



Prime Scaffold and
Structural Designs Limited

DESIGN CALCULATIONS

Date:	26-04-2024
Client:	Titchfield Group
Title:	Scaffold Banner Frame
Site:	70 High St, Manchester M4
Calculation No.	TG-12360-1-CAL-1 B
Drawing No:	TG-12360-1-DRG-1 B
Prepared By:	Hudson Byaruhanga
Checked By:	Vipin Bariya



Calculation No.	TG-12360-1-CAL-1 B	Date:	26-04-2024	 0204 581 5020 www.psd.uk.com The Beechwood Centre Office Suite 9, 40 Lower Gravel Road Bromley BR2 8GP Prime Scaffold and Structural Designs Limited   
Drawing No:	TG-12360-1-DRG-1 B	Client:	Titchfield Group	
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CONTENTS PAGE

Page:

Contents Page

Design load information sheet

Design Risk Assessment

Design Calculations

1. General Information
2. Loading Considerations
3. Wind Loading
4. Load in Bungees
5. Top & Bottom Rails
6. End Frame
7. Corners
8. Intermediate Frame
9. Access Scaffold
10. Beam Check
11. Leg load
12. Stability
13. Structure Summary

Appendix A - Wind data

Appendix B - Kee Klamp Data

Calculation No.	TG-12360-1-CAL-1 B	Date:	26-04-2024	 0204 581 5020 www.psd.uk.com The Beechwood Centre Office Suite 9, 40 Lower Gravel Road Bromley BR2 8GP Prime Scaffold and Structural Designs Limited
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DESIGN LOAD INFORMATION SHEET

Scaffold Tube

Tube refers to Type 4 steel galvanised scaffold tube conforming to BSEN39 with a minimum yield stress of 235N/mm², an outside diameter of 48.3mm with a wall thickness of 4.0mm.

Self weight	4.37kg/m	(As NASC TG20:21, Guide to good practice for scaffolding
Moment Capacity	1.12kN.m	with tube and fittings, Table 5.9)

Axial Load

Effective Length (Le)	Safe Axial Load (Pc)	(As NASC TG20:21, Guide to good practice for scaffolding
(M)	(kN)	with tube and fittings, Table 5.10)
1.20	51.90	All Tubes used in this design considered 'As New Tube'
1.40	45.30	
1.60	39.20	
1.80	33.70	
2.00	29.10	
2.20	25.30	
2.40	22.00	
2.60	19.30	
2.80	17.10	
3.00	15.20	
3.20	13.60	

Couplers

Type	SWL	Self weight	(As NASC TG20:21, Guide to good practice for scaffolding
	(kN)	(kg)	with tube and fittings, Table 5.15)
Right Angle (Class A)	6.1	1.2	
Right Angle (Class B)	9.1	1.2	
Swivel Coupler (Class A)	6.1	1.2	
Swivel Coupler (Class B)	9.1	1.2	
Sleeve (Class A)	3.6 (Tension)		
Sleeve (Class B)	5.5 (Tension)		

Scaffold Boards

225 x 38mm timber scaffold boards (38-1.2m)	(As NASC TG20:21 Guide to good practice for scaffolding
	with tube and fittings, Table 5.8)

Moment Capacity	0.475kN.m	(Load Applied acts on an individual board)
	0.61kN.m	(Load Applied is spread uniformly across min of 4 boards)

