



DALTON Consultants
Consulting Civil &
Structural Engineers

CALCULATION SHEET

Project Reference:	07155
Sheet Reference:	
Date:	Nov 2007
Calculations By:	JD
Checked By:	

TITLE

Esquire Glass Glossop - Extension

Structural Calculations
For
Steelwork Superstructure
To the Extension at Esquire Glass
At Platt Street Glossop
For
Jacamast Structureclad Ltd
November 2007



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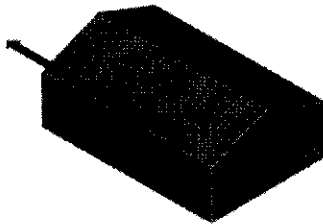
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TITLE Esquire Glass Glossop - Extension

Wind Loads – Building Dimensions

Roof Loads Considered: YES Length of Faces 1 & 3: 36.400 m Building Orientation: Unknown
Length of Faces 2 & 4: 12.000 m
Wall Loads Considered: YES
Cantilever Loads Considerer: NO
Parapet Loads Considered: NO

Roof type: Duo-pitched roof Gable faces are: 2 and 4
Roof height: 8.340 m Sidewall height: 7.600 m
Roof diagonal: 5.000 m Sidewall diagonal dimension a: 5.000 m
Roof pitch: 7.000 ° Gable wall height: 8.340 m
Number of frames (multi-bay roofs): 1 frame Gable diagonal dimension a: 5.000 m



Wind funnel gaps

To Face 1: 0.000 m
To Face 2: 0.000 m
To Face 3: 0.000 m
To Face 4: 0.000 m

Orientation – where an orientation angle has been specified by the user, it is the angle that a line along the apex, or along the high eaves of mono-pitched roofs, is rotated from N (0°)

For these types of building, the sides are faces 1 & 3, and the gables are faces 2 & 4

Where the building has a flat roof, the user is asked to specify which faces are to be considered as gables (see above), in which case the angle or orientation is measured from a line along the edge selected as 'side' to N (0°)



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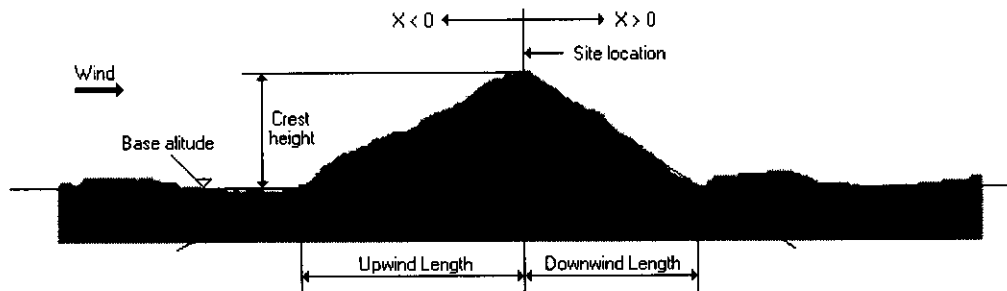
TITLE Esquire Glass Glossop - Extension

Dynamic Pressure Report

Calculation Method:	Hybrid		
Grid Reference:	SK028961	Probability Factor:	1.000
Site Altitude:	195.000 m	Duration:	All year
Basic Wind Speed:	22.300 m/s		
Annual Risk:	0.02000	Seasonal Factor:	1

Site Topography

Wind Direction	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
Crest Height (m)	57.00	57.00	57.00	57.00	57.00	57.00	57.00	57.00	57.00	57.00	57.00	57.00
Site Location (m)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Upwind Length (m)	285.00	285.00	285.00	285.00	285.00	285.00	285.00	285.00	285.00	285.00	285.00	285.00
Downwind Length (m)	285.00	285.00	285.00	285.00	285.00	285.00	285.00	285.00	285.00	285.00	285.00	285.00
Base Altitude (m)	138.00	138.00	138.00	138.00	138.00	138.00	138.00	138.00	138.00	138.00	138.00	138.00





