

"METHOD FOR MONITORING THE BONDING OF STRUCTURAL GLAZING
AND STRUCTURAL GLAZING ADAPTED FOR SUCH MONITORING"

The invention relates to a method of monitoring the bonding of structural glazing sealed with respect to facade elements, and to structural glazing adapted for carrying out the method.

The construction method known under the technical term "structural glazing" involves securing a frameless glazing at two or four sides to facade elements such as facade posts and facade cross-members or transoms. The glazing consists of a pane or a glazing of two or more panes and is bonded directly on to the facade elements, the sealing bond not only providing sealing functions but also performing static functions, for example transmitting wind loads (wind pressure and wind suction) and partially also bearing the weight of the glazing itself. The sealing bond is effected in particular with a one-component or two-component silicone rubber.

One problem resides in assessing the sealing of such a glazing via the bonding to the facade elements. It is possible to load such structural glazing under tension or shearing until the connection between glazing and facade element detaches. However, such a test is hardly possible on existing buildings because after the test the connection between the facade elements and glazing would have to be re-established. So far, the only possibility has thus been visual assessment, i.e. checking the connection with the aid of a more or less skilled eye to detect weak points because inadequately secured panes are a threat to persons and property.

The invention is based on the problem of providing a method and structural glazing adapted for monitoring the bonding or bonding strength

of structural glazing, avoiding damage to existing structures and eliminating the uncertainties of visual inspection.

This problem is solved according to the invention in that the gas in the space between a facade element and the edge of the glazing, and/or in the space enclosed between two glass panes of the glazing, is connected to a container containing drying agent and at intervals the drying agent is examined for changes due to charging with moisture from the connected space.

It is possible with this method to check indirectly via the leak-tightness of the connection between the glazing and the facade elements to which the glazing is secured on the one hand, and between the two glass panes of an insulating glazing on the other hand, without any damage to the structure. A visible change of the drying agent due to moisture absorption also eliminates the uncertainty of a visual inspection of the load-bearing sealing bond. By means of the method according to the invention a comparative test is carried out, i.e. in the event of a slight leak it is not necessary to replace the glazing if the leak determined is constant over a relatively long period of time and does not increase. After incorporation of the glazing at preferably regular intervals it can be checked whether the drying agent has undergone an irregular or abrupt change, i.e. whether the drying agent has absorbed moisture. This increased moisture can only penetrate the spaces otherwise enclosed by the seal through a leak therein whilst a gradual increase of the charge can result from the vapour permeability of the silicone and is not problematical. It is assumed that the sealing has been carefully installed, i.e. that no cavities occur. From a comparison of the present value with a previously recorded

value a decision can be made whether adequate sealing of the glazing to the facade is still ensured or whether an impairment of the sealing has occurred which requires replacement of the glazing or renewal of the load-bearing sealing bond.

To be able to assess in particular with insulating structural glazing whether the cohesion between the glazing as a whole and the facade elements or only between the glass panes forming the double-glazing is defective both the space between the facade elements and the edge of the glazing and the space included by two glass panes with encircling spacers sealed therebetween are monitored.

Preferably, the amount of changed drying agent is read from the container in which the drying agent is disposed. It has been found that the so-called mass-transfer zone (mtz) spreads starting from the supply line to the container up to the end of the container so that the region with modified drying agent in the event of a leak increases irregularly or abruptly until all the drying agent contained in the container has been changed by absorption of moisture.

In structural glazing adapted for carrying out the foregoing method, according to the invention, the space between the edge of the glazing and the facade element which is sealed by the load-bearing sealing bond of the glazing, and/or the space between two glass panes of the glazing, communicate(s) via a conduit with the drying agent container which is at least partially transparent.

The container may in particular be constructed as a cartridge and disposed within a facade post or facade cross-member, and an inspection window is preferably

provided in the post or cross-member for observing the cartridge.

According to preferred embodiments normal drying agent may be present in the container. A check of the charging of the drying agent is then carried out by weighing and comparison with previously determined weights. Preferably, however, the container is completely filled with a drying agent exhibiting colour change on moisture absorption. When the container is completely filled with drying agent exhibiting a colour change it is possible to determine from the start optically very accurately any change of the drying agent, providing a rapid indication of any leak and thus any risk due to the glazing.