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Lattice Beams

Ladder Beam

Restraints @ 1.2m Centres

Moment Capacity	12.5kN.m
Shear Capacity	12.5kN

Steel Unit Beam

Restraints @ 1.2m Centres

Moment Capacity	27.7kN.m
Shear Capacity	15.6kN

Hakitec 750 Aluminium Beam

Restraints @ 1.0m Centres

Moment Capacity	41.3kN.m
Shear Capacity	30.6kN
Selfweight	7.5Kg/m

Dessa 780 Aluminium Beam

Restraints @ 1.0m Centres

Moment Capacity	38.84kN.m
Shear Capacity	23.71kN
Selfweight	8.17Kg/m

Dessa 790 Aluminium Beam

Restraints @ 1.0m Centres

Moment Capacity	41.92kN.m
Shear Capacity	23.71kN
Selfweight	6.78kg/m

Dessa 1300 Aluminium Beam

Restraints @ 1.0m Centres

Moment Capacity	102.61kN.m
Shear Capacity	42.1kN
Selfweight	13.33Kg/m

ASP/UBIX 780 Aluminium Beam

Restraints @ 1.0m Centres

Moment Capacity	36.5kN.m
Shear Capacity	30.7kN
Selfweight	6.5Kg/m

Apollo 750 X Beam Aluminium

Restraints @ 1.0m Centres

Moment Capacity	37.0kN.m	Minimum values
Shear Capacity	35.0kN	Minimum values
Selfweight	6.7Kg/m	

Layher 750 Aluminium Beam

Restraints @ 1.0m Centres

Moment Capacity	36.8kN.m	V' Arrangement
Shear Capacity	17.0kN	
Selfweight	6.5Kg/m	

Layher 450 Aluminium Beam

Restraints @ 1.0m Centres

Moment Capacity	13.94kN.m
Shear Capacity	12.32kN
Selfweight	5.1Kg/m

FOR ALL BEAM TYPES – REFER TO MANUFACTURERS INFORMATION FOR MORE DETAILS

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DESIGN RISK ASSESSMENT

Hazard Ref	Hazard Source	Risk Categor	Preventive/Control Measures (See latest revisions/issue for all standards noted)	Residual Risk
1	Working at Height	HIGH RISK	Scaffolders must comply with procedures in NASC guidance SG4: as a minimum precaution. Approved method statement to outline a safe method of erection and dismantling of scaffold. Consider collective fall prevention measures ahead of personal fall arrest equipment. Scaffold Contractor to provide approved RAMS as outlined in NASC guidance SG7:	LOW RISK
2	Competence	HIGH RISK	Only competent ,trained persons should erect scaffold materials, this falls under the scaffold contractors area of responsibility .	LOW RISK
3	Manual Handling	HIGH RISK	The working area to be segregated and the manual handling regulations should be adhered to at all times by scaffolders, including correct lifting & lifting aid procedures in NASC guidance SG6:	LOW RISK
4	Erection/Dismantling/Altering	HIGH RISK	Only competent ,trained persons should Erect, Dismantle & Alter scaffold materials in accordance with NASC guidance SG4; this falls under the scaffold contractors area of responsibility . Scaffold Contractor to consider protection to public and others during the scaffold works, see NASC guidance SG34: and TG20: Operational Guide.	LOW RISK
5	Electricity[man made/natural]	HIGH RISK	Only trained/competent persons are to install, use & maintain electrical equipment. The installation of earthing is also to be carried out by suitably qualified persons.	LOW RISK
6	Environmental Conditions	HIGH RISK	The scaffold contractor should make his own site specific risk assessment with the client as whether the scaffold can be used during periods of inclement weather, [wind, rain & snow].	LOW RISK
7	Fire Exposure	HIGH RISK	Ensure all personnel at site are aware of evacuation procedures/routes off the scaffold, clearly sign the fire escape route, consider erection of emergency stair tower exit.	LOW RISK
8	General Use/Loading	HIGH RISK	The design drawings will clearly indicate the loading limitations of the specific scaffold which should be adhered to at all times, any deviation must be at the consent of the scaffold contractor and/or Prime Scaffold and Structural Designs Ltd. An external assessment to be carried out to approve existing structure/foundation suitability.	LOW RISK

