

Title:

The Fire Resistance Performance
of Mann McGowan Fabrications
Ltd Pyrogrille 100 Air Transfer
Grille

WF Assessment Report No:

407822 – Issue 2

Prepared for:

**Mann McGowan Fabrications
Ltd**

4 Brook Trading Estate
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Date:

11th December 2018

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Executive Summary

Objective	This report considers the expected fire resistance performance of Mann McGowan Fabrications Ltd Pyrogrille 100 air transfer grille if subjected to a test in accordance with BS 476: Part 20: 1987.
Report Sponsor	Mann McGowan Fabrications Ltd
Address	4 Brook Trading Estate Deadbrook Lane Aldershot Hants GU12 4XB
Summary of conclusions	<p>It can be concluded that Mann McGowan Fabrications Ltd Pyrogrille 100 air transfer grille as discussed in this report, should be capable of providing up to 120 minutes integrity performance if subjected to a fire resistance test in accordance with BS 476: Part 20: 1987.</p> <p>This assessment represents our opinion as to the performance likely to be demonstrated on a test in accordance with BS 476: Part 20: 1987, on the basis of the evidence referred to above. We express no opinion as to whether that evidence, and/or this assessment, would be regarded by any Building Control authority as sufficient for that or any other purpose. This assessment is provided to the client for its own purposes and we cannot opine on whether it will be accepted by Building Control authorities or any other third parties for any purpose.</p>
Valid until	1 st January 2024

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Introduction

This report considers the expected fire resistance performance of Mann McGowan Fabrications Ltd Pyrogrille 100 air transfer grille if subjected to a test in accordance with BS 476: Part 20: 1987.

FTSG

The data referred to in the supporting data section has been considered for the purpose of this appraisal which has been prepared in accordance with the Fire Test Study Group Resolution No. 82: 2001.

Assumptions

General Construction

It is assumed that the materials and construction of the proposed Pyrogrille 100 air transfer grille will remain as tested in WF No's. 391348 and 391351 unless stated otherwise within this appraisal.

Supporting Construction

It is assumed that the doorset or partition in to which the air transfer grille is fitted shall be capable of maintaining adequate support for a period at least equivalent to that achieved by the air transfer grille.

Installation

It is assumed that the air transfer grille will be installed by competent installers in a similar manner to that used when installing the previously tested assemblies.

Proposals

It is proposed that the Pyrogrille 100 air transfer grille may be modified, from the constructions tested within WF No. 391348, without detriment to the fire resistance integrity rating achieved, for use in partitions as follows:

- The 600 mm high by 600 mm wide square Pyrogrille 100 air transfer grilles may be increased, in either height or width, up to a maximum of 750 mm subject to a maximum total area of 0.45m^2 , for 60 minute applications in both positive and negative pressure situations (full wall height) in steel stud or blockwork constructions.
- The use of a Pyrogrille 100 air transfer grille with maximum dimensions of 850 mm wide by 200 mm high for 60 minute applications in both positive and negative pressure situations (full wall height) when fitted within steel stud or blockwork constructions.
- The circular Pyrogrille 100 air transfer grille may be fitted directly within blockwork walls.
- In addition to the circular duct tested, the Pyrogrille 100 air transfer grille may be fitted within square ducting subject to the grille having a maximum area of 0.28m^2 .
- All above proposed assessed applications are applicable to the 38 mm thick and the 40 mm thick variations of the Pyrogrille 100 product and also both variations of the slat to perimeter connection.

It is also proposed that the Pyrogrille 100 air transfer grille may be modified, from the constructions tested within WF No. 391351, without detriment to the fire resistance integrity rating achieved, for use in fire doors as follows:

- When installed within a timber fire door with a 30 minute fire resistance integrity rating the Pyrogrille 100 air transfer grille may be increased, in either height or width, up to a maximum of 750 mm subject to a maximum total area of 0.45m^2 and subject to the specific requirements of that particular door leaf.
- When installed within a timber fire door with a 60 minute fire resistance integrity rating the Pyrogrille 100 air transfer grille may be increased, in either height or width, up to a maximum of 690 mm subject to a maximum total area of 0.42m^2 and subject to the specific requirements of that particular door leaf.
- The Pyrogrille 100 air transfer grille may be installed within a door in both positive and negative pressure situations (full door height).

Basic Evidence

WF No. 391348 To provide an indication of the performance of five specimens of air transfer grilles to reinstate the fire resistance performance in terms of integrity (as defined in BS 476: Part 20: 1987) of a non-loadbearing plasterboard wall assembly when tested utilizing the general principles for fire resistance testing given in BS 476: Part 20: 1987. 'Methods for determination of the fire resistance of elements of construction (general principles)'.

The drywall construction was of overall dimensions 3000 mm wide by 3000 mm high by 82 mm thick. The framing comprised 50 mm wide galvanised mild steel "C" studs, at maximum 600 mm centres, friction fitted into galvanised mild steel head and base "U" channels. Each side of the stud frame was faced with two layers of 12.5 mm thick 'Siniat Fireboard' plasterboard.

The partition was penetrated by six Pyrogrille 100 air transfer grilles, referenced as Specimens A to F.

