

(13)

2123052

-1-

"MECHANISM FOR JOINING A MULLION TO A TRANSOM
IN A CURTAIN WALL CONSTRUCTION"

14

The present invention relates to a mechanism for joining a mullion to a transom in a curtain wall construction.

5 The use of a pressure equalization system in a mullion type curtain wall construction has been gaining wider acceptance recently. According to this system, a space having a pressure almost equal to that of the atmosphere is created in both mullions and transoms, so that the wind pressure of an incoming rain storm is
10 eliminated in this space. Rain water is drained by gravity, whereas the entrance of rain water into the building is prevented by a rain barrier provided between the pressure-equalized space and the inside of the building. Since the rain barrier is not provided on
15 the outer surface of the curtain wall, this balanced pressure system claims significantly increased durability of the airproofing sealants (i.e. gaskets and caulking components) provided in the junctions of the rain barrier and protected from the elements. However,
20 in a mullion type curtain wall construction, the airproofing sealants on the rain barrier consist of an internal sealant around a glass pane encased in the mullion and transom and a joint sealant laid along the joint between the mullion and transom, and gaskets and
25 caulking compounds are carefully applied to the necessary sealing portions on site. Particularly, great care is needed in providing the joint between the mullion and transom with an hermetic seal that not only prevents water leakage but also adjusts well to
30 lateral displacement between the two members and to thermal expansion and contraction of the transom.

In the conventional method of assembling a curtain wall construction, a prefabricated mullion with an angular mounting member is shipped to the site,
35 where an end of a transom is bolted to the mounting member. However, this procedure (in addition to the need to install an hermetic seal in the joint between

the mullion and transom) greatly increases the complexity of construction the curtain wall.

40 It is an object of the present invention to overcome the above-described defects. More particularly, the invention seeks to provide a mechanism which enables simple on-site joining of a factory-fabricated mullion and transom and which prevents water leakage
45 from the joint between the mullion and the transom. At the same time, the mechanism should be capable of adjusting well to any lateral displacement between the mullion and the transom, as well as to thermal expansion and contraction of the transom.

50 According to the present invention, a mechanism for joining a mullion to a transom in a curtain wall construction comprises a joiner fitted in a notch made in that part of the mullion to which the transom is to be connected, the joiner being made integral with said
55 mullion and holding the transom in position with an airproofing sealant in order to restrain the transom from moving vertically and towards the inside of the building, one end of the transom engaging a slider on the joiner for restraining the transom from moving
60 towards the outside of the building.

The invention will now be further described, by way of example only, with reference to the accompanying drawings, wherein Figures 1 to 4 are perspective views illustrating a mechanism according to the present
65 invention, in a curtain wall construction of a building.

The illustrated curtain wall comprises a mullion 1 having a cover 2 and a joiner 3. The mullion 1 is made integral with a reinforcing member (not shown) and is supported on structural members of the building
70 by means of fasteners. The mullion 1 is made of a generally T-shaped metal sheet such as stainless steel,

3a

(16)

and is composed of a channel-shaped inner mullion 4 spot-welded to a hat-shaped partition member 5. The mullion cover 2 has an opening 6 along its length, 75 into which the partition member 5 is inserted to define, on both sides thereof, grooves 7a and 7b into which panes of glass are to be fitted. That part of the mullion 1 which is to be crossed by a transom is cut

(17)

away, as shown on the right-hand side of Figure 2.

80 The joiner 3 is fitted in the resulting notch 8 and is factory-welded to the mullion 1.

The joiner 3 comprises a column 9, arms 10a and 10b and a transom retainer 11, these elements usually being cast from stainless steel as a unit by a lost wax process. Since the two arms 10a and 10b are symmetrical in shape, the ensuing description will be confined to the arm 10a only. The centre column 9 has at its upper and lower ends respectively stepped portions 13a and 13b that bear against the rectangular cross-section defined by notched butt ends 12a and 12b of the partition member 5. The centre column 9 also has a transom table 14 and a ridge 15 along which a slider 16 is vertically movable. Two through channels 17a and 17b are provided in the centre column 9 and
95 communicate with an air inlet duct provided by the partition member 5, and openings 18a and 18b are also provided in the centre column 9 for introducing atmospheric air into the pressure-equalized space through the channels 17a and 17b.

100 The transom retainer 11 is connected to the centre column 9 by the arm 10a and is partially surrounded by a groove 19 into which an edge of a notched portion of the inner mullion 4 is fitted. A gap is left on the side of the groove remote from, rather than near to, 105 the centre column 9, which gap is large enough to be filled with a caulking compound 20. Therefore, the caulking operation can be performed off site to provide an hermetic seal between the inner mullion 4 and the transom retainer 11, and the mullion 1 with the joiner 110 3 as an integral part thereof can be shipped to the construction site.

The inner surface of the transom retainer 11 is generally U-shaped and is equipped with a gasket strip 115 21 for providing an hermetic seal. This gasket strip combines with the retainer 11 to hold in position

5

(18)

the end of a transom 22 facing the interior of the building, as shown in Figure 3. Since the gasket strip 21 is elastic, the transom 22 can be fitted into the retainer 11 on site. As shown in Figures 3 and 4, the transom 22 is composed of an inner wall member 23, a hollow core 24, upper and lower connectors 25a and 25b, and a detachable back bend 26. An upper end of the back bend 26 is connected to a tab 27 mounted on the upper connector 25a, and is bent down to form a water drip 28 which is bolted to the lower connector 25b. The hollow core 24 is secured to the inner wall member 23 and the connectors 25a and 25b by suitable means such as spot-welding. An engaging end portion 29 of the core 24 is placed on the transom table 14 extending from the centre column 9, while the lateral side of the core engages the slider 16.

