

Revision B: Supporting Calculations



BDS | SCAFFOLD
DESIGN
SPECIALISTS

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Checked By: Mike Brown	Drawing Title: Freestanding Temporary Roof	Associated Revision
Date: 15/01/2025		Pages: 31-37 Date: 15/01/2025

Components & Material Properties

Items listed below are for information purposes only, & are not necessarily used in this design.

All tubes used in this design are based on type 4, unless otherwise stated.

All couplers used in this design are based on class "B", unless otherwise stated.

NASC TG20:21 - Page 119 - Table 5.9Steel Tube (Type 4)

Area	=	5.57cm ²
Wall Thickness	=	4mm
Self Weight	=	4.37kg/m (0.043kN/m)
Diameter	=	48.3mm
Radius of Gyration	=	1.57cm
Plastic Modulus	=	7.87cm ³
Design Strength	=	235N/mm ²
Modulus of Elasticity	=	210000N/mm ²
Moment of Inertia	=	13.8cm ⁴
Moment Capacity	=	1.12kNm
Shear Capacity	=	29.1kN

NASC TG20:21 - Page 121 - Table 5.10

<u>Effective Length (L_E)</u>	<u>Slenderness ratio - λ</u>	<u>Safe axial load -P_c</u>
1.0m	63.50	58.60kN
1.1m	70.00	55.25kN
1.2m	76.50	51.90kN
1.3m	82.70	48.60kN
1.4m	88.90	45.30kN
1.5m	95.30	42.25kN
1.6m	101.70	39.20kN
1.7m	108.05	36.45kN
1.8m	114.40	33.70kN
1.9m	120.75	31.40kN
2.0m	127.10	29.10kN
2.1m	133.45	27.20kN
2.2m	139.80	25.30kN
2.3m	146.15	23.65kN
2.4m	152.50	22.00kN
2.5m	158.85	20.65kN
2.6m	165.20	19.30kN
2.7m	171.55	18.20kN
2.8m	177.90	17.10kN
2.9m	184.25	16.15kN
3.0m	190.60	15.20kN
3.1m	196.95	14.40kN
3.2m	203.30	13.60kN
3.3m	209.65	12.90kN
3.4m	216.00	12.20kN

<u>Effective Length (L_e)</u>	<u>Slenderness ratio - λ</u>	<u>Safe axial load - P_c</u>
3.5m	222.35	11.60kN
3.6m	228.70	11.00kN
3.7m	235.05	10.50kN
3.8m	241.40	10.00kN
3.9m	247.75	9.55kN
4.0m	254.10	9.10kN

NASC TG20:21 - Page 129 - Table 5.14

Effective lengths, L_e of standards in ledger braced tied independent scaffolds with 2m lifts with effective façade bracing

Vertical intervals betw Bay lengths

lines of ties	1.2m	1.5m	1.8m	2.0m	2.1m	2.4m	2.7m
2m with 2m 1st lift	2.5	2.5	2.5	2.5	2.55	2.75	2.9
2m with 2.7m 1st lift	2.7	2.7	2.7	2.7	2.7	2.9	3
4m	3.2	3.2	3.2	3.2	3.2	3.2	3.2
6m	4	4	4	4	4	4	4

NASC TG20:21 - Page 166 - Table C1

Aluminium Tube

Area	=	6.15cm ²
Wall Thickness	=	4.47mm
Self Weight	=	1.65kg/m
Diameter	=	48.3mm
Radius of Gyration	=	1.56cm
Plastic Modulus	=	8.61cm ³
Design Strength	=	255N/mm ²
Modulus of Elasticity	=	70000N/mm ²
Moment of Inertia	=	14.9cm ⁴
Moment Capacity	=	1.33kNm

NASC TG20:21 - Page 167 - Table C.2

<u>Effective Length (L_e)</u>	<u>Slenderness ratio - λ</u>	<u>Safe axial load - P_c</u>
1.0m	64.2	48.90kN
1.2m	77	36.60kN
1.4m	89.9	27.90kN
1.6m	102.7	21.80kN
1.8m	115.5	17.50kN
2.0m	128.4	14.40kN
2.2m	141.2	12.00kN
2.4m	154	10.10kN
2.6m	166.9	8.70kN
2.8m	179.7	7.50kN

NASC TG20:21 - Page 135 - Table 5.15**Couplers**

Right Angle Coupler (Double) Class "A"	SWL =	6.10kN	Slip
Right Angle Coupler (Double) Class "B"	SWL =	9.10kN	Slip
Band & plate (Double) coupler	SWL =	6.10kN	Slip
Right Angle Coupler (Double) Self Weight	SW =	1.25kg	
Swivel Coupler Class "A"	SWL =	6.10kN	Slip
Swivel Coupler Class "B"	SWL =	9.10kN	Slip
Swivel Coupler Self Weight	SW =	1.33kg	
Sleeve Coupler Class "A"	SWL =	3.60kN	Tension
Adjustable Screw Jack (200mm extension)	SWL =	35.00kN	Compression
Girder Coupler (must be used in pairs)	SWL =	10.00kN	"X" Axis
	SWL =	30.00kN	"Y" Axis
	SWL =	12.50kN	"Z" Axis
Girder Coupler Self Weight (each)	SW =	1.50kg	

Timber Scaffold Boards

Self Weight	=	25kg/m ²
Width	=	225mm
Thickness	=	38mm
Section Modulus	=	47.5cm ³
Moment Capacity	=	0.48kNm

300mm Ladder Beams* (Steel) Laced at 1m c/c

Self Weight	=	0.30kN	(laced & braced)
Moment Capacity	=	10.40kNm	
Shear Capacity	=	18.00kN	

*For further information refer to manufacturer

RMD Superslim Soldiers

Moment Capacity	=	38.0kNm
Shear Capacity	=	75.0kN

*For further information refer to manufacturer

450mm Apollo Beams* (Aluminium) Laced at 1m c/c

Self Weight	=	0.14kN	(laced & braced)
Moment Capacity	=	15.70kNm	
Shear Capacity	=	13.90kN	

*For further information refer to manufacturer

750mm Apollo Beams* (Aluminium) Laced at 1m c/c

Self Weight	=	0.28kN	(laced & braced)
Moment Capacity	=	42.90kNm	
Shear Capacity	=	45.50kN	

*For further information refer to manufacturer

1300mm Apollo Beams* (Aluminium) Laced at 1m c/c

Self Weight	=	Varies TBC	(laced & braced)
Moment Capacity	=	98.52kNm	
Shear Capacity	=	44.25kN	

*For further information refer to manufacturer

1500mm Apollo Beams* (Aluminium) Laced at 1m c/c

Self Weight	=	Varies TBC (laced & braced)
Moment Capacity	=	255.00kNm
Shear Capacity	=	60.00kN

*For further information refer to manufacturer

1300mm Asterix Beams* (Aluminium)

Self Weight	=	Varies TBC (laced & braced)
Moment Capacity	=	102.20kNm Laced at 1m c/c
Moment Capacity	=	77.70kNm Laced at 1.5m c/c
Shear Capacity	=	42.10kN (Top & Bottom chords connected)
Shear Capacity	=	32.60kN (Bottom chord connected)

*For further information refer to manufacturer

450mm Layher Beams* (Aluminium) Laced at 1m c/c

Self Weight	=	0.14kN (laced & braced)
Moment Capacity	=	13.94kNm
Shear Capacity	=	12.32kN

*For further information refer to manufacturer

450mm Layher Beams* (Aluminium) Laced at 1.5m c/c

Self Weight	=	0.14kN (laced & braced)
Moment Capacity	=	8.06kNm
Shear Capacity	=	12.32kN

*For further information refer to manufacturer

450mm Layher Beams* (Aluminium) Laced at 2m c/c

Self Weight	=	0.14kN (laced & braced)
Moment Capacity	=	5.14kNm
Shear Capacity	=	12.32kN

*For further information refer to manufacturer

780mm Dessa Beams* (Aluminium) Laced at 1m c/c. (6no. bolts 3 each side of spigot)

Self Weight	=	0.28kN (laced & braced)
Moment Capacity	=	38.84kNm
Shear Capacity	=	23.71kN

*For further information refer to manufacturer

Relevant Design Standards/guidance (only a selection of the below standards are applicable for this design)

BS EN 39	:2001	Specification for steel scaffold tube.
BS EN 74-1	:2005	Couplers, spigot pins & baseplates for use in falsework & scaffolds.
BS EN 12811-1	:2003	Temporary works equipment: Scaffolds - Performance requirements & general design.☒
BS EN 12812-1	:2008	Falsework: Performance requirements & general design.
BS EN 1139-1-2	:1990	Metal scaffolding - part 1: Tubes - Specification for aluminium tube.
BS EN 1139-2-2	:2009	Metal scaffolding - part 2: Couplers - Specification for aluminium couplers.
BS EN 1991-1-1	:2002	Eurocode 1: Actions on structures - Densities, self-weight & imposed loads.
BS EN 1991-1-3	:2003	Eurocode 1: Actions on structures - Snow loads.
BS EN 1991-1-4	:2005	Eurocode 1: Actions on structures - Wind loads.
BS EN 1991-2	:2003	Eurocode 1: Actions on structures - Part2: Traffic load and bridges
BS EN 13374	:2013	Temporary edge protection systems - Product specification, test methods.
BS 5975	:2019	Code of practise for temporary work procedures & the per design of false work.
BS 2482	:2009	Specification for timber scaffold boards.
TG3:19		Erection, use & dismantling of temporary rubbish chutes on scaffold.
TG4:25		Anchorage systems.
TG9:18		Guide to the design & construction of temporary roofs & buildings.
TG12:22		Tying down of scaffold boards.
TG13:23		Non-standard boarded platforms.
TG16:21		Anchoring to the ground.
TG20:21		Technical guidance on the use of BS EN 12811-1.
SG4:22		Preventing falls in scaffolding.
SG5:18		Overhead power sources.
SG25:20		Access & egress from scaffolds.
SG27:22		Temporary edge protection on open steelwork.
SG28:25		Safe system of work for scaffolding associated with timber frame building construction.
SG29:17		Internal edge protection on scaffold platforms.
SG32:17		Provision of extended & telescopic transoms & board brackets.
SG34:17		Guidance on protection of the public

Job Description: Freestanding Temporary Roof

Safe Working Loads: Independent with 1no. Lift at: 2 kN/m²
 All inside boards at: 0.75 kN/m²
 Buttress with 1no. Lift at: 1.5 kN/m²
 (For Erecting/Dismantling Purposes)
 Kentledge Platform at: 10 kN/m²

Item: Independent

Max Bay Length: 2.02m
 Max Bay Width: 1.20m (5 bds)
 Max Transom Centres: 1.20m
 Max Standard Load: Refer to DWG's