According to a preferred embodiment the container is provided with a scale so that the progression of the mass-transfer zone can be recorded by reading the progression of the colour change and comparison with further readings.

Exemplary embodiments of the invention will now be described in detail with reference to the accompanying drawings, wherein:

Figs. 1 and 2 show structural glazing consisting of one pane,

Figs. 3 and 4 show structural glazing consisting of double-glazed or insulating glazing,

Figs. 5 and 6 show structural glazing of a modified embodiment of a facade element, and

Figs. 7 and 8 show a modified embodiment of structural

glazing consisting of insulating glass panes.

Figs. 1 and 2 show in section a portion of a facade post 10 on which a glass pane 12 is disposed without frame. The connection between the pane 12 and the facade post 10 is via a load-bearing sealing bond 14 and a spacer 16. The sealing bond 14 performs not only sealing functions but also static functions, for example the transfer of wind pressure and wind suction, and carries the weight of the glass pane itself.

Between the edge of the pane 12 and a rib 18 of the post 10 a sealing bond 20 is disposed which serves primarily for sealing against weather but which like the sealing bond 14 may also be load-bearing. A space 22 is enclosed by the rib 18, the front side of the post 10, the sealing bond 14 with the spacer 16 and the sealing bond 20. When the sealing bonds 14 and 20 are properly installed the space 22 is air-tight so that no ambient air can enter said space. Via a schematically illustrated conduit 24 the space 22 is connected to a container 26 in which a drying agent 28 is disposed. As long as the seals 14 and 20 are intact and do not allow any appreciable amount of moist air to enter the space 22 there will be no abrupt change in the drying agent 28. If however for some reason a flaw occurs in one of the sealing bonds 14 or 20 ambient air can enter the space 22 and with it moisture. This moisture diffuses via the line 24 into the container 26 where it causes a change in the drying agent. In the container 26 three regions 30, 32 and 34 are illustrated. The region 30 corresponds to a region of the drying agent which has absorbed moisture. The region 32 corresponds to the mass-transfer zone, i.e. this region of the drying agent is just changing due to moisture absorption, whilst the region 34 has not yet undergone any change so that no moisture is contained in it. Through an

inspection window 36 in the post 10 the cartridge arranged within the post 10 can be observed. After time intervals of varying length, preferably at regular intervals, a check can be made to determine whether the progression of the zone 32 is rapid, indicating an appreciable leak or flaws and thus a serious mechanical, chemical or the like, damage to one of the seals 14 or 20.

Fig. 2 corresponds to the embodiment of Fig. 1 with the difference that the container 26 is provided with a scale 38 so that through the inspection window 36 a reading of the changing drying agent or a portion of the drying agent which has undergone a colour change due to moisture absorption can be made directly.

Fig. 3 shows a facade element 40 on which two glazings 42 and 44 are disposed. The glazing 42 consists of an outer pane 46 and an inner pane 48 which are connected together via a spacer 50. The spacer 50 is connected via a sealing bond 52 and a sealing bond 54 to the panes. The sealing bonds 52 and 54 perform apart from a sealing function also a load-bearing one. The glazing 42 is secured via a spacer 56 and a sealing bond 58 to the facade element 40. The glazing 44 is made up like the glazing 42 and secured to the facade element 40. To check whether the sealing bonds 52 and 54 are tight and thus have adequate strength to prevent detachment in particular of the pane 46 a line or conduit 60 is led through the spacer 50 and connected to a container 62 containing a drying agent 64. The structure and mode of operation of the container 62 correspond to that of the container 26 of Figs. 1 and 2. In this embodiment it is not possible to check the sealing bond 58 and the corresponding sealing of the glazing 44 to the facade element 40. A check of these load-bearing sealing bonds must be made in another manner.

The embodiment shown in Fig. 4 corresponds substantially to that of Fig. 3 with the difference that between the glazings 42 and 44 a weather seal 66 is additionally provided which can either be completely airtight or, via a passage opening 68, connect the space 70 between the edges of the glazing and the facade element 40 to the surrounding atmosphere. When this passage opening 68 is provided in the seal 66 the sealing bonds 58 between the glazings and the facade element can also not be checked by the invention. If however the seal 66 is airtight the space 70 can also communicate via a conduit with a container containing drying agent so that the airtightness of this space can be checked. On alteration of the drying agent, however, it is not readily possible to determine whether the leak is at the seal 66 or the sealing bond 58. Furthermore, the container 62 of the embodiment according to Fig. 4 in contrast to the container 62 of Fig. 3 is provided with a scale 72 so that the change can be read off directly.

