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HORIZONTAL LINE LOAD, UNIFORMLY DISTRIBUTED LOAD AND POINT LOAD TESTING OF ALU + LIMITED SLS34, MLS50 AND PBS35-FL SURFACE MOUNTED LOUVRES, TO THE REQUIREMENTS OF BS 6180 : 2011

REPORT No. GT8091/1/CDL/16

Prepared for:	ALU + Ltd Unit 1 Maguire Industrial Estate 219 Torrington Avenue Coventry CV4 9AP
For the attention of:	Mr R Rensch
Date:	21st April 2016

HORIZONTAL LINE LOAD, UNIFORMLY DISTRIBUTED LOAD AND POINT LOAD TESTING OF ALU + LIMITED SLS34, MLS50 AND PBS35-FL SURFACE MOUNTED LOUVRES, TO THE REQUIREMENTS OF BS 6180 : 2011

SUMMARY

ALU + Ltd SLS34, MLS50 and PBS35-FL surface mounted louvres have been subjected to a horizontal line load of 0.74 kN/m, a uniformly distributed load of 1.0 kN/m² and a point load of 0.5 kN.

All three louvre types complied with the deflection requirements of BS 6180 : 2011 for the load tests performed.

The results are summarised in the table below:

Louvre Type	0.74 kN/m Horizontal Line Load	1.0 kN/m² Uniformly Distributed Load	0.5 kN Point Load	BS 6180 Requirement ≤ 25.0mm
	Maximum Deflection, mm			
SLS34	5.29	2.23	15.19	Complies
MLS50	2.13	1.20	4.77	Complies
PBS35-FL	4.31	0.86	1.94	Complies

1 INTRODUCTION

Building Investigation and Testing Services (Surrey) Ltd (❖B.I.T.S.❖) have been requested by Mr R Rensch of ALU + Ltd to carry out loading tests on three types of their surface mounted louvres. The loading tests were to be carried out in accordance with the requirements of Table 2 of BS 6180 : 2011 "Barriers in and about buildings – Code of practice"

This work was authorised by the ALU + Ltd email dated the 2nd February 2016.

2 MATERIAL RECEIVED

The samples were received on the 29th February 2016. One SLS34, one MLS50 and one PBS35-FL surface mounted aluminium louvres mounted on aluminium box section sub-frames to facilitate testing. The SLS34 and MLS50 louvres are both 1m in width and 2m in height. The PBS35-FL is 1.06m in width and 2.1m in height.

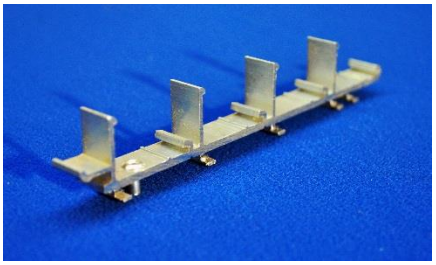
Each louvre was fixed to a sub-frame which consisted of 50mm by 38mm aluminium box section with a 3.5mm wall thickness. The SLS34 and MLS50 have six 35mm long, 4.8mm diameter self-tapping pan head screws fixing the louvres to the sub-frame, spaced equidistant apart on each side of the louvre. There being twelve in total. The PBS35-FL louvre has seven 43mm long, 4.8mm diameter self-drilling flange head screws fixing the louvre to the sub-frame, spaced equidistant apart on each side plus two more top and bottom, eighteen in total.

2.1 ALU + SLS34

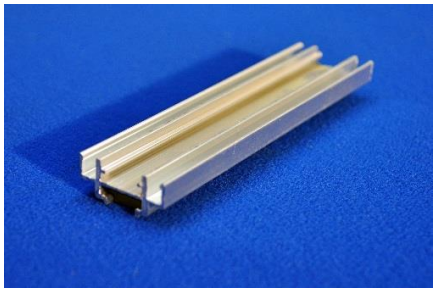
The louvre is shown on the manufacturer's drawing in Appendix A.

The ALU + SLS34 louvre is 1000mm wide by 2000mm high by 40mm deep. It consists of 58 horizontal aluminium blades 986mm long, 1.3mm thick and 43mm in depth, clipped in at the centre rib and at both sides over a width of 12mm. The distance from the bottom of a blade to the bottom of the blade below it is 34mm. The profile of the blade and frame are shown in photographs 1, 2 and 3.

