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Job	Rapid-Shield	By	TB	Checked EG

STRUCTURAL DESIGN CALCULATIONS

Client: First Fence Limited

Project: Rapid-Shield Product Line

Fencing System: RAPID-SHIELD-7420: 2.4m high x 4.0m long double leaf gate with 868 Mesh panel with RapidShield UniFoot base inc 200kg ballast.

Design References: Wind Loading; BS-EN 1991-1-4:2005+A1:2010

Brief: The calculations have been carried out to provide a design wind speed V_e .

Design Assumptions:

- All dimensions and weights of the system have been taken from the First Fence system drawings and details.
- No signage or coverings to be fixed to any part of the fencing
- No horizontal loading except for wind loading has been applied to the design.
- Panels are installed upright and on firm ground
- The calculation assumes a single panel, but applies equally to multiple panels in a straight line configuration.
- The calculations are to determine the overturning / sliding resistance of the kentledge system, the design strength of members has not been included in these calculations.

Design Summary: The maximum design wind speed of this system is:
21.0 m/s
47.0 mph

Cowan Consultancy Limited

3 Turnberry House, 4400 Parkway, Whiteley, Hampshire PO15 7FJ

T. 01489 577488 W. cowanconsult.co.uk E. consultants@cowanconsult.co.uk

Also at: Landguard Manor, Landguard Manor Road, Shanklin, Isle of Wight PO37 7JB. T. 01983 868497

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Stability Calculations

Kit SKU

RAPID-SHIELD-7420

Gate System Dimensions

Gate System Height (H)
Gate System Length (X) / 2
Offset at base of Panel (s)
Total area enclosed by panel (A)

from product drawing	2490	mm
from product drawing	2465	mm
from product drawing	50	mm
(H-s)X	6014600	mm ²
	6.015	m ²

UniFoot & Ballast Dimensions

UniFoot & Ballast Height (base_h)
UniFoot & Ballast Width (base_w)
UniFoot & Ballast Area

	730	mm
	330	mm
base _w *base _h	240900	mm ²
	0.241	m ²

Solidity of Panel

Pitch of vertical mesh bars (x)
Pitch of horizontal mesh bars (y)
Mesh Bar diameter (d_{bar})
No. bars vertical (n_v)
No. bars horizontal (n_h)

from product drawing	50.0	mm
from product drawing	50.0	mm
from product drawing	2.6	mm
from product drawing	61	
from product drawing	50	

Area of frame = one no. post (A₁)

H(post width)	149400	mm ²
	0.149	m ²

Area of vertical bars (A₂)

((H-s)-(n _h *d _{bar}))*(n _v *d _{bar}))	366366	mm ²
	0.366	m ²

Area of horizontal bars (A₃)

(X-post width)*(n _h *d _{bar})	312650	mm ²
	0.313	m ²

Area of UniFoot Base & Ballast (A₄)

(base _w *base _h) - (post width*base _h)	197100	mm ²
	0.197	m ²

Effective area of Panel (A_e)

A ₁ + A ₂ + A ₃ + A ₄	1025516	mm ²
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Add worst case system panel area (A_{ep})

SKU-6480 A _e / 2 (see calc sheet)	1288650	mm ²
(A _e + A _{ep}) / 1000000	2.314	m ²

Force Co-efficient

Effective Force Co-efficient (C_f)

From Table 20	1.2
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System Weight

Kentledge Weight: Uni Foot (Base + Ballast) (P₁)

218	kg
2138	N
416	mm

Kentledge Lever Arm (Z₁)

Weight of Panel (P₂)

158.0	kg
1549	N
30	mm

Panel Width Lever Arm (Z₂)

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Stabilising Moment

Stabilising Moment M_s

$$(P_1 \cdot Z_1) + (P_2 \cdot Z_2) = 936 \text{ Nm}$$

Wind Force required to overturn the panel

At the point where the fencing system loses stability, the overturning moment equals the stabilising moment

Lever Arm (Z_3)

$$H / 2 = 1245 \text{ mm}$$

$$1.245 \text{ m}$$

Force at point of instability (F)

$$M_s / Z_3 = 752 \text{ N}$$

Wind speed to generate overturning force

Dynamic wind pressure to generate wind force (q)

Factor for SI units (k)

$$(F/C_1) / A_e = 271 \text{ N/m}^2$$

$$0.613$$

Wind Speed (V_e)

$$v(q/k) = 21.0 \text{ m/s}$$

$$47.0 \text{ mph}$$

Wind speed to generate sliding force

Sliding resistance force = Total weight of fence system

Sliding Resistance (S_R)

Equivalent wind speed at point of sliding resistance (V_e)

$$P_1 + P_2 = 3687 \text{ N}$$

$$\sqrt{((S_R/A_e/C_f)/K)} = 46.5 \text{ m/s}$$

$$104.1 \text{ mph}$$