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TITLE **Esquire Glass Glossop - Extension**

Internal Pressure Co-efficient

Type of Structure: Enclosed building

Wind Pressure Value: Sidewall

Diagonal Dimension of Dominant Opening (m): 0

Internal Volume (m³): 2750

Normal Wind Results

Face	Dynamic pressure - q	Diagonal dimension - a	Size effect factor - C _{ai}	C _{pi} (pressure)	C _{pi} (suction)	Internal applied loads
1	0.982	140.102	0.748	0.000	0.300	-0.220 kN/m ²
2	0.982	140.102	0.748	0.000	0.300	-0.220 kN/m ²
3	0.982	140.102	0.748	0.000	0.300	-0.220 kN/m ²
4	0.982	140.102	0.748	0.000	0.300	-0.220 kN/m ²



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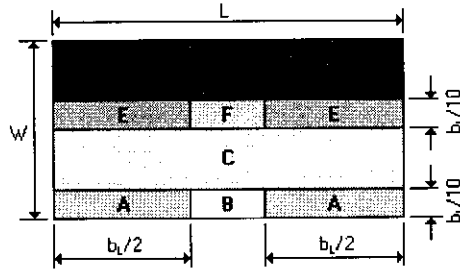
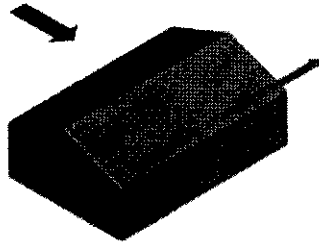
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TITLE Esquire Glass Glossop - Extension

Overall Wind Loads

Roof results, wind normal to face 1

Zone	Zone width & depth	External applied loads	Internal applied loads	Overall applied loads
A	8.340 m, 1.668 m	+0.041, -1.691 kN/m ²	-0.220 kN/m ²	+0.261, -1.470 kN/m ²
B	19.720 m, 1.668 m	+0.041, -1.141 kN/m ²	-0.220 kN/m ²	+0.261, -0.920 kN/m ²
C		+0.041, -0.570 kN/m ²	-0.220 kN/m ²	+0.261, -0.350 kN/m ²
E		-0.998 kN/m ²	-0.220 kN/m ²	-0.778 kN/m ²
F		-0.428 kN/m ²	-0.220 kN/m ²	-0.207 kN/m ²
G		-0.428 kN/m ²	-0.220 kN/m ²	-0.207 kN/m ²



Width measured across wind, depth measured in wind direction

Selected wind load type:

Zone C

Result value is +0.261, -0.350 kN/m²



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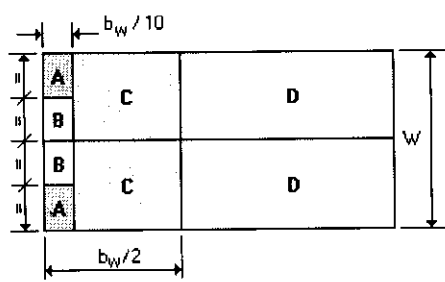
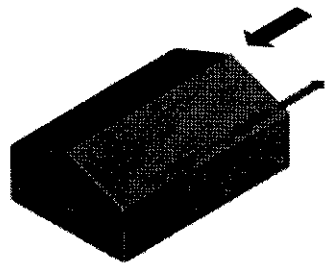
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TITLE Esquire Glass Glossop - Extension

Roof results, wind normal to face 2

Zone	Zone width & depth	External applied loads	Internal applied loads	Overall applied loads
A	3.000 m, 1.200 m	-1.956 kN/m ²	-0.220 kN/m ²	-1.735 kN/m ²
B	3.000 m, 1.200 m	-1.202 kN/m ²	-0.220 kN/m ²	-0.981 kN/m ²
C	6.000 m, 4.800 m	-0.611 kN/m ²	-0.220 kN/m ²	-0.391 kN/m ²
D		-0.489 kN/m ²	-0.220 kN/m ²	-0.268 kN/m ²



