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FIELD OF APPLICATION REPORT

IFCA/08008 REVISION C

Field of Application of 30 minute fire resisting double-glazed rooflight assemblies manufactured by Glazing Vision Ltd

Fire Test Standard – EN1363-1: 2012

Prepared on behalf of:

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Ref: #18205

Revision C Issued – June 2018
Due for review – June 2023

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ISSUE AND AMENDMENT RECORD

Rev	Date	Author	Review	Section	Amendments
-	July 2008	CH	DJI	-	-
Rev A	February 2011	MB	DJI	Clauses 2 and 4	Original adhesive used to bond glass to frame is discontinued. Change in adhesive included in product description, together with analysis of variation
Rev B	March 2013	MB	DJI	Clauses 2, 4 and 6	Change in aluminium profile, and additional gasket, included in product description; together with analysis of variation. Review and revalidation of approval
Rev C	June 2018	RK	MB	Various	Review and revalidation of approval. Update to IFC current format. Review of updated test standards

CONTENTS

1. INTRODUCTION

This report has been produced by International Fire Consultants Ltd (IFC) to define the Field of Application for double-glazed rooflight assemblies, manufactured by Glazing Vision Ltd, that are required to provide 30 minutes fire resistance performance, when adjudged against BS EN 1363-1: 20122012. IFC have performed the evaluations/analysis, and preparation of the Field of Application report, on the instruction of Glazing Vision Ltd.

The methodologies used in preparing this document are based upon the guidance in BS ISO/TR 12470; 'Fire resistance tests - Guidance on the application and extension of results'.

It is proposed that variations to the tested specification, as described in the following sections, may be accommodated into assemblies, without reducing their potential to achieve a 30 minute integrity and insulation rating, if tested in accordance with the method and criteria of BS EN 1363-1: 20122012. The omission of information on any components or manufacturing methods does not imply a lack of approval of those details, but these would need to be the subject of a separate analysis. Only variations specifically mentioned are supported by this assessment document, and all other aspects must otherwise be as proven in the test summarised herein.

2. SCOPE OF APPROVAL

2.1 General

It is proposed that this Field of Application Report shall establish the fire resistance performance of a double-glazed rooflight, (when fitted into a proprietary timber/concrete based roof design, with a proven fire resistance of not less than 30 minutes in accordance with BS EN 1363-1: 2012). The rooflight may be installed into roofs that are orientated horizontally, or, with a pitch not exceeding 45 degrees. The maximum size of rooflight will be discussed later and outlined in Section 4.2 of this report.

2.2 Rooflight Specification

The general construction of the rooflight comprises an outer frame formed using extruded profiles of T-section aluminium framing, referenced 'Flushglaze', which is aligned 'on-edge' and bonded at the corner junctions using Recabond 3000. The aluminium outer frame contains a pre-fabricated double-glazed unit (dgu) which comprises an inner single pane of 19mm thick Pyrobel glass, a 20mm thick desiccant filled steel spacer bar and an outer single pane of 6mm thick clear toughened, soft coat low E glass. A Bostic Hot Melt Butyl Sealant ref. P 5125 is used to seal the air-filled unit around its perimeter. See **Figure IFCA/08008C/01** in Appendix A.

The 45mm thick dgu is fitted within the aluminium perimeter framework and bedded on ceramic tape and retained in position using Terostat 8597 HMLC adhesive. An 8mm gap is left between the edge of the dgu and the upstand of the perimeter aluminium framework, and this gap is filled with ceramic wool and capped off with Arbosil 1070 silicone.

The rooflight assembly shall be installed onto a 75mm thick x 150mm deep timber sub-frame (minimum dimensions), having been bedded on ceramic tape and Arbosil 1070 silicone. An additional EPDM bubble gasket is installed between the underside of the dgu and the top edge of the timber sub-frame. The rooflight assembly is secured in position with 50mm long screws, at nominally 500mm centres, passing through the downstand of two opposing edges of the aluminium frame and into the timber sub frame; the heads of screws being concealed underneath a clip-on cover. The timber sub frame is clad on the exposed vertical face with one layer of Type 5 plasterboard. See **Figure IFCA/08008C/01** in Appendix A. Further details of the installation are described in Section 4.3, herein.

3. TEST EVIDENCE

Applicable fire resistance test evidence does exist for the rooflight design and this has been used as the basis for this Field of Application Report. The test was sponsored by Glazing Vision Ltd, and is summarised in Section 3.1 below.

