



EUROPEAN ASSESSMENT DOCUMENT

EAD 220013-01-0401

March 2017

SELF-SUPPORTING RIDGELIGHT

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This European Assessment Document (EAD) has been developed taking into account up-to-date technical and scientific knowledge at the time of issue and is published in accordance with the relevant provisions of Regulation (EU) 305/2011 as a basis for the preparation and issuing of European Technical Assessments (ETA).

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1 SCOPE OF THE EAD

1.1 Description of the construction product

The construction product is a kit consisting two CE-marked (see NOTE 1) roof windows with the same width. The roof windows are specifically designed to be used in the kit (see Annex A). The roof windows are connected at the top by means of hardware. The kits can be combined. The angle between the two roof windows can vary between 70 and 130 degrees.

NOTE 1: The roof windows covered by this EAD can also be used in other (traditional) applications.

NOTE 2: Reduction factors related to the following effects may be considered to be relevant for the kits and may be regulated at member state level, however, determination methods for the factors are not given in this EAD:

- *Effect of aging/ environmental influence*
- *Effect of temperature*
- *Effect of long term loads*
- *Effect of repeated loads*

NOTE 3: Values not subject to structural requirements are dealt with in EN 14351-1:2006+A2:2016 and EN 12101-2:2003.

The infill of the roof kit consists of double or triple insulating glass unit.

The profiles of the frame and casement of the roof windows are pultruded profiles consisting of 70% - 80% glass fiber and 30% - 20% polyurethane resin (by mass). Density: 1800 - 2200 kg/m³. The frame profiles of the fixed roof windows are identical. The frame profiles of the openable roof windows are identical as are the casement profiles. The openable roof windows are power operated. The maximum opening is 321 - 700 mm depending on the size. The surface of the profiles is treated with UV protecting coating.

Hardware (brackets and bearings) are made of steel.

An example of the kit is shown in Annex A.

The kits are not fully covered by a harmonised European standard (hEN). The kits covered by this EAD are assessed for structural applications (self-supporting) which is not covered by the harmonized standard EN 14351-1:2006 + A2:2016. Furthermore, the profiles of the frame consist of glass fibre reinforced resin, for which no harmonized assessment method exist in relation to structural applications.

Furthermore, the kits are not further not fully covered by an EAD/ETAG used as EAD 220013-00-04.01, since this EAD does not cover asymmetric geometry. In addition, some components of the kit have been updated.

Concerning packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport, storage, maintenance, replacement and repair of the kits as he considers necessary.

It is assumed that the kits will be installed according to the manufacturer's instructions or (in absence of such instructions) according to the usual practice of the building professionals.

Relevant manufacturer's stipulations having influence on the performance of the kits covered by this European Assessment Document shall be considered for the determination of the performance and detailed in the ETA.

1.2 Information on the intended use(s) of the construction product

1.2.1 Intended use(s)

The kits are intended to provide ventilation and/or weather protection and daylight luminance to any enclosed or partially enclosed building or space.

The kits do not contribute the stiffness of the roof (racking).

1.2.2 Working life/Durability

The assessment methods included or referred to in this EAD have been written based on the manufacturer's request to take into account a working life of the kits for the intended use of 25 years when installed in the works. These provisions are based upon the current state of the art and the available knowledge and experience.

When assessing the kits, the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works¹.

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the manufacturer or his representative nor by EOTA when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a means for expressing the expected economically reasonable working life of the kits.

1.3 Specific terms used in this EAD

See EN 12519:2004

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the construction product

Table 1 shows how the performance of the kits are established in relation to the essential characteristics.

Table 1 Essential characteristics of the construction product and methods and criteria for assessing the performance in relation to those essential characteristics

No	Essential characteristic	Method of verification and assessment	Type of expression of performance
Basic Works Requirement 1: Mechanical resistance and stability			
1	Load bearing capacity of the kit	See 2.2.1	Level
	Load bearing capacity of the glazing		
	- Resistance to wind load	See 2.2.2	Class and description
	- Resistance to snow and permanent load	See 2.2.3	Description

¹ The real working life of a construction product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than the working life indicated above.

