youngs modulus of panel material}}}$$



Area:	3388.1197
Perimeter:	1678.8785
Bounding box:	X: -126.1728 -- 141.8272
	Y: -25.9550 -- 24.0450
Centroid:	X: 0.0000
	Y: 0.0000
Moments of inertia:	X: 1096442.4189
	Y: 22191582.8241
Product of inertia:	XY: 7452.3477
Radii of gyration:	X: 17.9893
	Y: 80.9310
Principal moments and X-Y directions about centroid:	
	I: 1096439.7861 along [1.0000 0.0004]
	J: 22191585.4568 along [-0.0004 1.0000]

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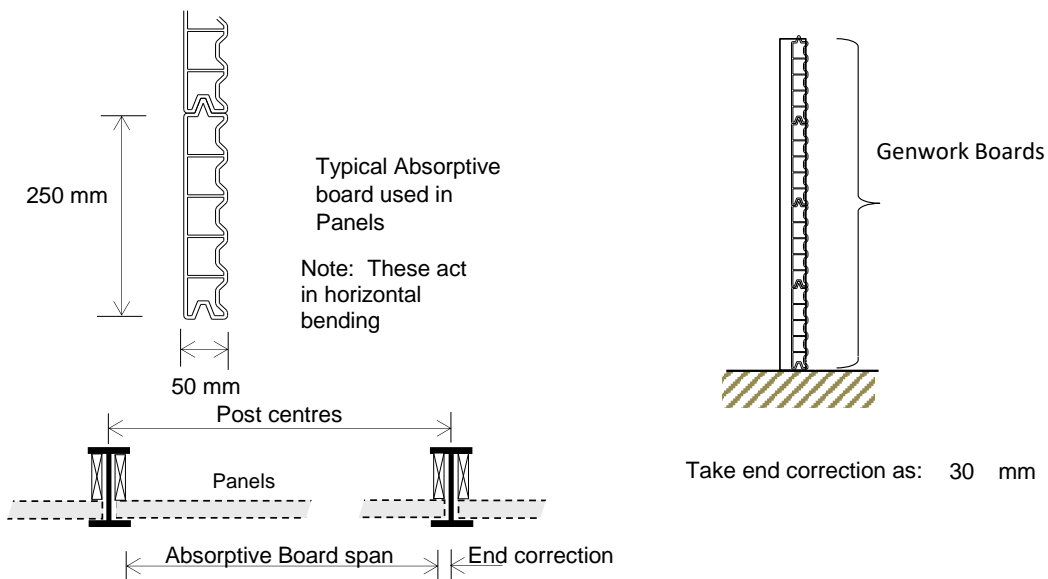
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The strength of the boards has been tested as indicated on page C4. These show the deflection and the ultimate load of the boards.

**Bending:**

The capacity of the board based on testing is: 2.57 kNm ( $= 5.86/100 \times 1096442/25 \times 10^{-3}$ )  
 To allow for the variability of the material, allow  $\gamma_M = 1.3$   
 Moment of resistance of single plank,  $R_d = 1.98$  kNm ULS  
 Moment of resistance unfactored = 1.32 kNm SLS  
 There are 4.00 Planks is 1.0 m width

$\lambda_q = 1.50$

Moment of resistance,  $R_d = 5.27$  kNm SLS/m width

To reach this value, the loads are:

Post centres	1.5	1.8	2.1	2.4	2.7	3	3.3	3.6	3.9	4.1	m
Wind load	20.3	13.9	10.1	7.7	6.1	4.9	4.0	3.4	2.9	2.6	kN/m <sup>2</sup>
Snow load	42.2	42.2	39.1	25.1	18.5	14.6	12.1	10.3	9.0	8.3	kN/m for 2.0 m of span (1/4 of full load)

**Deflection:** The code for Environmental Barriers is BS EN 1794. Part 1 covers structural criteria.  
 The deflection limit fo Barrier panels is : Minimum of span/40, with a maximum of 50 mm.