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9	Materials	HIGH RISK	All materials must be checked prior to installation and should meet the requirements of TG20:			LOW RISK	
10	Obstructions	HIGH RISK	A min. width of 600mm should be maintained on the working platform, free of obstacles & in accordance with BS EN 12811-1. Ensure clear and safe access is provided for scaffold erection and dismantling.			LOW RISK	
11	Stability Issues	HIGH RISK	Attention must be given to anchor & kentledge details shown on the design drawings. Inspection of these two areas must be detailed ensuring correct installation & testing in accordance with NASC document TG4.			LOW RISK	
12	Public	HIGH RISK	Sites are to be securely fenced off & appropriately protected to best prohibit access by the public to site. Scaffold Contractor to provide approved RAMS as outlined in NASC guidance SG7:			LOW RISK	
13	Welfare/First Aid	HIGH RISK	All aspects of Health & Safety should be addressed by the main contractor in accordance with the Health & Safety Act. Site should always have first aiders & kit on site at all times.			LOW RISK	
14	Beams	HIGH RISK	All beams to be fully laced and braced as per the manufacture's guidelines			LOW RISK	
		The Following symbol is used on Design Drawings to identify where residual risks remain in the scaffold design.		HIGH RISK	MEDIUM RISK	LOW RISK	
				ACTION TO BE TAKEN TO MITIGATE RISK	RISK TO BE NOTED WITHIN DESIGN	NO ACTION REQUIRED	

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1 **General Information:**

Scaffold and banner frame is required to be erected to existing scaffold at 70 High St, Manchester M4,

Access Scaffold

Scaffold to be installed via tube and fitting components.
Scaffold to be tied to existing building for stability.
Ledger and Sway bracing to be installed to full height
All Beams to be installed as per the manufacturer's guidelines.
Double handrails and toe boards are to be installed to all boarded levels.

The Banner Frame Design comprises:

Banner Frame (BF) – steel tubes connected with Kee Clamps to make an overall frame, attached to existing scaffold by Load Bearing Couplers.

Banner – a PVC material, printed with advertisement, that wraps around the BF via Bungees and Cable Ties through Eyelets. Both eyelets and PVC material are to be built to withstand loads, and affixed, as stipulated in BFD. Current PVC material is stipulated in BF as '510gsm pvc banner',

Any alternative to be agreed in advance, with prior consent.

Bungees – 8mm/10mm bungee cords, designed to take those loads stipulated in the BFD, which will give as a fail-safe in event of extreme wind.

2 **Loading Considerations:**

Access Scaffold

Maximum 2no working levels at any one time on access scaffold.

1 No. working level @ 0.75kN/m²

1 No. working level @ 0.75kN/m²

All inside boards rated at 0.75kN/m² on 2no working levels

Check concentrated load of 1.5kN on area of 500mm x 500mm

Self weight of boards @ 0.25kN/m²

Transom spacing at 1.2m c/c max

Wind loads will be assessed on the scaffold in accordance with BSEN1991-1-4.

No snow loadings are to be allowed for or checked on the scaffold.

Combined selfweights and live loads will be checked in the supporting scaffold components.

Site Location

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Drawing No:	TG-12360-1-DRG-1 B	Client:	Titchfield Group	
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3 Wind Loading

Location: 70 High St, Manchester M4,

Grid Ref: SJ 84284 98627

Max Height (Banner): 13.50 m

Max Height From Ground 17.00 m

Metspec Design suite used to determine Peak Velocity Pressure.

Peak Velocity Pressure: = 0.652 kN/m²

Cpe max = 1.2 (on edges)

