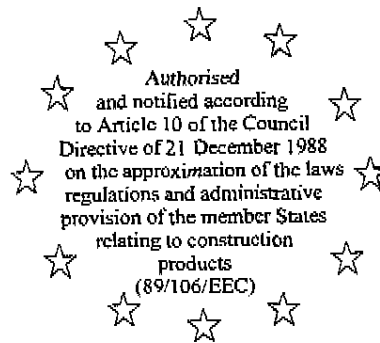


Union belge pour l'agrément
technique dans la construction
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Classes moyennes et énergie
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**SPF Economie – DGV
UBAtc**

MEMBER OF EOTA

European Technical Approval ETA-01/0005 Agrément Technique Européen

Nom commercial:
Trade name:

DC 993 and DC 896

Titulaire:
Holder of approval:

DOW CORNING
Parc Industriel Zone C, B 7180 SENEFFE

Type générique et utilisation prévue du produit de construction:

Mastics de collage pour usage dans des systèmes de vitrages extérieurs collés

Generic type and use of construction product:

Structural sealants for use in structural sealant glazing systems

Validité du - au:
Validity from -

From 20-06-2006
to
19-06-2011

Usines de fabrication:
Manufacturing plants:

DOW CORNING SENEFFE, Parc Industriel - Zone C, B 7180 SENEFFE
DOW CORNING GmbH, D WIESBADEN
Dow Corning Jincheon Korea

Le présent Agrément technique européen comprend:

11 pages incluant 0 figure et 1 annexe faisant partie intégrante du document

This European Technical Approval contains:

11 pages including 0 figure and 1 enclosure which form an integral part of the document

Cet agrément remplace:
This approval replaces :

ETA 01/0005 valid from 07-03-2001 to 06-03-2006



Organisation Européenne pour l'Agrément technique
European Organisation for Technical approvals

I LEGAL BASIS AND GENERAL CONDITIONS

1. This European Technical Approval is issued by the UBAtc - BUtgb - Belgian Union for Approval in Construction in accordance with :
 - Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products¹, modified by the Council Directive 93/68/EEC of 22 July 1993²;
 - Common Procedural Rules for Requesting, Preparing and the Granting of European Technical Approvals set out in the Annex of Commission Decision 94/23/EC³;
 - Guideline for European Technical Approval of "Structural Sealant Glazing System" ETAG 002, edition 1998, Part 1.
 - SCC decision CONSTRUCT 00/427 concerning structural sealants as component of kit covered by existing ETAG
2. The Belgian Union for Approval in Construction is authorised to check whether the provisions of this European Technical Approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European Technical Approval and for their fitness for the intended use remains with the holder of the European Technical Approval.
3. This European Technical Approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this European Technical Approval.
4. This European Technical Approval may be withdrawn by the Belgian Union for Approval in Construction, in particular after information by the Commission on the basis of Article 5 (1) of Council Directive 89/106/EEC.
5. Reproduction of this European Technical Approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of the UBAtc - BUtgb - Belgian Union for Approval in Construction. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European Technical Approval.
6. The European Technical Approval is issued by the approval body in its official language. This version corresponds to the version circulated within EOTA. Translations into other languages have to be designated as such.

¹ Official Journal of the European Communities N° L 40, 11.2.1989, p 12

² Official Journal of the European Communities N° L 220, 30.8.1993, p 1

³ Official Journal of the European Communities N° L 17, 20.1.1994, p 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of the product and intended use

1.1 Definition of the products

The structural sealants DC 895 and DC993 are silicone based sealants to be used in structural sealant glazing system (SSGS) as defined in ETAG 002.

1.2 Intended use

The structural sealants DC 895 and DC993 are to be used in structural sealant glazing system (SSGS) to bond glazing products on metallic structural seal support frames. The suitable substrates are defined for each sealant in the present ETA § 4.2.2.3.

The sealant DC 895 is a single component sealant which can be used in structural glazing systems types I or II as per ETAG 002 SSGS table 1, while DC 993 is a bi-component sealant which can be used in structural glazing systems types I, II, III, IV as per ETAG 002 SSGS table 1.

Concerning the adherence of the structural sealant on structural sealant support frame, this ETA approval on structural sealant is to be completed by an approval on the system."

The essential requirements ER2 Safety in case of fire, ER3 Hygiene, health and environment, ER4 Safety in use, ER6 Energy economy and heat retention shall be fulfilled, and failure of the structural bond would cause risk to human life and/or have considerable economic consequences.