No	Essential characteristic	Method of verification and assessment	Type of expression of performance
Basic Works Requirement 2: Safety in case of fire			
2	Reaction to fire	See 2.2.4	Class
3	External fire performance	See 2.2.5	Class
Basic Works Requirement 3: Hygiene, health and the environment			
4	Watertightness	See 2.2.6	Class
Basic Works Requirement 4: Safety and accessibility in use			
5	Impact resistance	See 2.2.7	Class
6	Load bearing capacity of safety devices	See 2.2.8	Level
Basic Works Requirement 5: Protection against noise			
7	Acoustic performance	See 2.2.9	Level
Basic Works Requirement 6: Energy economy and heat retention			
8	Thermal transmittance	See 2.2.10	Level
9	Radiation properties	See 2.2.11	Level
10	Air permeability	See 2.2.12	Class
	Durability	See 2.2.13	Description

2.2 Methods and criteria for assessing the performance of the construction product in relation to essential characteristics

The roof windows used in the kit are CE -marked in accordance with EN 14351-1:2006+A2:2016 and the characteristics for the roof windows are representative for the kit.

2.2.1 Load bearing capacity of the kits

The load bearing capacity of the kits (ultimate limit states and serviceability limit states/maximum relative deflection) shall be determined by means of calculations and tests.

The characteristic values will be based on short-term load tests at room temperature without influence of climatic or environmental factors.

NOTE: The determination of the design values (e.g. durability) is not covered by this EAD. They shall be calculated on a case by case by means of:

- Characteristics performance of profiles and connections
- EN 1990 (Eurocode 0)
- EN 1991-1-1 (self-weight), EN 1991-1-3 (snow loads), EN 1991-1-4 (wind actions)
- Common European reduction factors
- Nationally determined parameters

By default, the principles laid down in ETAG 010, sub clauses 5.1.1.1 (General, Figure 1 and the principle for "Flat sheets in construction"), 6.3.1.1 and 6.3.1.2 must be applied.

Small-scale initial test on frame profiles in accordance with:

- a) Density- EN ISO 1183-1 (Method A (immersion))
- b) Glass % - EN ISO 1172 (Method B)
- c) Thermal expansion coefficients (axial and transverse) - ISO 11359-2

Small-scale (characterization) tests on frame profiles shall be carried out as follows:

- d) Tensile strength (parallel to the glass fiber) - EN ISO 527-5
- e) Compression strength (parallel to the glass fiber) - EN ISO 14126 (Sample specimen type: type B1, Loading fixture method: type 2 (end loading))
- f) Bending strength (parallel to the glass fiber) - EN ISO 14125 (Method A)
- g) E- modulus / flexural modulus (parallel to the glass fiber) - EN ISO 14125 (Method A)
- h) G-modulus - EN ISO 14129
- i) Shear strength - EN ISO 14130

For a) and b) the number of specimens in accordance with EN ISO 1172.

For c) the number of samples is 3 in each direction in accordance with ISO 11359-2.

For d) to i) five tests at room temperature for every characteristic

For all tests a) to i) the test specimens are cut from the frame profile of the openable window

The characteristic properties of the profiles shall be expressed in MPa and be determined by means of EN 1990, Table D1 (V_x unknown). The test results shall be given in the ETA.

The ability of the hardware as well its connection to the profiles to withstand the reactions at the supports (top and bottom) shall be determined by means of tests, as shown in Annex B. By means of Annex B1 and Annex B.2 the load -bearing capacity of the kit (hardware connections) in any configuration (including asymmetric arrangements) can be determined. The test specimen shall be tested at room temperature and be installed in accordance with the manufacturer's instructions. Minimum five tests at room temperature shall be carried out. The loads shall be applied by means of sandbags and/or pneumatic/hydraulic test equipment and loaded until breakage.