Cpe avg = 1

Appendix A

4 Load in Bungees

Wind load on edges = 0.782 kN/m²

Load area of each bungee = 0.3 m spacing
= 2 m width

Load in each bungee = **0.47 kN**

Wind load (Windward) = 0.652 kN/m²

Load area of each bungee = 0.4 m spacing

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	=	4	m width					
Load in each bungee	=	1.04	kN					
5 <u>Top & Bottom Rails</u>								
Wind load on edges	=	0.782	kN/m²					
Load area of tube	=	2	m width					
	=	2	m span					
Max UDL	=	1.56	kN/m					
Continuous mo	=	0.63	kNm					
SWL of 48.3mm Scaffold tube	=	1.12	kNm	(TG20:21)				
<table><tr><td>1.12 kNm</td><td>></td><td>0.63 kNm</td><td>OK</td></tr></table>					1.12 kNm	>	0.63 kNm	OK
1.12 kNm	>	0.63 kNm	OK					
Connection load	=	3.4	kN					
Capacity of Class A coupler	=	6.1	kN	(TG20:21)				
<table><tr><td>6.1 kN</td><td>></td><td>3.4 kN</td><td>OK</td></tr></table>					6.1 kN	>	3.4 kN	OK
6.1 kN	>	3.4 kN	OK					
6 <u>End Frame</u>								
Wind load on edges	=	0.782	kN/m²					
Load area of tube	=	2	m width					
	=	2	m span					
Max UDL	=	1.56	kN/m					
Continuous mo	=	0.63	kNm					
SWL of 48.3mm Scaffold tube	=	1.12	kNm	(TG20:21)				
<table><tr><td>1.12 kNm</td><td>></td><td>0.63 kNm</td><td>OK</td></tr></table>					1.12 kNm	>	0.63 kNm	OK
1.12 kNm	>	0.63 kNm	OK					
Connection load	=	3.4	kN					
Capacity of Class A coupler	=	6.1	kN	(TG20:21)				

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Drawing No:	TG-12360-1-DRG-1 B	Client:	Titchfield Group	
Title:	Scaffold Banner Frame	Prepared By:	Hudson Byaruhanga	
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6.1 kN	>	3.4 kN	OK
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7 Corners

$$\begin{aligned} \text{Connection load} &= 0.782 \times 2 / 2 \times 2 / 2 \\ &= \mathbf{0.9 \text{ kN}} \end{aligned}$$

$$\text{Capacity of Class A coupler} = 6.1 \text{ kN}$$

(TG20:21)

6.1 kN	>	0.9 kN	OK
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8 Intermediate Frame

$$\text{Avg wind load} = 0.652 \text{ kN/m}^2$$

$$\begin{aligned} \text{Load area of tube} &= 4 \text{ m width} & [\text{Avg}] \\ &= 2 \text{ m span} \end{aligned}$$

$$\text{Max UDL} = 2.61 \text{ kN/m}$$

$$\text{Continuous mo} = 1.04 \text{ kNm}$$

$$\text{SWL of 48.3mm Scaffold tube} = 1.12 \text{ kNm}$$

(TG20:21)

1.12 kNm	>	1.04 kNm	OK
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$$\text{Connection load} = \mathbf{5.7 \text{ kN}}$$

$$\text{Capacity of Class A coupler} = 6.1 \text{ kN}$$

(TG20:21)

6.1 kN	>	5.7 kN	OK
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9 Access Scaffold:

4+2 scaffold with transoms provided at 1.2m centres.

$$\text{Max imposed load} = 0.75 \text{ kN/m}^2 \quad [\text{Load Class 1}]$$

$$\text{Max bay length provided} = 2.0 \text{ m}$$

$$\text{Scaffold designation} = \mathbf{3_4_2}$$

From TG20:21,

$$\text{Allowable bay length for } 3_4_2 = 2.1 \text{ m}$$

Calculation No.	TG-12360-1-CAL-1 B	Date:	26-04-2024	 0204 581 5020 www.psd.uk.com The Beechwood Centre Office Suite 9, 40 Lower Gravel Road Bromley BR2 8GP Prime Scaffold and Structural Designs Limited
Drawing No:	TG-12360-1-DRG-1 B	Client:	Titchfield Group	
Title:	Scaffold Banner Frame	Prepared By:	Hudson Byaruhanga	
Site:	70 High St, Manchester M4	Checked By:	Vipin Bariya	

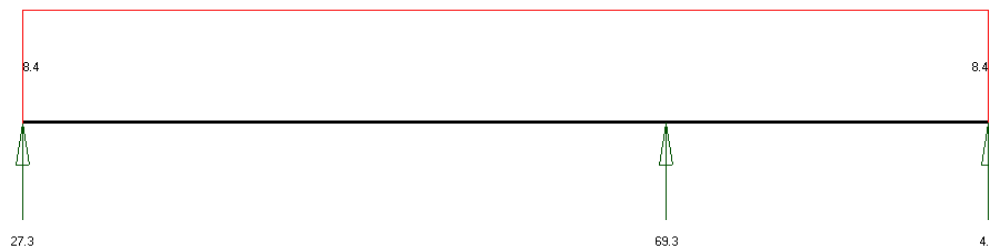
2.1 m	>	2.0 m	OK
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Therefore scaffold configuration is satisfied

