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European Assessment Document for

# Ceiling windows and ceiling daylighting devices



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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) No 305/2011 as a basis for the preparation and issuing of European Technical Assessments (ETA).

## Contents

<b>1</b>	<b>Scope of the EAD.....</b>	<b>4</b>
1.1	Description of the construction product	4
1.2	Information on the intended use(s) of the construction product	4
1.2.1	Intended use(s) .....	4
1.2.2	Working life/Durability.....	5
1.3	Specific terms used in this EAD	5
<b>2</b>	<b>Essential characteristics and relevant assessment methods and criteria.....</b>	<b>6</b>
2.1	Essential characteristics of the product	6
2.2	Methods and criteria for assessing the performance of the product in relation to essential characteristics of the product	6
2.2.1	Reaction to fire.....	7
2.2.2	External Fire performance.....	7
2.2.3	Watertightness.....	7
2.2.4	Resistance to wind load .....	7
2.2.5	Resistance to snow and permanent load .....	7
2.2.7	Impact resistance .....	7
2.2.8	Direct airborne sound insulation.....	7
2.2.9	Air permeability.....	8
2.2.10	Radiation properties.....	8
2.2.11	Thermal transmittance.....	8
2.2.12	Aspects of durability.....	8
<b>3</b>	<b>Assessment and verification of constancy of performance .....</b>	<b>9</b>
3.1	System(s) of assessment and verification of constancy of performance to be applied	9
3.2	Tasks of the manufacturer	9
<b>4</b>	<b>Reference documents .....</b>	<b>11</b>
<b>Annex A</b>	<b>Illustrations of the construction product .....</b>	<b>12</b>

## 1 SCOPE OF THE EAD

### 1.1 Description of the construction product

The ceiling window/ceiling daylighting device hereinafter named ceiling window, intended to lead daylight through the roof construction and give a view to the sky. The ceiling window consists of the following main parts:

- A roof module acting as part of the building envelope. Fixed light or fixed window equipped with a rectangular glass pane or Insulating Glass Unit with a low emission coating.
- A light shaft made of rigid or flexible material, that will transmit light through the roof construction. Length of this light shaft will be set according to roof construction and roof pitch.
- An openable rectangular ceiling module equipped with an insulating glass unit.

The kit can be fitted with shading and other accessories.

The ceiling module can be opened for cleaning and installation of accessories.

See Annex A for drawings of the ceiling window and section 1.3 for a description of the components.

The kit is not fully covered by a harmonised European standard hEN 14351-1<sup>1</sup> because the standard excludes internal partitions, as for instance ceilings/floor structures and also the standard does not include the relevant durability aspects and the characteristic resistance to fire. The construction product is not covered by EAD 220021-00-0402, since:

- The shaft length will be of the same order as dimensions of the projected shaft area, and the construction product can therefore transmit diffuse and/or direct daylight.
- transmission and reflection through the construction product will be spectral-selective (wave length dependent) and separate Total solar energy transmittance (g-value) and Light transmittance ( $\tau_v$ ) values must be established.

Concerning product 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 product as he considers necessary.

It is assumed that the product 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 product 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 intended use is to provide daylight and give a view to the sky through roof constructions with an inclination of 15° up to and including 35°.

The ceiling window is not intended to have a load bearing, load transferring or stiffening function.

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<sup>1</sup> All undated references to standards or to EAD's in this chapter are to be understood as references to the dated versions listed in chapter 4

## **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 ceiling window 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 product, 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 works<sup>2</sup>.

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product 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 product.

## **1.3 Specific terms used in this EAD**

### **1.3.1 Roof module**

Fixed light or fixed window which is installed into the roof and leads daylight into the building and serves as weather protection and connecting with the light shaft.

### **1.3.2 Light shaft**

Flexible or rigid component connecting the roof module and ceiling module and guide the daylight (direct and diffuse) to the ceiling module.

### **1.3.3 Ceiling module**

Openable window-like component which is installed into the ceiling and connecting with the light shaft.

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<sup>2</sup> The real working life of a 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 referred above.