The characteristic strength shall be expressed in kN and be determined by means of EN 1990, Table D1 (V_x unknown). The test results shall be given in the ETA.

The calculated characteristic load bearing capacity, without nationally determined reduction parameters (e.g.: duration, aging/environment, temperature) of typical applications will be given in the ETA. The calculation process will be demonstrated by means of an example.

2.2.2 Resistance to wind load

The roof windows are tested and the results are expressed in accordance with EN 14351-1:2006+A2:2016, 4.2 + E.1.

Description of the composition of the glazing are shall be provided, see EN 14351-1:2006+A2:2016, 4.2. +E.1.

2.2.3 Resistance to snow and permanent load

Description of the composition of the glazing of the roof window is provided, see EN 14351-1:2006+A2:2016, 4.3 + E.1.

2.2.4 Reaction to fire

The roof windows are tested, using the test method(s) relevant for the corresponding reaction to fire class according to EN 13501-1. The roof windows are classified according to Commission Delegated Regulation (EU) No 2016/364. Further information is provided in EN 14351-1:2006+A2:2016, 4.4.1 +E.1.

The brackets and bearings used as hardware and made of steel are considered to fulfil the requirements of EC decision 96/603/EC (as amended) and therefore classified as A1 without the need for testing

2.2.5 External fire performance

The roof windows are tested using the test method relevant for the corresponding external fire performance roof class, in order to be classified according to EN 13501-5. EN TS 1187 T1 and T4 are used as basis for classification in accordance with EN 13501-5

2.2.6 Water tightness

The roof windows are tested in accordance with EN 14351-1:2006+A2:2016, 4.5 + E.1.

The test results are expressed in accordance with EN 14351-1:2006+A2:2016, 4.5 +E.1 (non - shielded).

2.2.7 Impact resistance

The roof windows are tested in accordance with EN 14351-1:2006+A2:2016, 4.7 +E.1.

The test result are expressed in accordance with EN 14351-1:2006+A2:2016, 4.7 +E.1.

2.2.8 Load bearing capacity of safety devices

The load bearing capacity of safety devices of the roof windows are tested in accordance with EN 14351-1:2006 + A2:2016, 4.8 +E.1.

The result are expressed in accordance with EN 14351-1:2006 + A2:2016, 4.8 +E.1.

2.2.9 Acoustic performance

The acoustic performance of the roof windows are determined in accordance with EN 14351-1:2006 + A2:2016, 4.11 + E.1.

The result are expressed in accordance with EN 14351-1:2006 + A2:2016, 4.11 + E.1.

2.2.10 Thermal transmittance

The thermal transmittance of the roof windows are determined in accordance with EN 14351-1:2006 + A2:2016, 4.12 + E.1.

The result are expressed in accordance with EN 14351-1:2006 + A2:2016, 4.12 + E.1.

2.2.11 Radiation properties

The radiation properties of the roof windows are determined in accordance with EN 14351-1:2006 + A2:2016, 4.13 +E.1.

The results are expressed in accordance with EN 14351-1:2006 + A2:2016, 4.13 + E.1.

2.2.12 Air permeability

The air permeability of the roof windows are determined in accordance with EN 14351-1:2006 + A2:2016, 4.14 + E.1.

The result are expressed in accordance with EN 14351-1:2006 + A2:2016, 4.14 +E.1.

2.2.13 Durability

The durability of the roof windows are ensured as described in EN 14351-1:2006 + A2:2016, 4.15 + E.1.

The durability of the load bearing capacity of the kit is covered by the design values, see 2.2.1 NOTE.