The provisions made in this European Technical Approval are based on the assumed working life of the SSGS of 25 years. The assumed working life of a system cannot be taken as a guarantee given by the producer, but are to be used as a mean for selecting the appropriate product in relation to the expected economically reasonable working life of the works.

2 Characteristics of the product and method of verification

2.1 Characteristics of the products

2.1.1 STRUCTURAL SEALANT DC 895

Design stress in tension: $\sigma_{des} = 0,14$ MPa

Design stress in dynamic shear: $\tau_{des} = 0,14$ MPa

Elastic modulus in tension or compression tangential to the origin: $E_0 = 0,9$ MPa

Elastic modulus in shear tangential to the origin $G_0 = 0,3$ MPa

Working time (at 25°C, 50% R.H.) : 15 minutes

Skin over time (at 25°C, 50% R.H.) : 15 minutes

Tack-free time (at 25°C, 50% R.H.) : 30 to 50 minutes

Time before transport of the bonded frame : The minimum time before transport is normally 21 days.

Nevertheless, earlier transportation on work site is allowed if the following two conditions are respected (see ETAG Table 10 Checks during the production) : The tested H-samples give the result: Rupture 100% cohesive and breaking stress $\geq 0,7$ MPa.

DC 895: Structural Sealant - identification characteristics

Test	ETAG ref.	Result
Specific mass	5.2.1.1	$V_{\text{mean}} = 1,45$ (1,4 to 1,55)
Hardness A	5.2.1.2	Mean of 33 (minimum of 32)
Thermogravimetric analyze	5.2.1.3	Curve kept in the ETA technical file
Color	5.2.1.4	Black color

2.1.2 STRUCTURAL SEALANT DC 993

Design stress in tension: $\sigma_{\text{des}} = 0,14$ MPa

Design stress in dynamic shear: $\tau_{\text{des}} = 0,11$ MPa

Design stress in static shear : $\tau_{\infty} = 0,011$ MPa

Elastic modulus in tension or compression tangential to the origin: $E_0 = 1,4$ MPa

Elastic modulus in shear tangential to the origin $G_0 = 0,47$ MPa

Working time (at 25°C, 50% R.H.) : 10 to 30 minutes

Skin over time (at 25°C, 50% R.H.) : bi-component - not applicable

Tack-free time (at 25°C, 50% R.H.) : 80 to 100 minutes

Time before transport of the bonded frame: The minimum time before transport is normally 10 days.

Nevertheless, earlier transportation on work site is allowed if the following two conditions are respected (see ETAG Table 10 Checks during the production): The tested H-samples give the following result: Rupture 100% cohesive and breaking stress $\geq 0,7$ MPa.

DC 993: Structural sealant - identification characteristics

Test	ETAG ref.	Result
Specific mass (mixed at 10/1 ratio)	5.2.1.1	$V_{\text{mean}} = 1,33$ ($\pm 0,023$)
Hardness A	5.2.1.2	Mean of 36 (minimum of 34)
Thermogravimetric analyze	5.2.1.3	Curve kept in ETA technical file
Color	5.2.1.4	Black color

2.1.3 COMPLEMENTARY PRODUCTS OF STRUCTURAL SEAL ADHESION SURFACE PREPARATION**2.1.3.1 DC 895**

Cleaning product: R40 manufacturer DOW CORNING
Organic cleaner (isopropanol / acetone)

Primer DC 1200 manufacturer DOW CORNING
Silane solution in an organic solvent

2.1.3.2 DC 993

Cleaning product: R40 manufacturer DOW CORNING
Organic cleaner (isopropanol / acetone)

Primer	DC 1200 manufacturer DOW CORNING Silane solution in a organic solvent
Skimming primer	Q3-3556 Low molecular weight silicone

2.2 Method of verification

The assessment of the fitness for use of the structural sealants for the intended use in relation to the requirements for safety in case of fire; safety in use; hygiene health and environment; energy economy and heat retention; in the sense of the Essential Requirements 2, 3, 4 and 6 has been made in accordance with the "Guideline for European Technical Approval for Structural Sealant Glazing Systems (ETAG 002).

