

"METHOD FOR TESTING THE STABILITY OF STRUCTURAL
GLAZING SEALED ON TO FACADE ELEMENTS"

5 The invention relates to a method for testing the stability of frameless glazing sealed on to facade elements, consisting of a pane or an insulating glazing or structural glazing.

10 The construction technique known under the term "structural glazing" involves securing a glazing in frameless manner at two or four sides to facade elements, such as facade columns or facade transoms. The glazing consists of one pane or a heat or sound insulating glazing comprising two or more panes and is sealed directly on to the facade elements, the sealing performing not only the sealing functions but also static functions, such as for example
15 transferring wind loads (wind pressure and wind tension) and partly also bearing the weight of the glazing itself. The sealing is effected in particular with a one-component or two-component silicone rubber.

20 A problem resides in assessing the stability of such a glazing. It is possible to subject such a frameless or structural glazing to tension or shearing until the bond between the glazing and facade element detaches. Such a test is however not possible on existing buildings because after the test the connection between the facade elements and the glazing must be re-established. Up until now there was therefore only the possibility of visual inspection, i.e. checking the connection with the aid of a more or less
25 trained eye to detect weak points since inadequately secured panes endanger persons and property.

30 The invention is based on the problem of providing a method for testing the the stability of structural glazing, damage to existing structures being avoided and the uncertainty of

- visual inspection eliminated. This problem is solved according to one aspect of the invention in that a gas under pressure is introduced into a sealed space defined between the glazing and the facade elements and/or into a space within the glazing enclosed by two glass panes of the glazing and any pressure drop with time is determined and/or the integrity of the sealing of said space is tested with a probe operative to detect escaping gas and which is traversed along the sealing.
- 10 It is possible with this method indirectly on the basis of leaks to check firstly the connection between the glazing and the facade elements to which the glazing is secured and, secondly, the connection between two glass panes of double glazing without any damage to the structure. The
- 15 measurable pressure loss also eliminates the uncertainty of visual inspection. By means of the method according to the invention it is also possible to make a comparative test, i.e. it is not necessary to replace glazing having a slight leak if the leak determined is constant over a relatively
- 20 long period of time and does not increase. It is therefore possible during an approval inspection of a newly constructed building to check the bonds between the glazing and facade elements and keep a record of the values determined. After intervals of time of varying length this
- 25 check can be repeated and from a comparison with the previously determined value it is possible to decide whether the glazing has remained stable or whether a deterioration has occurred which requires changing of the glazing or renewal of the means securing the latter. If a
- 30 gas other than air, for example an inert gas, is used leaking gas can be detected should the seal leak by means of a suitable probe which is traversed along the seal.

In order to determine, in particular with structural insulating glazing, whether the bond between the glazing as

a whole and the facade elements or only that between the glass panes constituting the composite glazing is defective, a gas under pressure may be introduced into the sealed space between the edges of the glazing and the facade elements, and the space or the spaces included in each case by two glass panes is or are evacuated, or gas under pressure is introduced into the space or spaces enclosed in each case by two panes and the space between the edges of the glazing and the facade elements is vented. This ensures that when a leak is present only that of a sealing of the panes can establish pressure equalization between the spaces being checked.

According to a further aspect of the invention, in performing the method thereof a space in which the sealing of the glazing to the facade elements is disposed is sealed in a gas-tight manner, a gas is introduced into the space under pressure and any pressure drop with time of the gas contained in the space is determined and/or the integrity of the sealing is tested by means of a probe operative to detect escaping gas and which is traversed along the sealing. This form of the method is used with structural glazing when no space is present which is enclosed by sealing strips sealing the glazing. When a check of the sealing is made with a probe a detectable gas, such as for example neon, is employed.

The gas may be directed through a valve having access to the sealed space between the glazing and the facade element and/or with double glazing in a spacing profile of the glazing through a valve having access to the space enclosed by two panes. By connection to a pressure gas source, preferably a compressed air source or a neon gas supply, the gas under pressure can be introduced into the space. When the bond between the glazing and the facade elements or between two panes of a double glazing is no longer one

hundred percent intact a pressure drop will occur which can be measured and from the rate of the pressure decrease the quality of the means securing the glazing can be deduced. Alternatively or additionally a probe may be used to detect any escape of gas.

The valves are preferably made in the form of pneumatic tyre valves so that the gas is introduced under pressure and, after completion of the test, can be let out again. Other suitable valves could, however, be used.

- 10 When such valves are not disposed on the facade elements or there is no sealed space between securing strips, the gas may be introduced into the space defined between the glazing and a wall temporarily sealingly arranged behind the glazing. The pressure gas may be directed through a
- 15 valve in this wall, with pressure in the space between the wall and the glazing indicated by a manometer in the wall.