The EI value of the board is 25684292 kNmm<sup>2</sup> /m width

To reach this value, the loads are:

Post centres	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.1	m
Wind load	14.0	8.2	4.8	2.8	1.7	1.1	0.8	0.5	0.4	0.3	kN/m <sup>2</sup>
Snow load	40.1	19.9	11.4	6.7	4.4	3.0	2.2	1.6	1.2	1.0	kN/m for 2.0 m of span (1/4 of full load)

**From the calculations above:** The minimum values are taken

Span	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.1	m
Max wind load	14.0	8.2	4.8	2.8	1.7	1.1	0.8	0.5	0.4	0.3	kN/m <sup>2</sup>
Max snow load	40.1	19.9	11.4	6.7	4.4	3.0	2.2	1.6	1.2	1.0	kN/m for 2.0 m of span (1/4 of full load)

Note: The maximum Snow load is 15.0 kN over a 2m by 2.0 m square.  
 This is equivalent to a local UDL of  $15/4 = 3.5$  kN/m<sup>2</sup>

These values are shown in graphical form on the next page

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C5

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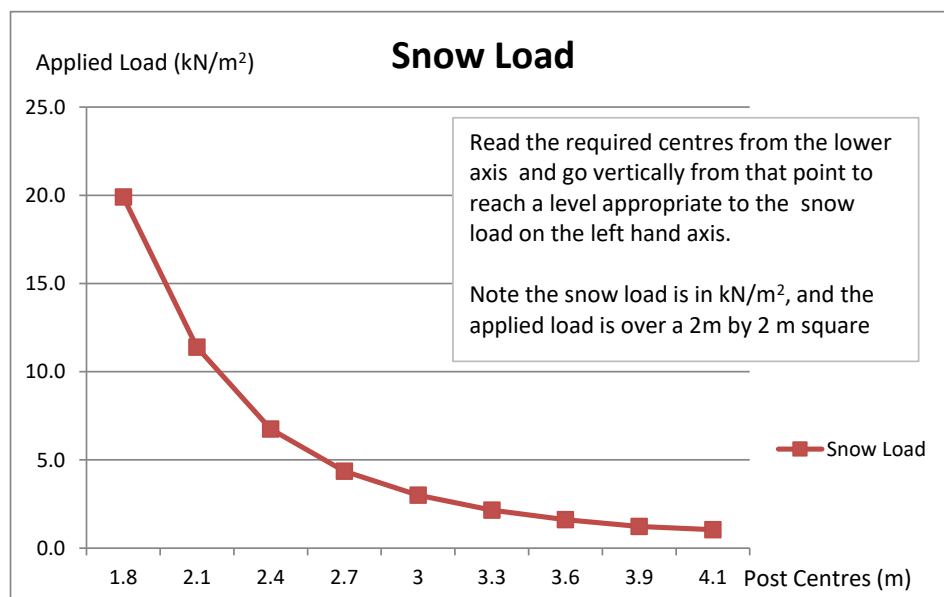
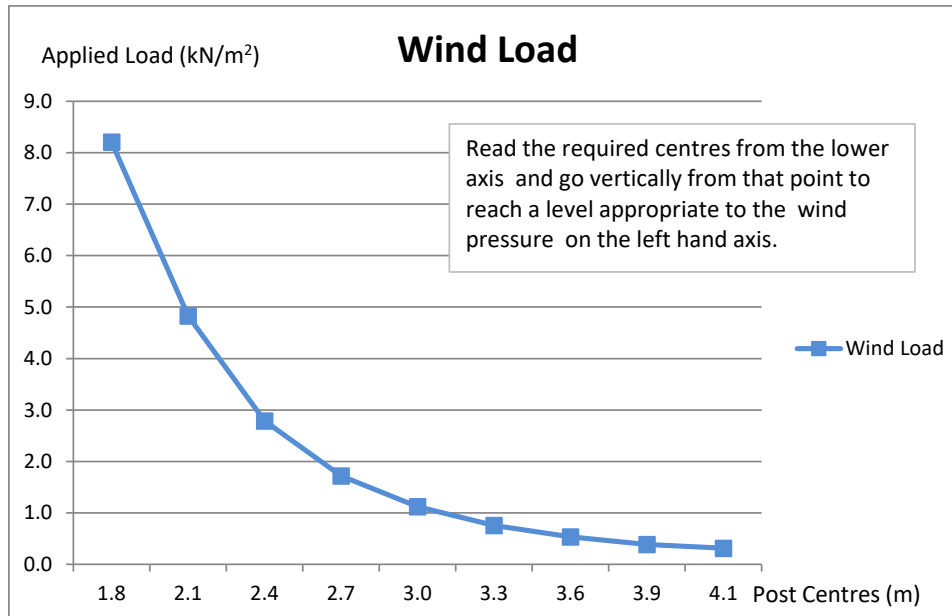
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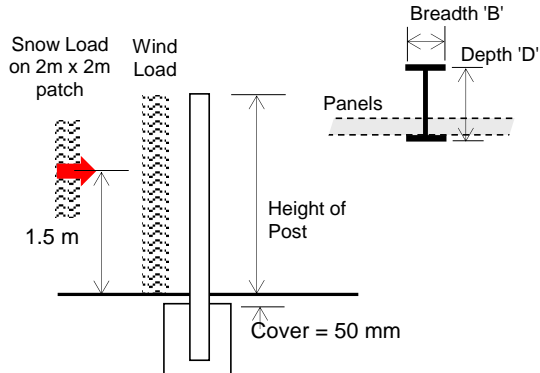
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**Chart for Absorptive Panel design:****This shows the maximum loads the Absorptive panels can take in terms of wind and snow loads.**