Photograph 1
Showing blade profile



Photograph 2
Showing a section of the 12mm wide clip, which slides into the central rib shown in Photograph 3



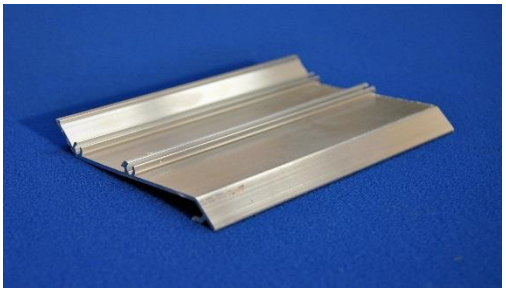
Photograph 3
Showing the profile of the central rib

Along the sides of the louvre there are 6 screws, 32mm long and 3.8mm diameter countersunk self-drilling screws which fix individual blades to the louvre frame. The first screw fixes the tenth blade, 338mm from the base. The second screw fixes the twenty first blade 712mm from the base, the third screw fixes the thirty first blade 1052mm from the base, the fourth screw fixes the thirty second blade 1086mm from the base, the fifth screw fixes the thirty eighth blade 1290mm from the base, the sixth screw fixes the forty eighth blade 1630mm from the base.

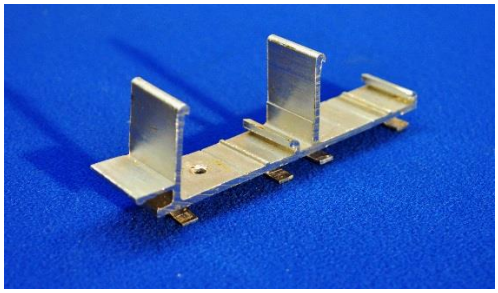
2.2 ALU + MLS50

The louvre is shown in on the manufacturer's drawing in Appendix A.

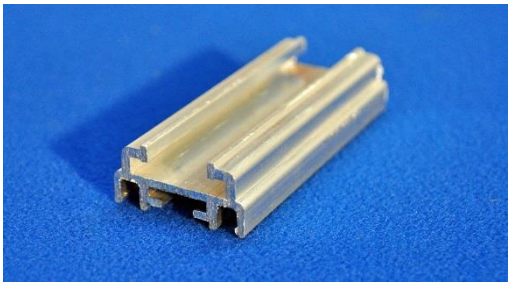
The ALU + MLS50 is 1000mm wide by 2000mm high by 63mm deep. It consists of 40 horizontal aluminium blades approximately 984mm long by 1.5mm thick and 85mm deep. These are clipped at the centre rib and at both ends over a width of approximately 20mm. The distance from the bottom of a blade to the bottom of the blade below it is 50mm. The profile of the blade and clips are shown in photographs 4, 5 and 6.



Photograph 4
Showing blade profile



Photograph 5
Showing a section of the 20mm wide clip, which slides into the central rib shown in Photograph 6



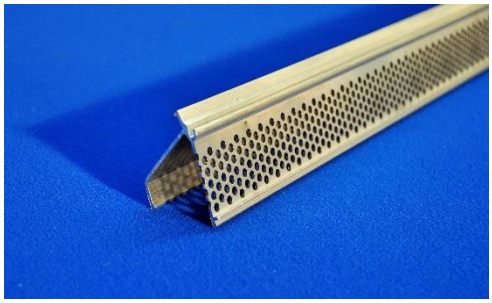
Photograph 6
Showing the profile of the central rib

A single screw on each side of the louvre fixes the twenty first blade up from the base. This screw is a 32mm long, 3.8mm diameter counter sunk self –drilling screw.

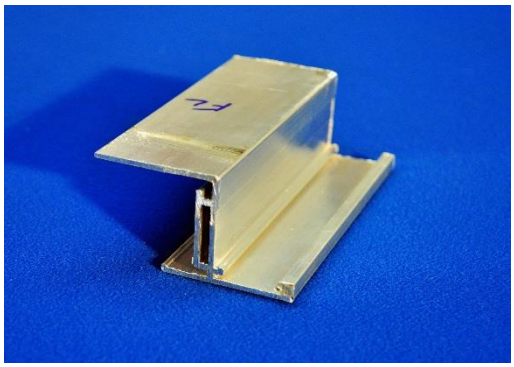
2.3 ALU + PBS35-FL

The louvre is shown in on the manufacturer's drawing in Appendix A.