## 2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

### 2.1 Essential characteristics of the product

Table 2.1.1 shows how the performance of the ceiling window is established in relation to the essential characteristics.

**Table 2.1.1 Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics.**

No.	Essential characteristic	Assessment method	Type of expression of product performance
<b>Basic Works Requirement 2: Safety in case of fire</b>			
1	Reaction to fire	2.2.1	Class
2	External fire performance	2.2.2	Class
<b>Basic Works Requirement 3: Hygiene, health and the environment</b>			
3	Watertightness	2.2.3	Class
<b>Basic Works Requirement 4: Safety in use</b>			
4	Resistance to wind load	2.2.4	Class
5	Resistance to snow load and permanent load	2.2.5	Description
6	Impact resistance	2.2.6	Class
<b>Basic Works Requirement 5: Protection against noise</b>			
7	Direct airborne sound insulation	2.2.7	Level
<b>Basic Works Requirement 6: Energy economy and heat retention</b>			
8	Air permeability	2.2.8	Class
9	Radiation properties	2.2.9	Level
10	Thermal Transmittance	2.2.10	Level
<b>Aspects of durability</b>			
11	Durability	2.2.11	Description

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

This chapter is intended to provide instructions for TABs. Therefore, the use of wordings such as “shall be stated in the ETA” or “it has to be given in the ETA” shall be understood only as such instructions for TABs on how results of assessments shall be presented in the ETA. Such wordings do not impose any obligations for the manufacturer and the TAB shall not carry out the assessment of the performance in relation to a given essential characteristic when the manufacturer does not wish to declare this performance in the Declaration of Performance.

Testing will be limited only to the essential characteristics which the manufacturer intends to declare. If for any components covered by harmonised standards or European Technical Assessments the manufacturer of the component has included the performance regarding the relevant characteristic in the Declaration of Performance, retesting of that component for issuing the ETA under the current EAD is not required.

### **2.2.1 Reaction to fire**

The roof module, ceiling module and shaft shall be tested, using the test method(s) relevant for the corresponding reaction to fire class according to EN 13501-1. The above-mentioned parts shall be classified according to EC Delegated Regulation 2016/364 in connection with EN 13501-1.

The roof module shall be tested as described in EN 14351-1 Annex H, the ceiling module shall be tested as seen from the room side as described in EN14351-1 Annex H and the shaft shall be tested according to the corresponding reaction to fire class in EN 13501-1 with surface exposure from both sides.

The materials to be considered belonging to class A1 without test are listed in e EC Decision 96/603/EC, amended by EC Decision 2000/605/EC and by EC Decision 2003/424/EC.

The reaction to fire classes according EN 13501-1 of the roof module, ceiling module and light shaft as well as the conditions for their validity shall be given in the ETA.

### **2.2.2 External Fire performance**

The external fire performance of the ceiling window shall be obtained by test of the roof module using the relevant part of CEN/TS 1187 (test 1 or 4 depending on the request from the applicant) and classified in accordance with EN 13501-5 and the applicable rules for extended application described in CEN/TS 16459. The class and the applicable direct and extended field of application shall be given in the ETA.

### **2.2.3 Watertightness**

The watertightness of the ceiling window shall be assessed on the basis of a test of the roof module only, since this represents the performance of the kit. The roof module shall be tested and classified according to clause 4.5 of EN 14351-1 using the test method EN 1027 and classification method EN 12208. The class shall be given in the ETA.

### **2.2.4 Resistance to wind load**

The resistance to wind load of the ceiling window shall be assessed on the basis of a test of the roof module only, since this represents the performance of the kit. The roof module shall be tested and classified according clause 4.2 of EN 14351-1 using the test method in EN 12211 and classification method EN 12210. The class shall be given in the ETA.

### **2.2.5 Resistance to snow and permanent load**

The resistance to snow and permanent load of the ceiling window shall be expressed through description of thickness and type of the glass in the roof module. The description of the glass (type and thickness) with reference to the relevant product standard and the applicable tabulated values for the glazing unit/units shall be given in the ETA.