Where the guideline allows for classifications and/or choice, the following selection has been made:

ER2 SAFETY IN CASE OF FIRE

The behaviour in case of fire has to be assessed in the framework of the ETA for the kit

ER3 HYGIENE, HEALTH AND ENVIRONMENT

In matter of "Dangerous substances", the sealants manufacturers made a declaration of conformity to the Council Directive 76/769/EEC published in "Official Journal of the European Communities " of 27/07/1976 and its amendments.

In addition to the specific clauses relating to dangerous substances contained in this European Technical Approval, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply

ER4 SAFETY IN USE

The following test, relevant for sealant assessment have been passed : 5.1.4.1.1, 5.1.4.1.2, 5.1.4.2.1, 5.1.4.2.2, 5.1.4.2.3, 5.1.4.2.4, 5.1.4.2.5, 5.1.4.6.1, 5.1.4.6.2, 5.1.4.6.3, 5.1.4.6.4, 5.1.4.6.5, 5.1.4.6.7, 5.1.4.6.8 (for DC 993 only), 5.2.1.1, 5.2.1.2, 5.2.1.3, 5.2.1.4, by reference to ETAG 002

ER6 ENERGY ECONOMY AND HEAT RETENTION:

Determination of thermal insulation and susceptibility to condensation:

Calculation method

As a function of the design and the glazing chosen for the SSGS kits, thermal modelling can be undertaken with various computer software packages. To use the results of these programs, it is necessary to ensure that they are at least two-dimensional and cover all the required parameters.

The generally accepted value of the thermal conductivity (λ -value) of the structural sealant to be used in thermal modeling for assessment of the thermal performance is 0,35 W/m K .

3 Evaluation of conformity and CE marking

3.1 ATTESTATION OF CONFORMITY SYSTEM

In the framework of the mandate for structural sealant glazing kits, the systems of attestation of conformity specified by the European Commission detailed in Mandate are as follows [Commission decision of 24/06/96, published in the EC Official Journal L254 of 08/10/96]:

System 1 (without audit testing of samples) for SSG kits Types II and IV

System 2+ (first possibility, including certification of the factory production control (FPC) by an approved body on the basis of its continuous surveillance, assessment and approval) for SSG kits Types I and III. [The systems being as described in Council Directive 89/106 EEC Annex 111.2.(i) and (ii) respectively].

The structural sealants being a component put on the market as such, it is impossible to determine in advance the Type of the kits in which the sealant is to be used.

As a consequence, only the system 1 applies.

System 1

(a) tasks for the manufacturer

- factory production control;
- testing of samples taken at the factory by the manufacturer in accordance with a prescribed test plan.

(b) tasks for the approved body

- initial type testing of the product;
- initial inspection of the factory and of factory production control;
- continuous surveillance, assessment and approval of the factory production control.

3.2 RESPONSIBILITIES

3.2.1 Tasks for the manufacturer

3.2.1.1 Factory production control

The sealants manufacturer exercises permanent internal control of production.

All the elements, requirements and provisions adopted by the manufacturer are documented in a systematic manner in the form of written policies and procedures. This production control system ensure that the product is in conformity with the European Technical Approval (ETA).

The FPC involve the following tests

- DC 993:** base: Colour, appearance, and extrusion rate
catalyst: viscosity
mixture: flow, working time, hardness, tensile and elongation to rupture at initial state and after 24 hours at 100°C
- DC 895:** Colour, density, flow, homogeneity, extrusion rate,
After 7, 28 days of polymerisation: hardness, tensile and elongation to rupture
After 24 hours at 100°C: tensile and elongation to rupture

3.2.1.2 Testing of samples taken at the factory — Prescribed Test Plan

In the context of structural sealants, it is necessary for the manufacturer to undertake adhesion/cohesion tests to rupture after thermal conditioning as described in ETAG 002 § 8.3.2.4, ■ check on incoming material (i) on each batch of sealant. The testing of "H" pieces, peel tests, as part of FPC provides the necessary evidence.

3.2.2 Tasks for the approved body :

3.2.2.1 Initial Type Testing

Approval tests have been conducted by the approval body (UBAtc - BUtgb) or under its responsibility (which may include a proportion conducted by an indicated laboratory or by the manufacturer witnessed by the approval body) in accordance with Chapter 5 of this ETAG. The approval body (UBAtc - BUtgb) has assessed the results of these tests in accordance with Chapter 6 of this ETAG, as part of the ETA issuing procedure. These tests should be used for the purposes of Initial Type Testing.