3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

3.1 System(s) of assessment and verification of constancy of performance to be applied

For the construction products covered by this EAD the applicable European legal act are: Decision 98/600/EC and Decision 98/436/EC

The system is: 3

In addition, with regard to reaction to fire for construction products covered by this EAD the applicable European legal act is: Decision 98/600/EC and Decision 98/436/EC

The system is: 3

System 1 as indicated in the above decision for reaction to fire does not apply, since there is not a clearly identifiable stage in the production process, which results in an improvement of the reaction to fire classification.

3.2 Tasks of the manufacturer

The cornerstones of the actions to be undertaken by the manufacturer of the ridgelight in the procedure of assessment and verification of constancy of performance are laid down in Table 2.

Table 2 Control plan for the manufacturer; corner stones

No	Subject/type of control (product, raw/constituent material, component - indicating characteristic concerned)	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) including testing of samples taken at the factory in accordance with a prescribed test plan					
1	Incoming materials The components shall be delivered with certificates 3.1 according to EN 10204. The manufacturer shall document the date of the manufacturing of components for every delivery	The manufacturer shall document the date of delivery and the date of the manufacturing of the components		Every delivery	Every delivery
2	Density of the frame profiles	By means of measuring the mass of sample and relate to the average Area of cross section multiplied by length of sample	Control plan	1	Per 3 hours production time
3	Dimensions of the profiles and the hardware	Tested and shall fulfil the requirements of a given profile and hardware list			At start up and thereafter every 3 hours of production time
4	Weight per meter	Tested and shall fulfil the requirements of a given profile and hardware list			At start up and thereafter every 7 production days
5	Density of the frame profiles	EN ISO 1183-1 (Room temperature)	Control plan	1	Per 5 th batch of side frame profile, and minimum twice a month
6	Bending strength (parallel to the glass fibre)	EN ISO 14125 (Room temperature)	Control plan	5	Per 5 th batch of side frame profile, and minimum twice a month
7	Glass % of the frame profiles	EN ISO 1172	Control plan	2 or 3	Per 5 th batch of side frame profile, and minimum twice a month
8	Reaction to fire (class A1, A2, B,C, D or E)	EN ISO 1182 or EN ISO 1716 and EN 13823 and EN 11925-2 as relevant	Control plan	1	once per two years

4 REFERENCE DOCUMENTS

As far as no edition date is given in the list of standards thereafter, the standard in its current version at the time of issuing the European Technical Assessment, is of relevance.

EN 14351-1:2006 + A2:2016

Windows and doors -- Product standard, performance characteristics -- Part 1: Windows and external pedestrian doorsets without resistance to fire and/or smoke leakage characteristics

EN ISO 1183-1

Plastics -- Methods for determining the density of non-cellular plastics Part 1: Immersion method, liquid pycnometer method and titration method

EN ISO 1172

Textile-glass-reinforced plastics -- Prepregs, moulding compounds and laminates --Determination of the textile-glass and mineral-filler content -- Calcination methods

EN ISO 527-5

Plastics - Determination of tensile properties -- Part 5: Test conditions for unidirectional fibre-reinforced plastic composites

EN ISO 14126

Fibre-reinforced plastic composites -- Determination of compressive properties in the in-plane direction

EN ISO 14125

Fibre-reinforced plastic composites -- Determination of flexural properties

EN ISO 14129

Fibre-reinforced plastic composites -- Determination of the in-plane shear stress/shear strain response, including the in-plane shear modulus and strength, by the plus or minus 45 degree tension test method

EN ISO 14130

Fibre-reinforced plastic composites -- Determination of apparent interlaminar shear strength by short-beam method

EN 1990

Eurocode -- Basis of structural design

EN 1991-1-1

Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings

EN 1991-1-3

Eurocode 1 - Actions on structures - Part 1-3: General actions - Snow loads

EN 1991-1-4

Eurocode 1: Actions on structures - Part 1-4: General actions - Wind actions

ETAG 010

Guideline for European technical Approval For Self-Supporting Translucent Roof Kits

EN 13501-1

Fire classification of construction products and building elements -- Part 1: Classification using test data from reaction to fire tests