### **2.2.7 Impact resistance**

The impact resistance of the ceiling window shall be obtained by testing and classifying the roof module in accordance with clause 4.7 of EN 14351-1 using the test method EN 13049. As default the specimen shall be tested in a vertical test rig with the impact direction being horizontal. The class and direction shall be given in the ETA.

### **2.2.8 Direct airborne sound insulation**

The direct airborne sound insulation performance of the ceiling window shall be obtained by test of the ceiling module in accordance with clause 4.11 of EN 14351-1, Annex B tabulated method and expressed according to EN ISO 717-1. The level shall be stated in the ETA.

### 2.2.9 Air permeability

The air permeability of the ceiling window shall be obtained by testing and classifying the ceiling module according to clause 4.14 of EN 14351-1 using test method EN 1026 and classification according to EN 12207. The class shall be given in the ETA.5.3

### 2.2.10 Radiation properties

For determination of vertical total solar energy transmittance (solar factor, g-value) and vertical light transmittance ( $\tau_v$ ) shall the spectral transmittance be measured in the wavelength range from 300nm to 2500 nm according to EN 410:2011 cl. 5.1. Calculation based on the measurement of vertical total solar energy transmittance (solar factor, g-value) shall be done according to EN 410:2011 c. 5.4 and vertical light transmittance ( $\tau_v$ ) shall be done according to EN 410:2011 cl. 5.2.

For determination of solar direct reflectance ( $\rho_e$ ) and light reflectance ( $\rho_v$ ) of the inner surface of the light shaft shall the spectral transmittance be measured in the wavelength range from 300nm to 2500 nm according to EN 410:2011 cl. 5.1. Calculation based on the measurement on the inner surface of solar direct reflectance ( $\rho_e$ ) 5.4.4 and light reflectance ( $\rho_v$ ) shall be done according to EN 410:2011 c. 5.3. The levels shall be given in the ETA.

### 2.2.11 Thermal transmittance

The thermal transmittance of the ceiling window shall be determined in accordance with EAD 220021-00-0402, section 2.2.13.

The level of Thermal transmittance of the ceiling window shall be given in the ETA

The thermal transmittance of the constituent elements, ceiling module and/or roof module, shall be tested according to EN 14351-1 using test method EN ISO 12567-2 (reference method) or calculation method in accordance with EN ISO 10077-1 and EN ISO 10077-2 together with EN 673 and ISO 15099 using minimum 2 significant figures.

### 2.2.12 Aspects of durability

The durability of watertightness, air permeability and thermal transmittance of the ceiling window shall be assessed in accordance with clause 4.15 in EN 14351-1 and as described below and shall be stated in the ETA as.

- Watertightness and air permeability: as described in section 4.15.2 of EN 14351-1. The weather strippings shall be described in the ETA.
- Thermal transmittance: as described in 4.15.2 of EN 14351-1 with the following addition; Insulating glass units fulfilling EN 1279-5 shall be deemed to meet the durability requirement. The glazing type or Insulating glass unit used on the product shall be stated in the ETA in accordance with the relevant applicable standard in accordance with Annex C of EN 14351-1 or EN 1279-5

It shall be stated in the ETA if the durability has been positively assessed in respect of the intended use.



### 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 products covered by this EAD the applicable European legal act is: Decision 98/436/EC as amended by decision 2001/596/EC.

The applicable AVCP system is 3 for any use except for reflectance and uses subject to regulations on reaction to fire and resistance to fire.

For uses subject to regulations on reaction to fire the applicable AVCP systems regarding reaction to fire are 1, 3 or 4 depending on the conditions defined in the said Decisions.

For uses subject to reflectance for daylight evaluation the applicable AVCP system is 3 according to 98/436/EC part 6/6.

#### 3.2 Tasks of the manufacturer

The cornerstones of the actions to be undertaken by the manufacturer of the product in the procedure of assessment and verification of constancy of performance are laid down in Table 3.2.1.