The invention will now be further described with reference to the accompanying drawings which illustrate, by way of example, several embodiments. In the drawings:

- 20 Fig. 1 is a cross-section through a facade column or upright with structural insulating glazing disposed thereon;

Fig. 2 is a section through modified insulating glazing on a facade upright;

- 25 Fig. 3 is a section through a facade upright comprising structural glazing and test apparatus disposed thereon; and

Fig. 4 is a section similar to Fig. 3 of double or insulating glazing.

Fig. 1 shows in section part of a facade upright 10 on which insulating glazing 12 is arranged in frameless manner. The insulating glazing 12 consists of an inner pane 14 and an outer pane 16. The connection between the panes 14 and 16 is via a spacing holder 18 running round the edge of the panes which is secured with a sealing layer 20 to the pane 14 and with a sealing layer 22 to the pane 16.

The facade upright 10 comprises at the outer corners steps 24 for the support of, and for securing, the insulating glazing 12. At one supporting face 26 there is provided a spacing profile 28 of an elastomer which can withstand pressure. Securing of the back of the pane 14 to the support face 26 is via a loadbearing sealing 30. The pane 16 of the insulating glazing 12 has a larger area than the pane 14 and lies with the projecting edge region on a spacing profile 32 of an elastomer which is supported at the outer surface 34 of the facade upright or support profile 10. The securing of the pane 16 to the support profile 10 is via a loadbearing sealing 36 which is disposed between the face 34 and the back of the pane 16.

The glazing 16, the step 24 of the support profile 10 and the spacing profiles 28 and 32 together with the supporting seals 30 and 36 enclose a space 38. With complete and intact sealing between the support profile 10 and the insulating glazing 12 said space 38 is gas-tight. A conduit 40 in the form of a flexible tube or other small tube is introduced into the space 38. Through the tube 40 a gas can be introduced into the space 38 with the aid of which the sealing of the loadbearing seals 30 and 36 and thus the stability of the glazing 12 at the support profile 10 can be checked. For this purpose compressed air, for example, is introduced into the space 38 until a

predetermined pressure obtains in said space 38. This pressure can be determined via a manometer arranged in the space 38 or in the course of the tube 40. The small tube 40 is preferably provided with a valve which closes when no more pressure is applied. When the seals 30 and 36 are absolutely tight no pressure drop occurs. If however the sealing strips 30 and 36 are defective compressed air can escape and a pressure drop of varying rapidity takes place. The magnitude of the pressure in the space 38 is chosen so that the sealing between the glazing and the support element is not impaired.

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Since the stability of a glazing 12 on a support element can also be ensured when the loadbearing seals 30 and 36 are not absolutely gas-tight, a measurement is carried out as described above for example after installation of the glazing and a record of this measurement is kept. On checking after a period of desired length it can be determined whether the sealing has remained the same or whether a deterioration has taken place. Acceleration of the pressure drop in the space 38 indicates deterioration of the stability which may require removal of the glazing 12 from the support profile 10 and reestablishment of the seals 30 and 36.

Instead of air neon can for example be introduced into the space 38. When the seal 30 and/or the seal 36 are not absolutely tight neon can pass through the seals. With a suitable probe by moving over the seals 30 and 36 at the outside it can be determined whether neon gas is escaping. This makes it possible to detect any leaks which allow the quality of the stability of the glazing 12 to be deduced.

In the embodiment shown in Fig. 2 insulating glazings 50 and 52 are secured to a support profile 54. The insulating glazing 50 consists of an outer glass pane 56 and an inner glass pane 58. The panes 56 and 58 are held spaced via an encircling spacer 60. The connection between the panes and the spacer is via seals 62 and 64. The insulating glazing 52 is made in analogous manner. Between the outer face 66 of the support profile 54 and the rear side of the pane 58 a spacing profile 68 of an elastomer is disposed which can be subjected to pressure stress. The securing of the glazing 50 at the support profile 54 is via a loadbearing seal 70.

Through the spacer 60 a small tube or conduit 72 provided with a valve is led. For checking the seals 62 and 64 and

thus the stability of the pane 50 a suitable gas can be introduced through the tube 52 into the space enclosed by the panes and the spacer. On the tube 72 or at another suitable point in the spacer 60 a manometer is disposed so that after completion of the introduction of the gas under pressure into the sealed space 74 any pressure drop with time can be determined if the seals 62 and/or 64 are not completely intact. The testing of the stability of the glazing at the support profile 54, i.e. the testing of the state of the loadbearing seal 70, will be explained with reference to Figs. 3 and 4.

In the embodiment shown in Fig. 3 two panes 82 and 84 are secured in frameless manner to a support profile 80. Between the outer side 86 of the support profile 80 and the inner side of the pane 82 a spacing profile 88 of an elastomer which can take up pressure is disposed. The securing of the pane 82 to the face 86 is via a loadbearing seal 90. The pane 84 is secured via a spacing profile 92 and a loadbearing seal 94 to the support profile 80.