As required by the System 1, this work is to be validated by the approved body for Certificate of Conformity purposes.

3.2.2.2 Assessment of the factory production control system-initial inspection and continuous surveillance

Assessment of the FPC is the responsibility of an approved body

An assessment must be carried out on the required manufacturing step of each manufacturing plant to demonstrate that the factory production control is in conformity with the ETA and any subsidiary information. This assessment is based on an initial inspection of the factory.

Subsequently continuous surveillance of factory production control is necessary to ensure continuing conformity with the ETA. This continuous surveillance is performed as per ETAG 002 SSGS chapter 8.3

It is recommended that surveillance inspections should be conducted at least twice a year.

3.2.2.3 Certification

The approved body has issued Certification of Conformity of the product (for System 1).

3.3 CE MARKING

The CE marking shall be affixed on each cartridge or packaging. The symbol "CE" shall be accompanied by the following information:

- Identification number of the certification body;
- Name of identifying mark of the producer and manufacturing plant;
- The last two digits of the year in which the CE marking was affixed;
- Number of European Technical Approval;
- Number of EC certificate of conformity.

4 Assumption under which the fitness of the product for the intended use was favourably assessed

4.1 MANUFACTURING DIRECTIVES

4.1.1 DC 895

The structural sealant DC 895 is fabricated and packaged by the firm Dow Corning Seneffe Belgium. The maximum storage duration of the sealant is 12 months after the fabrication date in its original unopened packaging, when stored below 30°C.

4.1.2 DC 993

The base of the structural sealant DC 993 is fabricated and packaged by the firm Dow Corning Seneffe Belgium and Dow Corning Jincheon Korea, while the catalyst is fabricated and packaged by the firm Dow Corning Wiesbaden Germany.

The maximum storage duration of the sealant is 12 months for the base and 12 months for the catalyst after the fabrication date in their original unopened packaging, when stored below 30°C.

4.2 DESIGN RULES AND APPLICATION OF THE SEALANT

4.2.1 Design rules

4.2.1.1 Structural seal design

see method of calculation in annexe 1.

4.2.1.2 Suitable substrates for structural adhesion surface

The generic types of suitable adhesion substrates are given here after as a function of the structural sealant only as indication.

Except for the float glass, the combination of a particular substrate of the generic types of substrates given in the table 1 and a structural sealant shall be assessed in the framework SSGS ETA by passing the following set of tests by reference to the ETAG 002 , § 5.1.4.1.1, 5.1.4.2.1, 5.1.4.2.2, 5.1.4.2.3, 5.1.4.2.4, 5.1.4.2.5.

In addition this particular substrate for structural seal adhesion surface has to be identified and assessed as per the relevant § of the chapter 5 and 6 of the ETAG 002

TABLE 1 Generic type of substrates

Generic type of substrates	Dow Corning 895	Dow Corning 993
Glass	Suitable	Suitable
Coated glass	Suitable	Suitable
Stainless steel	Suitable	Suitable
Anodised aluminium	Suitable	Suitable

Besides, those specific substrates for structural seal adhesion surface has been identified and assessed as per the relevant § of the chapter 5 and 6 of the ETAG 002.

Specific type of substrates	Dow Corning 895	Dow Corning 993	Primer
Coated glass SOLARBEL SS 20 (Glaverbel)	Not covered	Suitable	No primer
Coated glass SOLARBEL PB 20 (Glaverbel)	Not covered	Suitable	No primer
Coated glass SGG COOL-LITE SS 108 (Saint-Gobain Glass)	Not covered	Suitable	No primer
Coated glass SGG COOL-LITE PB 114 N (Saint-Gobain Glass)	Not covered	Suitable	No primer
Coated glass SGG ANTELIO Clair (Saint-Gobain Glass)	Not covered	Suitable	No primer
Coated glass SGG ANTELIO Argent (Saint-Gobain Glass)	Not covered	Suitable	No primer
Coated glass COOL LITE ST 150 (Saint-Gobain Glass)	Not covered	Suitable	No primer

From the table 1, suitable coated glass for structural adhesion can be extrapolated following the rules mentioned in the ETAG 002 § 5.2.3.3 without further initial type testing.

Note: Opacified glass with resin must not be considered as suitable structural seal adhesion surface.

4.2.1.3 Drainage and ventilation

Water stagnation is not allowed in the vicinity of structural seal. The SSGS shall then be designed with an efficient water tightness assisted by drainage and ventilation.