Although there are test methods for evaluating the fire resistance of horizontal "elements of construction", these apply to structural floors that are designed to be loadbearing; and there is no prescribed test method or procedure for glazed rooflights, which are non-loadbearing. The test summarised in Section 3.1 was thus performed using the methodology described in test standard BS EN 1363-1: 1999; which defines the generic furnace conditions, and criteria for failure, for evaluating fire resistance. The rooflight is designed for use in a variety of roof types and so it was not deemed appropriate to use a specific roof type as an associated construction for the test. The test was thus performed on a representative specimen of a rooflight, with a timber sub-frame forming the upstand around the perimeter.

The test was performed in 2007, and the test standard has subsequently been revised; (now BS EN 1363-1: 2012). IFC have performed a comparison of the original and revised standards, and it is our opinion that the revisions would not adversely affect the results of the test; and that the original evidence can still be used to support the approvals herein.

3.1 BRE Report Reference 239658 (13 November 2007)

The test specimen was a 1200mm x 1200mm horizontally orientated glazed rooflight incorporating a double-glazed (dgu) unit, comprising a 6mm clear toughened outer pane, a 16mm steel spacer, an air-filled cavity and a 19mm thick inner pane of Pyrobel glass. The dgu was retained within a framework constructed from sections of on edge 'T' sectioned aluminium framing, which had been bonded at the corner junctions using Recabond 3000.

The aluminium framing was screw fixed to a plasterboard clad timber frame, forming an upstand; to simulate an opening within a roof. Both the perimeter of the dgu and the entire rooflight assembly were bedded on, and sealed with, ceramic tape, glass adhesive and fire rated silicone.

When tested to the appropriate procedures and failure criteria of BS EN 1363-1: 1999 the following observations were made;

- *At 44 minutes into the test an unexposed face thermocouple positioned at the centre of the outer 6mm thick glass pane recorded a temperature rise exceeding 180°C.*

- *At 47 minutes a cotton pad integrity test was performed at the centre of the specimen which resulted in continuous flaming of the cotton pad. (According to the test standard, this constitutes integrity failure).*

- *At 48 minutes a gap had developed between the glazed panel and aluminium frame approximately 10mm wide x 15mm long.*

4. ANALYSIS

The most important aspects of design concerning the fire resistance of glass and glazing under BS EN 1363-1: 2012 test conditions are as follows:

- Orientation of the double-glazed unit
- Maximum size of the rooflight
- Sealing of the pane perimeter, and pane retention
- The ability of the surrounding elements to support the rooflight unit and remain stable whilst enduring erosion of the timber

The bespoke rooflight design will be assessed in respect of the integrity and insulation criteria of BS EN 1363-1: 2012 for 30 minutes.

4.1 Orientation of the Rooflight

Pyrobel glass is a fire resisting glass, with insulating properties, and therefore maintains low temperatures on the unexposed face. The Pyrobel glass used in this design of rooflight is 19mm thick and comprises several layers of conventional soda/lime plate glass which is separated by layers of proprietary 'gel' which solidifies and insulates when activated by exposure to heat. Whilst the glass layers which are exposed directly to the heat source will crack very early on upon heating, the broken pieces of glass will be retained in position by the 'sticky' interlayer, thus maintaining integrity of the pane. As the duration of the fire continues, the exposed face glass layers will gradually fall away and the freshly exposed gel interlayer gradually erodes away, exposing a fresh layer of glass which will have already been broken due to the combination of expansion pressure and uneven heating. This process continues until all the interlayers are consumed and the broken pieces of glass have fallen away.

This process will be exacerbated due to the gravitational effects when this type of glass is used in a horizontal plane, as opposed to a vertical plane; but the test summarised in Section 3.1 demonstrates that the proposed glass can satisfy the required criteria for considerably more than 30 minutes, in the tested arrangement.

Whilst this design of rooflight was originally tested in a horizontal orientation, the gravitational effects can be deemed as being no more onerous when fitted at a gradient. However, as the dgu only 'sits' within the perimeter framework and is adhered by one face only, it is a condition of this report, that the rooflight shall not be installed, at an angle greater than 45 degrees.

On the basis of this analysis, it is our opinion that the proposed orientation of the rooflight, outlined above, will not be the cause of premature integrity failure if a representative specimen were tested to the fire test conditions of BS EN 1363-1: 2012 for 30 minutes.