Specimens D to F were located in a positive pressure zone and Specimens A and C were located in a negative pressure zone. Specimen B was not subject of the test report.

There is no specific test procedure for ascertaining the time required for an intumescent grille to close, however If the performance of the specimens were evaluated against the integrity criteria of BS 476:Part 20:1987 after closure, the result could be expressed as follows:

Specimen	Time to Closure	Integrity
A	19 minutes	120 minutes*
C	19 minutes	120 minutes*
D	2 minutes	120 minutes*
E	2 minutes	120 minutes*
F	2 minutes	120 minutes*

*The test was discontinued after a period of 120 minutes.

WF No. 391351 To determine the fire resistance performance two single-acting, single-leaf timber based doorset fitted with intumescent air transfer grilles, when tested in accordance with BS EN 1634-1: 2014.

For the purpose of the test the doorsets were referenced Doorset A and Doorset B.

Doorset A had overall dimensions of 2078 mm high by 996 mm wide incorporating a door leaf with overall dimensions 2040 mm high by 926 mm wide by 44 mm thick. The door leaf was of a solid graduated density chipboard construction, with 6 mm hardwood lippings to the vertical edges and was hung within a softwood frame.

The doorset was installed such that it opened towards the heating conditions of the test and was latched for the duration of the test. The doorset incorporated a 600 mm x 600 mm aperture; the top edge of the aperture was located nominally 853 mm from the threshold of the doorset. An Intumescent air transfer grille referenced 'PYROGRILLE 100' was installed in the aperture.

Doorset B had overall dimensions of 2078 mm high by 996 mm wide incorporating a door leaf with overall dimensions 2040 mm high by 926 mm wide by 54 mm thick. The door leaf was of a solid graduated density chipboard construction, with 6 mm hardwood lippings to the vertical edges and was hung within a hardwood frame.

The doorset was installed such that it opened towards the heating conditions of the test and was latched for the duration of the test. The doorset incorporated a 600 mm x 600 mm aperture; the top edge of the aperture was located nominally 853 mm from the threshold of the doorset. An Intumescent air transfer grille referenced 'PYROGRILLE 100' was installed in the aperture.

The following results were achieved:

		Doorset A	Doorset B
Integrity performance	Sustained flaming	40 minutes	69 minutes
	Gap gauge	40 minutes [#]	69 minutes [#]
	Cotton Pad	40 minutes [#]	69 minutes [#]
Insulation performance	Door Leaf	40 minutes [#]	69 minutes [#]
	Time to Grille Closure	8 minutes, 50 seconds	8 minutes, 50 seconds

Test was discontinued after a period of 70 minutes.

[#] The failure criteria of each specimen was measured after the air transfer grilles had sealed by the means of their intumescent properties.

Assessed Performance - Partitions

Test report WF No. 391348 was conducted in accordance with the heating conditions and general principles of BS 476: Part 20: 1987. There is no specific test procedure for ascertaining the time required for an intumescent grille to close, however, if the performance of the specimens were evaluated against the integrity criteria of BS 476: Part 20: 1987 after closure, the results could be expressed as follows:

Specimen	Time to Closure	Integrity
A	19 minutes	120 minutes*
C	19 minutes	120 minutes*
D	2 minutes	120 minutes*
E	2 minutes	120 minutes*
F	2 minutes	120 minutes*

*The test was discontinued after a period of 120 minutes.

The test specimen arrangement can be seen below in figure 1.

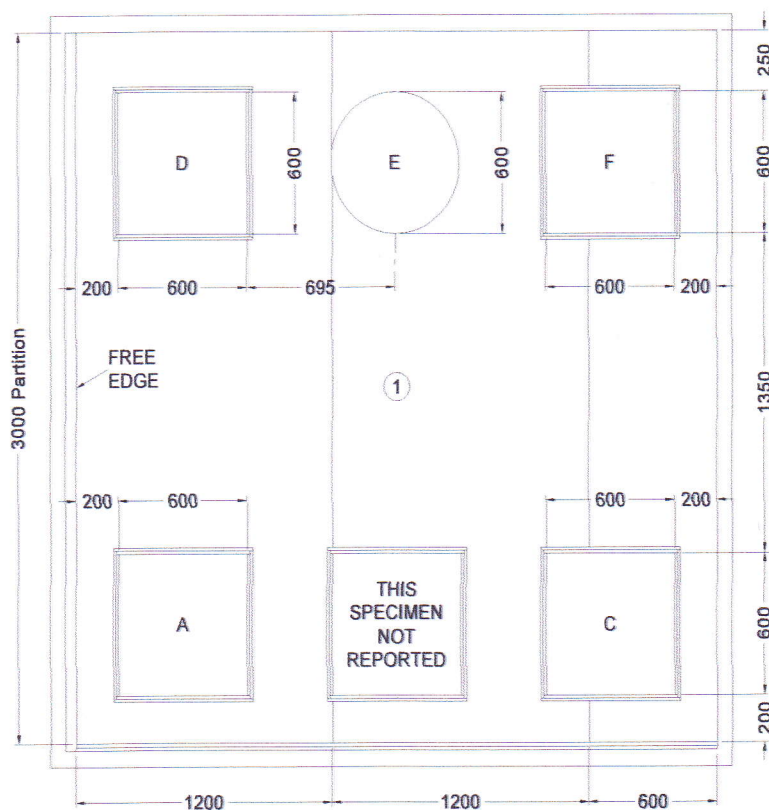


Figure 1

Figure 2, below, shows the constructional details of Specimens A & D. Specimen A was positioned in the lower section of the partition (the negative pressure zone) and Specimen D was positioned in the upper section of the partition (the positive pressure zone).