Width measured across wind, depth measured in wind direction

Selected wind load type:

Zone D

Result value is -0.268 kN/m²



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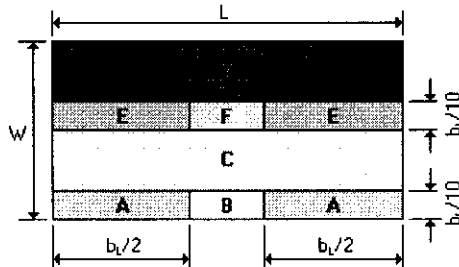
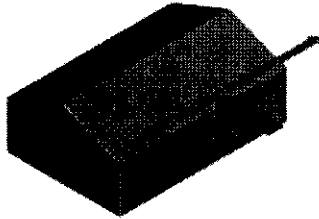
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Checked By:	

TITLE Esquire Glass Glossop - Extension

Roof results, wind normal to face 3

Zone	Zone width & depth	External applied loads	Internal applied loads	Overall applied loads
A	8.340 m, 1.668 m	+0.041, -1.691 kN/m ²	-0.220 kN/m ²	+0.261, -1.470 kN/m ²
B	19.720 m, 1.668 m	+0.041, -1.141 kN/m ²	-0.220 kN/m ²	+0.261, -0.920 kN/m ²
C		+0.041, -0.570 kN/m ²	-0.220 kN/m ²	+0.261, -0.350 kN/m ²
E		-0.998 kN/m ²	-0.220 kN/m ²	-0.778 kN/m ²
F		-0.428 kN/m ²	-0.220 kN/m ²	-0.207 kN/m ²
G		-0.428 kN/m ²	-0.220 kN/m ²	-0.207 kN/m ²



Width measured across wind, depth measured in wind direction

Selected wind load type:

Zone A

Result value is +0.261, -1.470 kN/m²



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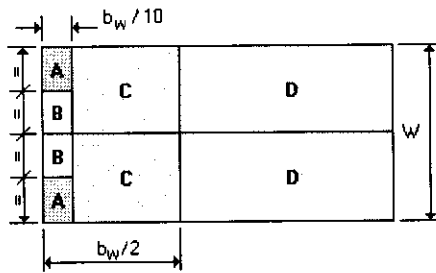
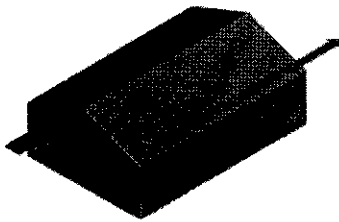
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TITLE Esquire Glass Glossop - Extension

Roof results, wind normal to face 4

Zone	Zone width & depth	External applied loads	Internal applied loads	Overall applied loads
A	3.000 m, 1.200 m	-1.956 kN/m ²	-0.220 kN/m ²	-1.735 kN/m ²
B	3.000 m, 1.200 m	-1.202 kN/m ²	-0.220 kN/m ²	-0.981 kN/m ²
C	6.000 m, 4.800 m	-0.611 kN/m ²	-0.220 kN/m ²	-0.391 kN/m ²
D		-0.489 kN/m ²	-0.220 kN/m ²	-0.268 kN/m ²



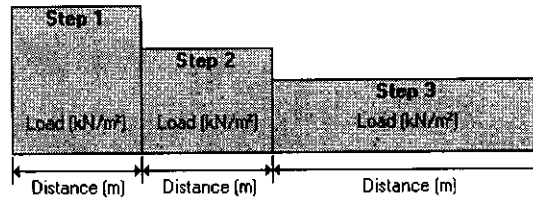
Width measured across wind, depth measured in wind direction

Selected wind load type:

Stepped Wind Load (See table below for details)