**Design of Steel posts at 3.0 m centres**



Design Code: BS EN 1993-1-1 + NA: Steel Structures  
**Steel Grade = S275** Steel to BS EN 10025  
 $f_y = 275 \text{ N/mm}^2$   $E = 210 \text{ N/mm}^2$

$\gamma_{Gk \text{ dead}} = 1.35$   
 $\gamma_{Qk \text{ wind \& snow}} = 1.50$   
 $\gamma_M = 1.00$

Post size	Maximum Bending Moment Resistance	
	Design Strength kNm ULS	Working Strength kNm SLS
127x76 UB 13	23.16	15.44
152x89 UB 16	33.83	22.55
178x102 UB 19	47.03	31.35
203x102 UB 23	64.35	42.90
203x133 UB 25	70.95	47.30
203x133 UB 30	83.88	55.92
254x102 UB 25	84.15	56.10
254x102 UB 28	97.08	64.72
254x146 UB 37	132.83	88.55
152x152 UC 23	50.05	33.37
152x152 UC 30	68.20	45.47
152x152 UC 37	84.98	56.65

The applicable wind loads and snow blower loads at various heights are given in the charts on the following pages

If Snow loads are specified the larger post from the charts on pages C7 and C8 should be used.

These enable the appropriate section size to be selected given the wind load and the height of the post/panel.

The load capacity of a particular section is based on the least capacity of those determining the maximum stress and limiting deflection.

The load capacity is given in  $\text{kN/m}^2$ , being the calculated unfactored wind load on the barrier.

Where a higher wind load occurs toward the ends of the barrier the posts in that section need to be sized for this higher wind load.

Wind loads are those calculated according to BS EN 1992-1-4

Snow loads are those calculated in accordance with BS EN 1274-1, Appendix E, Figure E.2. Please note that these loads are those from a snow blowing machine and not those from a snow plough blade.

The calculations for post strength take into account the effects of Lateral Torsional Buckling (LTB)

The LTB Check assumes post is restrained by the composite panel on the tension flange with the panels providing restraint. The wedged panel is similar to Case 2(b) in the SCI 'Lateral Stability of Steel Beams and Columns'. L is taken as 0.6 m.

The Design Strength is that which is entered in the CE Certificate

Notes: ULS = Ultimate Limit State. SLS = Servicability Limit State

The Design Strength is the factored resistance of the section at ULS.