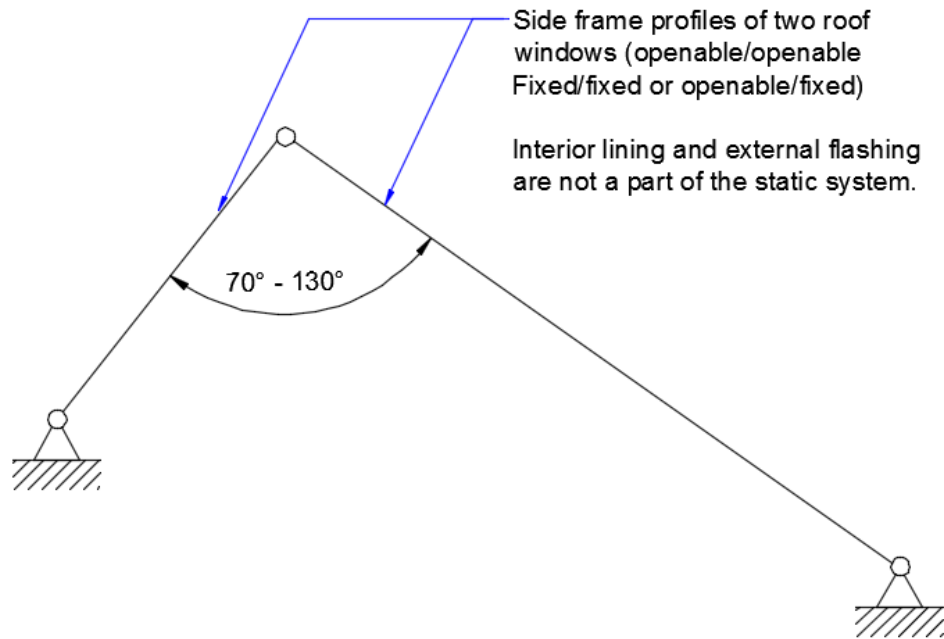
EN 13501-5

Fire classification of construction products and building elements -- Part 5: Classification using data from external fire exposure to roofs tests

ANNEX A DESCRIPTION OF THE CONSTRUCTION PRODUCT

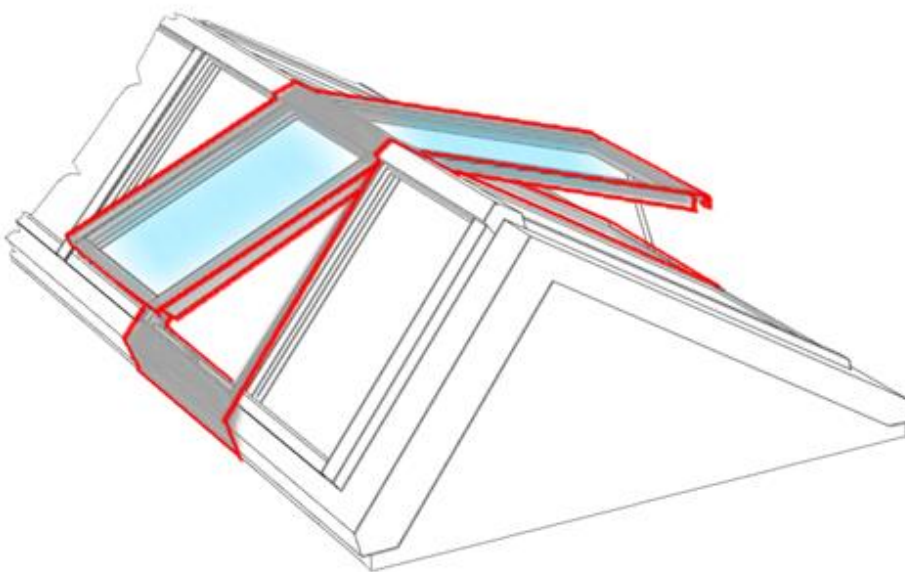
A.1 DESCRIPTION OF THE STATIC SYSTEM OF THE KIT

The glass panes apart from their self-weight, snow and wind do not carry any additional loads.