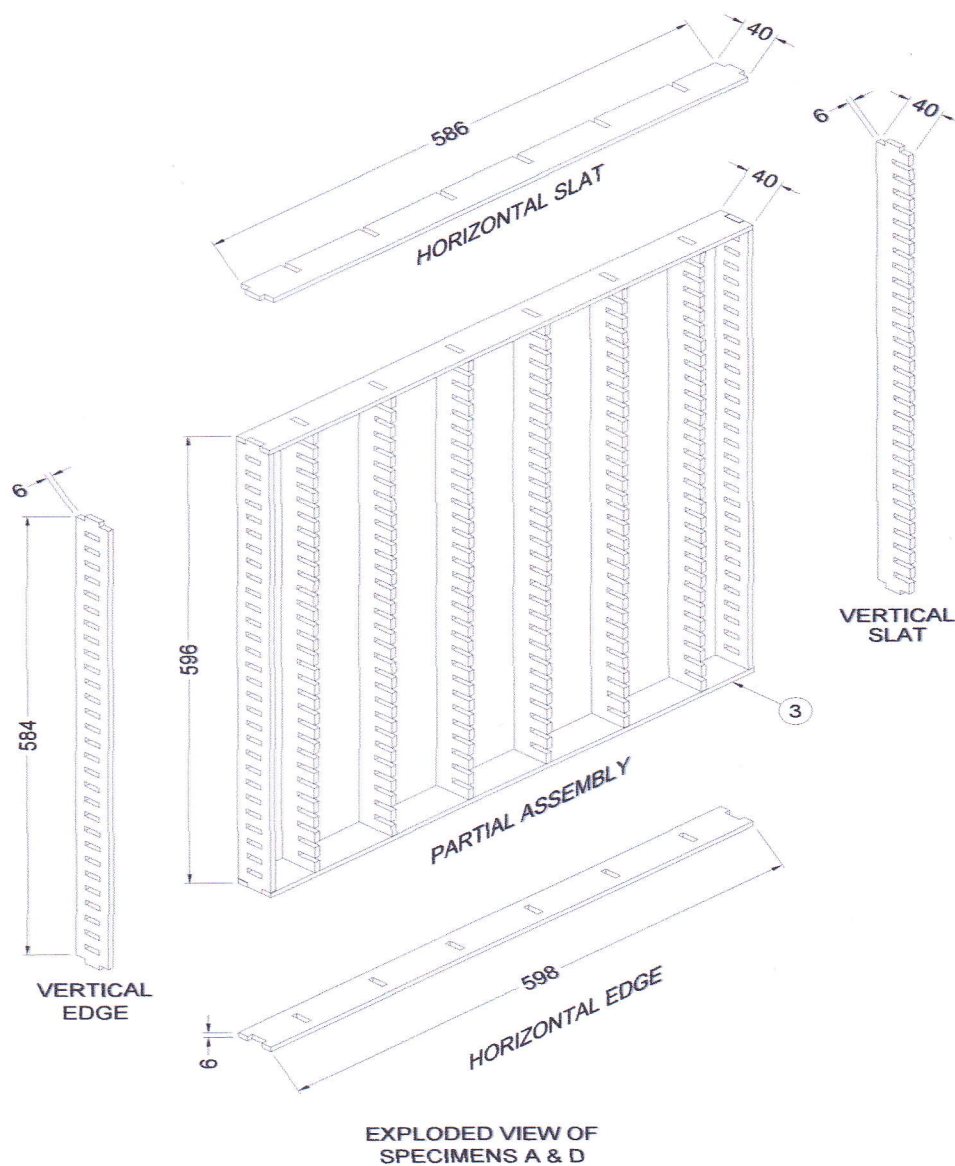


Figure 2

Figure 3, below, shows the constructional details of Specimen C. Specimen C was positioned in the lower section of the partition (the negative pressure zone) and has a different perimeter edge profile connection when compared to Specimens A & D.