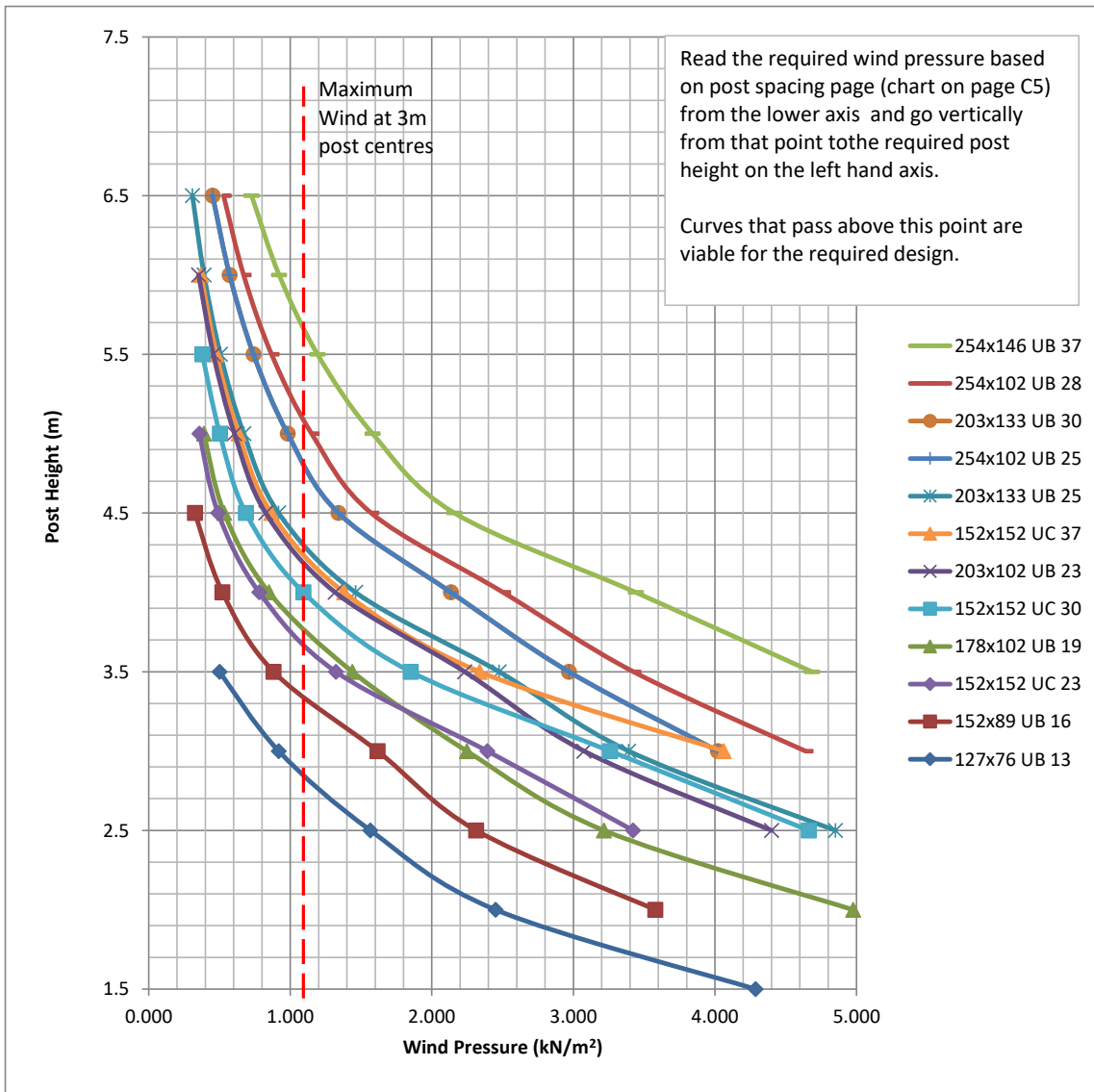
The Working Strength is the strength which can be compared directly with the applied unfactored wind loads.

**Chart for Post design:**

**Steel posts at 3.0 m centres, wind loads**

**Type of Post:** Steel UB and UC sections  
**Steel Grade:** S275  
**Nominal Centres:** 3.00 m  
**Cover to Foundation:** 50 mm

**UB and UC section vertical posts at 3.0 m centres**  
**Wind Loads**



**Chart for Post design:**

**Steel posts at 3.0 m centres, snow loads**

**Type of Post:** Steel UB and UC sections  
**Steel Grade:** S275  
**Nominal Centres:** 3.00 m  
**Cover to Foundation:** 50 mm

**Note:**  
 This chart only applies where snow loads are specified.  
 Use the larger of the post sizes given by this and the chart on the previous page.

**UB and UC section vertical posts at 3.0 m centres**  
**Snow Loads**

