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Testing. Advising. Assuring.

Title:

The Fire Resistance
Performance Of Timber
Based Doorsets When Fitted
With Royde & Tucker
Concealed Hinges

Report No:

WF 352617

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Date:

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Executive Summary

Objective This report presents an appraisal of the expected fire resistance performance of single-acting timber based doorsets, in single or double-leaf configurations, when fitted with Royde & Tucker concealed hinges.

Report Sponsor **Royde & Tucker Limited**

Address Bilton Road, Cadwell Lane, Hitchin SG4 0SB.

Summary of Conclusions Previously fire tested (or assessed by Exova Warringtonfire) timber doorsets which have achieved 30 minutes integrity as discussed in this report may be fitted with RT-218-FIRE ZINC BODIED and RT-218-FIRE STAINLESS STEEL BODIED concealed hinges in accordance with recommendations given in this report, without detracting from the overall performance of the doorset for 30 minutes integrity performances (and insulation where relevant).

The assessment also concludes that previously fire tested timber doorsets which have achieved 60 minutes integrity, as discussed in this report, may be fitted with Royde & Tucker RT-218-FIRE STAINLESS STEEL BODIED concealed hinges, in accordance with recommendations given in this report, without detracting from the overall performance of the doorset for 60 minutes integrity performances (and insulation where relevant).

The timber doorsets to which the hinges are to be fitted shall have been fire tested at a UKAS accredited laboratory (or assessed by Exova Warringtonfire) to BS EN 1634-1 or BS 476: Part 22: 1987, and for the relevant period of integrity.

Valid until 1st July 2020

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Introduction

This report provides a considered opinion regarding the fire resistance performance of timber based doorsets, in single or double-leaf configurations, required to provide 30 minutes integrity performances, when fitted with RT-218-FIRE ZINC BODIED and RT-218-FIRE STAINLESS STEEL BODIED concealed hinges as discussed.

The report also provides a considered opinion regarding the fire resistance performance of timber based doorsets in single or double-leaf configurations, required to provide 60 minutes integrity performances, when fitted with the RT-218-FIRE STAINLESS STEEL BODIED concealed hinges.

The proposed doorsets are required to provide a fire resistance performance of 30 minutes integrity or 60 minutes integrity (as relevant) and, where applicable insulation, with respect to BS EN 1634-1 or BS 476: Part 22: 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

It is assumed that the proposed RT-218-FIRE ZINC BODIED and RT-218-FIRE STAINLESS STEEL BODIED concealed hinges will be fitted to timber based doorsets which have previously been shown to be capable of providing 30 minutes integrity and, where applicable insulation.

It is further assumed that the proposed RT-218-FIRE STAINLESS STEEL BODIED concealed hinges will be fitted to timber based doorsets which have previously been shown to be capable of providing 60 minutes integrity and, where applicable insulation.

Supporting Construction

It is assumed that the construction of the wall which supports the proposed doorsets will have been the subject of a separate test and the performance of the wall is such that it will not influence the performance of the doorset for the required period.

Clearance Gaps

Door leaf to frame clearance gaps can have a significant effect on the overall fire performance of a doorset. It is therefore assumed that the leaf to leaf and leaf to frame clearance gaps will not exceed those measured for the relevant fire tested doorset, unless otherwise discussed in this report. In addition it is assumed that the door leaves will be in the closed position and, where appropriate, latched position.

The proposed doorsets will include a suitable, surface mounted overhead door closer capable of returning the door leaf to the fully closed position overcoming any latch mechanism as fitted.

Proposals

It is proposed that previously fire tested (or assessed by Exova Warringtonfire) timber doorsets which have achieved 30 minutes integrity and, where applicable, insulation performance, as discussed in this report, may be fitted with RT-218-FIRE ZINC BODIED and RT-218-FIRE STAINLESS STEEL BODIED concealed hinges, in accordance with recommendations given in this report, without detracting from the overall performance of the doorset.

It is further proposed that previously fire tested (or assessed by Exova Warringtonfire) timber doorsets which have achieved 60 minutes integrity and, where applicable, insulation performance, as discussed in this report, may also be fitted with RT-218-FIRE STAINLESS STEEL BODIED concealed hinges, in accordance with recommendations given in this report, without detracting from the overall performance of the doorset.

Additionally, this report will also discuss variations of the hinges with alternative door gaps and the use of the hinges on taller doors.

Basic Test Evidence

CFR1501121

A fire resistance test conducted in accordance with BS EN 1634-1: 2014 to two single-acting, single-leaf timber based doorsets.

The doorsets were of typical 30 and 60 minute constructions.