A.2 PRINCIPLE BUILD-UP OF THE KIT

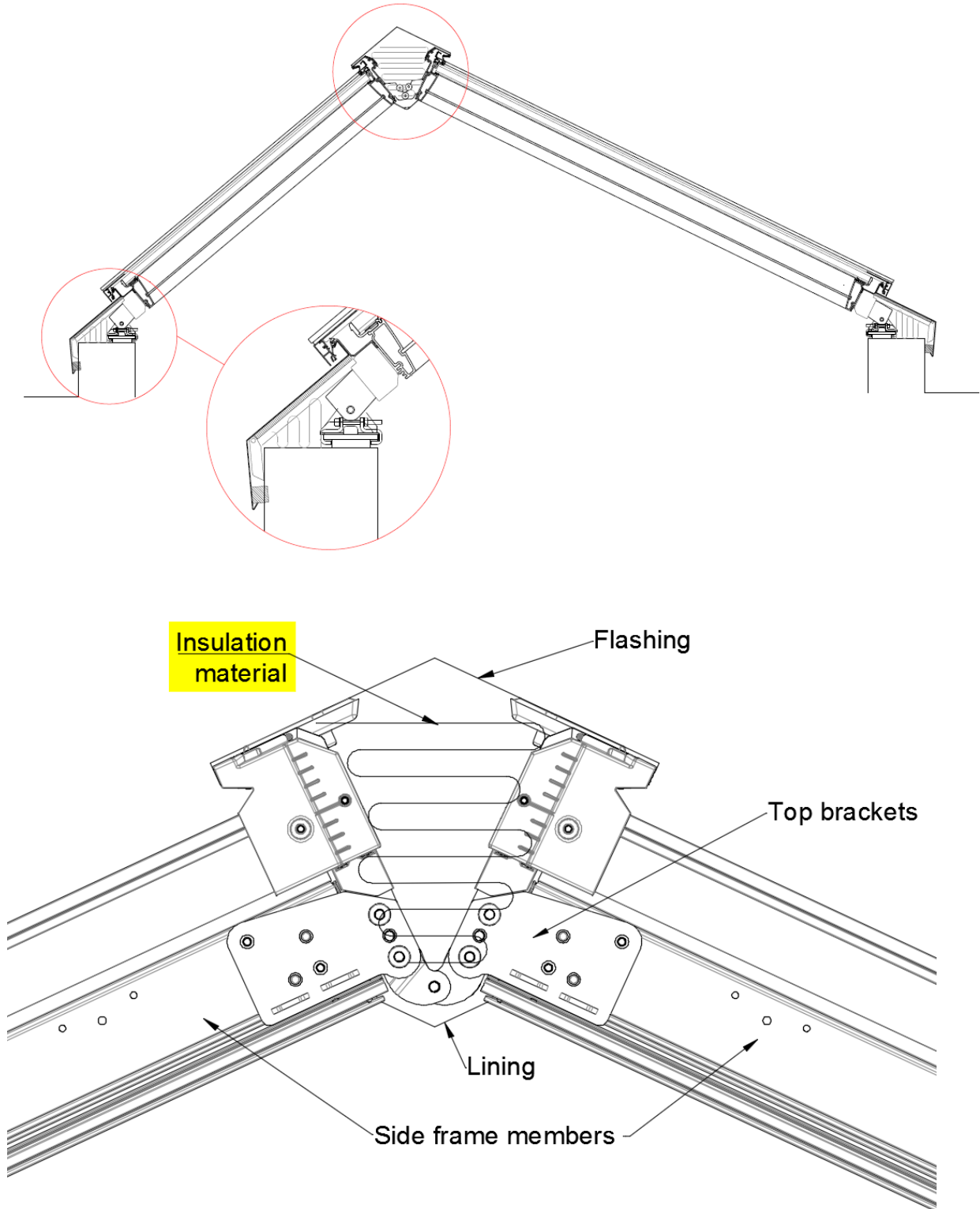
The frame widths of the two roof windows are identical.