The ALU + PBS35-FL is 1060mm wide, 2100mm high and 34mm thick. It consists of fifty eight horizontal aluminium blades 1000mm long by 1.3mm thick and 30mm deep. The profile of the blade and frame are shown in photographs 7 and 8.



Photograph 7
Showing blade profile



Photograph 8
Showing sub-frame

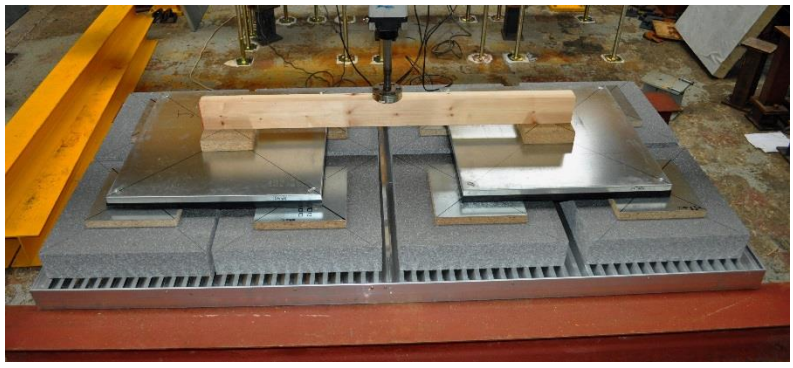
3 TEST REQUIREMENT

BS 6180 : 2011 "Barriers in and about buildings – Code of practice", in Table 2 gives the minimum horizontal loads for parapets, barriers and balustrades. These are a uniformly distributed load applied to the infill, of 1.0 kN/m², a horizontal uniformly distributed line load of 0.74 kN/m and a point load of 0.5 kN.

4 TEST PROCEDURE

4.1 UNIFORMLY DISTRIBUTED LOAD

To facilitate testing each of the louvres in turn was clamped horizontally between two Universal Columns using three small G-clamps fitted to the top, centre and bottom of each side of the sub-frame, the louvre was screwed to. The Universal Columns enable the louvre to be held off the floor, allowing the positioning of dial gauges beneath the louvre to measure deflection.
Photograph 9 shows the test set up.



Photograph 9
Showing the application of the UDL

The load applied was 1.0 kN/m², the total load was 2 kN.

4.2 UNIFORMLY DISTRIBUTED LINE LOAD

To facilitate this test each louvre type was again clamped to two Universal Columns, this time vertically. A reaction frame with three calibrated pneumatic rams was positioned adjacent to the louvre under test. Each ram has a 320mm long neoprene covered spreader plate mounted on the front. These were set up to load the louvre horizontally over its whole width.

The load applied was 0.74 kN/m, the total load was 0.74 kN.

Photograph 10 shows the test set up.

Photograph 10
Showing the application of the line load

4.3 POINT LOAD

Using the same set up as for the above Uniformly Distributed Line Load a single pneumatic ram acting via a 50mm by 50mm wooden cube, was positioned to load the louvre with a load of 0.5 kN.

A bedding load equal to the test load is applied for 5 minutes. The load was then removed. After a further 5 minutes recovery from the bedding load, zero deflection reading was taken using dial gauges.

The test load was applied incrementally, with the deflection recorded at each increment. When the full load was achieved an instant deflection reading was recorded. The deflection was again recorded after 5 minutes at full load. The load was then removed and the deflection measured immediately and again after a further 5 minutes. Photograph 11 shows the test set up.

Photograph 11
Showing the application of the point load

For the SLS34 and the MLS50 louvres the point load was applied midspan between the edge and the centre rail. For the PBS35-FL louvre the load was applied to the centre of the louvre. All three point loads were applied 1100mm up from the bottom of the louvre.

5 RESULTS

The results are only valid for the samples tested.

5.1 UNIFORMLY DISTRIBUTED LOAD APPLIED TO ALU + SLS34 - BOX

Tested on the 16th March 2016.

Load, kN	Time, minutes	Deflection of louvre, mm				Requirement of BS 6180 : 2011
		1	2	3	4	
0.33	0	0.06	0.49	0.05	0.12	≤25.0mm
0.66	0	0.13	0.72	0.10	0.30	
0.96	0	0.19	1.06	0.14	0.49	
1.26	0	0.25	1.34	0.18	0.69	
1.60	0	0.31	1.83	0.24	0.95	
2.00	0	0.38	2.20	0.30	1.22	
2.00	5	0.39	2.23	0.30	1.23	
0	0	0.01	0.20	0.01	0.00	
0	5	0.01	0.01	0.00	0.00	

Deflection measurement positions:
1. Top of louvre at centre line
2. Centre of louvre
3. Bottom of louvre at centre line
4. 9th blade up from base, 250mm in from right hand side

5.2 UNIFORMLY DISTRIBUTED LOAD APPLIED TO ALU + MLS50 - BOX

Tested on the 17th March 2016.