Figs. 5 and 6 show a facade element 80 which is formed on the front side with a rib 82. On the facade element 82 glazings 84 and 86 are disposed. The glazing 84 consists of an outer pane 88 and an inner pane 90 which are connected together via an encircling spacer 92 which is secured via bonding strips 94 and 96 to the panes. The bonds 94 and 96 also perform a load-bearing function in addition to providing an airtight seal. The glazing 84 is secured with its inner pane 90 via a spacer 98 and a load-bearing sealing bond 100 to the facade element 80. Between the edge of the pane 88 and the rib 82 a sealing bond 102 is disposed which is also constructed for load-bearing as well as to provide a seal. Furthermore, a bonding interruption 104 is disposed so that the sealing function of the sealing bond 102 is not impaired.

The space between the panes 88 and 90 communicates via a conduit 106 led through the spacer 92 with a container 108 containing a drying agent. The space 112 included between the edge of the glazing 84 and facade element 80 communicates via a line 114 with a container 116 containing a drying agent 118. The securing of the glazing 86 and the arrangement of the drying agent containers and conduits for checking the load-bearing sealing bonds of this glazing 86 are analogous to those of the glazing 84. The checking and carrying out of the method with this glazing is as in the embodiments outlined above.

The embodiment of Fig. 6 corresponds to the embodiment of Fig. 5 with the difference that on the containers 108 and 116 scales 120 and 122 respectively are provided for direct and exact reading off of the alteration of the drying agent resulting from moisture absorption.

In the embodiment shown in Figs. 7 and 8 a glazing 134 is secured in frameless manner on a profile 130 with a stepped outer side 132. The glazing 134 consists of an outer pane 136 and an inner pane 138. The inner pane is secured via a spacer 140 and a load-bearing sealing bond 142 to the facade element 130 whilst the outer pane 136 is attached via a spacer 144 and a load-bearing sealing bond 146 to the profile 130. Between the panes 136 and 138 an encircling spacer 148 is secured in air-tight manner via sealing bonds 150. The space 152 enclosed by the edge of the glazing 134 and the facade element 130 communicates via a line 154 with a container 156 containing drying agent 158. With the aid of this arrangement it can be checked whether the load-bearing sealing bond 142 or the load-bearing sealing bond 146 is defective.

The exemplary embodiment of Fig. 8 corresponds to the

exemplary embodiment of Fig. 7 with the difference that the container 156 is provided with a scale 166 so that the amount of drying agent in which moisture has been absorbed and led to a colour change can be read off directly.



CLAIMS:

1. A method of monitoring the bonding of structural glazing sealed on facade elements, wherein the gas in the space between a facade element and the edge of the glazing, and/or in the space enclosed between two glass panes of the glazing, is connected to a container containing drying agent and at intervals the drying agent is examined for change due to charging with moisture from the connected space.
2. A method according to claim 1, wherein the amount of the changed drying agent is read off at the container or the container with the drying agent is weighed at suitable intervals.
3. Structural glazing sealed on facade elements and adapted for carrying out the method according to claim 1 or 2, wherein the space between the edge of the glazing and a facade element which is sealed by a load-bearing sealing bond of the glazing, and/or the space between two glass panes of the glazing, communicate(s) via a conduit with the drying agent container which is at least partially transparent.
4. Structural glazing according to claim 3, wherein the container is constructed as a cartridge and is arranged within a facade post or facade cross-member, and an inspection window is disposed in the post or cross-member for observing the cartridge.
5. Structural glazing according to claim 3 or 4, wherein normal drying agent is disposed in the container.
6. Structural glazing according to claim 3 or 4, wherein drying agent exhibiting colour change on absorption of



moisture is disposed in the container.

7. Structural glazing according to one or more of claims 3 to 6, wherein the container is provided with a scale.

8. A method of monitoring the bonding of structural glazing sealed on facade elements, substantially as herein described with reference to the accompanying drawings.

9. Structural glazing adapted for monitoring the bonding of the structural glazing, constructed and arranged substantially as herein described with reference to any one of the accompanying drawings.