The above procedure completes the joining of the mullion 1 to the transom 22. As a result, the outer periphery of the wall member 23 of the transom 22 is retained by the gasket strip 21 on the retainer 11, which is made integral with the mullion 1, and the transom is restrained from moving vertically or towards the inside of the building. At the same time, the engagement with the slider 16 prevents the transom 22 from moving towards the outside of the building. The transom 22 is positioned such that the engaging portion 29 is spaced from the centre column 9 by a small clearance, so that the engaging portion 29 can slide horizontally on the table 14 as the transom 22 expands or contracts with heat. This movement is also permitted by the elastic gasket strip 21 formed on the inner surface of the transom retainer 11.

In Figure 3, there are shown grooves 30a and 30b in which panes of glass are set, and weep holes 31a and 31b which entrant rain water can drain from the transom 22 in the direction indicated by arrow A.

19

6

Figure 4 shows the completed installation with glass panes 32a and 32b set in position. The gap
155 between the exterior surface of the glass pane 32a and mullion cover 2/tab 27 is filled with a caulking compound 33a, and the gap around the exterior surface of the glass pane 32b is likewise filled with a caulking compound 33b. The gap between the interior surface of
160 the glass pane 32a and the inner transom wall 23 is provided with a gasket 34a, and the gap around the interior surface of the glass pane 32b is likewise provided with a gasket 34b. In this type of curtain wall, the gaskets 34a and 34b provided around the
165 interior surface of the glass panes function as hermetic seals for the rain barrier, and the gasket strip 21 forming the inner surface of the transom retainer 11 serves as an hermetic seal for the joint between the mullion 1 and the transom 22. Therefore, by setting
170 the glass panes 32a and 32b in place, spaces 35a, 35b, 35c, etc. having a pressure equal to the atmospheric pressure are formed within the mullion and the transom. The atmosphere outside the building is introduced into these spaces through the seams along the mullion cover
180 2, and these spaces communicate with each other by way of the channels 18a and 18b passing through the centre column 9.

In summary, the present invention provides a mechanism for joining a mullion 1 to a transom 22 in a
185 curtain wall, wherein the mullion is made integral with a joiner 3 fitted in a notch 8 made in that part of the mullion to which the transom is to be connected. The joiner holds the transom in position with a gasket 21 in order to restrain the transom from moving vertically
190 and towards the inside of the building, with the end 29 of the transom engaging a slider 16 on the joiner which restrains it from moving towards the outside of the building. This mechanism has the following advantages:
(1) The provision of an hermetic seal along the interior
195 junction between the mullion and the transom by

conventional techniques has been very complicated and without high reliability, but the joining mechanism of the present invention establishes the desired hermetic and waterproof seal, by gaskets that can be readily installed at the factory.

(2) Any lateral displacement of the transom can be absorbed by the gasket strip forming the interior surface of the transom retainer.

(3) The joint adjusts well to thermal expansion and contraction of the transom, because one end of the transom is capable of sliding on the table of the joiner only in the longitudinal direction of the transom.

More importantly, however, the transom retainer of the joiner is surrounded by a groove that completely accommodates the edge of the notched portion of the mullion, and this provides a joint between the mullion and the transom. Furthermore, the present invention obviates the need of a bolt for joining the mullions to the transoms at the construction site; instead, the invention can be used in the construction of a curtain wall by a simple method that comprises retaining the transom on gaskets primarily used for providing airtightness and providing a slider in engagement with one end of the transom.



220 CLAIMS:

1. A mechanism for joining a mullion to a transom in a curtain wall construction of a building, comprising a joiner fitted in a notch made in that part of the mullion to which the transom is to be
225 connected, the joiner being made integral with said mullion and holding the transom in position with an airproofing sealant in order to restrain the transom from moving vertically and towards the inside of the building, one end of the transom engaging a slider on
230 the joiner for restraining the transom from moving towards the outside of the building.
2. A mechanism as claimed in claim 1, wherein the joiner includes a pair of symmetrically arranged arms for receiving respective transoms, each of said arms
235 having a U-shaped transom-receiving portion which includes said airproofing sealant.
3. A mechanism as claimed in claim 2, wherein the airproofing sealant comprises a gasket tightly fitted in the transom-receiving portion of each arm.
- 240 4. A mechanism as claimed in claim 2 or 3, wherein the transom-receiving portion of each arm includes a surface in contact with the mullion and a free lip about the exterior of the mullion for receiving a sealant.
- 245 5. A mechanism as claimed in any preceding claim, wherein the joiner includes a table for receiving an extended end portion of the transom, and the slider engages said extended end portion.
6. A mechanism as claimed in claim 5, wherein the
250 transom is slidably disposed on said table.
7. A mechanism as claimed in any preceding claim,



22

wherein the joiner includes at least one central cavity, and air passageways join the cavity with air spaces in the transom.

5 8. A curtain wall construction in a building,
comprising a transom, a mullion having a notch therein
at a point where it is to be joined to the transom, a
joiner fitted in said notch and made integral with the
mullion, an airproofing sealant by means of which the
transom is held in position on the mullion and which
10 thereby restrains the transom from moving vertically
and towards the inside of said building, and a slider
on the joiner which is engaged by one end of the
transom and which thereby restrains the transom from
moving towards the outside of said building.

15 9. A mechanism for joining a mullion to a transom
in a curtain wall construction of a building,
substantially as hereinbefore described with reference
to the accompanying drawings.

20 10. A curtain wall construction in a building,
substantially as hereinbefore described with reference
to the accompanying drawings.