Load, kN	Time, minutes	Deflection of louvre, mm				Requirement of BS 6180 : 2011
		1	2	3	4	
0.33	0	0.05	0.23	0.05	0.15	≤25.0mm
0.66	0	0.09	0.45	0.11	0.29	
0.96	0	0.14	0.63	0.17	0.40	
1.26	0	0.18	0.78	0.23	0.48	
1.60	0	0.23	0.97	0.30	0.58	
2.00	0	0.30	1.19	0.37	0.70	
2.00	5	0.32	1.20	0.39	0.72	
0	0	0.07	0.19	0.10	0.23	
0	5	0.02	0.18	0.07	0.20	

Deflection measurement positions:

1. Top of louvre at centre line
2. Centre of louvre
3. Bottom of louvre at centre line
4. 6th blade up from base, 250mm in from right hand side

5.3 UNIFORMLY DISTRIBUTED LOAD APPLIED TO ALU + PBS34-FL - BOX

Tested on the 17th March 2016.

Load, kN	Time, minutes	Deflection of louvre, mm				Requirement of BS 6180 : 2011
		1	2	3	4	
0.33	0	0.04	0.11	0.04	0.13	≤25.0mm
0.66	0	0.08	0.24	0.08	0.24	
0.96	0	0.12	0.37	0.12	0.36	
1.26	0	0.16	0.51	0.15	0.48	
1.60	0	0.21	0.66	0.19	0.60	
2.00	0	0.28	0.85	0.25	0.76	
2.00	5	0.29	0.86	0.25	0.77	
0	0	0.07	0.05	0.03	0.27	
0	5	0.04	0.03	0.02	0.21	

Deflection measurement positions:

1. Top of louvre at centre line
2. Centre of louvre
3. Bottom of louvre at centre line
4. 12th blade up from base, 250mm in from right hand side

5.4 UNIFRMLY DISTRIBUTED LINE LOAD APPLIED TO ALU + SLS34 - BOX

Note: Load applied at a height of 1100mm.

Tested on the 7th April 2016.

Load, kN	Time, minutes	Deflection of louvre, mm			Requirement of BS 6180 : 2011
		Left hand side	Centre	Right hand side	
0.1	0	0.17	1.04	0.15	≤25.0mm
0.2	0	0.25	1.11	0.18	
0.3	0	0.36	1.52	0.26	
0.4	0	0.60	2.52	0.60	
0.5	0	0.74	3.72	0.69	
0.6	0	0.99	4.36	0.89	
0.74	0	1.11	5.27	0.97	
0.74	5	1.24	5.29	1.19	
0	0	0.13	1.12	0.11	
0	5	0.07	1.07	0.06	

5.5 UNIFRMLY DISTRIBUTED LINE LOAD APPLIED TO ALU + MLS50 - BOX

Note: Load applied at a height of 1100mm.

Tested on the 7th April 2016.

Load, kN	Time, minutes	Deflection of louvre, mm			Requirement of BS 6180 : 2011
		Left hand side	Centre	Right hand side	
0.1	0	0.00	0.37	0.00	≤25.0mm
0.2	0	0.01	0.89	0.00	
0.3	0	0.04	1.33	0.02	
0.4	0	0.09	1.71	0.13	
0.5	0	0.23	1.87	0.28	
0.6	0	0.44	1.94	0.51	
0.74	0	0.73	2.11	0.78	
0.74	5	0.78	2.13	0.83	
0	0	0.03	0.09	0.05	
0	5	0.03	0.05	0.02	

5.6 UNIFRMLY DISTRIBUTED LINE LOAD APPLIED TO ALU + PBS35 - FL - BOX

Note: Load applied at a height of 1100mm.

Tested on the 8th April 2016.