Item: Buttress

Max Bay Length: 2.02m
 Max Bay Width: 1.40m
 Max Transom Centres: 1.20m
 Max Standard Load: Refer to DWG's

Item: kentledge Platform

Max Bay Length: 1.01m
 Max Bay Width: 0.70m
 Max Transom Centres: 0.51m
 Max Standard Load: Refer to DWG's

Item: Loading Bay

Max Bay Length: N/A
 Max Bay Width: N/A
 Max Transom Centres: N/A
 Max Standard Load: N/A

Item: Ties (Tension)

Max Tie Load: N/A
 Preliminary Test: N/A
 Proof Test: N/A

Item: Ties (Shear)

Max Tie Load: N/A
 Preliminary Test: N/A
 Proof Test: N/A

Additional Comments (if required)

- Kentledge to be in place prior to the shetting being installed

Item: **Independent** Y

Bay Lengths (m)	Bay Widths (m)	Transom C/C (m)	No. Inside Boards	SWL (kN/m ²)
2.02	1.2	1.2	2	2

Dynamic Load Applied	Board Dead Load (kN/m ²)
N/A	0.25

Consider Scaffold Boards Spanning

Dead Load	Centres	Width	Load	Results
Boards	1.2 m	0.225 m	0.25 kN/m ²	(kN) = 0.068
Imposed Loads	1.2 m	0.225 m	2 kN/m ²	(kN) = 0.540
Bending Moment	0.068	+	0.540 X 1.2 / 8	(kNm) = 0.091
Allowable Bending Moment For Scaffold Boards = 0.48kNm				(kNm) > 0.091
PASSES				

Transoms With No Inside Boards

Dead Load	Centres	Span	Load	Results
Boards	1.2 m	1.2 m	0.25 kN/m ²	(kN) = 0.360
Tube	1.2 m	X	0.043 kN/m	(kN) = 0.052
Total	0.360 kN	+	0.052 kN	(kN) = 0.412
Imposed Load	1.2 m	1.2 m	2 kN/m ²	(kN) = 2.880
Non-cantilevered Transom BM as TG20:21 - section 5.11.1.1 - M = 0.125 X W X L (kNm)				
Bending Moment	0.125	3.29 kN	1.2 m	(kNm) = 0.494
Allowable Bending Moment For Scaffold Tube = 1.12kNm				(kNm) > 0.494
PASSES				

Transoms With Inside Boards

Dead Load	Centres	Span	Load	Results
Boards	1.2 m	0.45 m	0.25 kN/m ²	(kN) = 0.135
Tube	0.45 m	X	0.043 kN/m	(kN) = 0.019
Total	0.135 kN	+	0.019 kN	(kN) = 0.154
Imposed Load	1.2 m	0.45 m	0.75 kN/m²	(kN) = 0.405
Cantilevered Transom BM as TG20:21 - section 5.11.1.2 - M _c = 0.5 X W _c X L _c (kNm)				
Bending Moment	0.5	0.56 kN	0.45 m	(kNm) = 0.126
Allowable Bending Moment For Scaffold Tube = 1.12kNm				(kNm) > 0.126
PASSES				

Continuous Transoms e.g. Birdcage**Consider The Transoms Spanning**

Dead Load	Centres	Span	Load	Results	
Boards	1.2 m	1.2 m	0.25 kN/m ²	(kN) =	0.360
Tube	1.2 m	X	0.043 kN/m	(kN) =	0.052
Total	0.360 kN	+	0.052 kN	(kN) =	0.412
Imposed Load	1.2 m	1.2 m	2 kN/m ²	(kN) =	2.880
Continuous Transom BM as TG20:21 - section 5.11.1.3 - $M = 0.086 \times W \times L$ (kNm)					
Bending Moment	0.086	3.29 kN	1.2 m	(kNm) =	0.340
Allowable Bending Moment For Scaffold Tube = 1.12kNm				(kNm) >	0.340

PASSES**Simply Supported Ledger****Consider The Ledger Spanning**

		2.02 m			
Transom Point Load		2.21 kN			
Simply supported ledger as TG20:21 - section 5.12.1.1 - $M = 0.25 \times P \times L$ (kNm)					
Bending Moment	0.25	2.21 kN	2.02 m	(kNm) =	1.114
Allowable Bending Moment For Scaffold Tube = 1.12kNm				(kNm) >	1.114

PASSES**Continuous Ledger****Consider The Ledger Spanning**

		2.02 m			
Transom Point Load		2.21 kN			
Continuously supported ledger as TG20:21 - section 5.12.1.2 - $M = 0.167 \times P \times L$ (kNm)					
Bending Moment	0.167	2.21 kN	2.02 m	(kNm) =	0.744
Allowable Bending Moment For Scaffold Tube = 1.12kNm				(kNm) >	0.744

PASSES**Part Continuous Ledger (end bay)****Consider The Ledger Spanning**

		2.02 m			
Transom Point Load		2.21 kN			
Part continuous supported ledger as TG20:21 - section 5.12.1.2 - $M = 0.172 \times P \times L$ (kNm)					
Bending Moment	0.172	2.21 kN	2.02 m	(kNm) =	0.766
Allowable Bending Moment For Scaffold Tube = 1.12kNm				(kNm) >	0.766

PASSES

Additional Platform Check Comments (if required)

Item: **Buttress** Y

Bay Lengths (m)	Bay Widths (m)	Transom C/C (m)	No. Inside Boards	SWL (kN/m ²)
2.02	1.4	1.2	0	1.5

Dynamic Load Applied	Board Dead Load (kN/m ²)
N/A	0.25

Consider Scaffold Boards Spanning

Dead Load	Centres	Width	Load	Results
Boards	1.2 m	0.225 m	0.25 kN/m ²	(kN) = 0.068
Imposed Loads	1.2 m	0.225 m	1.5 kN/m ²	(kN) = 0.405
Bending Moment	0.068	+ 0.405	X 1.2 /8	(kNm) = 0.071
Allowable Bending Moment For Scaffold Boards = 0.48kNm				(kNm) > 0.071
PASSES				

Transoms With No Inside Boards

Dead Load	Centres	Span	Load	Results
Boards	1.2 m	1.4 m	0.25 kN/m ²	(kN) = 0.420
Tube	1.4 m	X	0.043 kN/m	(kN) = 0.060
Total	0.420 kN	+	0.060 kN	(kN) = 0.480
Imposed Load	1.2 m	1.4 m	1.5 kN/m ²	(kN) = 2.520
Non-cantilevered Transom BM as TG20:21 - section 5.11.1.1 - $M = 0.125 \times W \times L$ (kNm)				
Bending Moment	0.125	3.00 kN	1.4 m	(kNm) = 0.525
Allowable Bending Moment For Scaffold Tube = 1.12kNm				(kNm) > 0.525
PASSES				

Transoms With Inside Boards

Dead Load	Centres	Span	Load	Results
Boards	1.2 m	0 m	0.25 kN/m ²	(kN) = 0.000
Tube	0 m	X	0.043 kN/m	(kN) = 0.000
Total	0.000 kN	+	0.000 kN	(kN) = 0.000
Imposed Load	1.2 m	0 m	0.75 kN/m²	(kN) = 0.000
Cantilevered Transom BM as TG20:21 - section 5.11.1.2 - $M_c = 0.5 \times W_c \times L_c$ (kNm)				
Bending Moment	0.5	0.00 kN	0 m	(kNm) = 0.000
Allowable Bending Moment For Scaffold Tube = 1.12kNm				(kNm) > 0.000
PASSES				

Continuous Transoms e.g. Birdcage

Consider The Transoms Spanning			1.4 m		
Dead Load	Centres	Span	Load	Results	
Boards	1.2 m	1.4 m	0.25 kN/m ²	(kN) =	0.420
Tube	1.4 m	X	0.043 kN/m	(kN) =	0.060
Total	0.420 kN	+	0.060 kN	(kN) =	0.480
Imposed Load	1.2 m	1.4 m	1.5 kN/m ²	(kN) =	2.520
Continuous Transom BM as TG20:21 - section 5.11.1.3 - M = 0.086 X W X L (kNm)					
Bending Moment	0.086	3.00 kN	1.4 m	(kNm) =	0.361
Allowable Bending Moment For Scaffold Tube = 1.12kNm				(kNm) >	0.361
PASSES					

Simply Supported Ledger

Consider The Ledger Spanning		2.02 m				
Transom Point Load		1.50 kN				
Simply supported ledger as TG20:21 - section 5.12.1.1 - $M = 0.25 \times P \times L$ (kNm)						
Bending Moment	0.25	1.50 kN	2.02 m	(kNm) =	0.758	
		Allowable Bending Moment For Scaffold Tube = 1.12kNm		(kNm) >	0.758	
						PASSES

Continuous Ledger

Consider The Ledger Spanning		2.02 m				
Transom Point Load		1.50 kN				
Continuously supported ledger as TG20:21 - section 5.12.1.2 - $M = 0.167 \times P \times L$ (kNm)						
Bending Moment	0.167	1.50 kN	2.02 m	(kNm) =	0.506	
Allowable Bending Moment For Scaffold Tube = 1.12kNm				(kNm) >	0.506	
						PASSES

Part Continuous Ledger (end bay)

Consider The Ledger Spanning		2.02 m				
Transom Point Load		1.50 kN				
Part continuous supported ledger as TG20:21 - section 5.12.1.2 - $M = 0.172 \times P \times L$ (kNm)						
Bending Moment	0.172	1.50 kN	2.02 m	(kNm) =	0.521	
		Allowable Bending Moment For Scaffold Tube = 1.12kNm		(kNm) >	0.521	
						PASSES

Additional Platform Check Comments (if required)

Item: **kentledge Platform** Y

Bay Lengths (m)	Bay Widths (m)	Transom C/C (m)	No. Inside Boards	SWL (kN/m ²)
1.01	0.7	0.51	0	10

Dynamic Load Applied	Board Dead Load (kN/m ²)
N/A	0.25

Consider Scaffold Boards Spanning

Dead Load	Centres	Width	Load	Results
Boards	0.51 m	0.225 m	0.25 kN/m ²	(kN) = 0.029
Imposed Loads	0.51 m	0.225 m	10 kN/m ²	(kN) = 1.148
Bending Moment	0.029	+ 1.148	X 0.51 /8	(kNm) = 0.075
Allowable Bending Moment For Scaffold Boards = 0.48kNm				(kNm) > 0.075
PASSES				