Assessed Performance

General

Both hinge models are of the same design and share the same overall dimensions. RT-218-FIRE ZINC BODIED comprises zinc alloy body with steel arms whereas RT-218-FIRE STAINLESS STEEL BODIED comprises a stainless steel body with stainless steel arms. Additionally the Zinc bodied model requires four fixings per blade, whereas the stainless steel bodied version uses two fixings per blade.

30 minutes applications

The proposals require RT-218-FIRE ZINC BODIED and RT-218-FIRE STAINLESS STEEL BODIED concealed hinges to be fitted to previously fire tested (or assessed by Exova Warringtonfire) timber doorsets.

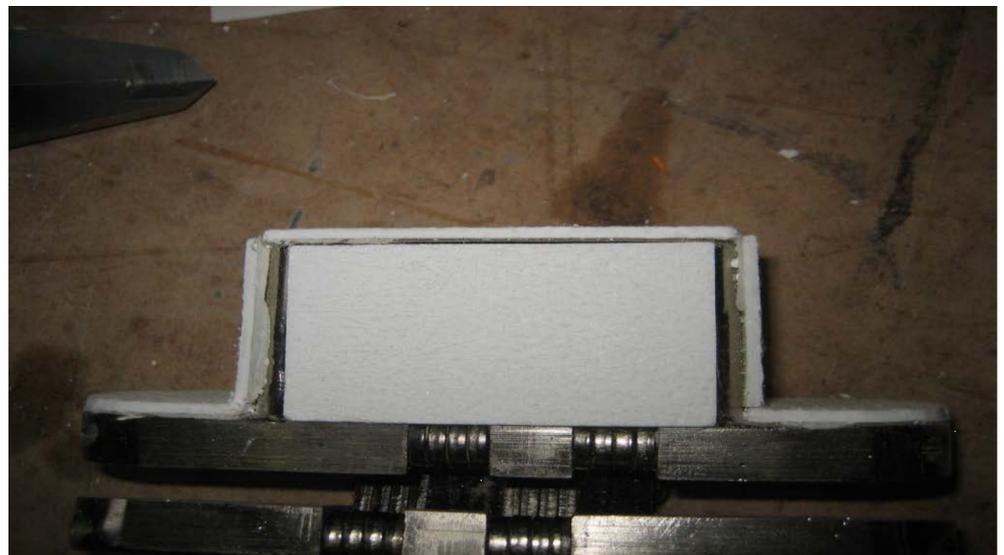
Evidence demonstrating the suitability of the proposed concealed hinges is taken from the test report referenced CFR1501121 which detail a fire resistance test conducted in accordance with EN 1634-1: 2014 on two timber based doorsets. The performance of the doorset referenced as Left hand specimen is cited in support of the proposal.

The doorset was of a typical 30 minute single-leaf, single-acting timber based construction and comprised a softwood door frame and a timber based door leaf lipped with hardwood to its vertical edges. The door leaf was hung within the door frame on three concealed hinges referenced RT-218-FIRE-NP (RT-218-FIRE ZINC BODIED). The doorset did not include any form of latch, but was provided with a surface mounted overhead door closer on its exposed face. The doorset was mounted such that it opened towards the heating conditions of the test.

The test continued for a period of 47 minutes before any incidence of integrity failure.

The test has therefore demonstrated the ability of the proposed RT-218-FIRE ZINC BODIED hinge to be installed within a typical 30 minute doorset construction and contribute positively towards the fire resistance performance of the doorset for well in excess of the required 30 minute performance.

The hinges were provided with intumescent protection in the form of Interdens intumescent sheet material fully lining the hinge mortices to both leaf and frame under the rear surface of the fixing plate (1mm thick on the larger pieces (4 per hinge) and 2mm thick on the edges (10 per hinge). The photograph below shows the extent and position of the protection to one part of the hinge (2mm thick material seen in profile, 1 mm material seen in plan).



It is therefore a requirement of this appraisal that the use of the hinges with other timber based doorsets required to provide a 30 minute fire resistance performance shall be subject to the inclusion of the same level of intumescent protection. The protection kit is supplied by Royde & Tucker under the reference 'HP218-FIRE'.

**RT-218-FIRE
STAINLESS
STEEL BODIED
30 minute
applications**

As discussed earlier, the RT-218-FIRE STAINLESS STEEL BODIED has the same physical dimensions as the proven hinge included in the 30 minute doorset. In terms of comparison of the two models, it can therefore be considered that the inclusion of this model within 30 minute doorset constructions would not have any greater impact on the performance of the doorset in terms of removal of door leaf and frame material. Furthermore, the proposed model has also been included in a 60 minute timber based doorset where it positively contributed to the performance of that doorset for in excess of the 60 minute requirement.