Load, kN	Time, minutes	Deflection of louvre, mm			Requirement of BS 6180 : 2011
		Left hand side	Centre	Right hand side	
0.1	0	0.38	1.20	0.45	≤25.0mm
0.2	0	0.51	1.54	0.55	
0.3	0	0.63	1.93	0.62	
0.4	0	0.74	2.48	0.71	
0.5	0	0.80	3.11	0.77	
0.6	0	0.92	3.64	0.89	
0.74	0	1.01	4.29	0.97	
0.74	5	1.03	4.31	0.98	
0	0	0.07	0.04	0.08	
0	5	0.04	0.01	0.05	

5.7 POINT LOAD, 0.5 KN APPLIED TO A SINGLE BLADE OF ALU + SLS34 - BOX

Tested on the 7th April 2016.

Load, kN	Time, minutes	Deflection, mm	Requirement of BS 6180 : 2011
0.25	0	9.30	≤25.0mm
0.50	0	15.11	
0.50	5	15.19	
0	0	1.88	
0	5	1.79	

5.8 POINT LOAD, 0.5 KN APPLIED TO A SINGLE BLADE OF ALU + MLS50 - BOX

Tested on the 7th April 2016.

Load, kN	Time, minutes	Deflection, mm	Requirement of BS 6180 : 2011
0.25	0	1.93	≤25.0mm
0.50	0	4.76	
0.50	5	4.77	
0	0	0.28	
0	5	0.23	