Transoms With No Inside Boards

Consider The Transoms Spanning

Dead Load	Centres	Span	Load	Results
Boards	0.51 m	0.7 m	0.25 kN/m ²	(kN) = 0.089
Tube	0.7 m	X	0.043 kN/m	(kN) = 0.030
Total	0.089 kN	+	0.030 kN	(kN) = 0.119
Imposed Load	0.51 m	0.7 m	10 kN/m ²	(kN) = 3.570
Non-cantilevered Transom BM as TG20:21 - section 5.11.1.1 - M = 0.125 X W X L (kNm)				
Bending Moment	0.125	3.69 kN	0.7 m	(kNm) = 0.323
Allowable Bending Moment For Scaffold Tube = 1.12kNm				(kNm) > 0.323
PASSES				

Transoms With Inside Boards

Consider The Transoms Spanning

Dead Load	Centres	Span	Load	Results
Boards	0.51 m	0 m	0.25 kN/m ²	(kN) = 0.000
Tube	0 m	X	0.043 kN/m	(kN) = 0.000
Total	0.000 kN	+	0.000 kN	(kN) = 0.000
Imposed Load	0.51 m	0 m	0.75 kN/m²	(kN) = 0.000
Cantilevered Transom BM as TG20:21 - section 5.11.1.2 - M _c = 0.5 X W _c X L _c (kNm)				
Bending Moment	0.5	0.00 kN	0 m	(kNm) = 0.000
Allowable Bending Moment For Scaffold Tube = 1.12kNm				(kNm) > 0.000
PASSES				

Continuous Transoms e.g. Birdcage**Consider The Transoms Spanning**

Dead Load	Centres	Span	Load	Results	
Boards	0.51 m	0.7 m	0.25 kN/m ²	(kN) =	0.089
Tube	0.7 m	X	0.043 kN/m	(kN) =	0.030
Total	0.089 kN	+	0.030 kN	(kN) =	0.119
Imposed Load	0.51 m	0.7 m	10 kN/m ²	(kN) =	3.570
Continuous Transom BM as TG20:21 - section 5.11.1.3 - $M = 0.086 \times W \times L$ (kNm)					
Bending Moment	0.086	3.69 kN	0.7 m	(kNm) =	0.222
Allowable Bending Moment For Scaffold Tube = 1.12kNm				(kNm) >	0.222

PASSES**Simply Supported Ledger****Consider The Ledger Spanning**

		1.01 m			
Transom Point Load		1.84 kN			
Simply supported ledger as TG20:21 - section 5.12.1.1 - $M = 0.25 \times P \times L$ (kNm)					
Bending Moment	0.25	1.84 kN	1.01 m	(kNm) =	0.466
Allowable Bending Moment For Scaffold Tube = 1.12kNm				(kNm) >	0.466

PASSES**Continuous Ledger****Consider The Ledger Spanning**

		1.01 m			
Transom Point Load		1.84 kN			
Continuously supported ledger as TG20:21 - section 5.12.1.2 - $M = 0.167 \times P \times L$ (kNm)					
Bending Moment	0.167	1.84 kN	1.01 m	(kNm) =	0.311
Allowable Bending Moment For Scaffold Tube = 1.12kNm				(kNm) >	0.311

PASSES**Part Continuous Ledger (end bay)****Consider The Ledger Spanning**

		1.01 m			
Transom Point Load		1.84 kN			
Part continuous supported ledger as TG20:21 - section 5.12.1.2 - $M = 0.172 \times P \times L$ (kNm)					
Bending Moment	0.172	1.84 kN	1.01 m	(kNm) =	0.320
Allowable Bending Moment For Scaffold Tube = 1.12kNm				(kNm) >	0.320

PASSES

Additional Platform Check Comments (if required)

Item: **kentledge Platform** Y

Bay Lengths (m)	Bay Widths (m)	Transom C/C (m)	No. Inside Boards	SWL (kN/m ²)
1.01	0.7	0.51	0	10

Dynamic Load Applied (25%)	Board Dead Load (kN/m ²)
N/A	0.25

Consider Scaffold Boards Spanning

Dead Load	Centres	Width	Load	Results
Boards	0.51 m	0.225 m	0.25 kN/m ²	(kN) = 0.029
Imposed Loads	0.51 m	0.225 m	10 kN/m ²	(kN) = 1.148
Bending Moment	0.029	+ 1.148	X 0.51 /8	(kNm) = 0.075
Allowable Bending Moment For Scaffold Boards = 0.48kNm				(kNm) > 0.075
PASSES				

Transoms With No Inside Boards

Consider The Transoms Spanning

Dead Load	Centres	Span	Load	Results
Boards	0.51 m	0.7 m	0.25 kN/m ²	(kN) = 0.089
Tube	0.7 m	X	0.043 kN/m	(kN) = 0.030
Total	0.089 kN	+	0.030 kN	(kN) = 0.119
Imposed Load	0.51 m	0.7 m	10 kN/m ²	(kN) = 3.570
Non-cantilevered Transom BM as TG20:21 - section 5.11.1.1 - M = 0.125 X W X L (kNm)				
Bending Moment	0.125	3.69 kN	0.7 m	(kNm) = 0.323
Allowable Bending Moment For Scaffold Tube = 1.12kNm				(kNm) > 0.323
PASSES				

Transoms With Inside Boards

Consider The Transoms Spanning

Dead Load	Centres	Span	Load	Results
Boards	0.51 m	0 m	0.25 kN/m ²	(kN) = 0.000
Tube	0 m	X	0.043 kN/m	(kN) = 0.000
Total	0.000 kN	+	0.000 kN	(kN) = 0.000
Imposed Load	0.51 m	0 m	0.75 kN/m²	(kN) = 0.000
Cantilevered Transom BM as TG20:21 - section 5.11.1.2 - M _c = 0.5 X W _c X L _c (kNm)				
Bending Moment	0.5	0.00 kN	0 m	(kNm) = 0.000
Allowable Bending Moment For Scaffold Tube = 1.12kNm				(kNm) > 0.000
PASSES				

Continuous Transoms e.g. Birdcage**Consider The Transoms Spanning**

Dead Load	Centres	Span	Load	Results	
Boards	0.51 m	0.7 m	0.25 kN/m ²	(kN) =	0.089
Tube	0.7 m	X	0.043 kN/m	(kN) =	0.030
Total	0.089 kN	+	0.030 kN	(kN) =	0.119
Imposed Load	0.51 m	0.7 m	10 kN/m ²	(kN) =	3.570
Continuous Transom BM as TG20:21 - section 5.11.1.3 - $M = 0.086 \times W \times L$ (kNm)					
Bending Moment	0.086	3.69 kN	0.7 m	(kNm) =	0.222
Allowable Bending Moment For Scaffold Tube = 1.12kNm				(kNm) >	0.222

PASSES**Simply Supported Ledger****Consider The Ledger Spanning**

		1.01 m			
Transom Point Load		3.69 kN			
Simply supported ledger as TG20:21 - section 5.12.1.1 - $M = 0.25 \times P \times L$ (kNm)					
Bending Moment	0.25	3.69 kN	1.01 m	(kNm) =	0.932
Allowable Bending Moment For Scaffold Tube = 1.12kNm				(kNm) >	0.932

PASSES**Continuous Ledger****Consider The Ledger Spanning**

		1.01 m			
Transom Point Load		3.69 kN			
Continuously supported ledger as TG20:21 - section 5.12.1.2 - $M = 0.167 \times P \times L$ (kNm)					
Bending Moment	0.167	3.69 kN	1.01 m	(kNm) =	0.622
Allowable Bending Moment For Scaffold Tube = 1.12kNm				(kNm) >	0.622

PASSES**Part Continuous Ledger (end bay)****Consider The Ledger Spanning**

		1.01 m			
Transom Point Load		3.69 kN			
Part continuous supported ledger as TG20:21 - section 5.12.1.2 - $M = 0.172 \times P \times L$ (kNm)					
Bending Moment	0.172	3.69 kN	1.01 m	(kNm) =	0.641
Allowable Bending Moment For Scaffold Tube = 1.12kNm				(kNm) >	0.641

PASSES

Additional Platform Check Comments (if required)

Consider Load Per Node Capacities**Item:** **Independent**

Bay Widths (m)	Bay Length (m)	SWL (kN/m ²)	Bds Dead Load (kN/m ²)	Tube Dead Load (kN)
1.2	2.02	2	0.25	0.45
No. Inside Boards		SWL (kN/m ²) inside bds		
2		0.75		

Coupler Type Used - Class A:		6.1kN	No. of Primary Connections:	1
Coupler Type Used - Class B:	Y	9.1kN	No. of Supplementary Connections:	0
			Strength of Connection:	9.10kN

Loads in accordance with TG20:21, 5.9.2

Inside Node

Bay Width	*	Bay Length	*	(SWL	+	BDS _{sw})	+	T _{sw}	Result
0.60m	*	2.02m	*	2	+	0.25	+	0.45kN	3.18kN
0.45m	*	2.02m	*	0.75	+	0.25			0.91kN
								=	4.09kN
				4.09kN	<	9.10kN	Therefore		PASSES

Outside Node

Bay Width	*	Bay Length	*	(SWL	+	BDS _{sw})	+	T _{sw}	Result
0.60m	*	2.02m	*	2	+	0.25	+	0.45kN	3.18kN
				3.18kN	<	9.10kN	Therefore		PASSES

Item: **Buttress**

Bay Widths (m)	Bay Length (m)	SWL (kN/m ²)	Bds Dead Load (kN/m ²)	Tube Dead Load (kN)
1.4	2.02	1.5	0.25	0.45
No. Inside Boards		SWL (kN/m ²) inside bds		
0		0.75		

Coupler Type Used - Class A:		6.1kN	No. of Primary Connections:	1
Coupler Type Used - Class B:	Y	9.1kN	No. of Supplementary Connections:	0
			Strength of Connection:	9.10kN

Loads in accordance with TG20:21, 5.9.2

Inside Node

Bay Width	*	Bay Length	*	(SWL	+	BDS _{sw})	+	T _{sw}	Result
0.70m	*	2.02m	*	1.5	+	0.25	+	0.45kN	2.92kN
0.00m	*	2.02m	*	0.75	+	0.25			0.00kN
								=	2.92kN
				2.92kN	<	9.10kN	Therefore		PASSES

Outside Node

Bay Width	*	Bay Length	*	(SWL	+	BDS _{sw})	+	T _{sw}	Result
0.70m	*	2.02m	*	1.5	+	0.25	+	0.45kN	2.92kN
				2.92kN	<	9.10kN	Therefore		PASSES

Item: **kentledge Platform**

Bay Widths (m)	Bay Length (m)	SWL (kN/m ²)	Bds Dead Load (kN/m ²)	Tube Dead Load (kN)
0.7	1.01	10	0.25	0.9
No. Inside Boards		SWL (kN/m ²) inside bds		
0		0		