**Table 3.2.1 Control plan for the manufacturer; cornerstones**

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
<b>Factory production control (FPC)</b>					
1	Incoming materials, e.g. - IGU - gaskets - shaft material	Verification of materials specification from supplier	To be specified in control plan	-	To be specified in control plan
2	Dimensions - overall dimensions of prefabricated elements - tolerances of geometry - final inspection	Visual and by measurement	To be specified in control plan	To be specified in control plan	To be specified in control plan
3	Reaction to fire	According to 2.2.1	To be specified in control plan	To be specified in control plan	Once per two years
4	External fire performance	According to 2.2.2	To be specified in control plan	To be specified in control plan	To be specified in control plan
5	Resistance to fire	According to 2.2.3	To be specified in control plan	To be specified in control plan	To be specified in control plan

### 3.3 Tasks of the notified body

The intervention of the notified body under AVCP system 1 are necessary for resistance to fire and reaction to fire for products/materials for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material).

In this case the cornerstones of the tasks to be undertaken by the notified body under AVCP system 1 are laid down in Table 3.3.1.

**Table 3.3.1 Control plan for the notified body; cornerstones**

Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
<b>Initial inspection of the manufacturing plant and of factory production control</b>				
Where the intervention of the Notified Body is necessary only because the conditions for the applicability of system 1 are fulfilled for reaction to fire, the notified body will consider especially the clearly identifiable stage in the production process which results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material).	Verification of the complete FPC as described in the control plan agreed between the TAB and the manufacturer	As defined in the control plan agreed between the TAB and the manufacturer	As defined in the control plan agreed between the TAB and the manufacturer	When starting the production or a new line
<b>Continuous surveillance, assessment and evaluation of factory production control</b>				
Where the intervention of the Notified Body is necessary only because the conditions for the applicability of system 1 in the Decisions regarding reaction to fire are fulfilled, the notified body will consider especially the clearly identifiable stage in the production process which results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material)	Verification of the controls carried out by the manufacturer as described in the control plan agreed between the TAB and the manufacturer with reference to the raw materials, to the process and to the product as indicated in Table 3.2.1	As defined in the control plan agreed between the TAB and the manufacturer	As defined in the control plan agreed between the TAB and the manufacturer	1/year

## 4 REFERENCE DOCUMENTS

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
EAD 220021-00-0402	Tubular daylight devices
EN 13501-1:2018	Fire classification of construction products and building elements - Part 1: Classification using test data from fire reaction to fire tests
EN 13501-2:2016	Fire classification of construction products and building elements – Part 2: Classification using data from fire resistance tests, excluding ventilation services
EN 13501-5:2016	Fire classification of construction products and building elements - Part 5: Classification using data from external fire exposure to roofs tests
CEN/TS 1187:2012	Test methods for external fire exposure to roofs
CEN/TS 16459:2019	External fire exposure of roofs and roof coverings – Extended application of test results from CEN/TS 1187
EN 1027:2016	Windows and doors - Watertightness - Test method
EN 12208:1999	Windows and doors - Watertightness – Classification
EN 12211:2016	Windows and doors – Resistance to wind load – Test method
EN 12210:2016	Windows and doors – Resistance to wind load – Classification
EN 1026:2016	Windows and doors – Air permeability – Test method
EN 12207:2016	Windows and doors – Air permeability – Classification
EN ISO 12567-2:2005	Thermal performance of windows and doors – Determination of thermal transmittance by hot box method – Part 2: Roof windows and other projecting windows
EN ISO 10077-1:2017	Thermal performance of windows, doors and shutters – Calculation of thermal transmittance – Part 1: General
EN ISO 10077-2:2017	Thermal performance of windows, doors and shutters – Calculation of thermal transmittance – Part 2: Numerical method for frames
EN 673:2011	Glass in building – Determination of thermal transmittance (U value) – Calculation method
EN 410:2011	Glass in building – Determination of luminous and solar characteristics of glazing
EN ISO 10140-1:2021	Acoustics - Laboratory measurement of sound insulation of building elements - Part 1: Application rules for specific products
EN ISO 10140-2:2021	Acoustics - Laboratory measurement of sound insulation of building elements - Part 2: Measurement of airborne sound insulation
EN ISO 717-1:2020	Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation - Amendment 1: Rounding rules related to single number ratings and single number quantities
ISO 15099:2003	Thermal performance of windows, doors and shading devices — Detailed calculations
EN 1279-5:2018	Glass in building – Insulating glass units – Part 5: Product standard
EN 13049:2003	Windows – Soft and heavy body impact – Test method, safety requirements and classification