Step	Load (kN/m ²)	Distance (m)
1	-1.735	1.200
2	-0.391	4.500
3	-0.391	0.000

Result value is -0.674 kN/m²





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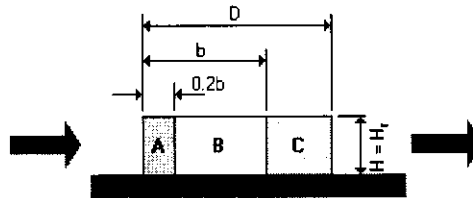
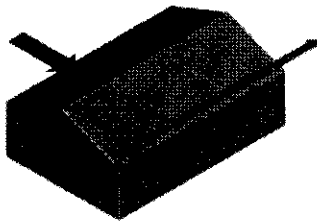
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TITLE **Esquire Glass Glossop - Extension**

Wall results, wind loads on face 1

Zone	Zone length	External applied loads	Internal applied loads	Overall applied loads
Windward	36.400 m	+0.787 kN/m ²	-0.220 kN/m ²	+1.007 kN/m ²
Leeward	36.400 m	-0.491 kN/m ²	-0.220 kN/m ²	-0.270 kN/m ²
A (face 2)	2.400 m	-1.276 kN/m ²	-0.220 kN/m ²	-1.056 kN/m ²
B (face 2)	9.600 m	-0.785 kN/m ²	-0.220 kN/m ²	-0.565 kN/m ²
C (face 2)	24.400 m	-0.491 kN/m ²	-0.220 kN/m ²	-0.270 kN/m ²
A (face 4)	2.400 m	-1.276 kN/m ²	-0.220 kN/m ²	-1.056 kN/m ²
B (face 4)	9.600 m	-0.785 kN/m ²	-0.220 kN/m ²	-0.565 kN/m ²
C (face 4)	24.400 m	-0.491 kN/m ²	-0.220 kN/m ²	-0.270 kN/m ²



Selected wind load type:

Windward

Result value is +1.007 kN/m²



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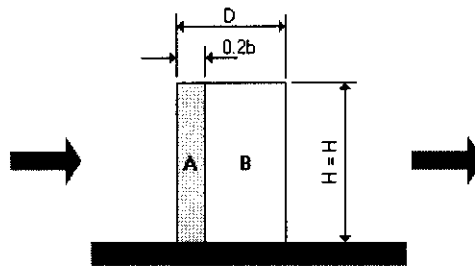
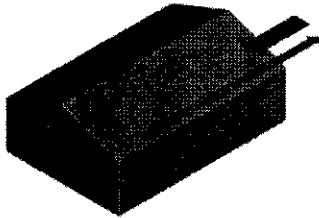
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TITLE Esquire Glass Glossop - Extension

Wall results, wind loads on face 2

Zone	Zone length	External applied loads	internal applied loads	Overall applied loads
Windward	12.000 m	+0.611 kN/m ²	-0.220 kN/m ²	+0.831 kN/m ²
Leeward	12.000 m	-0.509 kN/m ²	-0.220 kN/m ²	-0.289 kN/m ²
A (face 1)	3.336 m	-1.324 kN/m ²	-0.220 kN/m ²	-1.104 kN/m ²
B (face 1)	8.664 m	-0.815 kN/m ²	-0.220 kN/m ²	-0.594 kN/m ²
A (face 3)	3.336 m	-1.324 kN/m ²	-0.220 kN/m ²	-1.104 kN/m ²
B (face 3)	8.664 m	-0.815 kN/m ²	-0.220 kN/m ²	-0.594 kN/m ²



Selected wind load type:

Windward

Result value is +0.831 kN/m²



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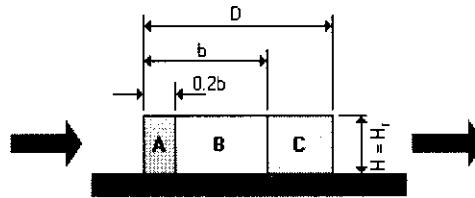
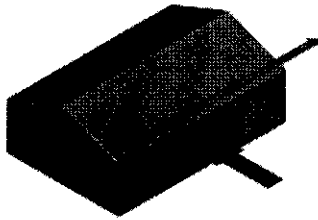
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TITLE Esquire Glass Glossop - Extension