Coupler Type Used - Class A:		6.1kN	No. of Primary Connections:	1
Coupler Type Used - Class B:	Y	9.1kN	No. of Supplementary Connections:	1
Strength of Connection:				15.20kN
Loads in accordance with TG20:21, 5.9.2				

Perimeter Node

Bay Width	*	Bay Length	*	(SWL	+	BDS _{sw})	+	T _{sw}	Result
0.35m	*	1.01m	*	10	+	0.25	+	0.45kN	4.07kN
				4.07kN	<	15.20kN	Therefore	PASSES	

Centre Node

Bay Width	*	Bay Length	*	(SWL	+	BDS _{sw})	+	T _{sw}	Result
0.70m	*	1.01m	*	10	+	0.25	+	0.90kN	8.15kN
				8.15kN	<	15.20kN	Therefore	PASSES	

INSIDE STANDARD

Allowance For Double Width: N/A

Tube DL (kN/m)	0.043	Boards DL (kN/m ²) (kN/m)	0.25 0.056	Fittings (kN)	0.018	Length (m)	Width (m)	Quantity	Length (or) Area
Bay Size						2.02m	1.20m		
Standards (lift height)								1	2.70m
Ledgers								1	2.02m
Beam							kN/m	0	2.02m
Transom								4	0.60m
Guardrails								0	2.02m
Boarded (Main Platform)								1	1.21
Boarded (Inside Boards)								1.5	0.68
Toe Boards								0	2.02m
Ledger Bracing								0	2.85m
Façade Bracing								1	3.26m
Plan Bracing								0	2.51m
Fittings								6	N/A
Live Loads Applied				Total Number of Lifts:				3	
				Number of Boarded Lifts:				2	
(SWL) 100%		2.00kN /m ²		Total Dead Load Per Lift:					0.55kN
(SWL) 50%		1.00kN /m ²		Total Dead Load					2.52kN
(SWL) Inside bds		0.75kN /m ²							
Maximum No. Lifts at 100%		1		Total Live Load:					2.94kN
Maximum No. Lifts at 50%		0							
No. Lifts with inside bds loaded		1		Total Load Combined:					5.46kN
No. Support Stds/Puncheons		1							
Axial Load	Effective Length (L _E)	Safe Axial Load (P _c)	Slenderness Ratio (λ)	Slenderness Max (λ)	Result				
5.46kN	2.4 m	22.00kN	152.5	271	PASSES				

Ground Bearing Pressure (GBP)

		Sole Pad Arrangements		
		Pad Width (m)	Pad Length (m)	Pad Area (sqm)
Typical Arrangement	Y	0.225	0.450	0.10125
Increased Arrangement		0.450	0.450	0.2025
Tredda Plate		0.210	0.210	0.0441
Other				0
Imposed Load:	5.46 kN			
GBP:	26.96 kN/m ²			

Additional Comments If Required

CENTRE STANDARD

Allowance For Double Width: N/A

Tube DL (kN/m)	0.043	Boards DL (kN/m ²) (kN/m)	0.25 0.056	Fittings (kN)	0.018	Length (m)	Width (m)	Quantity	Length (or) Area
Bay Size						2.02m	1.20m		
Standards (lift height)								1	2.60m
Ledgers								1	2.02m
Beam							kN/m	0	2.02m
Transom								4	0.60m
Guardrails								1.5	2.02m
Boarded (Main Platform)								1	1.21
Boarded (Inside Boards)								0	0.00
Toe Boards								1	2.02m
Ledger Bracing								1	2.80m
Façade Bracing								1	3.21m
Plan Bracing								0	2.51m
Fittings								9.5	N/A
Live Loads Applied				Total Number of Lifts:				3	
				Number of Boarded Lifts:				2	
(SWL) 100%		2.00kN /m ²		Total Dead Load Per Lift:					0.97kN
(SWL) 50%		1.00kN /m ²		Total Dead Load					3.53kN
(SWL) Inside bds		0.75kN /m ²							
Maximum No. Lifts at 100%		1		Total Live Load:					2.42kN
Maximum No. Lifts at 50%		0							
No. Lifts with inside bds loaded		1		Total Load Combined:					5.95kN

Consider Imposed Load From Butress/Adjacent Bay

Bay Length	Bay Width	Lift Heights	No. Lifts	No. Boarded Lifts	Safe Working Load	Ledger Brace	Plan Brace
2.02m	0.70m	2.60m	3	0	1.50kN/m ²	Y	N
Boarded lift Load:		0.00kN					
Un-Boarded lifts Load:		0.27kN					
Bracing Load:		0.53kN					
Total Dead Load:		0.80kN		+	Standard Load 3.53kN	=	Total Load 4.33kN
Total Load:		0.80kN		+	5.95kN	=	6.76kN

No. Support Stds/Puncheons 1

Axial Load	Effective Length (L _E)	Safe Axial Load (P _c)	Slenderness Ratio (λ)	Slenderness Max (λ)	Result
6.76kN	2.4 m	22.00kN	152.5	271	PASSES

Ground Bearing Pressure (GBP)

		Sole Pad Arrangements		
		Pad Width (m)	Pad Length (m)	Pad Area (sqm)
Typical Arrangement	Y	0.225	0.450	0.10125
Increased Arrangement		0.450	0.450	0.2025
Tredda Plate		0.210	0.210	0.0441
Other		0.750	0.450	0.3375

Imposed Load: 6.76 kN

GBP: 33.36 kN/m²

OUTSIDE STANDARD

Allowance For Double Width: N/A

Tube DL (kN/m)	0.043	Boards DL (kN/m ²) (kN/m)	0.25 0.056	Fittings (kN)	0.018	Length (m)	Width (m)	Quantity	Length (or) Area
Bay Size						2.02m	1.40m		
Standards (lift height)								1	2.50m
Ledgers								1	2.02m
Beam							kN/m	0	2.02m
Transom								4	0.70m
Guardrails								1	2.02m
Boarded (Main Platform)								1	1.41
Boarded (Inside Boards)								0	0.00
Toe Boards								0	2.02m
Ledger Bracing								1	2.85m
Façade Bracing								1	3.16m
Plan Bracing								0	2.61m
Fittings								8	N/A
Live Loads Applied								3	
								0	
(SWL) 100%			1.50kN /m ²						0.80kN
(SWL) 50%			0.75kN /m ²						2.41kN
(SWL) Inside bds			0.75kN /m ²						
Maximum No. Lifts at 100%			1						2.12kN
Maximum No. Lifts at 50%			0						
No. Lifts with inside bds loaded			1						4.53kN
No. Support Stds/Puncheons			1						
Axial Load	Effective Length (L _E)	Safe Axial Load (P _c)	Slenderness Ratio (λ)	Slenderness Max (λ)	Result				
4.53kN	2.4 m	22.00kN	152.5	271	PASSES				

Ground Bearing Pressure (GBP)

		Sole Pad Arrangements		
		Pad Width (m)	Pad Length (m)	Pad Area (sqm)
Typical Arrangement	Y	0.225	0.450	0.10125
Increased Arrangement		0.450	0.450	0.2025
Tredda Plate		0.210	0.210	0.0441
Other				0
Imposed Load:	4.53 kN			
GBP:	22.39 kN/m ²			

Additional Comments If Required



BDS

SCAFFOLD
DESIGN
SPECIALISTS

John Rylands Library, Spinningfields, Manchester

Job No:

Revision

N/A

CO002-11371-2-Rev-B

Page:

C/01

Section:

WIND ANALYSIS

Prepared By:

Joe Rigby

Date:

14/01/2026

SITE AND BUILDING (STRUCTURE) DATA

Site location (postcode for VelVenti): m3 3eh

Building (structure) height 'h' [m] = 9.0

Site altitude 'A' [m] = 43.7

Fundamental basic wind velocity 'v_{b,map}' [m/s] = 22.7

Building (structure) design life [years] = 2.0

Season factor 'c_{season}' = 1.00

Probability factor 'c_{prob}' = 0.78

Altitude factor 'c_{alt}' = 1.04

CALCULATIONS: BASIC WIND VELOCITY

Building (structure) rotation from North 'Ø' [deg] = N/A

Wind direction: ANY

Angle from North 'Ø_n' [deg] = -

Direction factor 'c_{dir}' = 1.00

Basic wind velocity 'v_b' [m/s] = 18.37

Basic velocity pressure 'q_b' [kN/m²] = 0.207

CALCULATIONS: EFFECTIVE HEIGHT

Wind direction: ANY

Terrain in upwind direction: Town

Distance upwind to shoreline [km] = 48.15

Distance upwind inside town [km] = 9

NEARBY BUILDINGS DATA:

Average height 'h_{ave}' [m] = -

Upwind spacing 'x' [m] = -

Effective height 'h_{ef}' [m] = 9.00

CALCULATIONS: PEAK VELOCITY PRESSURE

Wind direction: ANY

Topography factor 'c_o' = -

Roughness factor 'c_{r(z)}' = -

Correction factor 'c_{r,T}' = -

Turbulence factor 'I_{v(z)flat}' = -

Turbulence correction factor 'k_{i,T}' = -

Exposure factor 'c_{e(z)}' = 2.30

Exposure correction factor 'c_{e,T}' = 0.79

Peak velocity pressure 'q_p' [kN/m²] = 0.38

CALCULATIONS:

Snow:

Characteristic snow load at 100 m altitude = 0.50

Characteristic ground snow load = 0.50

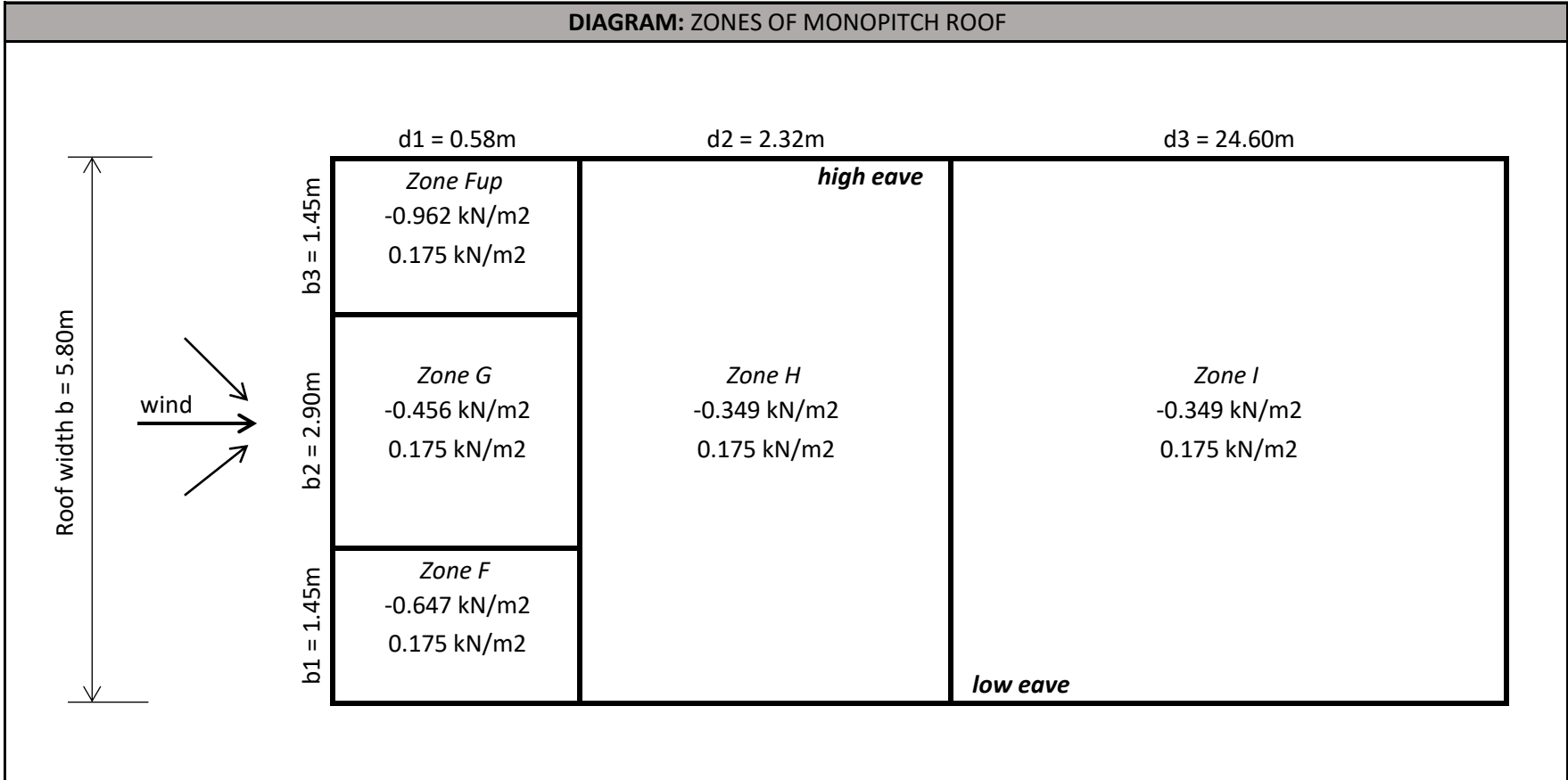
Designer's Notes:

BUILDING (STRUCTURE) DATA	
Structure:	Monopitch roofs
Structural type:	Mixed structures concrete plus steel
Type of surface:	Smooth (e.g. smooth concrete, steel)
Peak velocity pressure ' q_p ' [kN/m^2]	0.38
Roof/building width ' b ' [m]	5.80
Roof/building depth ' d ' [m]	27.50
Building height ' h ' [m]	9.00
Building effective height ' h_{eff} ' [m]	9.00
Roof pitch angle ' α ' [deg]	14.00
Wind direction [deg]	90

CALCULATIONS: DAMPING AND FRICTION	
Structural damping ' δ_s '	0.08
Dynamic factor ' c_d '	1.02
Reference area for friction ' A_{fr} ' [m^2]	164.38
Friction force ' F_{fr} ' [kN]	0.62

CALCULATIONS: EXTERNAL WIND PRESSURES FOR ROOF					
	Zone:	F / F_{up}	G	H	I
case A:	c_{pe}	-1.650/-2.560	-1.100	-0.790	-0.790
case B:	c_{pe}	0.180/0.180	0.180	0.180	0.180
case A:	' w_e ' [kN/m^2]	-0.571/-0.886	-0.381	-0.273	-0.273
case B:	' w_e ' [kN/m^2]	0.062/0.062	0.062	0.062	0.062

RESULTS: NET WIND PRESSURES FOR ROOF						
	Zone:	F / F_{up}	G	H	I	internal press. coeff. c_{pi}
case A:	' w ' [kN/m^2]	-0.647/-0.962	-0.456	-0.349	-0.349	case I = 0.200
	' w ' [kN/m^2]	-0.458/-0.773	-0.268	-0.160	-0.160	case II = -0.300
case B:	' w ' [kN/m^2]	-0.013/-0.013	-0.013	-0.013	-0.013	case I = 0.200
	' w ' [kN/m^2]	0.175/0.175	0.175	0.175	0.175	case II = -0.300



note: diagram is not to scale. gives critical values per zone.

calculations are based on Eurocode EN1991-1-4 (2005) + UK N.A.

SITE DATA	
Site terrain type:	Town
Minimum distance to shoreline [km]	48.15
Minimum distance to town boundary [km]	9.00

COEFFICIENTS AND FACTORS (?)	
Internal pressure coefficient ' c_{pi} ' - case I	0.20
Internal pressure coefficient ' c_{pi} ' - case II	-0.30
Building zone:	B
Size factor for external pressure ' c_s '	0.90
Friction coefficient for roof surface ' c_{fr} '	0.01
Distance ' e ' [m]	5.80

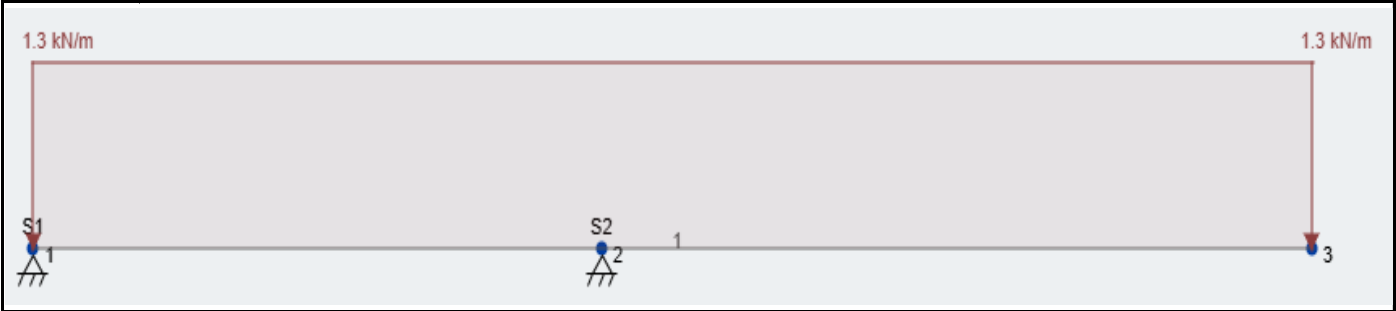
SUMMARY OF RESULTS					
Zone:	F / F_{up}	G	H	I	
w_{min}	-0.647/-0.962	-0.456	-0.349	-0.349	
w_{max}	0.175/0.175	0.175	0.175	0.175	

net pressure ' w ' is in kN/m^2

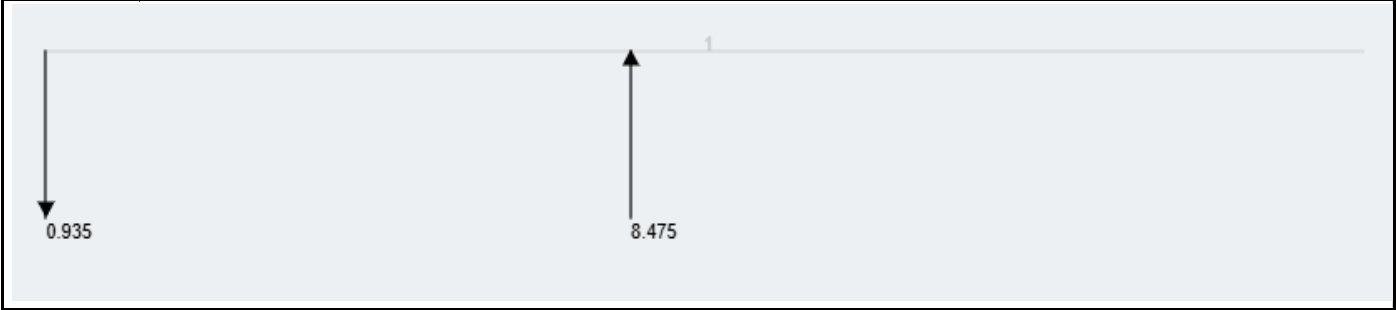
Item:	Loadings and Reactions on 450mm Layher Beam			Beams -	Centre Beam
Beam C/C (m)	Wind (kN/m ²)	Snow Sw (kN/m ²)	Beam Sw (kN/m)	UDL kN/m	
2.02	0.175	0.40	0.14	1.30	

450mm Layher Beam Data	
Beam Span Length:	10000mm
Area A:	1,852
Constant Iy:	448,100,000
Constant Iz:	448,100,000
Torsional Constant J:	1,000