The hinge would be installed with the same level of intumescent protection as was included with the previously tested model, that being the 'HP218-FIRE' intumescent kit.

Further comparison of the proposed hinge shows that when tested in the 60 minute application four hinges were fitted and that this model uses two screw fixings per blade rather than four fixings as used with the RT-218-FIRE ZINC BODIED.

Given that less fixings are used with this model, it shall be a requirement of this appraisal that a minimum number of four hinges shall be fitted. This is considered a reasonable means by which any potential negative impact on performance can be overcome.

Based on the above discussion, the RT-218-FIRE STAINLESS STEEL BODIED is positively appraised for use with previously proven timber based doorsets required to provide 30 minute fire resistance performances.

To enable the use of the proposed hinges on other doorsets, it is necessary to address the available information on the proposed doorset. As this appraisal is intended to be used on a general basis and not restricted to any particular manufacturer of fire doors, the following points are given to enable the concealed hinges to be used safely:

The timber doorset, including door frame, intumescent seals and associated ironmongery should have achieved 30 minutes integrity and, where applicable, insulation when tested by a UKAS approved laboratory (or assessed by Exova Warringtonfire) to BS 476: Part 22: 1987.

If the proposed doorset is to be used in double-leaf configuration the test or assessment evidence should be applicable to double-leaf configurations.

The critical aspects of the doorset construction are considered to be the material of the door frame, the leaf to frame clearance gaps and the lipping material. Attention should be paid to these details and these should not be amended from that previously fire tested. Where this information is not known the following minimum specification will be followed:

- a) Door frame density - 460 kg/m³,
- b) Leaf to frame clearance gaps not to exceed 2.5 mm average and 3 mm maximum,
- c) Door leaf to be lipped to vertical edges with minimum 8 mm thick hardwood lippings having a minimum density of 650 kg/m³.

The critical factor when changing from one item of ironmongery to another is the size of the alternative item. A larger item may require more timber material to be removed from the leaf and therefore may provide an easier route for the passage of flames and/or hot gases leading to premature integrity failure.

Additionally, the amount of interruption to the intumescent seal specification at the door leaf to frame perimeter clearance gaps should be replicated or reduced from that originally specified for the tested doorset.

**RT-218-FIRE
STAINLESS
STEEL BODIED
60 minute
applications**

The doorset referenced as Right hand specimen in the test report CFR1501121 is cited in support of the proposed use of the RT-218-FIRE STAINLESS STEEL BODIED in 60 minute timber doorset applications.

The doorset was of a typical 60 minute single-leaf, single-acting timber based construction and comprised a hardwood door frame and a timber based door leaf lipped with hardwood to its vertical edges. The door leaf was hung within the door frame on four concealed hinges referenced RT-218-FIRE-SS (RT-218-FIRE STAINLESS STEEL BODIED). The doorset did not include any form of latch, but was provided with a surface mounted overhead door closer on its exposed face. The doorset was mounted such that it opened towards the heating conditions of the test.

The test continued for a period of 67 minutes before any incidence of integrity failure.

The test has therefore demonstrated the ability of the proposed RT-218-FIRE STAINLESS STEEL BODIED hinge to be installed within a typical 60 minute doorset construction and contribute positively towards the fire resistance performance of the doorset for well in excess of the required 60 minute performance.

The hinges were provided with intumescent protection in the form of Interdens intumescent sheet material fully lining the hinge mortices to both leaf and frame under the rear surface of the fixing plate (1mm thick on the larger pieces (4 per hinge) and 2mm thick on the edges (10 per hinge).

It is therefore a requirement of this appraisal that the use of the hinges with other timber based doorsets required to provide a 60 minute fire resistance performance shall be subject to the inclusion of the same level of intumescent protection. The protection kit is supplied by Royde & Tucker under the reference 'HP218-FIRE'.

The critical aspects of the doorset construction are considered to be the material of the door and door frame, the leaf to frame clearance gaps, the lipping material and the standard intumescent specification of the doorset. Attention should be paid to these details and these should not be amended from that previously fire tested. The following minimum specification will be followed:

- a) Door frame hardwood with a minimum density of 650 kg/m³,
- b) Leaf to frame clearance gaps not to exceed 2.5 mm average and 3 mm maximum,
- c) Door leaf to be lipped to vertical edges with minimum 6 mm thick hardwood lippings having a minimum density of 650 kg/m³.

Hinge variation

In both cases the tested hinge models had 0.5 mm machined from their faces such that they had a closed gap of 3.0 mm. It is further proposed that the standard, non-machined, hinge could be fitted such that the additional 0.5 mm to each face would be raised from the edge of the door leaf and frame allowing the 3.0 mm door gap to be maintained. Alternatively, it is also proposed that the same non-machined hinge option could also be fitted where it is morticed flush into the leaf edge and frame meaning that the door gap is reduced to nominally 2.0 mm.