## ANNEX A ILLUSTRATIONS OF THE CONSTRUCTION PRODUCT

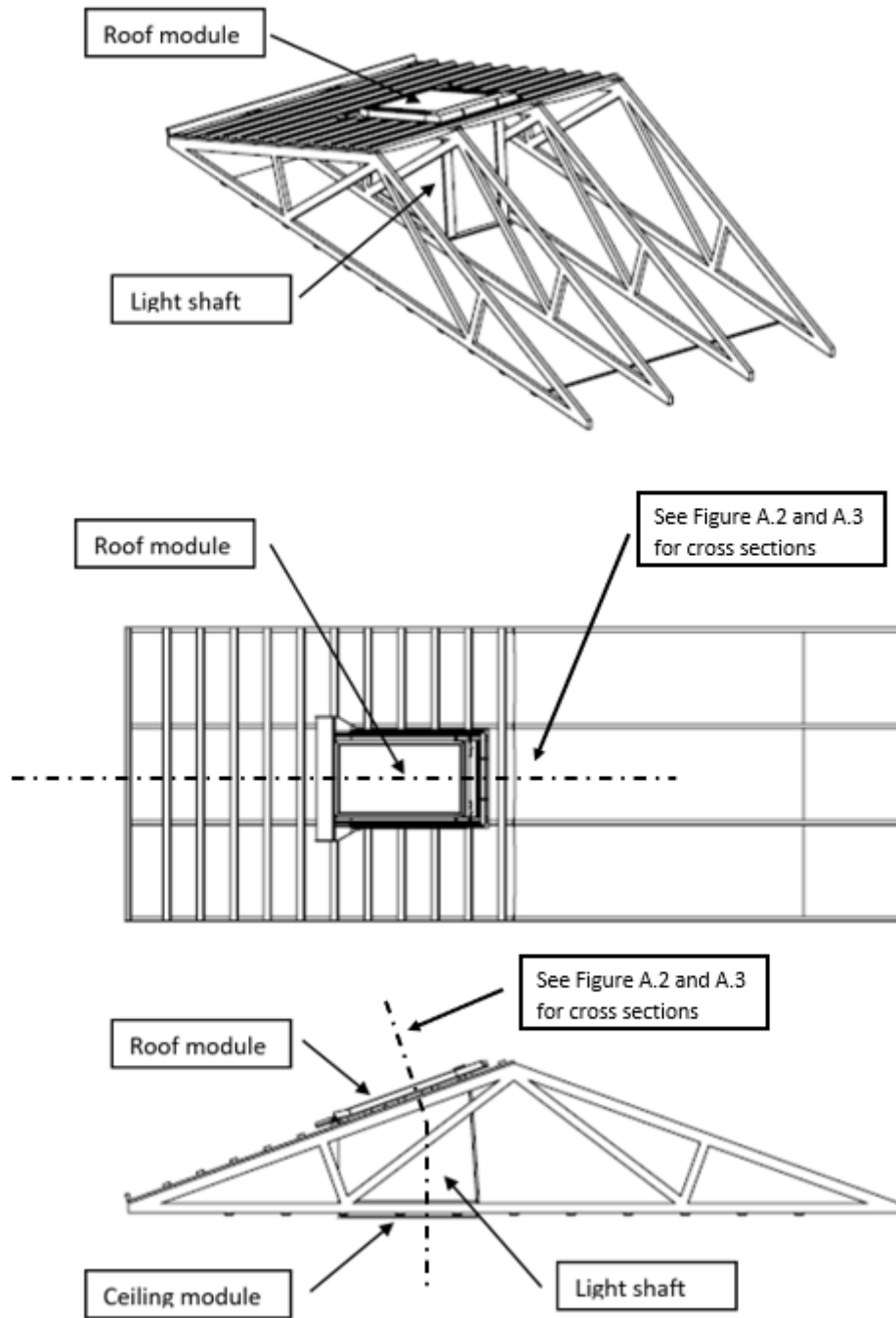


Figure A.1: Drawings of assembly principle. (Top) isometric view, (middle) top view, (bottom) cross sectional view