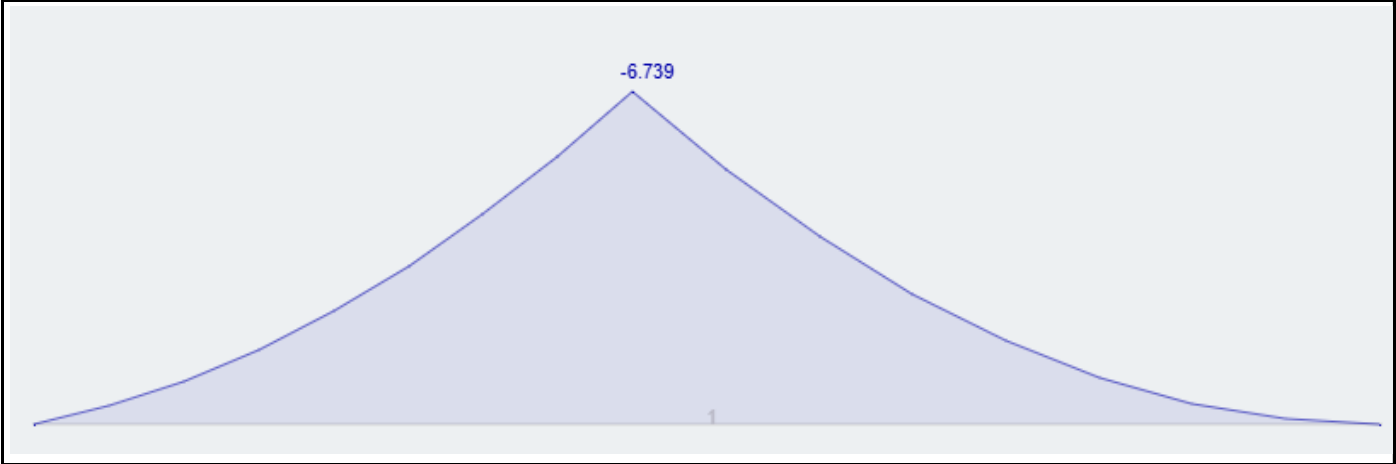
Frame



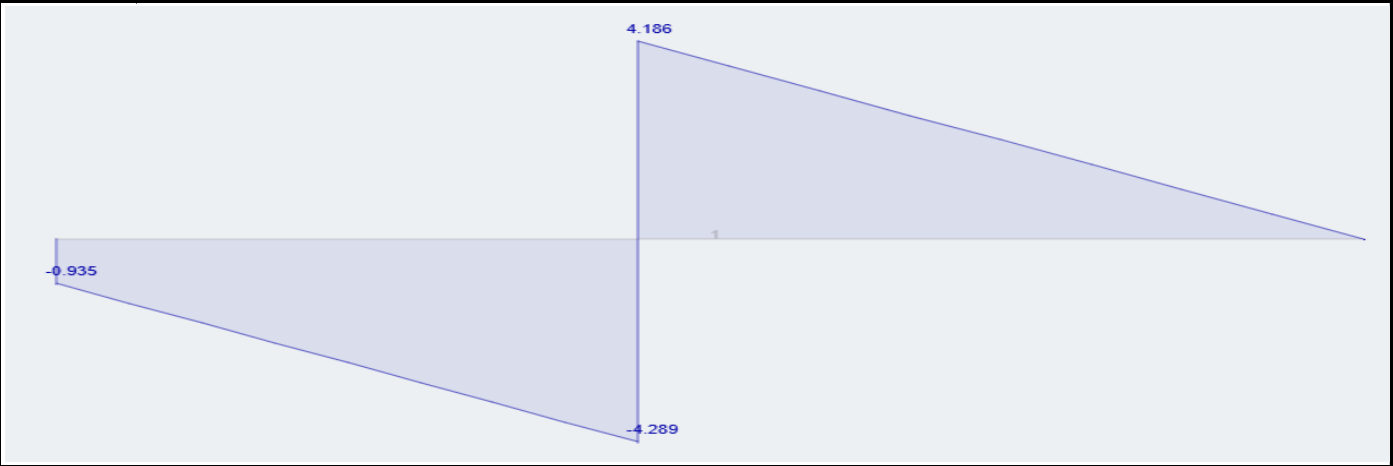
Reaction



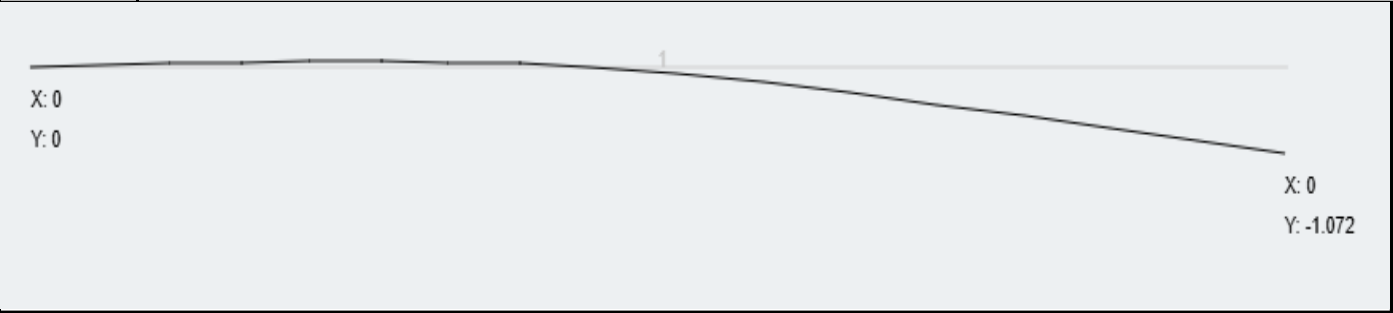
BM



Shear



Deflection



Coupler Capacities

Coupler Type Used - Class A: 6.1kN
Coupler Type Used - Class B: Y 9.1kN
Node loads in accordance with TG20:21, 5.9.2

No. of Primary Connections: 1
No. of Supplementary Connections: 1
Strength of Connection: 15.20kN

Maximum Reactions

Support	Reaction	Node	Result
1	-0.94kN	15.20kN	PASSES
2	8.48kN	15.20kN	PASSES

Maximum BM

Max BM	Allowable	Result
6.74kN < 13.94 kNm		PASSES

Maximum Shear

Max Shear	Allowable	Result
2.04kN < 12.32 kN		PASSES

Maximum Deflection

Length	/	Value	=	Capacity
10000mm	/	250	=	40.00mm
Deflection		Capacity		Result
1.1mm	<	40.00mm		PASSES

Loads Imposed on to		Ground							
Support	Reaction		Additional Leg/Loads		Additional Leg/Loads			Total Load	
1	-0.94kN	+	4.53kN	+		=		3.60kN	
2	8.48kN	+	5.46kN	+		=		13.93kN	

No. Support Stds/Puncheons		1					
Axial Load	Effective Length (Le)	Safe Axial Load (Pc)	Slenderness Ratio (λ)	Slenderness Max (λ)	Result		
3.60kN	2.4 m	22.00kN	152.5	271	PASSES		
13.93kN	2.4 m	22.00kN	152.5	271	PASSES		

Ground Bearing Pressure (GBP)

		Sole Pad Arrangements		
		Pad Width (m)	Pad Length (m)	Pad Area (sqm)
Typical Arrangement	Y	0.225	0.450	0.10125
Increased Arrangement		0.450	0.450	0.2025
Tredda Plate		0.210	0.210	0.0441
Other				0

Imposed Load:	13.93 kN
GBP:	68.81 kN/m²

Additional Comments If Required

Item:**Loadings and Reactions on 450mm Layher Beam**

Beams -

Centre Beam

Beam C/C (m)

2.02Wind (kN/m²)**-0.384**Snow Sw (kN/m²)**0.00**

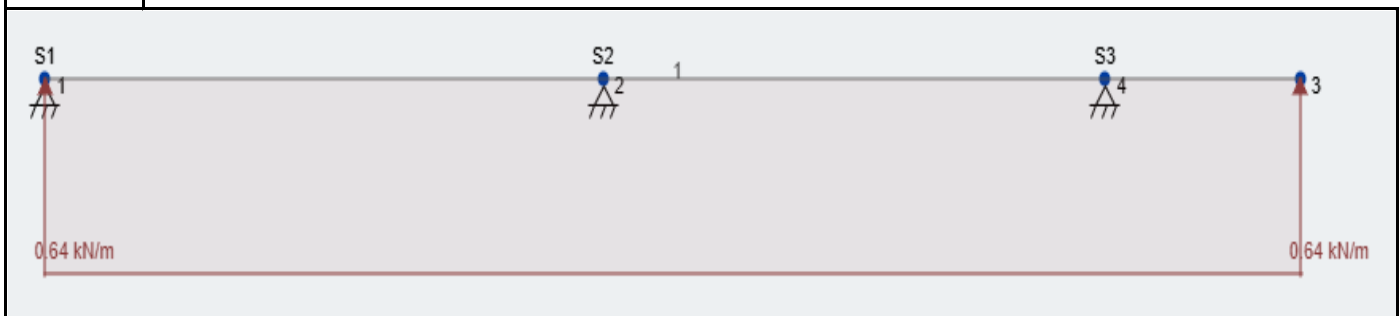
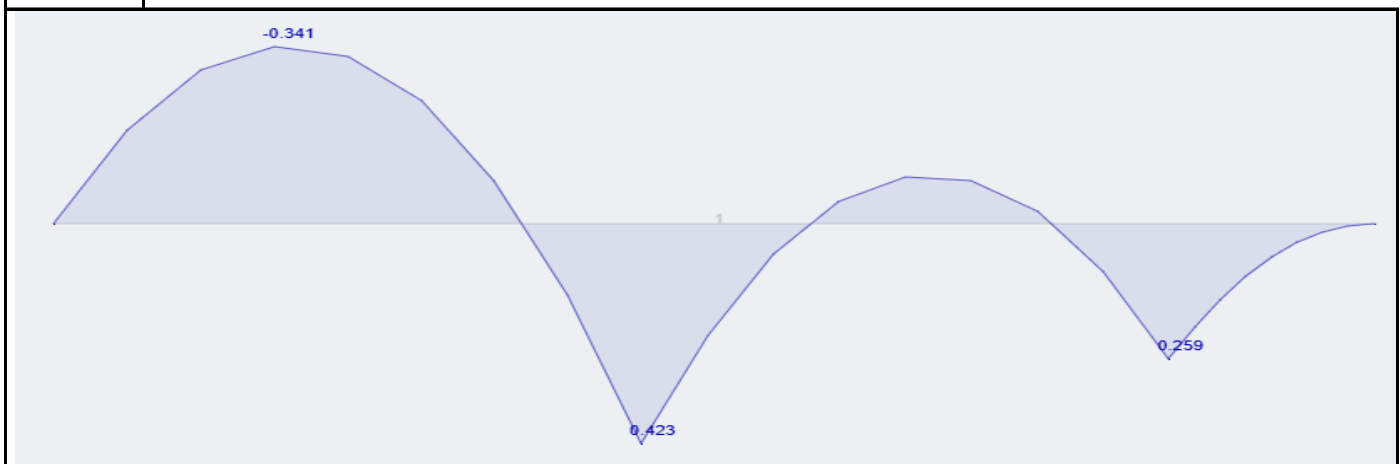
Beam Sw (kN/m)