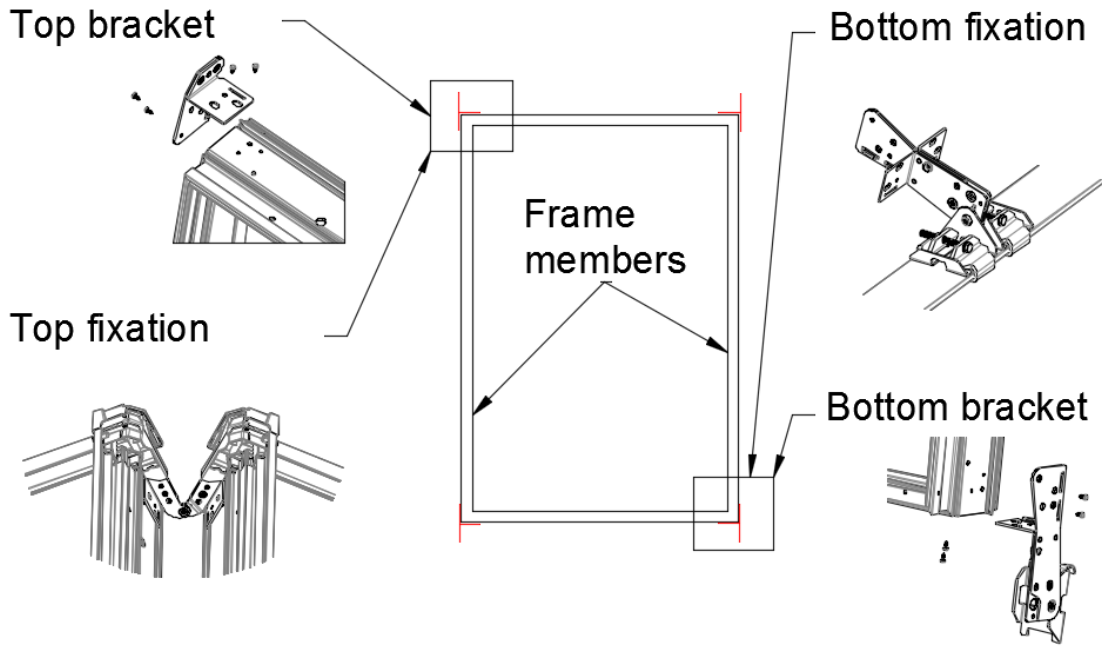
A.3 AN EXAMPLE SECTION OF THE KIT

The marked details show the external flashings and internal linings.

There is no loadbearing beam in top in the longitudinal direction of the kit.