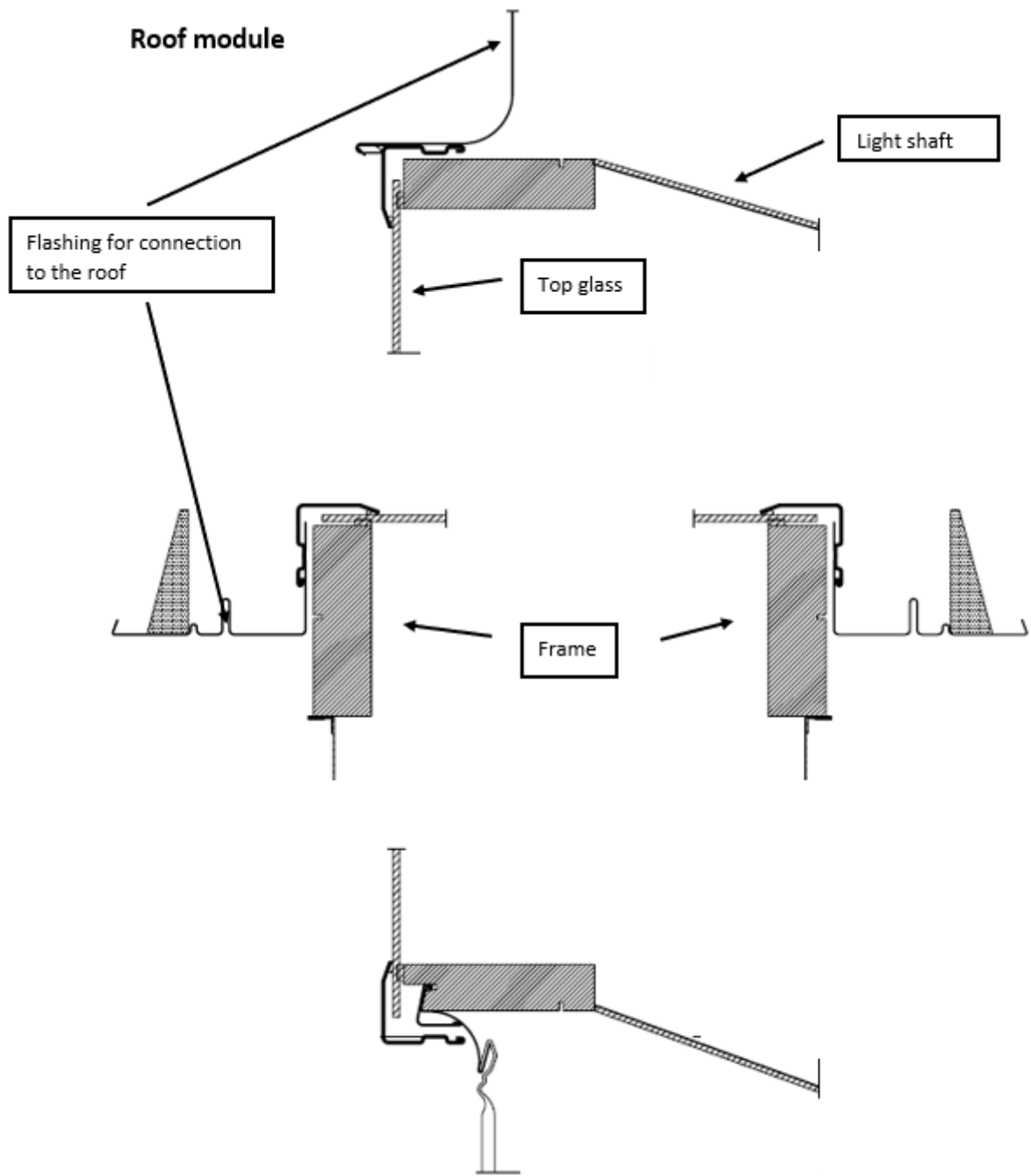


Figure A.2: Example of cross sectional drawings of the roof module