For testing the stability of the pane 84 at the support profile 80, i.e. for testing the loadbearing seal 94, on the support profile 80 and the further facade elements not shown a wall or sealing frame 96 is disposed. Said sealing frame 96 is anchored all round via a seal 98 to the facade elements. After installing the wall or sealing frame 96 a space 100 is created in which the loadbearing seal 94 of the pane 84 is disposed. Via a conduit 102 led through the sealing frame 96 a gas is introduced into the space 100 until a predetermined pressure obtains in the space 100. The indication of the pressure in the space 100 is via a manometer which is not illustrated and which is disposed in the sealing frame 96 and open towards the space 100. The quality of the seal 94 is found by determining whether a pressure drop occurs in the space 100. If

it is assumed that the seal 98 is intact this pressure drop can be due to gas escaping from the chamber 100 through flaws in the sealing 94. If an inert gas such as neon is introduced through the conduit 102 into the space 100, by testing the sealing 94 with a suitable probe it can be determined whether and if so at which points gas escapes towards the outside through the seal 94. By repeated measurements at predetermined intervals of time it can be tested whether the quality of the seal deteriorates, i.e. whether at some time the instant is reached when the stability of the pane 84 is no longer ensured and a new sealing has to be carried out.

The example of embodiment illustrated in Fig. 4 differs from the example of embodiment shown in Fig. 3 only in that instead of individual panes insulating glazings 110 and 112 are disposed on a facade support section or profile 114. The insulating glazings 110 and 112 are formed like the insulating glazings of Fig. 2. The securing of the glazings 110 and 112 is via spacing profiles 116 and 118 and loadbearing sealings 120 and 122. To test the sealing 122 a wall or sealing frame 124 is clamped between the facade elements and via a seal 126 sealed with respect to said facade elements. Via a conduit 128 a gas, air or neon, is introduced into the space 130 between the glazing and the sealing frame 124. From a possible pressure drop in the space 130 after completion of the gas supply and sealing of the conduit 128 the quality of the sealing 122 can be deduced. When neon is introduced as gas into the space 130 apart from a pressure measurement by means of a probe at the outside of the sealing 122 it can be determined where flaws are present in the sealing 122.

The testing of the stability of the glazings 110 and 112 itself, i.e. the test whether the outer pane is secured adequately firmly to the spacer or whether the spacer is sealed adequately firmly to the inner pane, is carried out



- as outlined with reference to Fig. 2. For this purpose corresponding conduits are provided which are led through the spacers so that in the space between the panes of the glazing 110 and 112 a gas can be introduced to build up a
- 5 pressure in said space or by means of a probe at the edge of the glazing to check whether the gas is escaping through the seal.



CLAIMS:

1. A method for testing the stability of structural glazing sealed on to facade elements, wherein a gas under pressure is introduced into a sealed space defined between the glazing and the facade elements and/or into a space within the glazing enclosed by two glass panes of the glazing and any pressure drop with time is determined and/or the integrity of the sealing of said space is tested with a probe operative to detect escaping gas and which is traversed along the sealing.

2. A method according to claim 1, wherein gas under pressure is introduced into the sealed space between the glazing and the facade elements and the space enclosed by two glass panes is evacuated, or vice versa.

3. A method for testing the stability of structural glazing sealed on to facade elements, wherein a space in which the sealing of the glazing to the facade elements is disposed is sealed in a gas-tight manner, a gas is introduced into the space under pressure and any pressure drop with time of the gas contained in the space is determined and/or the integrity of the sealing is tested by means of a probe operative to detect escaping gas and which is traversed along the sealing.

4. A method according to any one of claims 1 to 3, wherein the gas is air.

5. A method according to any one of claims 1 to 3, wherein the gas is neon.

6. A method according to any one of the preceding claims, wherein the gas is directed through a valve having access to the sealed space between the glazing and the facade



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element and/or in a spacing profile of the glazing, in the case of an insulating glazing comprising two spaced panes, having access to the space enclosed by the two panes.

7. A method according to claim 6, wherein the gas is directed through the or each valve constructed in the form of a one-way valve as used with a pneumatic tyre and allowing pressure to be released through the valve.

8. A method according to claim 3, wherein the gas is introduced into the space defined between the glazing and a wall temporarily sealingly disposed behind the glazing.

9. A method according to claim 8, wherein compressed air is used as the pressure gas.

10. A method according to claim 8, wherein neon gas is used as the pressure gas.

11. A method for testing the stability of structural glazing sealed on to facade elements, substantially as herein described with reference to the accompanying drawings.