5.9 POINT LOAD, 0.5 KN APPLIED TO A SINGLE BLADE OF ALU + PBS35 - FL - BOX

Tested on the 8th April 2016.

Load, kN	Time, minutes	Deflection, mm	Requirement of BS 6180 : 2011
0.25	0	1.42	≤25.0mm
0.50	0	1.93	
0.50	5	1.94	
0	0	0.02	
0	5	0.02	

6 CONCLUSION

Building Investigation and Testing Services (Surrey) Ltd (❖B.I.T.S.❖) have been requested by Mr R Rensch of ALU + to carry out loading tests on three types of their surface mounted louvres, namely the ALU + Ltd SLS34 - Box, ALU + MLS50 – Box and ALU + PBS35-FL. The testing to be in accordance with the load requirements contained within Table 2 of BS 6180 : 2011 “Barriers in and about buildings – Code of practice”.

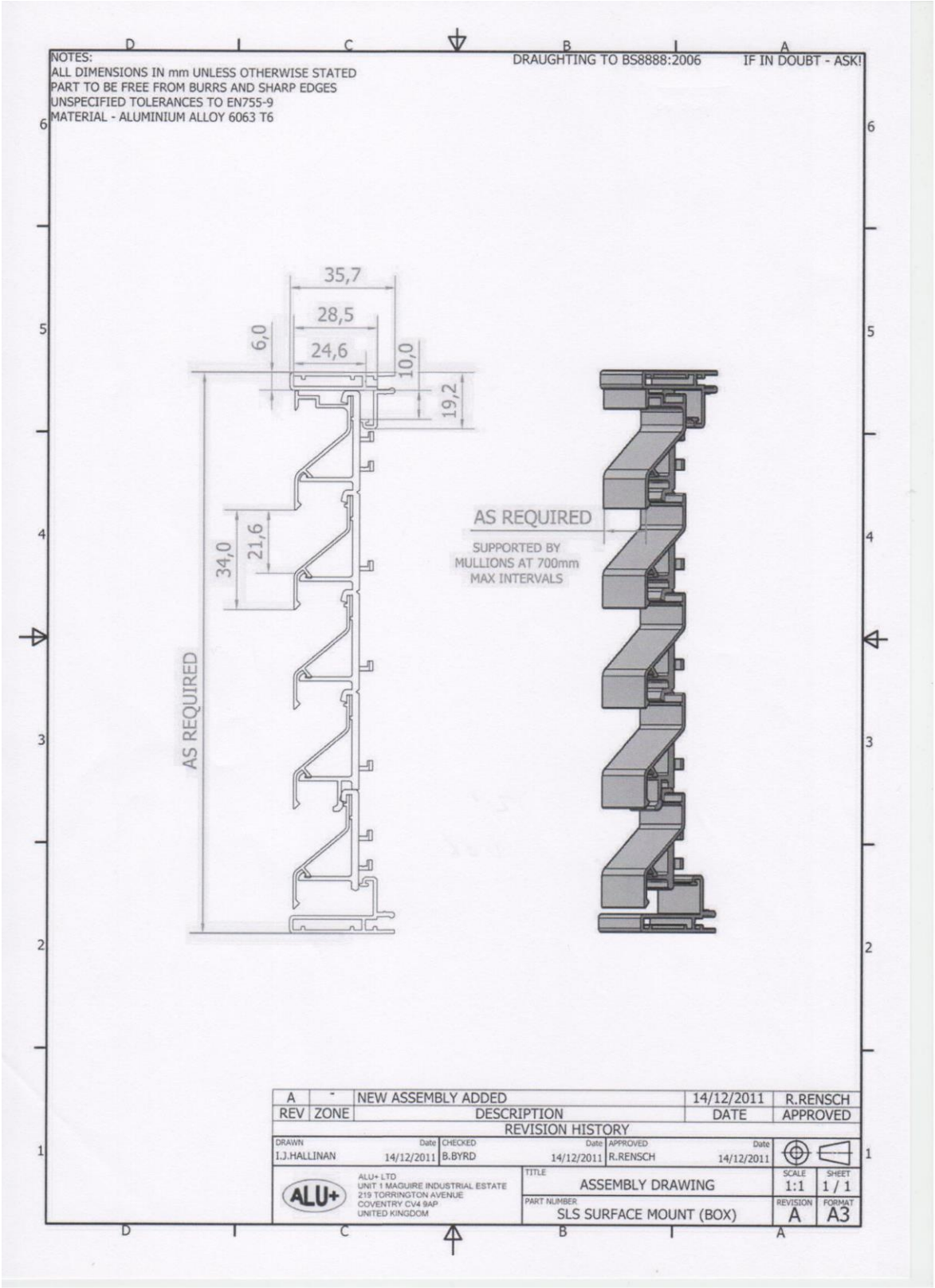
A horizontal uniformly distributed line load of 0.74 kN/m, a uniformly distributed load of 1.0 kN/m² over the whole louvre and a point load of 0.5 kN have been applied.