4.2 Maximum Size of Rooflight

The test outlined in Section 3.1 of this report demonstrates the ability of the 19mm thick Pyrobel glass to achieve in excess of 30 minutes integrity and insulation performance, when installed as part of a dgu in a horizontally orientated rooflight assembly. The size of the test specimen was 1200 x 1200mm.

Due to the level of "over-run" experienced in the fire test outlined in Section 3.1 of this report, beyond the required period of 30 minutes fire resistance, it will be possible to extrapolate this evidence and use it as the basis for justifying an increase in overall size of the rooflight.

However, due to the potentially onerous, and unpredictable, nature of using laminated glass in a horizontal orientation, as already discussed in Section 4.1, the maximum size will have to be limited to a size that will not compromise the required level of fire resistance. The maximum 'kerb' size that can therefore be justified, in either a horizontal plane or at 45 degrees, is as follows:

1500mm x 1500mm

Note: Having a kerb size of 1500mm x 1500mm will entail having a dgu measuring 1508mm x 1508mm.

Subject to all other details being as tested or as outlined in this report, it is our opinion that the above maximum size of rooflight assembly would not be the cause of integrity or insulation failure, if a representative specimen were to be tested in accordance with BS EN 1363-1: 2012 for 30 minutes.

4.3 Installation and Supporting Construction

The rooflight assembly is designed to be surface mounted onto the top edge of a timber sub-frame which lines an aperture created within a roof.

Due to the propensity that timber has to char when exposed to fire, the minimum thickness of the timber sub-frame must remain at 75mm. The timber must also be faced on the inner face and underside, (i.e. those faces which will exposed to the fire), with a minimum of 12.5mm thick "Type 5" plasterboard; which shall be fixed to the sub-frame with screws at maximum 250mm centres, set 25mm from the edge of the plasterboard.

The ceramic tape and Arbosil 1070 silicone, as described in Section 2.2, must also be used to seal the rooflight to the top of the timber sub-frame. Stainless steel screws must be used to secure the aluminium framework to the timber sub-frame. These must be fitted at no greater than nominally 500mm centres, (minimum 2no screws to each side of the rooflight), and be of sufficient length to penetrate the timber sub-frame by at least 30mm.

It is the responsibility of others to ensure that the roof design is capable of providing the required level of fire resistance, when including the proposed aperture. It is also the responsibility of others to ensure that the timber sub-frame is adequately fixed to the structure; and that it is adequately sealed at the interface, to prevent exploitation of gaps by hot furnace gases.

4.4 Change in Type of Adhesive

The specimen proven in the test summarised in Section 3.1 included Betamate 7120 as the adhesive to bond the glass to the horizontal leg of the aluminium frame. This product has now been discontinued by the manufacturer, and Glazing Vision Ltd have proposed Terostat 8597 HMLC adhesive as an alternative product.

IFC are not aware of any fire test evidence to demonstrate the suitability of the alternative product for use in the intended application, and our analysis has been made from first-principles. The following aspects summarise the major points of our analysis, in terms of the contribution provided by the adhesive, and any potentially adverse effects resulting from the substitution;

- Neither of the data sheets for the original, and alternative, adhesives, provided by Glazing Vision Ltd, include any indication as to the relative efficacy of the adhesives under the high temperatures experienced in fire test conditions. Indeed, the efficacy of the original adhesive was not necessarily qualified in the test. However, it is the opinion of IFC that the contribution provided the adhesive, towards the overall fire resistance of the rooflight, is relatively minimal. The DGU will initially remain in position within the frame due to self-weight, and, as the interlayers of the Pyrobel glass activate under heating, the intumescent material exuding from the edge of the glass will maintain a degree of cohesion within the frame.

- Neither of the data sheets include any reference to flaming or ignition temperatures of either adhesive. If flaming were to occur at the perimeter of the assembly, due to ignition of the adhesive, the specimen would fail the integrity criterion; even though the glass pane itself was not breached. However, the adhesive is positioned 'deep' within the glazing pocket, such that it is not directly exposed to the furnace. Furthermore, and more importantly, there is no direct path between the adhesive and the unexposed face, due to the presence of the ceramic fibre tape, Arbosil sealant, and the intumescent material exuding from the edge of the glass. It is thus evident that any potentially adverse effects, resulting from the flaming of the adhesive, can thus be discounted.

It is thus our opinion that a rooflight, otherwise as described and approved within this report, would achieve the assessed integrity and insulation performance, if assembled using the Terostat 8597 adhesive, in lieu of the Betamate product, to bond the DGU to the frame.