4.2.1.4 Transfer of the infill loading on the building structure via the structural sealant

The DC 895 is suitable to be used in SSGS type I or II as defined in ETAG 002. This means that the SSGS must be equipped with mechanical self-weight devices in order to transfer the dead load of the glass to the façade structure.

The DC 993 is suitable to be used in SSGS type I to IV as defined in ETAG 002. This means that the SSGS may or may not be equipped with mechanical self-weight devices.

4.2.2 Application of the sealant

4.2.2.1 Description of the structural sealants application

The ETA's for structural sealant glazing kits describe the sealant application, in particular, the ETA's give the cleaning product to be used as well as the primer, if needed, and method of application.

4.2.2.2 General technical conditions

The Dow Corning DC 895 sealant has to be applied between 5 and 35°C in a dust free location. The seal needs to be tooled before the skin-over time has been reached, preferably within 10 minutes after the extrusion. It is important to realise that the skin-over time can vary with temperature and relative humidity. After the skin-over time has been reached, there should be no further relative movement induced between the glass and the metal frame.

The Dow Corning DC 993 needs to be mixed at a ratio base/catalyst by weight of 10/1 (min. 9/1 and max. 11/1). The Dow Corning DC 993 sealant has to be applied between 5 and 35°C in a dust free location. The joint needs to be tooled before the snap time has been reached, preferably within 10 minutes after the extrusion. It is important to realise that the snap time can vary with temperature and relative humidity.

After the snap time has been reached, there should be no relative movement induced anymore between the glass and the metal frame.

In all cases, it should be checked that there is no condensation on the substrates prior to the sealant application.

4.2.3 Recommendation for façade cleaning

It is recommended to use the following product for façade cleaning:

- cleaning agent EXTRAN 02 Neutral -MERK, dilution 2% for DC 895 and DC 993
- cleaning agent PRIL dilution 1% for DC 993

Nevertheless, the assessment of the façade cleaning product must be done in the framework of the ETA for the kit in order to check that those cleaning agents do not affect other kit products (gaskets, weather sealant, ...).

4.2.4 Chemical compatibility

The chemical compatibility has to be assessed in the framework of the ETA for system as required by the ETAG 002 SSGS, § 5.1.4.2.5.

In the assessment procedure of the present ETA, the following products combination has been evaluated as required.

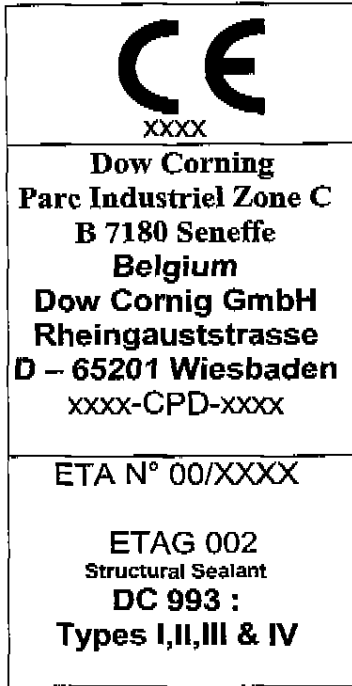
The structural sealant DC 895 is compatible with the NORTON spacer V2100.

The structural sealant DC 993 is compatible with the NORTON spacers V2100 and V3100.

4.2.5 Responsibility of the manufacturer

It is the responsibility of the ETA holder to ensure that the information on the related component requirements and their fabrication and setting is given to the person concerned. This information may be made by reproduction of the relevant parts of the European Technical Approval.

For the structural sealant DC 993



"CE"-symbol

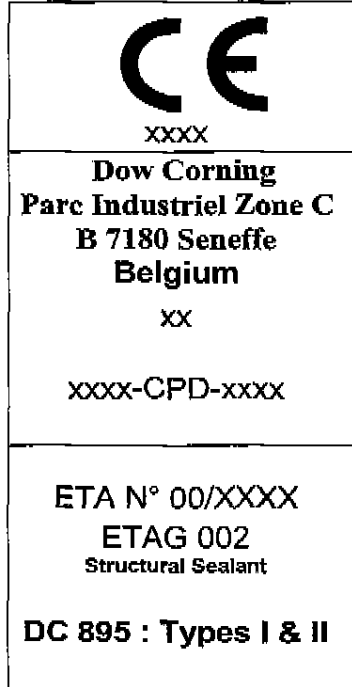
Number of Notified Body
Name and address of the manufacturer or his representative established in the EEA and of the plant where the product was manufactured
Two last digits of year of affixing CE Marking