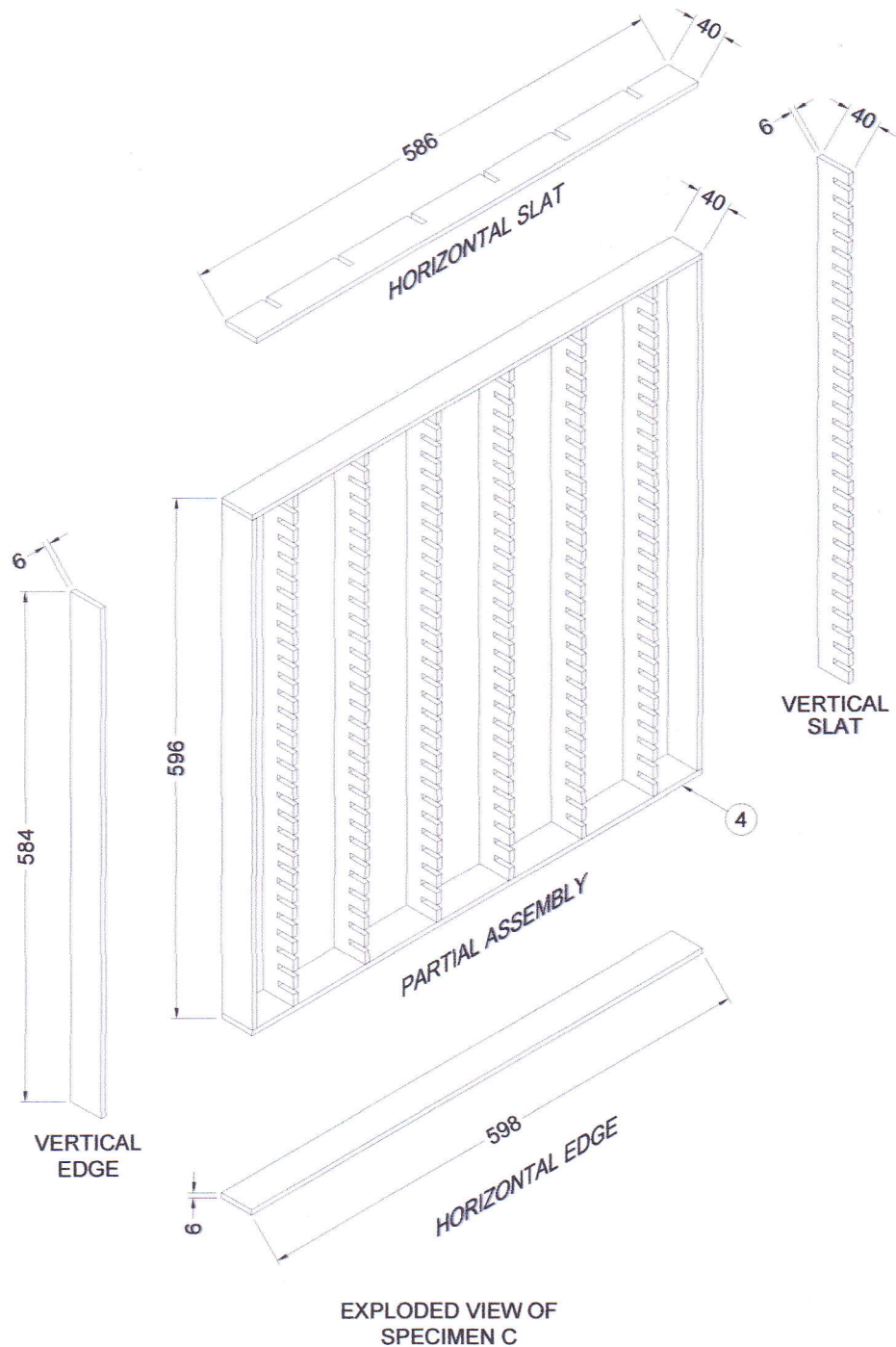


Figure 3

Figure 4, below, shows the constructional details of Specimen F. Specimen F was positioned in the upper section of the partition (the positive pressure zone) and has the same perimeter edge profile connection as Specimens A & D but is 38mm in depth (as opposed to 40mm).