0.14

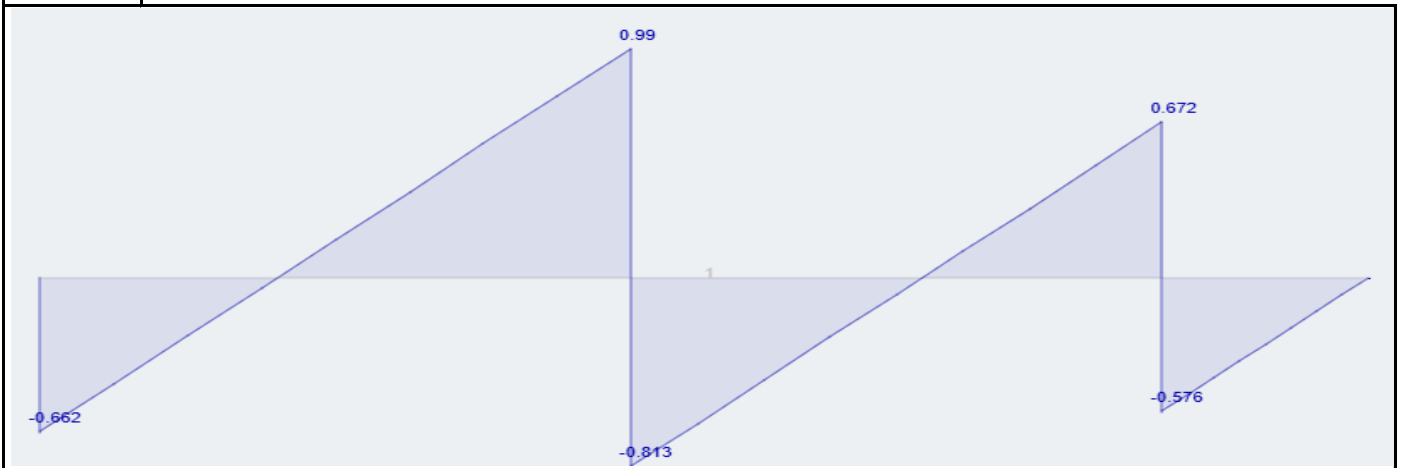
UDL kN/m

-0.64**450mm Layher Beam Data**

Beam Span Length:	10000mm
Area A:	1,852
Constant I _y :	448,100,000
Constant I _z :	448,100,000
Torsional Constant J:	1,000

Frame**Reaction****BM**

Shear



Deflection

**Coupler Capacities**

Coupler Type Used - Class A: 6.1kN
 Coupler Type Used - Class B: **Y** 9.1kN
 Node loads in accordance with TG20:21, 5.9.2

No. of Primary Connections: **1**
 No. of Supplementary Connections: **1**
 Strength of Connection: **15.20kN**

Maximum Reactions

Support	Reaction	Node	Result
1	-0.66kN	15.20kN	PASSES
2	-1.80kN	15.20kN	PASSES
3	-1.25kN	0.00kN	PASSES

Maximum BM

Max BM	Allowable	Result
0.42kN	13.94 kNm	PASSES

Maximum Shear

Max Shear	Allowable	Result
0.99kN	12.32 kN	PASSES

Maximum Deflection

Length	/	Value	=	Capacity
10000mm	/	250	=	40.00mm
Deflection		Capacity		Result
0.0mm	<	40.00mm		PASSES

Loads Imposed on to Ground

Support	Reaction		Additional Leg/Loads		Additional Leg/Loads		Total Load
1	-0.66kN	+	4.53kN	+		=	3.87kN
2	-1.80kN	+	5.46kN	+		=	3.66kN
3	-1.25kN		Reaction Through Lip Tie				

Coupler Capacities

Coupler Type Used - Class A: 6.1kN
 Coupler Type Used - Class B: **Y** 9.1kN
 Node loads in accordance with TG20:21, 5.9.2

No. of Primary Connections: **1**
 No. of Supplementary Connections: **1**
 Strength of Connection: **15.20kN**

Consider Load Through Brace

1.25kN < 15.20kN **PASSES**

Consider Axial Load Capacities

Axial Load	Effective Length (Le)	Safe Axial Load (Pc)	Slenderness Ratio (λ)	Slenderness Max (λ)	Result
1.25kN	2.0 m	29.10kN	127.1	271	PASSES

No. Support Stds/Puncheons **1**

Axial Load	Effective Length (Le)	Safe Axial Load (Pc)	Slenderness Ratio (λ)	Slenderness Max (λ)	Result
3.87kN	2.4 m	22.00kN	152.5	271	PASSES
3.66kN	2.4 m	22.00kN	152.5	271	PASSES

Ground Bearing Pressure (GBP)**Sole Pad Arrangements**

		Pad Width (m)	Pad Length (m)	Pad Area (sqm)
Typical Arrangement	Y	0.225	0.450	0.10125
Increased Arrangement		0.450	0.450	0.2025
Treda Plate		0.210	0.210	0.0441
Other				0

Imposed Load: 3.66 kN
 GBP: **18.06** kN/m²

Additional Comments If Required

Consider Wind Loads On Scaffold

Table E1: Combined exposure factor, C_e

Height $Z = h_{vis}^{**}$ (m)	Site in country or adjacent to sea				Site in town, more than 2 km from the edge of the town		
	Closest distance to the shoreline (km)				Distance to shoreline (km)		
	≤ 0.1	2	10	≥ 100	≥ 2	10	≥ 100
≤ 2	1.90	1.60	1.50	1.40	1.07	1.01	0.94
3	2.15	1.84	1.73	1.62	1.32	1.25	1.17
4	2.31	2.03	1.90	1.78	1.54	1.44	1.35
5	2.43	2.18	2.05	1.90	1.72	1.62	1.50
10	2.82	2.65	2.50	2.32	2.33	2.20	2.04
15	3.07	3.02	2.85	2.67	2.81	2.65	2.48
20	3.20	3.05	2.98	2.78	2.90	2.83	2.64
30	3.42	3.43	3.27	3.04	3.40	3.24	3.01
50	3.68	3.68	3.62	3.39	3.68	3.62	3.39
100	3.98	3.98	3.98	3.80	3.98	3.98	3.80

Notes: (1) Interpolation may be used in this table
(2) Based on Figure NA.7 and Figure NA.8 in the NA to BS EN 1991-1-4

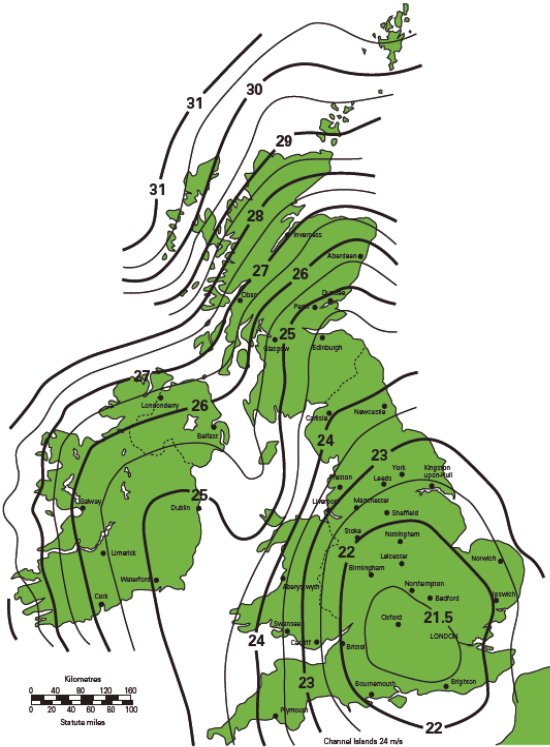


Figure E.1 Wind speed U (m/s)

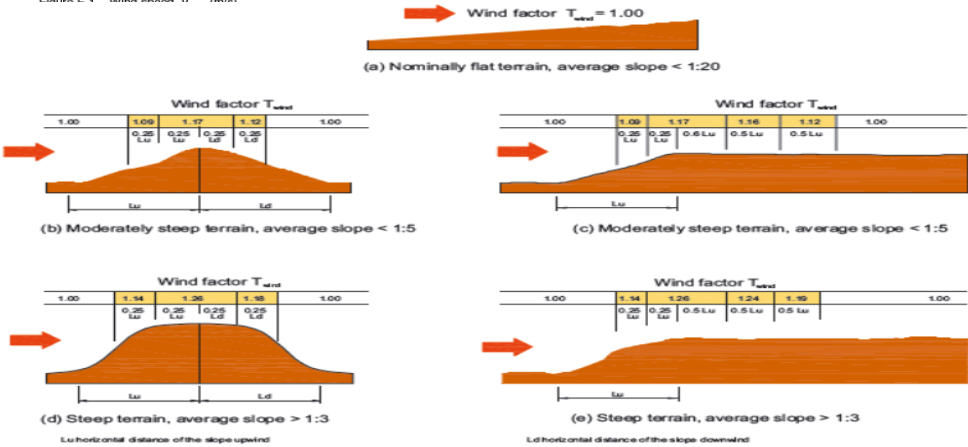


Figure E.2 – Topography factor, T_{wind}



Figure E.3 – Displacement height

Table NA.1 Directional factor c_{dir}

Direction	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
c_{dir}	0,78	0,73	0,73	0,74	0,73	0,80	0,85	0,93	1,00	0,99	0,91	0,82

NOTE 1 Interpolation may be used within Table NA.1.

NOTE 2 The directions are defined by angles from due North in a clockwise direction.

NOTE 3 Where the wind loading on a building is assessed only for orthogonal load cases, the maximum value of the factor for the directions that lie $\pm 45^\circ$ either side of the normal to the face of the building is to be used.

NOTE 4 Conservatively, c_{dir} may be taken as 1,0 for all directions.

Consider Wind Loads On Scaffold**Wind Loads- as TG20, TG9:18 Appendix E, EN 12811 and NA to BS EN 1991-1-4:2005**

SITE AND BUILDING (STRUCTURE) DATA	
Site location (postcode for VelVenti):	M3 3EH
Building (structure) design life [years] =	2.0
Building (structure) height 'h' [m] =	9.00
Structure Orientation From North	0.0
Cdir (Table NA.1 Page 4) =	1.00
Cseason (Table NA.2 Page 6) =	1.00
Twind (Fig E3) =	1.00
Cprob- do not use twf if <1 =	1.00
Site altitude 'A' [m] =	43.7
Fundamental basic wind velocity 'vb,map' [m/s] =	22.7
Qp' =	0.48

Additional Comments If Required

- CADS Velventi Software Has Been Used To Generate Qp Values Based On The Inputted Parameters

Wind Load Per Frame

(Cpe for sheeting-Cpe*1, for debris netting Cpe*0.5, for unsheeted Cpe *0.26)

Ae- Max Area acting on 1 tie =	14.00	in m2	1
Qp=	0.48	kN/m ²	
Cpe +ve=	1.2	ind-TG20 page 150, sign-7.4.3 EN 1991,	net cpe 2walls- NA4
Cpe -ve	1.2		

- 1) Load= Qp*Ae*Cpe*Cf
- 2) Therefore max push in=8.11kN
- 3) Therefore max pull out=8.11kN

Additional Comments If Required

Consider Stability: Leeward**Overturning**

Node 1:	8.11kN	Load Acting At:	3.45m	= 27.99kNm
Node 2:		Load Acting At:		= N/A
Node 3:		Load Acting At:		= N/A
Node 4:		Load Acting At:		= N/A