In both of these instances the variation from that tested is considered to either insignificant or erring on the side of a less onerous condition, therefore both alternatives are also positively appraised for both hinge models in all applications previously discussed.

Taller doors

Both of the tested doorsets included a door leaf nominally 2300 mm high. It is proposed that the hinges may be fitted to other, previously proven doorsets which include taller door leaves.

Hinge placement on the tested doorsets was as follows:

RT-218-FIRE ZINC BODIED 3no. at 200, 450 and 2100 mm

RT-218-FIRE STAINLESS STEEL BODIED 4no. at 200, 450, 1150 and 2100 mm

The dimensions given are taken from the top edge of the door leaf to the centreline of the hinge.

Where the application may require the hinges to be fitted to a taller door than those tested, it is considered reasonable to allow the use of the hinges on previously proven doors up to 500 mm taller than the doors included in the reference test detailed for the hinges.

To ensure that at least the same level of support is afforded to the taller door leaf, it shall be a requirement of this appraisal that an additional hinge is included where the height of the door leaf is greater than 300 mm taller than the tested leaf height of the doors originally included in the test cited in support of the hinges.

In all situations the uppermost and lowest hinge positions shall maintain the same nominal 200 mm distance from centre to the head and base of the leaf respectively.

Alternative finishes

Both hinge models may be provided with a range of alternative, decorative finishes. The choice of finish is purely aesthetic and has no influence on the fire resistance performance of the hinge.

Conclusions

Based on the above discussion, the Royde & Tucker RT-218-FIRE ZINC BODIED and RT-218-FIRE STAINLESS STEEL BODIED concealed hinges are positively appraised for use with previously proven, single-action timber based doorsets required to provide fire resistance performances of 30 minutes in terms of BS EN 1634-1 or BS 476: Part 22: 1987.

Furthermore, based on the above discussion, the Royde & Tucker RT-218-FIRE STAINLESS STEEL BODIED concealed hinges are positively appraised for use with previously proven, single-action timber based doorsets required to provide fire resistance performances of 60 minutes in terms of BS EN 1634-1 or BS 476: Part 22: 1987.

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 Exova Warringtonfire, the assessment will be unconditionally withdrawn and **Royde & Tucker Limited** 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, 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

CFR1501121

A fire resistance test conducted in accordance with BS EN 1634-1: 2014 to two single-acting, single-leaf timber based doorsets. The assemblies were referenced as Left hand specimen and Right hand specimen for the purpose of the test.

The doorset referenced as Left hand specimen was of a typical 30 minute single-leaf, single-acting timber based construction and comprised a softwood door frame and a Halspan 'Prima' graduated density particleboard timber based door leaf lipped with hardwood to its vertical edges and had nominal dimensions of 2300 mm high by 926 mm wide and 44 mm thick. The door leaf was hung within the door frame on three concealed hinges referenced RT-218-FIRE-NP. The doorset did not include any form of latch, but was provided with a surface mounted overhead door closer referenced Dorma TS92B on its exposed face. The doorset was mounted such that it opened towards the heating conditions of the test

The doorset referenced as Right hand specimen was of a typical 60 minute single-leaf, single-acting timber based construction and comprised a hardwood door frame and a Halspan 'Prima' graduated density particleboard timber based door leaf lipped with hardwood to its vertical edges and had nominal dimensions of 2300 mm high by 926 mm wide and 54 mm thick. The door leaf was hung within the door frame on four concealed hinges referenced RT-218-FIRE-SS. The doorset did not include any form of latch, but was provided with a surface mounted overhead door closer referenced Dorma TS92B on its exposed face. The doorset was mounted such that it opened towards the heating conditions of the test

The specimen doorsets satisfied the test requirements for the following periods:

| Test Results: | | Doorset A | Doorset B |
|-------------------------------|-------------------|-------------|-------------|
| Integrity performance | Sustained flaming | 47 minutes | 67 minutes |
| | Gap gauge | 47 minutes* | 81 minutes* |
| | Cotton Pad | 47 minutes | 67 minutes |
| Insulation performance | | 47 minutes | 67 minutes |

*No failure the evaluation having been discontinued for this doorset. The test duration. The test was discontinued after a period of 81 minutes

Date of Test 12th January 2015

Declaration by Royde & Tucker Limited

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 **Exova Warringtonfire** to withdraw the assessment.

Signed:

For and on behalf of:

Signatories



Responsible Officer

D. Forshaw* - Principal Certification Engineer



Approved

A. Kearns * - Technical Manager

* For and on behalf of Exova Warringtonfire.

Report Issued: 10th July 2015

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