All three types of louvre tested comply with the requirements of BS 6180 for the tests performed.

Reported by.....	Checked & Authorised by.....
Mr C D LORAINE	Mr R P P FRYER
Test Engineer	Building Consultant

APPENDIX A

MANUFACTURER'S DRAWINGS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UNSPECIFIED TOLERANCES TO EN755-9
MATERIAL - ALUMINIUM ALLOY 6063 T6
DRAUGHTING TO BS8888:2006
IF IN DOUBT - ASK!
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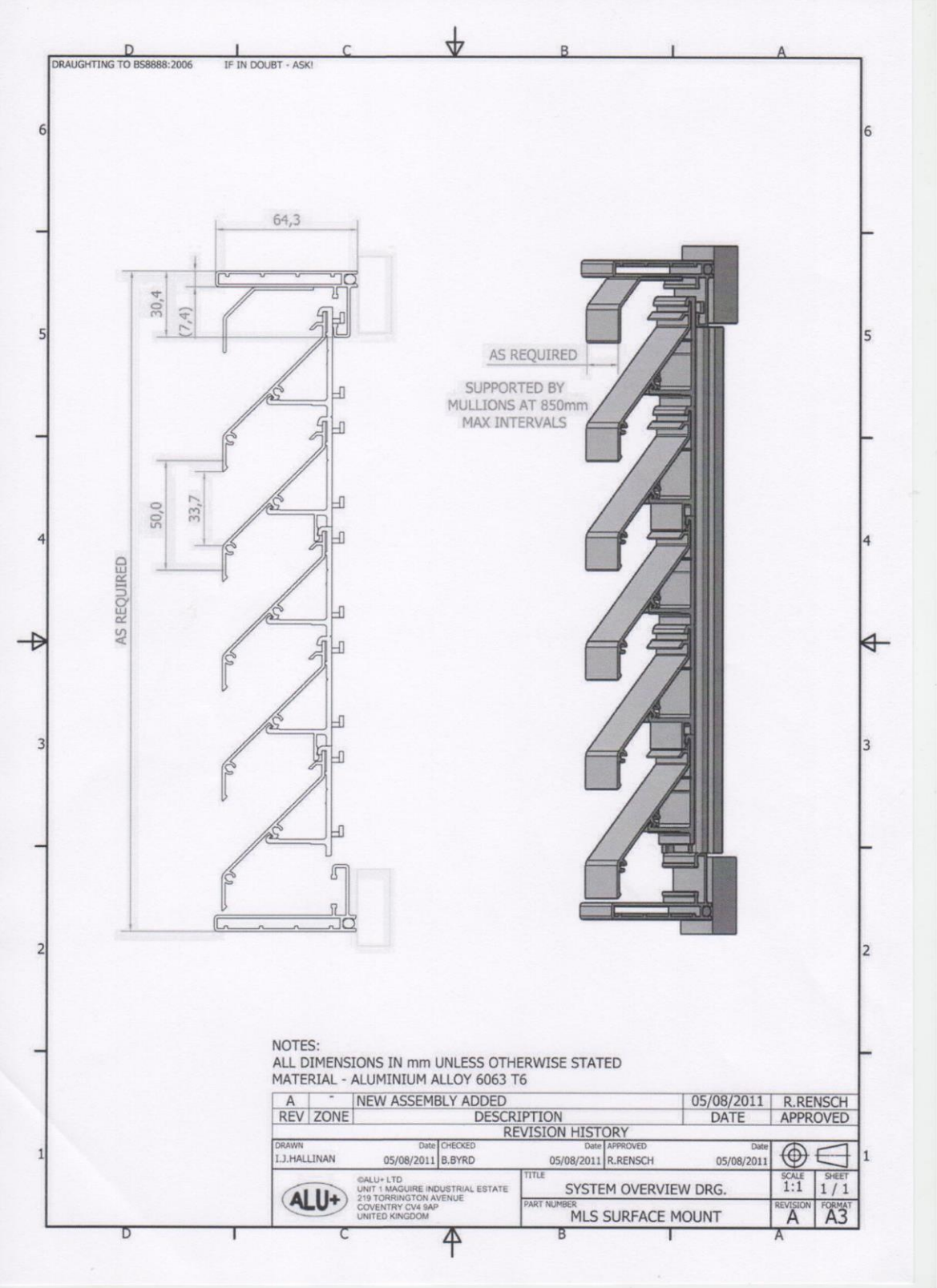
28,5
24,6
6,0
10,0
19,2
34,0
21,6
AS REQUIRED
AS REQUIRED
SUPPORTED BY
MULLIONS AT 700mm
MAX INTERVALS
A - NEW ASSEMBLY ADDED 14/12/2011 R.RENSCH
REV ZONE DESCRIPTION DATE APPROVED
REVISION HISTORY
DRAWN I.J.HALLINAN Date 14/12/2011
CHECKED B.BYRD Date 14/12/2011
APPROVED R.RENSCH Date 14/12/2011
ALU+
ALU+ LTD
UNIT 1 MAGUIRE INDUSTRIAL ESTATE
219 TORRINGTON AVENUE
COVENTRY CV4 9AP
UNITED KINGDOM
TITLE
ASSEMBLY DRAWING
PART NUMBER
SLS SURFACE MOUNT (BOX)
SCALE 1:1
SHEET 1 / 1
REVISION A
FORMAT A3