10 Beam Check

	Main Frame				End Frame
	Tub.Fit.	Boards	Imposed	Total	Total
Total Inner Leg Load (kN)=	4.14	2.76	1.81	8.71	6.53
Total Outer Leg Load (kN)=	4.26	1.66	1.79	7.70	6.00

Puncheon Load (Combined)	=	16.41	kN
Bay Size	=	2	m
Linear Load	=	8.2	kN/m
Beam SW	=	0.2	kN/m
Total Udl	=	8.4	kN/m
Beam Span	=	8	m



Beam Length	12.00 m
Moment of Inertia	15000.00 cm ⁴
Elastic Modulus	68900 N/mm ²

APPLIED LOADING

Distributed Loads

End1	End2	End1	End2
8.40	8.40 kN/m	 at	0.000 12.000 m

REACTIONS (+ve Up) ... Non-Reversible !

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27.30 kN at 0.00 m

69.30 kN at 8.00 m

4.20 kN at 12.00 m

MAXIMUM LOADS & DEFLECTIONS

Max. Reaction	69.30 kN	 at 8.000 m
Max. Sag BM	44.37 kN.m	 at 3.250 m
Max. Hog BM	50.40 kN.m	 at 8.000 m
Max. Shear Force	39.90 kN	 at 8.000 m
Max. Sag Deflection	24.16 mm	 at 3.600 m
Max. Hog Deflection	2.46 mm	 at 9.350 m

Mmax = 50.4 kNm

Qmax = 39.9 kN

750 Aluminium X Beams *Restraints @ 1.0m Centres*

Moment Capacity	37.0kNm	OK
Shear Capacity	35.0kN	OK

1No inner and 1No outer beams to be installed.

Connection Check

Max Beam Reaction	=	69.3	kN	[Over 2No Beams]
	=	34.7	kN	
Capacity of Class A coupler	=	6.1	kN	[8No]

(TG20:21)

48.8 kN	>	34.7 kN	OK
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11 Leg load

Scaffold Components				
Tube(kg/m)=	4.37			
Fittings(kg/fitt)=	1.50			
Boards(kg/m ²)=	25.00			
Scaffold Information per Lift				
Main Boards (no)=	4.00			
Inside Boards (no)=	2.00			
Width of scaffold (m) =	1.2			
Inside width (m) =	0			
Bay Length (m)=	2.00			
Lift Height (m)=	2.000			
Effective Lift Height (m)=				
Actual No of Lifts (no)=	8.00			

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Title:	Scaffold Banner Frame	Prepared By:	Hudson Byaruhanga	
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Boarded Lifts (no)=	7.00				
Working Lifts (no)=	2.00				
	1st	2nd	3rd	4th	5th
Imposed Load on Main Run (kN/m ²)=	0.75	0.75			
Imposed Load on Inside Run (kN/m ²)=	0.00	0			
Inside Hand Rails (no)=	2.00				
Inside Toe board(no)=	1.00				
Outside Hand Rails (no)=	2.00				
Section Bracing (no)=	1.00				
Inner Sway Bracing (no)=	0.00				
Outer Sway Bracing (no)=	0.00				
Additional Inner Leg Load (kN)=	0.46				
Additional Outer Leg Load (kN)=	0.44				
	Main Frame				End Frame
	Tub.Fit.	Boards	Imposed	Total	Total
Total Inner Leg Load (kN)=	4.71	3.86	1.81	10.38	7.71
Total Outer Leg Load (kN)=	4.84	2.32	1.79	8.95	6.93

Axial Load Check

Max Beam Reaction	=	69.3	kN	
Scaffold Tower SW	=	2.0	kN	
Combined leg load	=	71.3	kN	[Over 4No]
	=	17.8	kN	
SWL 2.0m effective length [Max]	=	29.1	kN	

(TG20:21)

29.1 kN	>	17.8 kN	OK
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12 Stability:

Scaffold to be tied to the existing structure.

