Structural Design Calculations

Project Title: **Protek 2000**

Privacy Screen Post Design

Job No: **PPS.01**

Date: **March 2024**

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CALCULATION SHEET

Project:

Protek 2000 Privacy Screen Post Design Structural Calulations

Project No.	Design By	Date	Sheet No.	Rev	Rev Date
PPS.01	NPK	March 2024	01		

100x50x3 Post Checks

Section Modulus = 21.9 cm^3, Allowable Stress = 275N/mm^2

Stess = $\frac{M}{Z}$ So M = $\frac{21.9 \times 1000 \times 275}{10^6}$ = 6.0 kNm

M = $\frac{WL^2}{2}$, H = 2.4m, So W = $\frac{6 \times 2}{2.4^2}$ = 2.0 kN/m Run

Locate Posts at 2.5m Crs, Allowable pressure = 2 / 2.5 = 0.8kN/m^2

Using Factor of Safety of 1.2 for wind allowable pressure = 0.8 / 1.2 = 0.67 kN/m^2

So : A solid Pretek Screen with 100x50x3 Posts at 2.5m crs is suitable to support wind pressures of up to 0.67kN/m^2

In accordance with Kroftman Table, this equates to approximatley 70mph Winds.

Each site is to be checked by the project engineer to ensure compliance of this allowable pressure.

Check Posts for Pedstrian Load

Pedestrian Load = 0.74 kN/m Run + 0.2 kN/m^2

M = $\frac{2.4^2 \times 0.2 \times 1.2 \times 2.5}{2}$ + 0.74 x 1.6 x 2.5 x 1.1 = 5.0 kNm

Allowable for Post = 6.0 kNm > 5.0 kNm So O.K.

Use the same posts Size for 1.8m, 2.0m and 2.4m high hoardings

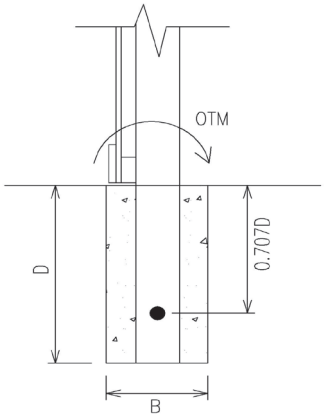
CALCULATION SHEET

Project:

Protek 2000 Privacy Screen Post Design Structural Calulations

Project No.	Design By	Date	Sheet No.	Rev	Rev Date
PPS.01	NPK	March 2024	02		

Check Overall Stability



With Reference to TWF guide ground conditioans are:

1 - Good Ground = 630kN/m^2
2 - Average Ground = 390kN/m^2
3 - Poor Ground = 230kN/m^2

Check when H = 2.4m, B = 350mm

UDL = 0.8 x 2.5m = 2.0kN/m run

For Good Ground - D = 900mm, So Le = 2.4 + 0.9 x 0.707 = 3.04m

OTM = $\frac{3.04^2 \times 2.0}{2}$ = 9.24 kNm, Stabalising = $\frac{630 \times 0.35 \times 0.9^3}{10 \times 1.5}$ = 10.7 kNm So O.K.

For Average Ground - D = 1100mm, So Le = 2.4 + 1.1 x 0.707 = 3.18m

OTM = $\frac{3.18^2 \times 2.0}{2}$ = 10.1 kNm, Stabalising = $\frac{390 \times 0.35 \times 1.1^3}{10 \times 1.5}$ = 12.1 kNm So O.K.

For Poor Ground - D = 1300mm, So Le = 2.4 + 1.3 x 0.707 = 3.32m

OTM = $\frac{3.32^2 \times 2.0}{2}$ = 11.0 kNm, Stabalising = $\frac{230 \times 0.35 \times 1.3^3}{10 \times 1.5}$ = 11.8 kNm So O.K.

All the above values utilise a factor of Safety of 1.5.

CALCULATION SHEET

Project:

Protek 2000 Privacy Screen Post Design Structural Calulations

Opus Engineering Consultants

Project No.	Design By	Date	Sheet No.	Rev	Rev Date
PPS.01	NPK	March 2024	03		

Check Overall Stability for 2.0m High Screens

H = 2.0m, B = 350mm, UDL = 0.8 x 2.5m = 2.0kN/m run

For Good Ground - D = 800mm, So Le = 2.0 + 0.8 x 0.707 = 2.57m

OTM = $\frac{2.57^2 \times 2.0}{2}$ = 6.58 kNm, Stabalising = $\frac{630 \times 0.35 \times 0.8^3}{10 \times 1.5}$ = 7.53 kNm So O.K.

For Average Ground - D = 950mm, So Le = 2.0 + 0.95 x 0.707 = 2.67m

OTM = $\frac{2.67^2 \times 2.0}{2}$ = 7.14 kNm, Stabalising = $\frac{390 \times 0.35 \times 0.95^3}{10 \times 1.5}$ = 8.65 kNm So O.K.

For Poor Ground - D = 1150mm, So Le = 2.0 + 1.15 x 0.707 = 2.81m

OTM = $\frac{2.81^2 \times 2.0}{2}$ = 7.91 kNm, Stabalising = $\frac{230 \times 0.35 \times 1.15^3}{10 \times 1.5}$ = 8.16 kNm So O.K.

Check Overall Stability for 1.8m High Screens

H = 1.8m, B = 350mm, UDL = 0.8 x 2.5m = 2.0kN/m run

For Goor Ground - D = 750mm, So Le = 1.8 + 0.75 x 0.707 = 2.33m

OTM = $\frac{2.33^2 \times 2.0}{2}$ = 5.43 kNm, Stabalising = $\frac{630 \times 0.35 \times 0.75^3}{10 \times 1.5}$ = 6.20 kNm So O.K.

For Average Ground - D = 900mm, So Le = 1.8 + 0.90 x 0.707 = 2.44m

OTM = $\frac{2.44^2 \times 2.0}{2}$ = 5.94 kNm, Stabalising = $\frac{390 \times 0.35 \times 0.90^3}{10 \times 1.5}$ = 6.64 kNm So O.K.

For Poor Ground - D = 1100mm, So Le = 1.8 + 1.1 x 0.707 = 2.58m

OTM = $\frac{2.58^2 \times 2.0}{2}$ = 6.64 kNm, Stabalising = $\frac{230 \times 0.35 \times 1.10^3}{10 \times 1.5}$ = 7.14 kNm So O.K.

All the above values utilise a factor of Safety of 1.5.

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Project:

Protek 2000 Privacy Screen Post Design Structural Calulations

Project No.	Design By	Date	Sheet No.	Rev	Rev Date
PPS.01	NPK	March 2024	04		

TABLE SHOWING FOUNDATION DEPTHS

Ground conditions	Height of screen	Depth of foundation
Good Ground	2.4m	900mm
AverageGround	2.4m	1100mm
Poor Ground	2.4m	1300mm
Good Ground	2.0m	800mm
AverageGround	2.0m	950mm
Poor Ground	2.0m	1150mm
Good Ground	1.8m	750mm
AverageGround	1.8m	900mm
Poor Ground	1.8m	1100mm

ALL FOUNDATIONS TO BE 350mm DIA

EACH PROJECT ENGINEER TO CONFIRM STRATA ON SITE AND COMPLIANCE OF WIND LOAD