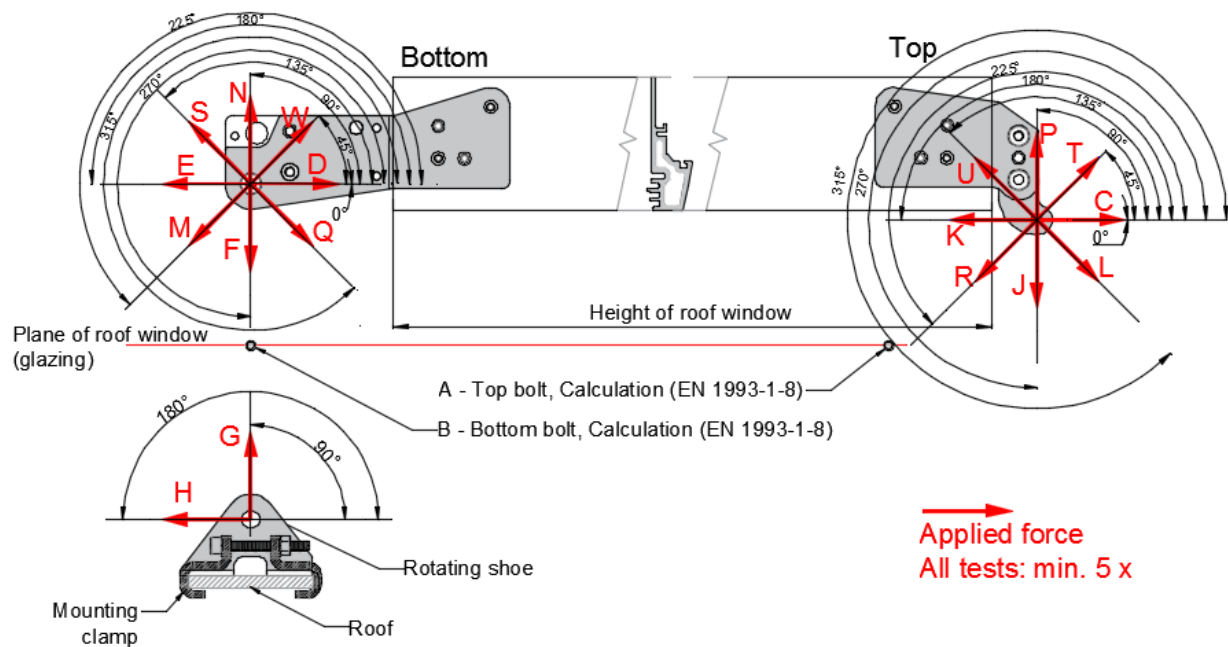


A.4 OVERVIEW OF HARDWARE



ANNEX B STRENGTH OF HARDWARE CONNECTIONS

B.1 APPLIED FORCES TO THE HARDWARE



Directions S, N, W, M, F, Q, U, P, T, R, J, L, plus further directions if any:

Full-scale tests on roof windows placed horizontally in an adjustable test rig.

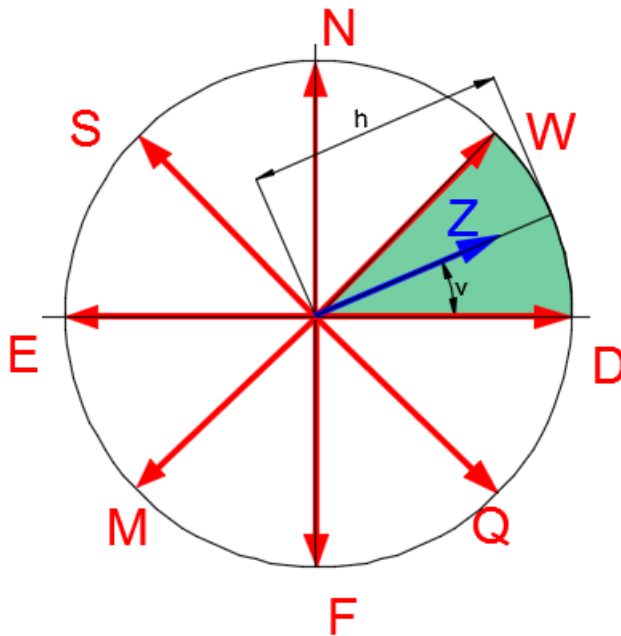
Directions D, E as well as C, K:

Test on specimens from corners cut out of the full-scale roof windows in a test bench.

Directions G and H:

Full-scale test in a test bench.

B.2 STRENGTH OF HARDWARE CONNECTION IN OTHER DIRECTION THAN TESTED (PRINCIPLE)



Z: Result of a structural calculations [kN]

v : Result of a structural calculations [angle to the roof window]

h: Result of a linear interpolation [kN]

$$h = (D * (45^\circ - v^\circ) + W * v^\circ) / 45^\circ$$

Requirement: $h \geq Z$