Number of EC certificate of conformity (where relevant)

ETA Number
ETAG Reference

Relevant performance characteristics and/or designation code

For the structural sealant DC 895



"CE"-symbol

Number of Notified Body
Name and address of the manufacturer or his representative established in the EEA and of the plant where the product was manufactured
Two last digits of year of affixing CE Marking

Number of EC certificate of conformity (where relevant)

ETA Number
ETAG Reference

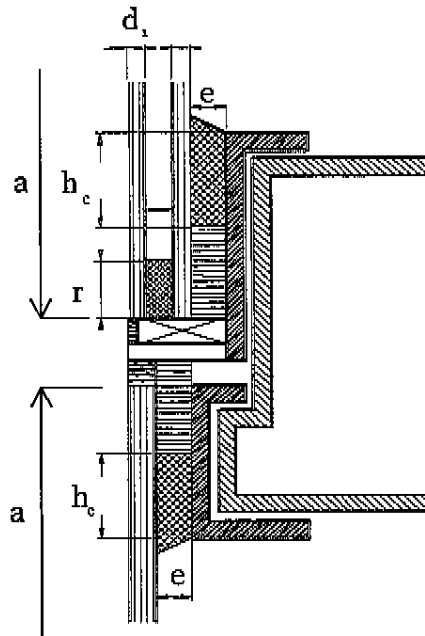
Relevant performance characteristics and/or designation code

Annex to ETA on Structural Sealant DC 895 and DC 993 set up by the ETA applicant

Structural Glazing Joint Dimensioning : 4-Sided SG System.

This calculation deals with the standard case for a SG joint dimensioning in case the SG element is sealed on the 4 sides using rectangular or square panel. The most detailed reference document for structural glazing application in Europe are the EOTA Guideline ETAG 002: Structural sealant Glazing systems - and the CEN PrEN 13022 dated October 97.

The following calculation has to be used with care and technical recommendations using the below mentioned formula should only be given by qualified employee. The way the calculation is done, there is no stress combination being considered between wind pressure, temperature and constant load if any.



list of symbols

W	=	combined actions of the wind and the snow (Pa)
σ_{des}	=	tension design stress $\sigma_{des} = R_{u,s} / \gamma_{tot}$
τ_{des}	=	shear design stress under dynamic load $\tau_{des} = R_{u,s} / \gamma_{tot} (2 (23 \text{ } ^\circ\text{C}))$
τ_{pe}	=	shear design stress under permanent load $\tau_{pe} = \tau_{des} / \gamma_c$
E	=	modulus of elasticity in tension of the silicone
Δ	=	the maximum thermal movement, as a combination of the elongation in directions a and b

a	=	short side dimension of the glass pane
b	=	long side dimension of the glass pane
h_v	=	glazing height = vertical dimension a or b
γ_{tot}	=	total safety factor γ_{tot}
T_c	=	temperature of the metallic frame at the moment t
T_v	=	temperature of the glass at the moment t
T_0	=	temperature during silicone application
α_c	=	linear coefficient of thermal expansion of the structural sealant support frame
α_v	=	linear coefficient of thermal expansion of glass
e	=	thickness of the seal
ΔT	=	$T_c - T_v = 25^\circ\text{C}$ the case under consideration (see also 4.4.4.1)
h_c	=	bite, see also terminology
r	=	bite of the hermetic seal having a structural function
G	=	shear modulus $G = E/3$
P	=	glazing self weight
d_1	=	outer glass thickness of the IGU
d_2	=	inner glass thickness of the IGU
d	=	single glass thickness

⇒ WIND PRESSURE

Ref: Theory of plates and shells.
 1. Timoshenko, S. Krieger.
 Mc Graw - 2nd Ed - 1959.
 ISBN: 0-07-Y85820-9.

The wind action will induce on the glass plate a trapezoidal deformation from which is derived the simplified formula.

If the glass deformation or/and the sealant bite is too high, an additional rotation factor has to be taken into account for the determination of the maximum stress value.

1.1: Simplified Formula.