Combined Overturning = 27.99kNm

OT Factor of Safety = 1.5

Lever Arm = 2.58m

Total Overturning = **41.99kNm**

Bay Lengths = 2.02m

RM Factor of Safety = 0.9

Restoring Moment

Std 1:	2.41kN	Load Acting At:	0.00m	= .00kNm
Std 2:	4.33kN	Load Acting At:	1.40m	= 6.06kNm
Std 3:	2.52kN	Load Acting At:	2.58m	= 6.51kNm
Std 4:		Load Acting At:		= N/A
Std 5:		Load Acting At:		= N/A
Std 6:		Load Acting At:		= N/A

Total Restoring Moment = **11.32kNm****Kentledge Requirement**

41.99kNm - 11.32kNm = 30.67kNm

30.67kNm / 2.58m = 11.89kN

Additional Up-Lift To Be Applied = 1.80kN

Kentledge Required Per Frame = **1396.79kg**Continuous Tube Equivalent = **158**

Consider Stability: Windward**Overturning**

Node 1:	8.11kN	Load Acting At:	3.45m	= 27.99kNm
Node 2:		Load Acting At:		= N/A
Node 3:		Load Acting At:		= N/A
Node 4:		Load Acting At:		= N/A

Combined Overturning = 27.99kNm Factor of Safety = 1.5

Lever Arm = 2.58m

Total Overturning = **41.99kNm** Bay Lengths = 2.02m

RM Factor of Safety = 0.9

Restoring Moment

Std 1:	2.52kN	Load Acting At:	0.00m	= .00kNm
Std 2:	4.33kN	Load Acting At:	1.18m	= 5.11kNm
Std 3:	2.41kN	Load Acting At:	2.58m	= 6.22kNm
Std 4:		Load Acting At:		= N/A
Std 5:		Load Acting At:		= N/A
Std 6:		Load Acting At:		= N/A

Total Restoring Moment = **10.20kNm**

Kentledge Requirement

41.99kNm - 10.20kNm = 31.79kNm

31.79kNm / 2.58m = 12.32kN

Additional Up-Lift To Be Applied = 0.94kN

Kentledge Required Per Frame = **1352.57kg**

Continuous Tube Equivalent = **153**

Consider Kentledge Requirement

IBC Deadload (Kg)

Load	*	Conversion		Result
1000kg	*	0.00981	=	9.81kN
Load	*	%		Total Loss
9.81kN	*	10.00%	=	0.98kN
Load	-	Loss		Total IBC (DL)
9.81kN	-	0.98kN	=	8.83kN
IBC (DL)	*	No.		Total DL
8.83kN	*	2	=	17.66kN

Consider Kentledge Requirement

WC Uplift		Total DL		Result
13.69kN	<	17.66kN	=	PASSES 2no. IBC Required
WC Uplift		Total DL		Result
13.26kN	<	17.66kN	=	PASSES no. IBC Required

Consider Total Standard Load (Inside Std)

Bay Width (m)	*	Bay Length (m)	*	(SWL (kN/m ²)	+	Bds DL (kN/m ²)	)	+	Tube Dead Load(kN)	=
0.29m	*	1.01m	*	(10	+	0.25	)	+	0	3.00kN
Standard	+	Kentledge	=	Total						
13.93kN	+	3.00kN	=	16.94kN						

Consider Total Standard Load (Centre Std)

Bay Width (m)	*	Bay Length (m)	*	(SWL (kN/m ²)	+	Bds DL (kN/m ²)	)	+	Tube Dead Load(kN)	=
0.65m	*	1.01m	*	(10	+	0.25	)	+	0	6.73kN
Standard	+	Kentledge	=	Total						
6.76kN	+	6.73kN	=	13.48kN						

Consider Total Standard Load (Outside Std)

Bay Width (m)	*	Bay Length (m)	*	(SWL (kN/m ²)	+	Bds DL (kN/m ²)	)	+	Tube Dead Load(kN)	=
0.35m	*	1.01m	*	(10	+	0.25	)	+	0	3.62kN
Standard	+	Kentledge	=	Total						
4.53kN	+	3.62kN	=	8.16kN						

No. Support Stds/Puncheons **1**

Axial Load	Effective Length (Le)	Safe Axial Load (Pc)	Slenderness Ratio (λ)	Slenderness Max (λ)	Result
13.48kN	0.6 m	70.90kN	38.1	271	PASSES

Ground Bearing Pressure (GBP)

		Sole Pad Arrangements		
		Pad Width (m)	Pad Length (m)	Pad Area (sqm)
Typical Arrangement	y	0.225	0.450	0.10125
Increased Arrangement		0.450	0.450	0.2025
Tredda Plate		0.210	0.210	0.0441
Other				0
Imposed Load:	16.94			
GBP:	83.64			

Consider Splicing Requirement

Single Splice Capacities

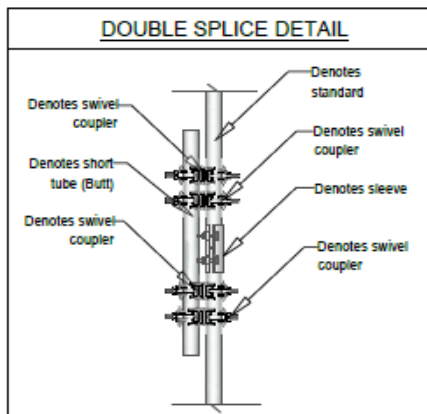
Coupler Type Used - Sleeve	Y	3.60kN
Coupler Type Used - Class B:	Y	9.10kN
Node loads in accordance with TG20:21, 5.9.2		

No. of Primary Connections:	2
No. of Primary Connections:	1
Strength of Connection:	16.30kN

Consider Splicing Requirement

WC Uplift	<	Splice Capacity	Result
13.69kN	<	16.30kN	PASSES Double Splice Detail Required

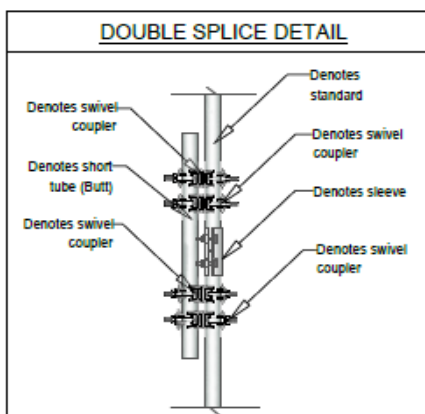
Consider Horizontal Splicing Requirement



Consider Splicing Requirement

WC Uplift	<	Splice Capacity	Result
13.26kN	<	16.30kN	PASSES Double Splice Detail Required

Consider Horizontal Splicing Requirement



Consider Timber Pad Foundation

Timber Sole Pad Information	
Timber Grade:	C24
Bending Strength:	24N/mm ²
Shear Strength:	2.5N/mm ²
Modulus Elasticity (E):	10800mpa
Length (L):	450mm
Width/Bredth (b):	450mm
Depth/Height (h):	76mm

Point Load Information	
Consider Point Load (P):	13.48kN
Conversion (P):	13484N

Consider Bearing Stress On Timber Under A Steel Base Plate

Area of Plate:	150mm	*	150mm	=	Result			
σ_{Bearing} =	13484N	/	22500mm ²	=	22500mm ²			
					0.60N/mm ²	<	24N/mm ²	Result
								PASSES

Consider Timber Section PropertiesArea (A): $A = bh$

b	*	h	=	A
450mm	*	76mm	=	34200mm ²

Second Moment of Area (I): $I = \frac{bh^3}{12}$

b	*	h ³	/	12	=	I
450mm	*	76mm ³	/	12	=	16461600/mm ⁴

Section Modulus (Z): $z = \frac{I}{bh/2}$

b	*	h ²	/	6	=	Z
450mm	*	76mm ²	/	6	=	433200/mm ³

Consider Global Bending (Simply Supported, Mid-Point Load)Bending Moment: $M_{\text{max}} = \frac{PL}{4}$

P	*	L	/	4	=	M_{max}
13484N	*	450mm	/	4	=	1516998Nmm

Bending Stress: $\sigma_b = \frac{M_{\text{max}}}{z}$

Mmax	/	Z	=	σ_b		Capacity	Result
1516998N/mm	/	433200/mm ³	=	3.50N/mm ²	<	24N/mm ²	PASSES

Consider Global Shear (Reactions At Supports)Reaction: $V = P/2$

P	/	2	=	V
13484N	/	2	=	6742N

Rectangular Section: $T_{max} = 1.5 \frac{V}{A}$

V	/	A	=	Result	
6742N	/	34200mm ²	=	0.20N/mm ²	
1.5	*	Result	=	T_{max}	Capacity
1.5	*	0.20N/mm ²	=	0.30N/mm ²	2.5N/mm ²
				<	PASSES

Consider DeflectionDeflection: $\delta_{max} = \frac{PL^3}{48EI}$

P	*	L ³	=	Result
13484N	*	450mm ³	=	1228768392229Nmm ³

48	*	E	*	I	=	Result
48	*	10800mpa	*	16461600/mm ⁴	=	8533693440000Nmm ²

Result	/	Result	=	δ_{max}
1228768392229Nmm ³	/	8533693440000Nmm ²	=	0.14mm

Allowable Deflection: $L/300$

L	/	300	=	Capacity	δ_{max}	Result
450mm	/	300	=	1.50mm	0.14N/mm ²	PASSES
				>		

Conclusion

	σ_b		Capacity	Result
Bending Stress:	3.50N/mm ²	<	24N/mm ²	PASSES

	T_{max}		Capacity	Result
Global Shear:	0.30N/mm ²	<	2.5N/mm ²	PASSES

	δ_{max}		Capacity	Result
Deflection:	0.14mm	<	1.50mm	PASSES

Project:	John Rylands Library, Spinningfields, Manchester
Drawing Number:	CO002-11371-2-Rev-B
Item:	Freestanding Temporary Roof
Category of Check (1, 2, or 3):	2

Description of Temporary Works:

Freestanding Temporary Roof

I certify for and on behalf of BDS Ltd, that in my opinion, the erection proposals and proposed temporary works details, specified in the schedule attached hereto relating to the construction of the above contract, are satisfactory for the proper discharge of responsibilities for the safe temporary works design elements of the works, and for their safe execution and removal (if applicable) in accordance with the drawings and specification, and without detriment to the related permanent Works.

Schedule of Drawings and Other Documents:

Drawing:	Page 1
Supporting Calculations:	Page 1 to 37
Check Certificate:	Page 38

Drawn By: Hayden Allan
Company: Buckley Design Solutions

Signature:

Drawing Status:

APPROVAL

Calculations By: Joe Rigby
Company: Buckley Design Solutions

Signature:

Checked By: Mike Brown
Company: Buckley Design Solutions

Signature:

Date:
15/01/2025