DRAUGHTING TO BS8888:2006
IF IN DOUBT - ASK!
64,3
30,4
(7,4)
50,0
33,7
AS REQUIRED
AS REQUIRED
SUPPORTED BY MULLIONS AT 850mm MAX INTERVALS
NOTES:
ALL DIMENSIONS IN mm UNLESS OTHERWISE STATED
MATERIAL - ALUMINIUM ALLOY 6063 T6
A - NEW ASSEMBLY ADDED 05/08/2011 R.RENSCH
REV ZONE DESCRIPTION DATE APPROVED
REVISION HISTORY
DRAWN I.J.HALLINAN Date 05/08/2011
CHECKED B.BYRD Date 05/08/2011
APPROVED R.RENSCH Date 05/08/2011
©ALU+ LTD
UNIT 1 MAGUIRE INDUSTRIAL ESTATE
219 TORRINGTON AVENUE
COVENTRY CV4 9AP
UNITED KINGDOM
TITLE SYSTEM OVERVIEW DRG.
PART NUMBER MLS SURFACE MOUNT
SCALE 1:1
SHEET 1 / 1
REVISION A
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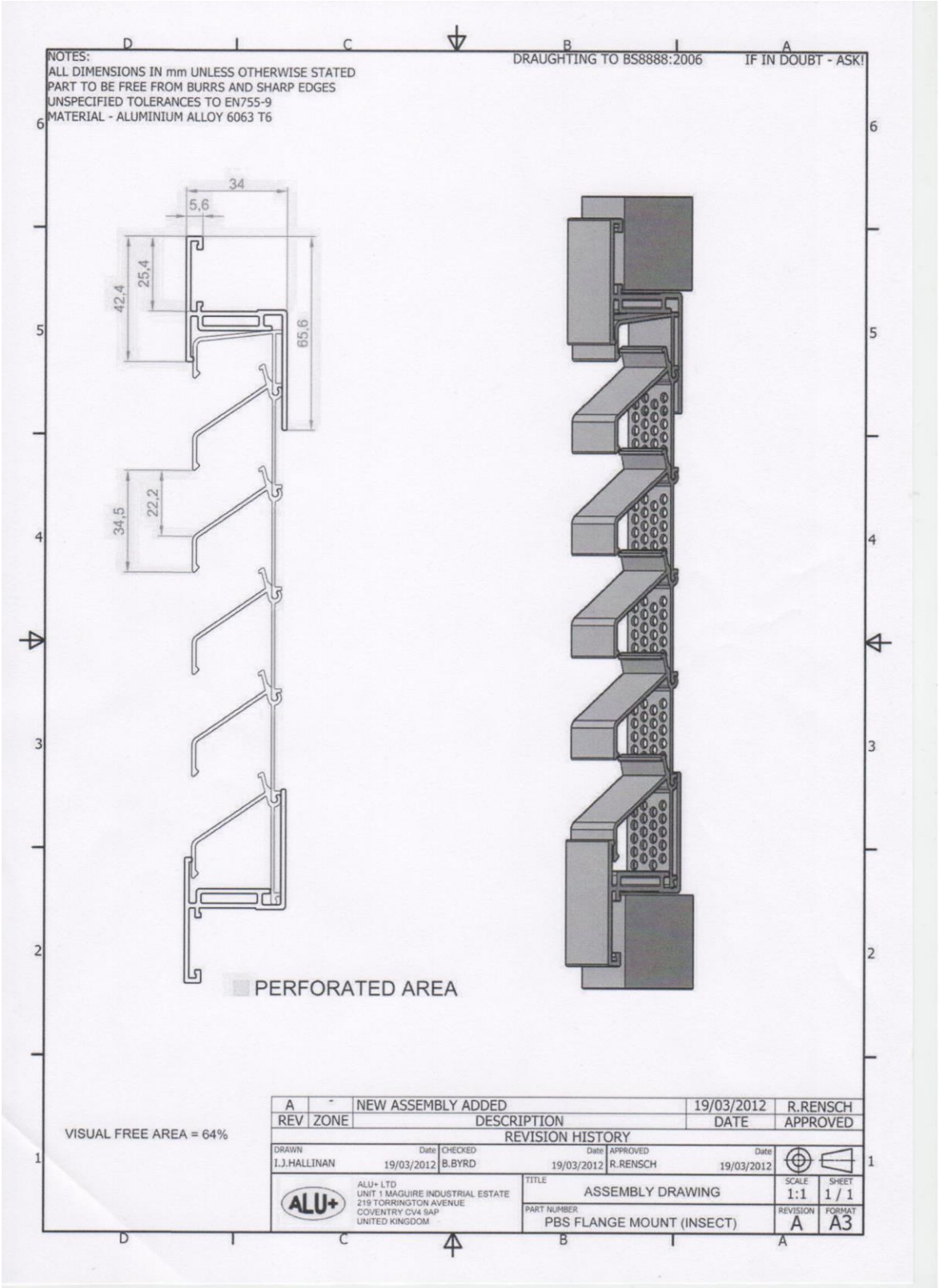
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UNSPECIFIED TOLERANCES TO EN755-9
MATERIAL - ALUMINIUM ALLOY 6063 T6
DRAUGHTING TO BS8888:2006
IF IN DOUBT - ASK!
34
5,6
25,4
42,4
65,6
34,5
22,2
PERFORATED AREA
VISUAL FREE AREA = 64%
A - NEW ASSEMBLY ADDED 19/03/2012 R.RENSCH
REV ZONE DESCRIPTION DATE APPROVED
REVISION HISTORY
DRAWN I.J.HALLINAN Date 19/03/2012
CHECKED B.BYRD Date 19/03/2012
APPROVED R.RENSCH Date 19/03/2012
ALU+ LTD
UNIT 1 MAGUIRE INDUSTRIAL ESTATE
219 TORRINGTON AVENUE
COVENTRY CV4 9AP
UNITED KINGDOM
TITLE ASSEMBLY DRAWING
SCALE 1:1
SHEET 1 / 1
PART NUMBER PBS FLANGE MOUNT (INSECT)
REVISION A
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