Note: This analysis only applies to the contribution provided by, and/or adverse effects resulting from, the use of Terostat 8597 adhesive (as described, herein) under fire test conditions. It is the responsibility of others to ensure that the alternative adhesive is suitable for other 'cold-state' and 'in-service' criteria.

All other materials used to install the glass within the rooflight, (i.e. ceramic fibre tape and Arbosil sealant), remain unchanged from those tested; and are therefore proven to be adequate to seal the perimeter of the pane, and maintain integrity, if tested to BS EN 1363-1: 2012 for the proposed period of 30 minutes.

4.5 Additional variations

It is proposed that an EPDM gasket is added between the underside of the dgu and the top edge of the timber sub frame. It is also proposed that the aluminium extrusion forming the perimeter frame is to be modified to allow the screw fixings to be concealed. IFC are not aware of any fire test evidence to demonstrate the suitability of the alternative details, and our analysis has been made from first-principles. The following aspects summarise the major points of our analysis, in terms of any potentially adverse effects resulting from the variations;

- The EPDM gasket does not contribute to the support of the glass pane, and the gasket does not form part of the sealing around the pane perimeter; this latter aspect being effected by the existing components which remain unchanged. Even if the EPDM were to flame, there is no direct path between the gasket and the unexposed face, due to the presence of the ceramic fibre tape and Arbosil sealant. It is thus evident that any potentially adverse effects, resulting from the flaming of the gasket, can be discounted.
- The change to the perimeter frame, to accept the concealed screw fixings, will not adversely weaken the fixity of the rooflight assembly under fire test conditions; since the screws are on the unexposed face. *It is the responsibility of others to ensure that the alternative extrusion allows adequate fixing capability for other 'cold-state' and 'in-service' criteria.*

It is thus our opinion that these modified components would not be a cause of integrity and insulation performance, if a rooflight, otherwise as described and approved within this report, were tested to BS EN 1363-1: 2012 for the proposed period of 30 minutes.

5. CONCLUSION

It is the opinion of International Fire Consultants Ltd that, if a representative specimen of the proposed rooflight assemblies, by Glazing Vision Ltd, were manufactured and installed in accordance with the requirements of this Assessment Report, and tested for fire resistance, the specimen would satisfy the integrity and insulation criteria of BS EN 1363-1: 2012 for the proposed period of 30 minutes.

6. DECLARATION BY THE APPLICANT

We the undersigned, confirm that, except for that information declared to International Fire Consultants Ltd previously during the original engineering evaluation process, the components, products, and/or assemblies evaluated within IFC Field of Application Report **IFCA/08008 Revision C** have not been altered in any way; and have not subsequently, to our knowledge, been included in a fire test [to the standard against which the evaluation is being carried out] in the form and/or configurations proposed.

We also confirm that we have supplied all information and assurances requested of us, for the purpose of writing this Field of Application Report, and are not aware of any other information that would adversely influence or affect the conclusions of this report.

We agree that if fire test evidence or other information subsequently becomes available, to supply this to IFC in full and seek immediate review of the continuing validity of the original report from IFC. If after review IFC conclude that the original evaluation and report is no longer appropriate, we agree to withdraw it and any references to it from circulation and advise clients and agents accordingly.

Signature: _____

Position: _____

Company: **Glazing Vision Ltd**

7. LIMITATIONS

This assessment addresses itself solely to the ability of the proposed assembly described to satisfy the criteria of the fire resistance test and does not imply any suitability for use with respect to other unspecified criteria.

This document only considers the rooflight construction, manufactured by Glazing Vision Ltd and described herein, and assumes that the surrounding construction will provide no less restraint than the tested assembly, and that it will remain in place and be substantially intact for the full fire resistance period.

Where the constructional information in this report is taken from details provided to IFC and/or fire resistance test reports referenced herein, it is therefore limited to the information given in those documents. It is necessarily dependent upon the accuracy and completeness of that information. Where constructional or manufacturing details are not specified, or discussed herein, it should not, therefore, be taken to infer approval of variation in such details from those tested or otherwise approved.

Any materials specified in this report have been selected and judged primarily on their fire performance. IFC do not claim expertise in areas other than fire safety. Whilst observing all possible care in the specification of solutions, we would draw the reader's attention to the fact that during the construction and procurement process, the materials used should be subjected to more general examination regarding the wider Health and Safety, and CoSHH Regulations. Designers, manufacturers and installers are reminded of their responsibilities under the CDM Regulations; but particularly with regard to installation and maintenance of heavy or inaccessible items.