Wall results, wind loads on face 3

Zone	Zone length	External applied loads	Internal applied loads	Overall applied loads
Windward	36.400 m	+0.787 kN/m ²	-0.220 kN/m ²	+1.007 kN/m ²
Leeward	36.400 m	-0.491 kN/m ²	-0.220 kN/m ²	-0.270 kN/m ²
A (face 2)	2.400 m	-1.276 kN/m ²	-0.220 kN/m ²	-1.056 kN/m ²
B (face 2)	9.600 m	-0.785 kN/m ²	-0.220 kN/m ²	-0.565 kN/m ²
C (face 2)	24.400 m	-0.491 kN/m ²	-0.220 kN/m ²	-0.270 kN/m ²
A (face 4)	2.400 m	-1.276 kN/m ²	-0.220 kN/m ²	-1.056 kN/m ²
B (face 4)	9.600 m	-0.785 kN/m ²	-0.220 kN/m ²	-0.565 kN/m ²
C (face 4)	24.400 m	-0.491 kN/m ²	-0.220 kN/m ²	-0.270 kN/m ²

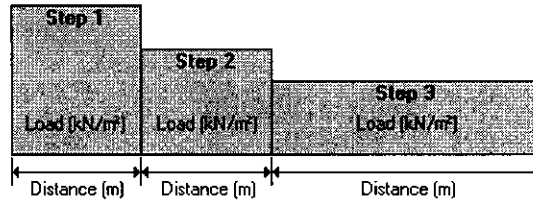


Selected wind load type:

Stepped Wind Load (See table below for details)

Step	Load (kN/m ²)	Distance (m)
1	-1.056	2.400
2	-0.565	3.500
3	-0.565	0.000

Result value is -0.785 kN/m²



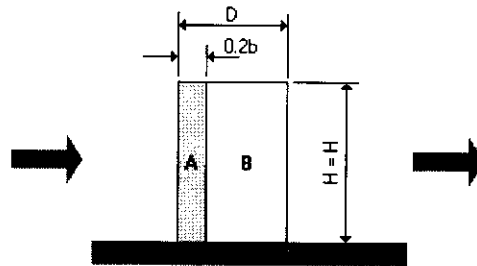
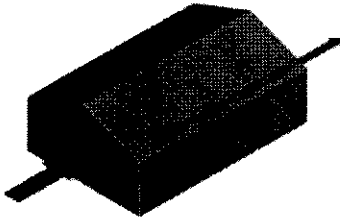


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TITLE **Esquire Glass Glossop - Extension**

Wall results, wind loads on face 4

Zone	Zone length	External applied loads	Internal applied loads	Overall applied loads
Windward	12.000 m	+0.611 kN/m ²	-0.220 kN/m ²	+0.831 kN/m ²
Leeward	12.000 m	-0.509 kN/m ²	-0.220 kN/m ²	-0.289 kN/m ²
A (face 1)	3.336 m	-1.324 kN/m ²	-0.220 kN/m ²	-1.104 kN/m ²
B (face 1)	8.664 m	-0.815 kN/m ²	-0.220 kN/m ²	-0.594 kN/m ²
A (face 3)	3.336 m	-1.324 kN/m ²	-0.220 kN/m ²	-1.104 kN/m ²
B (face 3)	8.664 m	-0.815 kN/m ²	-0.220 kN/m ²	-0.594 kN/m ²

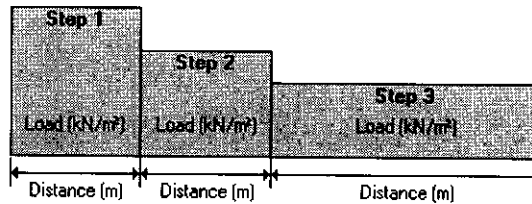


Selected wind load type:

Stepped Wind Load (See table below for details)

Step	Load (kN/m ²)	Distance (m)
1	-1.104	3.336
2	-0.594	1.664
3	-0.594	0.000

Result value is -0.934 kN/m²





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TITLE Esquire Glass Glossop - Extension

Crane Beam Design Program

Design Information :

Max. Lift	5.0 Tonne	Bridge Weight	1675 kg
Bridge Span	10.35 m	Crab Weight	465 kg
Frame Centres	5.700 m	Wheel Centres	1.80 m
Impact Factor	1.10	Min. Hook Approach	0.63 m
Est Rail self weight	70 kg/m	Max Allowable Deflection	9.5 mm

Vertical Load (dynamic) :

Max. Unfactored Wheel Loads	32.22 kN
Coexistent Wheel Load at opposite end of bridge	6.31 kN

Horizontal Loads :

a) Surge (10% of crab + lift)	Wheel Load	1.34 kN	on each wheel
b) Crabbing	Wheel Load	4.21 kN	
c) Longitudinal Surge (5% static wheel load)	Wheel Load	1.46 kN	

Crane Beam Design

Under Vertical Loads :

Possible max vertical ultimate BM with :- 1 wheel midspan	104.43 kNm
Intersection c of g & wheel at midspan	108.09 kNm
Vertical Ultimate Bending Moment	108.09 kNm
Minimum Vertical Inertia (Ixx)	5802 cm ⁴

Under Horizontal Loads :

Possible max horizontal ultimate BM 1 wheel midspan	Under Surge 4.18 kNm	Under Crabbing 6.06 kNm
Intersection c of g & wheel at midspan	4.33 kNm	
Force to Stabilise Compression Flange (2.5% Vertical Load)	2.70 kNm	
Horizontal Ultimate Bending Moment	8.76 kNm	
Minimum Horizontal Inertia (Ixx)	834 cm ⁴	

Loads to Frames - Maximum Reaction with 1 wheel over support :

	Max Reaction	Coexistent Reaction
Vertical Reaction (Unfactored)	58.18 kN	14.53 kN
Horizontal Reaction (Unfactored)	2.26 kN	2.26 kN

Site: Esquire Glass**Comment: Purlins****PURLIN SELECTION****Z PURLIN SYSTEM TYPE: SLEEVED****METAL CLADDING****Dimensions & Limits**

Span: 5.850 m

Centres: 1.500 m

Deflection Limit: Span/ 180

Design Loads in kN/m²

Dead Load : 0.150

Service Load : 0.150

Super Load : 0.600

Wind Uplift Load : 0.674

SELECTED PURLINS

Section	Pass			Unfactored load for deflection	Ultimate download	Ultimate wind uplift
Required Loads in kN/m² :				0.900	1.380	0.794
Capacity Loads in kN/m² :						
Section Reference	Weight in kg/m	Restraint				
172.Z.14	3.60	0	Sags	1.112	1.764	1.040

