

Chorlton scaffolding .

Title: Independent Access to The front and side of Portland house building for an advertising banner to be fixed to the building.

Live Loading is 2kN/m²

Drawing No Sd 25-Chorlton-58

Site:Portland building,Portland street/princess street Manchester.	
Sheet No.1	of 4 pages. Prepared by:R.Challender(Scaffold Design Engineer)
Date: 2-10-25.	
<u>MATERIALS:</u>	

STANDARD SCAFFOLD TUBE & FITTINGS IN ACCORDANCE WITH TG20-21/EN12811
FITTINGS IN ACCORDANCE WITH BS1139
ALL TUBE WILL BE GALVANISED THEREFORE AS NEW CONDITION.

<u>PROPERTIES OF TUBE:</u>		STEEL	ALUMINIUM
OUTSIDE DIA	=	48.30mm	48.30mm
WEIGHT	=	4.37Kg/M	1.67Kg/M
Z	=	5.70cm ³	6.18cm ³
I	=	13.80cm ⁴	14.90cm ⁴
R	=	1.57cm	1.56cm
AREA	=	5.57cm ²	6.15cm ²
MAX BM	=	1.120Kn.M*	0.95Kn.M

ALLOWABLE TUBE STRUT LOADS (STEEL)

LENGTH(mm)	LOAD(Kn)	LENGTH(mm)	LOAD(Kn)	LENGTH(mm)	LOAD(Kn)
1000	57.50	1700	35.76	2400	20.46
1100	54.62	1800	32.94	2500	18.90
1200	51.75	1900	30.42	2600	17.74
1300	48.64	2000	27.90	2700	16.58
1400	45.32	2100	25.86	2800	15.42
1500	42.00	2200	23.82	2900	14.50
1600	38.88	2300	22.00	3000	13.50

ALLOWABLE FITTING LOADS:

TYPE OF FITTING	TYPE OF LOAD	SWL(Kn)
RIGHT ANGLE	SLIP	6.1
MRK 3a	SLIP	12.6
SWIVEL	SLIP	5.5
SLEEVE	TENSION	3.10
SPIGOT	SHEAR	21.0
SINGLE COUPLER	SLIP	0.63
ADJ BASE/FH	AXIAL	30.0

SCAFFOLD BOARD: 225mm x 37mm in accordance with BS2482

MAX BM = 0.468kN.M

ALLOWABLE B.M & SHEAR FOR SCAFFOLD BEAMS:

TYPE OF BEAM	ALLOWABLE B.M (kN.M)	ALLOWABLE SHEAR (kN)
UNIT BEAM	27.70	15.60
LADDERBEAM	13.50	18.00
PLETTAC ALUM BEAM	18.00	14.00
APPOLLO X BEAM(750)	44.50	45.50

450 ALUM BEAM

15.70

13.90

References used in design

BS6399 – Part 2 – Wind Load

EN12811 – Latest code of practice (TG20 – 21)

Determined wind forces

Distance from edge of roof	45	in m	Cc	2.2	Table E' (combination)
Significant Topography	n	or r	Vb.map	23	Fig E 1 App E
Altitude above sea-level	88	in m	Cdir	1	Table NA.1 page 4
Cprob- do not use tw	1		Cseason	1	Table NA.2 page 6
			Twind	1	Fig E 3

1) Peak Wind Pressure: $0.613 \cdot Cc \cdot Swind$ Appendix E

2) Swind: $Twind \cdot Vmap \cdot (1 + 0.001 \cdot A) \cdot Cprob \cdot Cdir$ Appendix E

3) Swind

4) Qp= 0.74 kN/m² * 0.70 tw factor 0.52 kN/m²

Loading from wind per tie

Ae- Max Area acting	8.00	in m ²
Qp=	0.52	kN/m ²
Cpe +ve=	1.2	
Cpe -ve	1.2	

1) Load= Qp * Ae * Cf

2) Therefore max push 5.76 Kn

3) Therefore max pull 5.76 Kn

Test to 1.5 fos= 7.20kn

Liveloading is 2.0kn/m² with 1 lift working at once.

(Max 2.0m x 1.2m) max bearer span is 1.20 metre.).

Transom Check

Boards 1.20m x 1.20m span x 0.25kN/m² =0.36 kN

Tube 0.043k x 1.2m =0.0516 kN

Sub Total=0.4116kN.

Imposed load

2.0kn/m² x 1.00m x 1.20m =2.40kN

Total load is 0.4116kN plus 2.40kN.=2.8116kN.

Transom BM = $\frac{wl^2}{8}$ $\frac{2.8116\text{kN}}{8} \times 1.20 \text{ span}$
 $= 0.42174\text{N.m} < 1.12\text{kN.m}$ ok Allowable Bm for tube.ok

Ledger Check

Ledger span max 2.0m point load from transom is 2.8116kn/m²
 BM = WL x 0.175(continuous)=0.984kN.m Allowable BM for tube is 1.12kN.m ok

Check scaffold boards

Boards 0.25kN/m² self wt x 1.20m x 0.225m =0.0675kN
 Imposed load 2kN/m² x 1.20m x 0.225m =0.54kN
 Total=0.6075kN.

BM WL/8=0.6075kN x 1.20m
 $\frac{8}$
 $= 0.091125\text{kN.m} < 0.468\text{kn.m}$ Allowable bending for a 38mm scaffold board. ok

Check Facade bracing

Length of facade bracing
 Scaffold 2.0m high x 2.0m wide
 Thus 2.0m² plus 2.0m²=8.00m² square root=2.82m allowable load in brace is 15.00kN

The worst case horizontal load will occur from a percentage of the vertical load.
 Assume 25 percent of vertical load is acting horizontally.
 15.00kN x 0.25 =3.75kN
 Load 3.75kN /cosine 40 degree angle of strut.=4.895kN.Fitting each end of Brace.
 All bracing fixed with traditional double couplers acting in slip with a capacity of 6.1kn swl.

Length of Ledger bracing

Scaffold 2.0m high x 1.2m wide.
 Thus 2.0m² plus 1.20m²=5.44m square rooted=2.33m allowable load in strut is 21kN.
 The worst case horizontal load will occur from a percentage of the vertical load.
 Assume 25 percent of vertical load is acting horizontally.
 21.00kn x 0.25 =5.25kN
 Load 5.25kN /cosine 52degree angle of strut.= 8.6065kN

Check the loading on the ties supporting the banner frame.

$0.52\text{kN/m}^2 \times 0.21 \text{ permeability of banner} \times 2\text{m} \times 14\text{m} = 3.0576\text{Kn}$. Test the tie anchors to a minimum of this value.

Calculation by R.A.Challender(Scaffold Design Engineer)