Where the assessed constructions have not been subject to an on-site audit by IFC, it is the responsibility of anyone using this report to confirm that all aspects of the assemblies fully comply with the descriptions and limitations herein.

The analysis and conclusions within this report are based upon the likely fire resisting performance of a complete assembly that is manufactured and installed in accordance with this document, and offered for fire resistance testing in 'perfect' condition. In practice, management procedures must be in place in any building where the rooflights are installed, to ensure that no parts of the assembly, or the surrounding structure, are damaged or faulty. Any such shortfalls in respect to the condition of the rooflights, or surrounding structure, will invalidate the approval by IFC, and may seriously affect the ability of the assembly to provide the required level of fire resistance performance. Determination of what constitutes wear or damage, and any corrective actions in order to return assemblies to the required condition, should only be carried out following consultation with the manufacturer and IFC.

This report is issued on the basis of test data and information to hand at the time of issue. If contradictory evidence becomes available, IFC reserves the right to withdraw the report unconditionally but not retrospectively.

This Report is provided to the sponsor on the basis that it is a professional independent engineering opinion as to what the fire performance of the construction/system would be should it to be tested to the named standard. It is IFC's experience that such an opinion is normally acceptable in support of an application for building approvals, certainly throughout the UK and in many parts of Europe and the rest of the world.

However, unless IFC have been commissioned to liaise with the Authorities that have jurisdiction for the building in question for the purpose of obtaining the necessary approvals, IFC cannot assure that the document will satisfy the requirements of the particular building regulations for any building being constructed.

It is, therefore, the responsibility of the sponsor to establish whether this evidence is appropriate for the application for which it is being supplied and IFC cannot take responsibility for any costs incurred as a result of any rejection of the document for reasons outside of our control. Early submittal of the Report to the Authorities will minimise any risks in this respect.

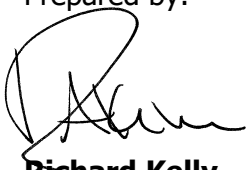
Further, it should be noted that, although this report approves specific integrity and insulation ratings, in relation to the stated test standard, the combination of ratings defined herein may not necessarily be applicable to a particular application. IFC recommend that users of this document confirm what rating is suitable for each scenario, in terms of meeting the requirements of the Local Building Codes and Regulations.

8. VALIDITY

This Field of Application Report has been prepared based on International Fire Consultants Ltd's present knowledge of the product described, the stated testing regime and the submitted test evidence. For this reason, anyone using this document after June 2023 should confirm its ongoing validity.

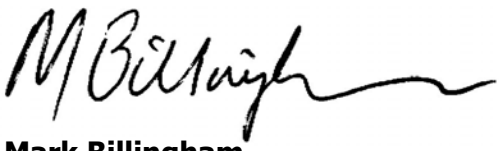
This report is not valid unless the Declaration in Section 6 is signed by the client.

Prepared by:



Richard Kelly
Senior Fire Safety Engineer
International Fire Consultants Ltd. (IFC)

Checked by:



Mark Billingham
Senior Fire Safety Engineer
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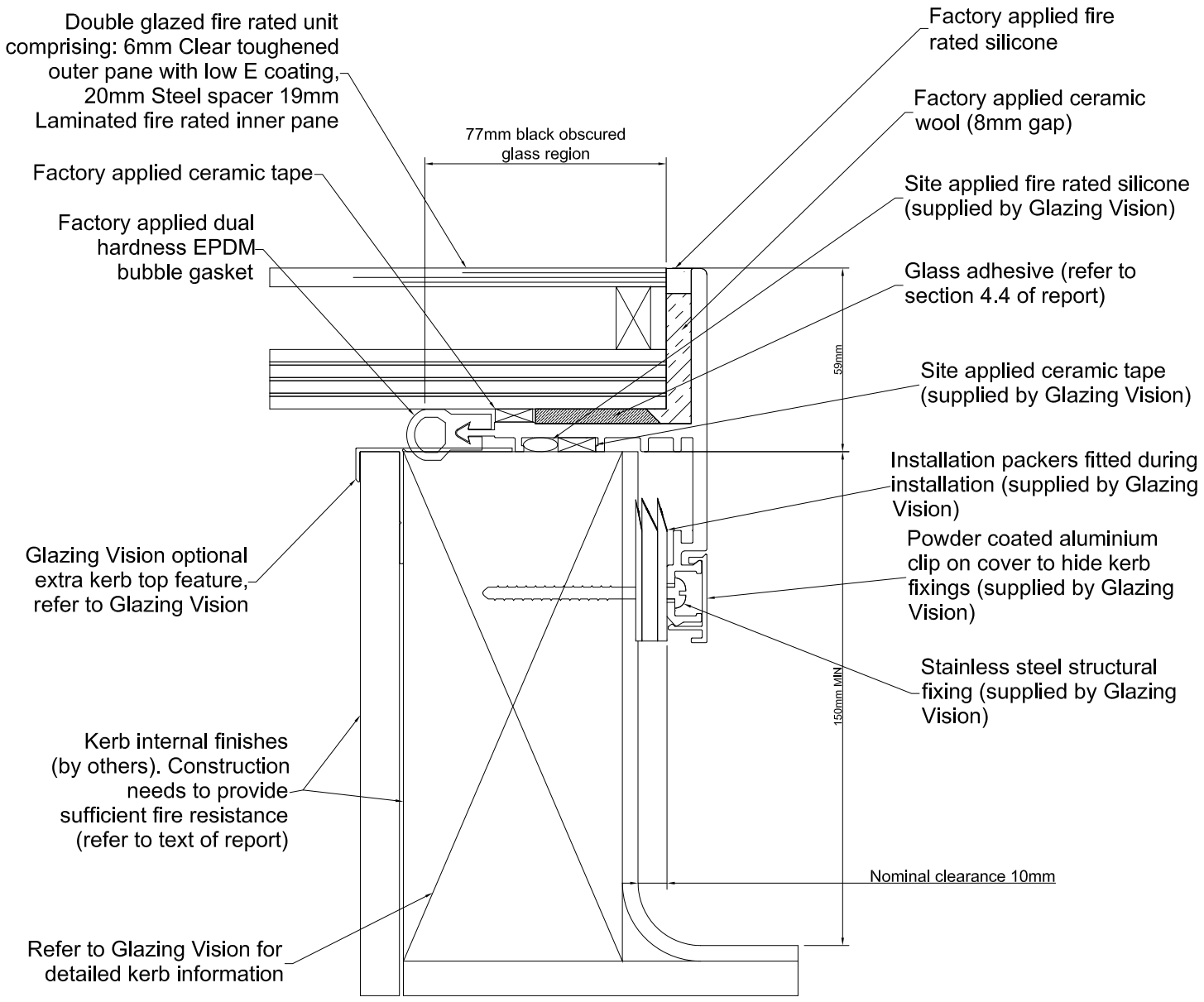
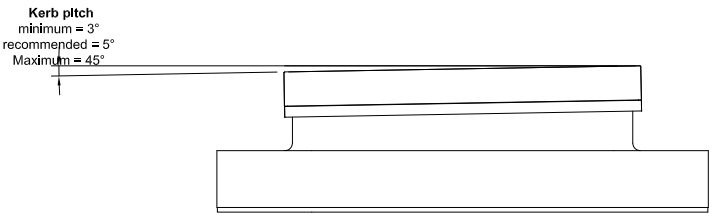
APPENDIX A

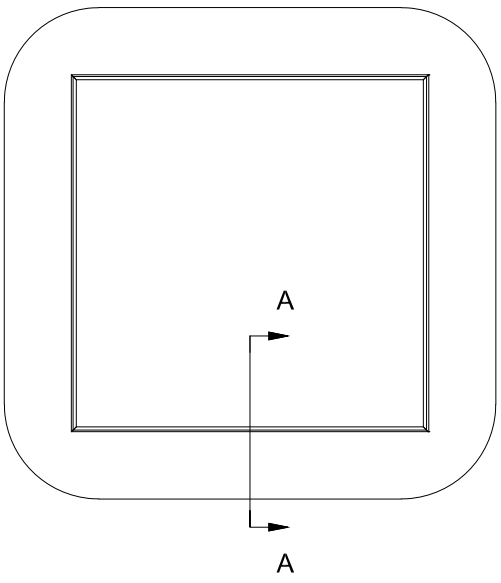
Figure 08008C/01

Details of Glazed Rooflight

The figures in this Appendix are not included in the sequential page numbering of this report.







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Field of Application Report
IFCA/08008 Revision C
Glazing Vision Ltd
30 Minute Double Glazed Rooflight Assembly

Cross-Section of Double Glazed Rooflight

Job number: 18205	
Drawn by: CSP	Checked by: MB
Not To Scale	Drawn: Jun 2018

08008C/01