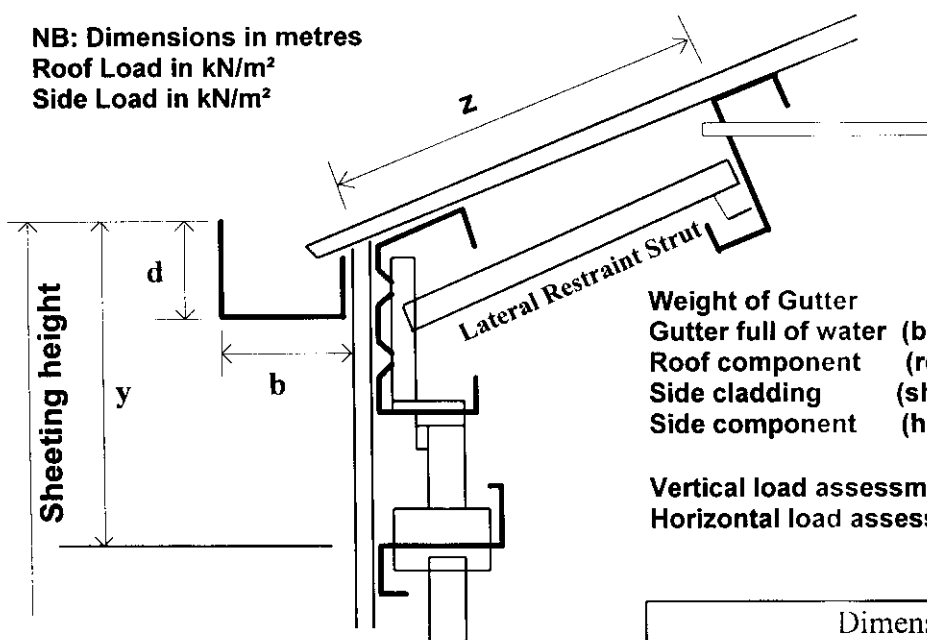
The above values assume that the cladding panel or liner tray is screw fixed to the section(s) at a maximum spacing of 600mm.

Site: Esquire Glass

Comment: Gutter Support

EAVES BEAM SELECTION

NB: Dimensions in metres
Roof Load in kN/m²
Side Load in kN/m²



Working Loads
(kN/m)

- Weight of Gutter A
- Gutter full of water (b x d x 10) B
- Roof component (roof load x 0.5 z) C
- Side cladding (sheet weight x height) D
- Side component (horz. wind load x 0.5 y) H

Vertical load assessment = A + B + C + D
Horizontal load assessment = H

Dimensions & limits

Design loads in kN/m

Vertical load : 1.100

Horizontal load : 0.332

Span : 5.848 m

No. lateral struts : 1

Deflection limit : Span / 200 (29mm)

Eaves Section reference	Weight (kg/m)	No. of lateral struts	Load to capacity ratios			
			Ultimate Bi-Axial Bending	Vertical deflection check	Vertical shear check	Pass or Fail
			Combined			
170.E.20	6.32	1	0.508	0.733	0.115	Pass

Site: Esquire Glass

Comment: GL 9, 7 and 5 Cladding Support Rail

SIDE RAIL ENTERED DATA**SYSTEM TYPE :****C Sleeved System****Dimensions & Limits****Design Loads in kN/m²**

Span : 5.850 m

Cladding Weight: 0.125

Centres : 1.800 m

Wind Pressure: 1.007

Deflection Limit : Span / 150(39mm)

Wind Suction 0.765

No. of Supports: 1

Cladding : Restraining

SELECTED SIDE RAILS

Span No.	Reference	Weight kg/m	Factored Loads (kN/m ²)		Capacities (kN/m ²)		Unfactored Load (defln)	Deflection Capacity (kN/m ²)	Pass / Fail
			Pressure	Suction	Pressure	Suction			
1	202.C.14	3.93	1.410	1.071	1.657	1.657	1.007	1.598	Pass

The above values assume that the cladding panel or liner tray is screw fixed to the section(s) at a maximum spacing of 600mm

/ MetSPEC /®

DESIGN SUITE

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LIMITED

Broadwell Road, Oldbury, West Midlands B69 4HE

Tel: 0121 601 6000 Fax: 0121 601 6111

Email: purlin@metsec.com

Website: <http://www.metsec.com>

Sheet No: 21 of

Job No.: 07155

Designer: JD

Date: 02/12/2007

Registered Details:-

Dalton Consultants

Unit 18 S4 Brookes Mill, Armitage Bridge,
Huddersfield, HD4 7NR

Tel: 01484 666262 Fax: 01484 666611

Email: jd@daltonconsultants.co.uk

Site: Esquire Glass

Comment: GL 9 Brickwork Support Rail

SIDE RAIL ENTERED DATA

SYSTEM TYPE :