Minimum Sealant Bite

$$h_c \geq | a W / 2 \sigma_{des} |$$

- Where :
1. W : The wind pressure to take into account is the wind for a return period of minimum 10 years. This value has to be given by Curtain wall manufacturer in accordance with local regulation. EUROCODES exists for wind calculation.
 2. h_c minimum should be $>$ to 6 mm.
 3. h_c effective = H_{mc} minimum + Tolerances.
 4. $\sigma_{des} = 140\,000 \text{ Pa} = R_{u,5} / 6$.

The $R_{u,5}$ value is the probability at 75% that 95% of the population will have a breaking strength above this value. The sealant design stress is given in the ETA.

1.2 Complete Formula to be used if ω glass (glass deflection) is > to $a/100$ or $h_c \text{ eff} \geq 3e$.

This formula which takes into account the effect of the joint rotation on the sealant stress due to the glass deflection should be used if the glass deflection is superior to 1/100 of the small side dimension or if the length of the sealant bite is superior to 3 times the sealant thickness. The condition is to have a sealant stress below 0,21 MPa.

Calculation of the maximum in the structural seal

$$\begin{aligned}\sigma_{\max} &= \frac{a * W * 0.5}{h_c \text{ Eff.}} + \frac{h_c \text{ eff} * \alpha * E \text{ rigid.}}{2 * e} \\ &= \sigma_1 + \sigma_2 \\ &\leq \sigma_{\text{des}, \omega} \text{ see (3) here under}\end{aligned}$$

Where

1.

$$\alpha = \frac{\omega * 3.2}{a}$$

ω = maximum Glass deflection

3.2 = Form factor. (4 sided deformation)

$h_c \text{ eff}$ = Max h_c effectively used in the project.

2. W : The wind pressure to take into account is the wind for a return period of minimum 10 years. This value has to be given by Curtain wall manufacturer in accordance with local regulation. EUROCODES exists for wind calculation

3. $\sigma_{\text{des}, \omega} = R_{u,s}/4. = 0.21 \text{ MPa}$

The fact of taking into account the rotation factor allow to decrease the safety factor γ_{tot} from 6 to 4.

The safety factor is still calculated from the design stress versus the minimum sealant breaking strength. The sealant design stress is given in the ETA

4. $E \text{ rigidity} = E_0 * 1,60$.

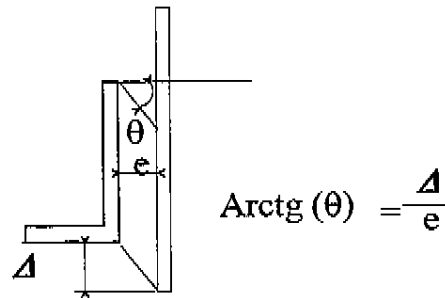
The sealant modulus taken into account for this formula is taking into account the effect of the adhesion surface and its added rigidity effect. The Young's modulus is derived from measurement done on dumbbells as per ETAG 002 § 5.1.4.6.7. The factor 1,60 is to be found in literature and is an average covering most sealant configurations. (ref: Els Deforche: "Methodologie voor het technisch ontwerp van omhulsel van het gebouw. WTCB - CSTC 1993", InV test reports on DC 993)

5. This formula is general and should be used in absence of more precise computation or tests results. Validation of system out-side this frame should be allowed only if real scale data exist confirming system durability and performances
6. The rotation factor is calculated with the assumption that the spacer is not contributing to the location of the rotation point. This is generally the case for SG system with internal spacers calculated in wind suction.

In the case of wind pressure the σ_1 term should be subtracted from the rotation term (including the effect of the spacer). In practice, this means that wind suction will be most often the worst case. Depending on the location of the spacer, its hardness, the highest wind pressure (pressure or suction), the distance contributing to the rotation may vary. (by default, it is equal to $h_{eff}/2$). This have to be assessed case per case in the framework of the systems.

THERMAL EXPANSION

The differential thermal expansion between the glass and the metallic frame will induce on the sealant a shear stress that needs to be below the allowed designed shear stress. The amplitude of the differential dilatation will depend upon the glass and metal used (aluminium, stainless steel) but also upon the design of the SG system



$$e \geq | (G \cdot \Delta) / (\tau_{des}) |$$

Where

τ_{des} = Maximum allowed stress in shear = $R_{0,5} / 6$.

The maximum allowed stress in shear to be taken as the $R_{0,5}$ as determined in shear, divided by $\gamma_{tot} = 6$.