Dynamic pressure from wind	=	Velventi wind analysis	BSEN1991-1-4
Location	=	70 High St, Manchester M4,	
Grid reference	=	SJ 84284 98627	
Peak Velocity Pressure	=	0.652 kN/m ²	Appendix A
C _{pNET}	=	1	BSEN1991-1-4
Scaffold solidity	=	100% UnClad	

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Design Wind Pressure = 0.652 kN/m²

Area = 2 m Length
x 4 m Height
= 8 m²

Horizontal Load = 0.652 x 8
= 5.2 kN

Capacity of Class A coupler = 6.1 kN

6.1 kN	>	5.2 kN	OK
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Tie test = 6.5 kN [Inc. 1.25 FoS]

1 in 20 ANCHORS WITH A MIN OF 3NO ANCHORS TO BE TESTED TO = 6.5 kN

(TG20:21)

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13 **Structure Summary:**

Scaffold should be erected in accordance with TG20:21 and SG4:22.

All loads indicated should be used to ensure all banner fixing method use suitable components with the load bearing capacity indicated.

All bungee, fixings and banner details are to be confirmed by supplier/ manufacturers.

Final Kee clamp details are to be finalised by scaffold contractor/ banner supplier/ installers.

Manufacturers and suppliers of all components are to ensure they agree with the details and installation assumptions shown.

Care must be taken to install correct number of uprights at indicated positions.

Care must be taken to install ties at indicated positions using load bearing couplers at all times.

Plan bracing to be installed as indicated on the drawing

All beams are installed with lacing & bracing

Tie loads have been indicated on drawing / calcs. Main contractor to ensure structure is capable of withstanding loads imposed.

Max leg loads have been indicated on drawing / calcs. Main contractor to ensure structure is capable of withstanding loads imposed.

END OF CALCULATIONS

Calculation No.	TG-12360-1-CAL-1 B	Date:	26-04-2024	 0204 581 5020 www.psd.uk.com The Beechwood Centre Office Suite 9, 40 Lower Gravel Road Bromley BR2 8GP Prime Scaffold and Structural Designs Limited
Drawing No:	TG-12360-1-DRG-1 B	Client:	Titchfield Group	
Title:	Scaffold Banner Frame	Prepared By:	Hudson Byaruhanga	
Site:	70 High St, Manchester M4	Checked By:	Vipin Bariya	

Appendix A Wind data



Project no:
Prepared by:
Checked by:
Site reference: 65 High Street, Manchester, Greater Manchester, M4 1FS, UK

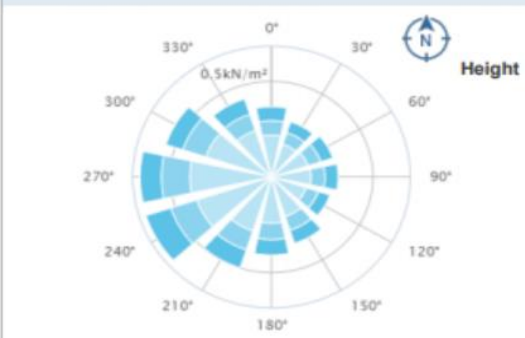
Calculation no:
Date: 25-04-2024
Page no: 1