C Sleeved System

Dimensions & Limits

Design Loads in kN/m²

Span : 5.850 m

Cladding Weight: 0.125

Centres : 1.800 m

Wind Pressure: 1.007

Deflection Limit : Span / 360(16mm)

Wind Suction 0.765

No. of Supports: 1

Cladding : Restraining

SELECTED SIDE RAILS

Span No.	Reference	Weight kg/m	Factored Loads (kN/m ²)		Capacities (kN/m ²)		Unfactored Load (defln)	Deflection Capacity (kN/m ²)	Pass / Fail
			Pressure	Suction	Pressure	Suction			
1	202.C.23	6.35	1.410	1.071	3.466	3.466	1.007	1.071	Pass

The above values assume that the cladding panel or liner tray is screw fixed to the section(s) at a maximum spacing of 600mm.

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DESIGN SUITE

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Huddersfield, HD4 7NR

Tel: 01484 666262 Fax: 01484 666611

Email: jd@daltonconsultants.co.uk

Site: Esquire Glass

Comment: GL D Cladding Rail

SIDE RAIL ENTERED DATA

SYSTEM TYPE :

Z Butt System

Dimensions & Limits

Design Loads in kN/m²

Span : 7.200 m

Cladding Weight: 0.125

Centres : 1.400 m

Wind Pressure: 0.831

Deflection Limit : Span / 150(48mm)

Wind Suction 0.934

No. of Supports: 2

Cladding : Restraining

SELECTED SIDE RAILS

Span No.	Reference	Weight kg/m	Factored Loads (kN/m ²)		Capacities (kN/m ²)		Unfactored Load (defln)	Deflection Capacity (kN/m ²)	Pass / Fail
			Pressure	Suction	Pressure	Suction			
1	202.Z.23	6.35	1.163	1.308	2.282	1.500	0.934	1.004	Pass

The above values assume that the cladding panel or liner tray is screw fixed to the section(s) at a maximum spacing of 600mm.

Site: Esquire Glass

Comment: GL D Bottom Cladding Rail

SIDE RAIL ENTERED DATA**SYSTEM TYPE :****Z Butt System****Dimensions & Limits****Design Loads in kN/m²**

Span : 7.200 m

Cladding Weight: 0.125

Centres : 0.800 m

Wind Pressure: 0.831

Deflection Limit : Span / 150(48mm)

Wind Suction 0.934

No. of Supports: 2

Cladding : Restraining

SELECTED SIDE RAILS

Span No.	Reference	Weight kg/m	Factored Loads (kN/m ²)		Capacities (kN/m ²)		Unfactored Load (defln)	Deflection Capacity (kN/m ²)	Pass / Fail
			Pressure	Suction	Pressure	Suction			
1	202.Z.14	3.93	1.163	1.308	1.967	1.659	0.934	1.092	Pass

The above values assume that the cladding panel or liner tray is screw fixed to the section(s) at a maximum spacing of 600mm.

Site: Esquire Glass

Comment: GL B and J Cladding Rails

SIDE RAIL ENTERED DATA**SYSTEM TYPE :****Z Butt System****Dimensions & Limits****Design Loads in kN/m²**

Span : 5.000 m

Cladding Weight: 0.125

Centres : 2.000 m

Wind Pressure: 0.831

Deflection Limit : Span / 150(33mm)

Wind Suction 0.934

No. of Supports: 1

Cladding : Restraining

SELECTED SIDE RAILS

Span No.	Reference	Weight kg/m	Factored Loads (kN/m ²)		Capacities (kN/m ²)		Unfactored Load (defln)	Deflection Capacity (kN/m ²)	Pass / Fail
			Pressure	Suction	Pressure	Suction			
1	172.Z.15	3.85	1.163	1.308	1.480	1.480	0.934	0.958	Pass

The above values assume that the cladding panel or liner tray is screw fixed to the section(s) at a maximum spacing of 600mm.