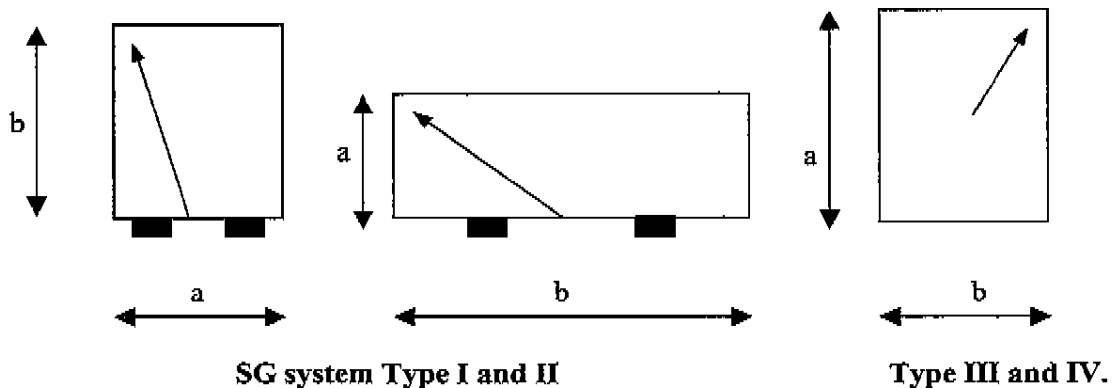
Value of Δ

$b > a$, the pane is supported at side a : $\Delta = [(T_c - T_0) \cdot \alpha_c - (T_v - T_0) \cdot \alpha_v] \cdot \sqrt{(a/2)^2 + b^2}$ $b >$

a , the pane is supported at side b : $\Delta = [(T_c - T_0) \cdot \alpha_c - (T_v - T_0) \cdot \alpha_v] \cdot \sqrt{a^2 + (b/2)^2}$

The pane is not supported :

$$\Delta = [(T_c - T_0) \cdot \alpha_c - (T_v - T_0) \cdot \alpha_v] \cdot \sqrt{(a/2)^2 + (b/2)^2}$$

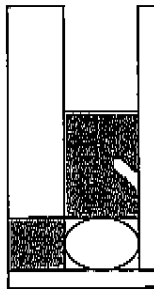


Remark : ΔT calculation.

Case 1: SG system with internal frame: ΔT glass is 60 °C, ΔT Metal is 35 °C.

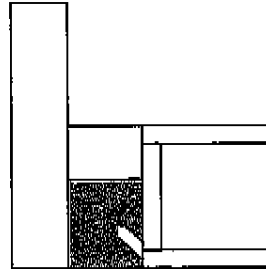
Case 2: SG system with external frame: ΔT glass = ΔT metal = 60°C.

Case 3: Curtain wall manufacturer is supplying ΔT data for glass and frame.



Case 2

ΔT glass = ΔT metal = 60 °C.



case 1

ΔT glass = 60 °C.
 ΔT metal = 35 °C.

DEAD LOAD

The calculation for dead load is to be applied for SG system type III and IV i.e. when the dead load of the glass is transferred to the façade structure by the silicone sealant.

The basic calculation will determine if the constant sealant stress is not above the allowed stress. The allowed stress is calculated either taking into account the limit of flow divided by 14 or based on official test results.

$$h_c \geq \frac{P}{2 \cdot \tau_{\infty} \cdot h_v}$$

Rem:

1. The value for h_c is the minimum value without tolerances. For a non supported SG project, the minimum h_c is always the highest value obtained either via wind or dead load calculation.
2. h_c minimum should be > to 6 mm.
3. h_c effective = h_c minimum + Tolerances.
4. τ_{∞} = see ETA § 2.1.1

AGREMENT

Décision

Vu l'Arrêté ministériel du 6 septembre 1991 relatif à l'organisation de l'agrément technique et à l'établissement de spécifications-types dans la construction (Moniteur belge du 29 octobre 1991);

Vu la demande introduite par la firme DOW CORNING sa (A/G 060204-E);

L'agrément technique Européen est délivré à la firme DOW CORNING sa pour le produit DOW CORNING 895 and 993 (id. Façades, système de façade VEC, mastic de collage) compte tenu de la description ci-dessus.

Cet agrément est soumis à renouvellement le 19/06/2011.

Bruxelles le 19-06-2006



Vincent MERKEN
Directeur général