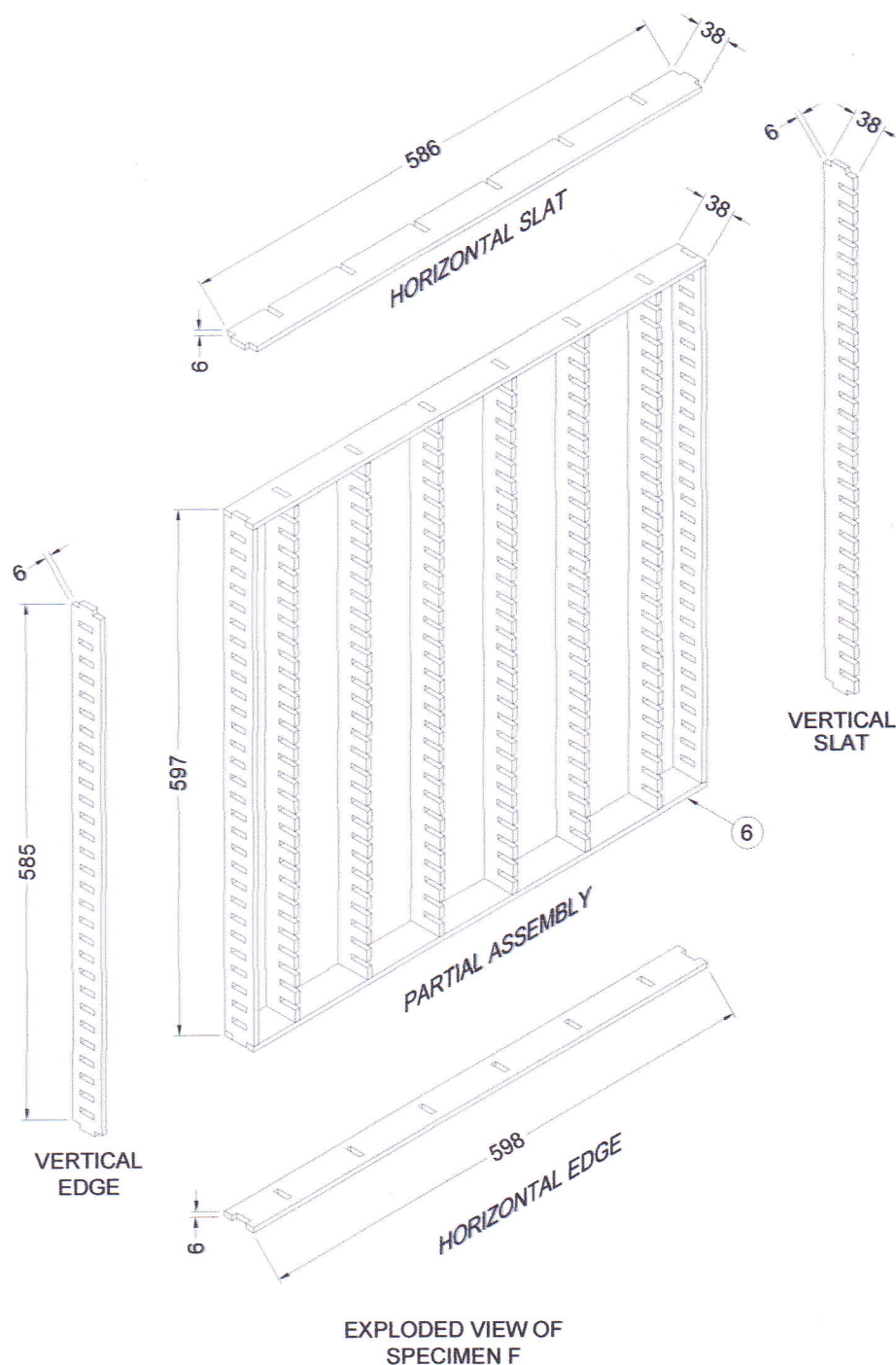
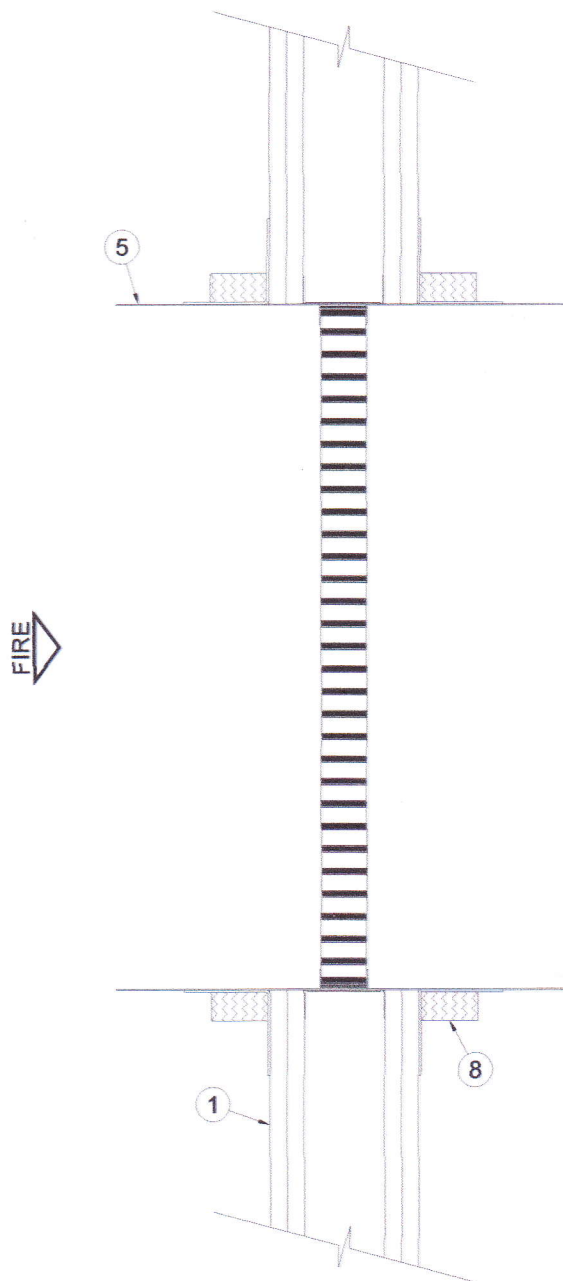


Figure 4

Figure 5, below, shows the cross section details of Specimen E, the air transfer grille installed within a section of duct.



TYPICAL SECTION
THROUGH SPECIMEN E

Figure 5

Increase in size

For a 60 minute application; it is proposed that the dimensions of the air transfer grilles may be increased, by 25% in either height or width – resulting in a maximum of 750 mm in either direction (but not simultaneously), subject to an overall maximum area of 0.45m^2 (i.e. an air transfer grille can measure up to 750 mm high by 600 mm wide or vice versa and all dimensions in between subject to maximum area of 0.45m^2) in both positive and negative pressure situations (full wall height) in steel stud or blockwork constructions.