Notes

Peak velocity pressure calculation to BS EN 1991-1-4:2005+A1:2010 and UK national annex
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Description	Value		Description	Value	
Site location	53.484124°N -2.238301°E	(Figure NA.1)	OS grid reference	SJ 84284 98627	
Fundamental basic wind velocity, $V_{b,map}$ (m/s)	22.7		Structure height, h (m)	18.00	
Site altitude, A (m)	51		Structure orientation from North (°N)	0	
Seasonal factor is based on all year.			Seasonal factor, C_{season}	1.00	(Table NA.2)
Probability factor, C_{prob}	0.83	★ (NA.2.8)	Directional factor, C_{dir}	1.00	(Table NA.1)
Altitude factor, C_{alt}	1.050	(NA.2.5)	Local effects factor, K_f	1.00	(A.3(4))
Orography	Not significant		Orography factor, C_o	1.000	(A.3)
The site is in town terrain			Distance to shoreline (km)	32.69	
Distance inside town terrain (km)	1.17		Displacement height, h_{ds} (m)	0.0	(A.5)
Effective height, z_e (m)	18.0	(A.5)	Exposure factor, C_e	2.79	(Figure NA.7)
Exposure correction factor, $C_{e,T}$	0.98	(Figure NA.8)	Zone for size factor, C_s	C	(NA.8)
Peak velocity, V_p (m/s)	32.6		Peak velocity pressure, q_p (kN/m²)	0.652	(NA.2.17)

Pressure variation across compass directions



Peak velocity pressure variation with height across all wind directions

Calculation No.	TG-12360-1-CAL-1 B	Date:	26-04-2024	 0204 581 5020 www.psd.uk.com The Beechwood Centre Office Suite 9, 40 Lower Gravel Road Bromley BR2 8GP Prime Scaffold and Structural Designs Limited   
Drawing No:	TG-12360-1-DRG-1 B	Client:	Titchfield Group	
Title:	Scaffold Banner Frame	Prepared By:	Hudson Byaruhanga	
Site:	70 High St, Manchester M4	Checked By:	Vipin Bariya	

Appendix B: Kee Klamp Data

KEE KLAMP GALVANISED FITTINGS



KEE KLAMP fittings offer a flexible, versatile solution for the construction of structures such as **handrails, safety barriers** and **guardrails**. The principle is simple yet highly effective, proven over the last **80 years** in thousands of completed projects across the globe. The KEE KLAMP system securely joins standard sizes of structural steel tube (from 17.5mm O/D to 60.3mm O/D) into almost any configuration imaginable, utilising the widest range of fittings available on the market today.

KEE KLAMP fittings are iron castings manufactured to the requirements of **BS EN 1562 & BS EN 1563**. Each fitting can support an axial load of 900 Kg and includes safety factor 2:1. The main fittings are **TÜV certified** for strength, manufacturing quality and consistency. KEE KLAMP fittings offer a more flexible solution when it comes to constructing barriers, handrails and guardrails. All components are designed with **ease of installation** in mind and to completely eliminate the need to weld or fabricate.

Features of KEE KLAMP fittings

- Galvanised cast iron to BS EN ISO 1461
- Fitted with KEE KOAT corrosion protected grub screws and THREDKOAT recess protection
- TÜV certified for strength, manufacturing quality and consistency
- Meets specified loadings up to 1500 N/m

The benefits of using KEE KLAMP fittings

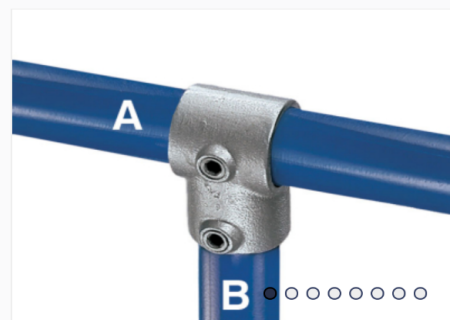
- No welding, so no hot work permits are required
- No threading or bolting so no special tools are required
- A flexible system that can accommodate on site variations
- Cost effective to install; no specialist labour required

Project Service

Kee Systems can help you with all aspects of a project, including **Free Technical Assistance, Site Surveys** and **Installation**.

For further information, please call us on **Tel: 0208 874 6566** or fill out our online **Contact Form** and we'll be in touch to discuss your requirements.

Photos Video



Product Downloads

- Kee Klamp Fittings Guide
- Kee Klamp TÜV Certificate

Related Case Studies

- Kee Klamp guardrails at the Chatham Historic Dockyard
- Cricket net cages made from Kee Klamp fittings
- Kee Klamp guard rail along a highway
- Safety barriers at the sports arena in Hampstead Heath
- Safe access to a roof at Selfridges in London