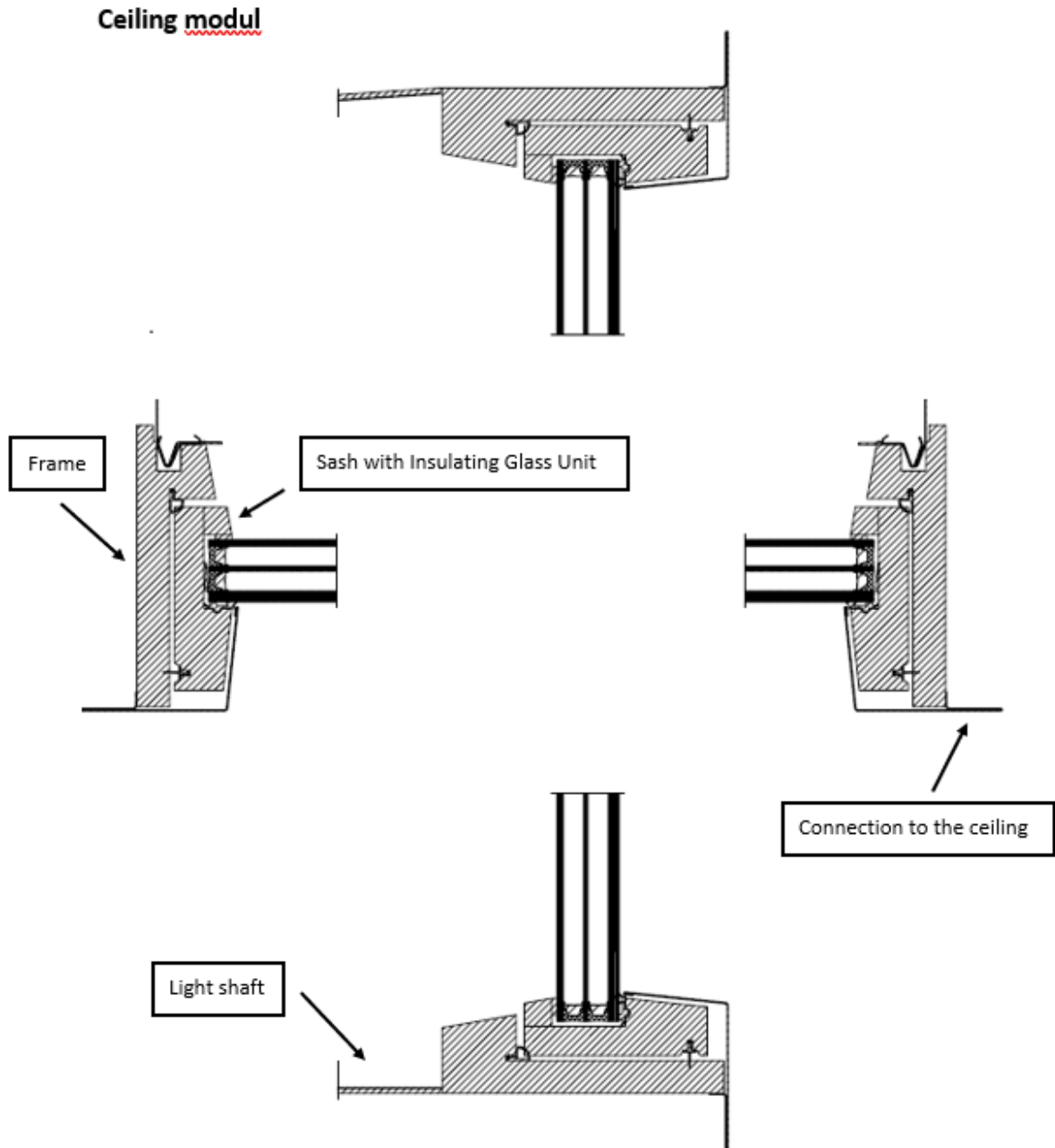


Figure A.3: Example of cross sectional drawing of ceiling module