The tested constructions measured 600 mm high by 600 mm wide, giving an area of 0.36m^2 . The grilles achieved an integrity performance of 120 minutes without failure.

The 120 minute fire resistance integrity rating achieved, by all specimens, during the reference test represents a 60 minute (or 100%) overrun when compared to the 60 minutes required. It is considered that this overrun provides more than sufficient reassurance in the ability of an air transfer grille of larger dimensions to meet the required fire resistance integrity performance for 60 minutes and can, therefore, be used to offset the required 25% dimension increases.

Variation in Depth

The test included specimens of a depth of 40 mm (Specimens A, C & D) and a specimen of 38 mm depth (Specimen F) – there were no discernible differences in the performance of these air transfer grilles. The above proposed dimension increases can, therefore, apply equally to the 40 mm deep and 38 mm deep products.

Variation in Perimeter Design

Specimens A, D & F incorporated one type of perimeter edge design. Specimen C used an alternative perimeter edge design – again, there were no discernible differences in the performance of these air transfer grilles. The above proposed dimension increases can, therefore, apply equally to both perimeter edge designs.

Positive / Negative Pressure Situation

Specimens D and F were positioned in the positive pressure section of the test furnace (the upper section). Specimens A and C were positioned in the negative pressure section of the furnace (the lower section). The time to closure (reaction of the intumescent material to fully close the gaps in the air transfer grille) of Specimens D and F was 2 minutes. The time to closure of specimens A and C was 19 minutes. This is to be expected because, in the lower section of the furnace, cold air is being drawn in to the furnace (through specimens A and C) from the laboratory atmosphere and hot air is being forced out of the furnace (through specimens D and F) thus causing the intumescent material to react and close up the gaps in the air transfer grille. Despite this difference; it is evident that the air transfer grilles do behave as expected and required. The above proposed dimension increases can, therefore, apply equally to air transfer grilles positioned in both the upper and lower sections of a partition.

Installation in to Steel Stud or Blockwork Partition

The air transfer grilles were tested within a steel stud, plasterboard clad construction. It is proposed that the air transfer grilles may also be installed within blockwork supporting constructions, which have been suitably tested and have a fire resistance rating at least equivalent to that required for the air transfer grilles. Steel stud constructions are considered less stable than blockwork constructions, particularly in regards deformation during test, and so represent a more onerous set of conditions. It is considered, therefore, that installation of the air transfer grilles within a blockwork construction can be positively appraised provided that the same type of, and centre-to-centre distance of, the fixings is used as was tested.

Oversized Width Application

It is proposed that, an alternative shape of dimensions up to 850 mm wide by up to 200 mm high (maximum area of 0.17m^2), is allowable. The tested construction measured 600 mm wide by 600 mm high, giving a total area of 0.36m^2 . Limiting the area to 0.17m^2 (47.2% of the tested construction) provides reassurance that the increase in width of the construction, and subsequently the horizontal slats, will not present a risk in regards slumping of the slats. Further reassurance is provided by virtue of the fact that the air transfer grilles are constructed in such a manner that there are vertical slats (to support the horizontal slats) at approximately 100 mm centres. It is also considered prudent to limit this construction to applications requiring up to a 60 minute fire resistance integrity performance.

In summary; the above listed design variations (overall dimensions, 38 mm or 40 mm depth, alternative perimeter edge designs, use in positive or negative pressure situations and use in steel stud or blockwork walls) may be used in all combinations possible.

Use of Circular Grille

Specimen E, within test report WF No. 391348, was an air transfer grille fitted within a section of circular ducting. As previously mentioned, this also achieved a performance of 120 minutes fire resistance integrity. It is proposed that the circular air transfer grille may be fitted directly in to a blockwork wall (i.e. the duct is removed). Given the previous discussion in regards the use of the air transfer grille in a blockwork wall; it is not thought that the shape of the air transfer grille would have a great influence on the fire resistance integrity result achieved. It is considered, therefore, that the use of a circular air transfer grille installed directly in to a block work wall may be positively appraised. The air transfer grille must, however, be limited to a maximum dimension of 600 mm diameter (as tested) and an appropriate fixing type should be used at the centre-to-centre distances as used on Specimens A, C, D & F. The grille may be of the 38 mm or 40 mm depth designs, it may use either of the alternative perimeter edge designs and can be used in positive or negative pressure situations for requirements up to 120 minutes.

Shape of Ducting

As mentioned previously; Specimen E, within test report WF No. 391348, was an air transfer grille fitted within a section of circular ducting. It is proposed that the ducting, in to which the air transfer grille is fitted, may be square in shape. It is not thought that the shape of the duct will have a great influence on the fire resistance integrity performance achieved by the air transfer grille, therefore, this proposal can be positively appraised for applications up to 120 minutes. It is considered prudent, however, to limit the size of the air transfer grille to that of the tested construction. i.e. the maximum area of the grille to be fitted within a section of square ducting is 0.28m^2 .

Within the referenced test specimen E was subjected to a positive pressure environment. The test did not, however, incorporate a forced extraction through the grille when mounted in the section of duct, therefore, it is not suitable for installation into ducts which utilise a forced system unless the system will effectively 'shut down' upon detection of fire.

Assessed Performance - Doors

30 Minute Timber Doorsets

Doorset A, as tested in WF No. 391351, achieved 40 minutes integrity and insulation performance when tested to EN 1634-1. The time to closure (reaction of the intumescent material to fully close the gaps in the air transfer grille) was 8 minutes 50 seconds. The air transfer grille was positioned in the lower half of the doorset and measured 600mm wide by 600 mm high.

It is proposed that the dimensions of the air transfer grille may be increased, by 25% in either height or width – resulting in a maximum of 750 mm in either direction (but not simultaneously), subject to an overall maximum area of 0.45m^2 (i.e. an air transfer grille can measure up to 750 mm high by 600 mm wide or vice versa and all dimensions in between subject to maximum area of 0.45m^2).

It is considered that the 10 minute (or 25%) overrun can be used to offset the proposed 25% increase in either dimension thus resulting in this proposal being positively appraised. It must be noted, however, that these modifications are considered secondary to the requirements of the particular timber door leaf in to which the air transfer grilles are fitted (for example; air transfer grille to door leaf edge distance).

60 Minute Timber Doorsets

Doorset B, as tested in WF No. 391351, achieved 69 minutes integrity and insulation performance when tested to EN 1634-1. The time to closure (reaction of the intumescent material to fully close the gaps in the air transfer grille) was 8 minutes 50 seconds. The air transfer grille was positioned in the lower half of the doorset and measured 600mm wide by 600 mm high.

It is proposed that the dimensions of the air transfer grille may be increased, by 15% in either height or width – resulting in a maximum of 690 mm in either direction (but not simultaneously), subject to an overall maximum area of 0.42m^2 (i.e. an air transfer grille can measure up to 690 mm high by 600 mm wide or vice versa and all dimensions in between subject to maximum area of 0.42m^2).

It is considered that the 9 minute (or 15%) overrun can be used to offset the proposed 15% increase in either dimension thus resulting in this proposal being positively appraised. It must be noted, however, that these modifications are considered secondary to the requirements of the particular timber door leaf in to which the air transfer grilles are fitted (for example; air transfer grille to door leaf edge distance).

**Positive /
Negative
Pressure
Situation**

The construction tested and reported in WF No. 391351 incorporated two single-leaf doorsets in which the air transfer grilles were positioned in the lower half of each doorset. It is proposed that the Pyrogrille 100 air transfer grille may be installed within a door in both positive and negative pressure situations (full door height).

Test report WF No. 391348 was conducted in accordance with the heating conditions and general principles of BS 476: Part 20: 1987, of a steel stud partition which included several specimens of the same Pyrogrille 100 air transfer grille. Two of these specimens (Specimens D and F) were located in the upper (positive pressure) section of this partition and contributed to the construction achieving a fire resistance integrity of 120 minutes.

Obviously, the test of the air transfer grilles in the upper section of a partition is not entirely applicable to the use of the air transfer grilles in the upper section of timber doorsets. It does, however, provide a good deal of reassurance that if the air transfer grilles were positioned in the upper half of the door leaves, they would be able to provide the 30 or 60 minute fire resistance integrity rating as required, if tested in accordance with BS 476: Part 20: 1987. The use of the Pyrogrille 100 air transfer grille in the upper and lower sections of a timber door leaf can, therefore, be positively appraised.

**Note on Rating
as per BS 476:
Part 20**

It is necessary to carry out this assessment as per the requirements of BS 476: Part 20: 1987 because the evidence, WF No. 391348 (a test of a partition incorporating air transfer grilles), used in support of the use of air transfer grilles in the upper section of a door, was carried out to BS 476: Part 20: 1987. BS 476: Part 20: 1987 represents a slightly less onerous set of conditions when compared to EN 1634-1 (the main supporting test evidence for use of the air transfer grilles in doors), in regards the heating regime, and so must be used as the lowest common denominator in this instance.

Conclusions

It can be concluded that Mann McGowan Fabrications Ltd Pyrogrille 100 air transfer grille as discussed in this report, should be capable of providing up to 120 minutes integrity performance if subjected to a fire resistance test in accordance with BS 476: Part 20: 1987.

This assessment represents our opinion as to the performance likely to be demonstrated on a test in accordance with BS 476: Part 20: 1987, on the basis of the evidence referred to above. We express no opinion as to whether that evidence, and/or this assessment, would be regarded by any Building Control authority as sufficient for that or any other purpose. This assessment is provided to the client for its own purposes and we cannot opine on whether it will be accepted by Building Control authorities or any other third parties for any purpose.

Validity

This assessment is issued on the basis of test data and information available at the time of issue. If contradictory evidence becomes available to Warringtonfire the assessment will be unconditionally withdrawn and Mann McGowan Fabrications Ltd will be notified in writing. Similarly the assessment is invalidated if the assessed construction is subsequently tested because actual test data is deemed to take precedence over an expressed opinion. The assessment is valid initially for a period of five years i.e. until 1st January 2024, after which time it is recommended that it be returned for re-appraisal.

The appraisal is only valid provided that no other modifications are made to the tested construction other than those described in this report.

Summary of Primary Supporting Data

WF No. 391348

To provide an indication of the performance of five specimens of air transfer grilles to reinstate the fire resistance performance in terms of integrity (as defined in BS 476: Part 20: 1987) of a non-loadbearing plasterboard wall assembly when tested utilizing the general principles for fire resistance testing given in BS 476: Part 20: 1987. 'Methods for determination of the fire resistance of elements of construction (general principles)'.

The drywall construction was of overall dimensions 3000 mm wide by 3000 mm high by 82 mm thick. The framing comprised 50 mm wide galvanised mild steel "C" studs, at maximum 600 mm centres, friction fitted into galvanised mild steel head and base "U" channels. Each side of the stud frame was faced with two layers of 12.5 mm thick 'Siniat Fireboard' plasterboard.

The partition was penetrated by six Pyrogrille 100 air transfer grilles, referenced as Specimens A to F.

Specimens D to F were located in a positive pressure zone and Specimens A and C were located in a negative pressure zone. Specimen B was not subject of the test report.

There is no specific test procedure for ascertaining the time required for an intumescent grille to close, however If the performance of the specimens were evaluated against the integrity criteria of BS 476:Part 20:1987 after closure, the result could be expressed as follows:

Specime n	Time to Closure	Integrity
A	19 minutes	120 minutes*
C	19 minutes	120 minutes*
D	2 minutes	120 minutes*
E	2 minutes	120 minutes*
F	2 minutes	120 minutes*

*The test was discontinued after a period of 120 minutes.

Test Date : 18th November 2017

Sponsor : Mann McGowan Fabrications Ltd

WF No. 391351

To determine the fire resistance performance two single-acting, single-leaf timber based doorset fitted with intumescent air transfer grilles, when tested in accordance with BS EN 1634-1: 2014.

For the purpose of the test the doorsets were referenced Doorset A and Doorset B.

Doorset A had overall dimensions of 2078 mm high by 996 mm wide incorporating a door leaf with overall dimensions 2040 mm high by 926 mm wide by 44 mm thick. The door leaf was of a solid graduated density chipboard construction, with 6 mm hardwood lippings to the vertical edges and was hung within a softwood frame.

The doorset was installed such that it opened towards the heating conditions of the test and was latched for the duration of the test. The doorset incorporated a 600 mm x 600 mm aperture; the top edge of the aperture was located nominally 853 mm from the threshold of the doorset. An Intumescent air transfer grille referenced 'PYROGRILLE 100' was installed in the aperture.

Doorset B had overall dimensions of 2078 mm high by 996 mm wide incorporating a door leaf with overall dimensions 2040 mm high by 926 mm wide by 54 mm thick. The door leaf was of a solid graduated density chipboard construction, with 6 mm hardwood lippings to the vertical edges and was hung within a hardwood frame.

The doorset was installed such that it opened towards the heating conditions of the test and was latched for the duration of the test. The doorset incorporated a 600 mm x 600 mm aperture; the top edge of the aperture was located nominally 853 mm from the threshold of the doorset. An Intumescent air transfer grille referenced 'PYROGRILLE 100' was installed in the aperture.

The following results were achieved:

		Doorset A	Doorset B
Integrity performance	Sustained flaming	40 minutes	69 minutes
	Gap gauge	40 minutes [#]	69 minutes [#]
	Cotton Pad	40 minutes [#]	69 minutes [#]
Insulation performance	Door Leaf	40 minutes [#]	69 minutes [#]
	Time to Grille Closure	8 minutes, 50 seconds	8 minutes, 50 seconds

Test was discontinued after a period of 70 minutes.

[#] The failure criteria of each specimen was measured after the air transfer grilles had sealed by the means of their intumescent properties.

Test Date : 9th December 2017

Sponsor : Mann McGowan Fabrications Ltd

Declaration by Mann McGowan Fabrications Ltd

We the undersigned confirm that we have read and complied with the obligations placed on us by the UK Fire Test Study Group Resolution No. 82: 2001.

We confirm that the component or element of structure, which is the subject of this assessment, has not to our knowledge been subjected to a fire test to the Standard against which the assessment is being made.

We agree to withdraw this assessment from circulation should the component or element of structure be the subject of a fire test to the Standard against which this assessment is being made.

We are not aware of any information that could adversely affect the conclusions of this assessment.

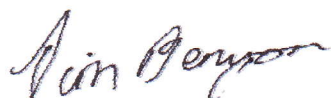
If we subsequently become aware of any such information we agree to cease using the assessment and ask Warringtonfire to withdraw the assessment.

Signed: 

For and on behalf of:

Mann McGowan Fabrications Ltd.

Signatories



Responsible Officer

T Benyon* – Certification Engineer



Approved

A Kearns* - Technical Manager

* For and on behalf of Warringtonfire.

Report Issued: 11th December 2018

Issue 2: Correction of typographical mistake on Page 3 (14th December 2018)

The assessment report is not valid unless it incorporates the declaration duly signed by the applicant.

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