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Testing. Advising. Assuring.

**Title:**

The Fire Resistance  
Performance of Timber  
Doorsets Fitted with 'Kubica'  
Concealed Hinges

**WF Assessment Report No:**

**371858**

**Prepared for:**

**Royde & Tucker Ltd**

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**Date:**

7<sup>th</sup> October 2016

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## Executive Summary

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<b>Objective</b>	This report considers the fire resistance performance of single-acting timber based doorsets when fitted with 'Kubica' concealed hinges with fire bolts.
<b>Report Sponsors</b>	<b>Royde &amp; Tucker Ltd,</b>  Bilton Road, Cadwell Lane, Hitchin, Hertfordshire SG4 0SB
<b>Summary of Conclusions</b>	Should the recommendations given in this report be followed, it can be concluded that previously fire tested (or assessed by Exova Warringtonfire) timber doorsets which have achieved 30 or 60 minutes integrity in accordance with BS 476: Part 22: 1987 or BS EN 1634-1, as discussed in this report, may be fitted with the 'Kubica' concealed hinge models detailed and fire bolts, without detracting from the overall integrity (and insulation where relevant) performance of the doorset.
<b>Valid until</b>	6 <sup>th</sup> October 2021

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## Introduction

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This report considers the fire resistance performance of single-acting timber based doorsets when fitted with 'Kubica' concealed hinges with fire bolts.

The proposed doorsets are required to provide a fire resistance performance of 30 minutes, and/or 60 minutes integrity, and where applicable insulation, with respect to BS 476: Part 22: 1987 or BS EN 1634-1 when incorporating the hinge models detailed in this report.

### 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

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### Supporting wall

It is also 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 or those identified later in this report. In addition, it is assumed that the door leaves will be in the closed position.

### Doorset details

It is assumed that the proposed hinges will be fitted to timber based doorsets which have previously been shown to be capable of providing 30 or 60 minutes integrity, and where applicable insulation, as required. The critical aspects of the door construction are detailed later in this report.

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

### Intumescent Material

1 mm thickness of 'Interdens' intumescent sheet material shall be wrapped around body of hinge to both the door and frame (none is required under face plate), and beneath the Fire bolt door leaf catch plate. Additionally, for 60 minute applications only, 9 mm of perimeter intumescent material shall by-pass the hinge on the closing face or stop-side of the frame as applicable.

### Door mass

It is assumed that the hinges will be appropriate to the maximum door mass permitted.

## Proposals

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It is proposed that previously fire tested (or assessed by **Exova Warringtonfire**) timber doorsets which have achieved 30 or 60 minutes integrity and, where applicable, insulation performance, as discussed later in this report, may be fitted with 'Kubica' concealed hinges with fire bolts, in accordance with recommendations given in this report, without detracting from the overall performance of the doorset.

The hinge models proposed for use are as follows:

- Kubica K7080 – 30 and 60 minute
- Kubica K7120 – 60 minute only

The K7080 and K7120 and the FB1 fire bolts have been fire tested and the details of the test are given in the following section of this report.

Additionally, it is proposed that the doorsets may be of single or double-leaf configuration.

## Basic Test Evidence

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### Report No. CFR1606091

The test referenced Test Report No. CFR1606091 and briefly described in the supporting data section of this report, describes a test conducted in accordance with BS EN 1634-1: 2014 which included two unlatched, single-acting, single-leaf timber doorsets.

The test demonstrated the ability of 30 and 60 minute doorsets to provide 33 and 67 minutes integrity and insulation performances respectively.

## Assessed Performance

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### General

The supporting evidence used as the basis for this appraisal is taken from a fire test to doorsets that achieved 33 and 67 minutes integrity and insulation performance.

### Asymmetry of installation

As the installation of the hinges is asymmetrical the tested arrangement, where the doorsets opened towards the heating conditions of the test, is considered to have demonstrated the performance of the hinges in the most onerous opening direction. The contribution of the hinges to the performance of doorsets opening away from the fire hazard is therefore considered to be at least equal to that of the tested arrangement.

### K7080 30 minute application

The tested Kubica K7080 hinge models included in the left-hand doorset of test report No. CFR1606091 are considered to have suitably demonstrated their abilities to contribute to the performance of the doorsets for well in excess of the required 30 minute level of performance considered by this appraisal.



The hinges were predominantly manufactured from Zamak and consequently, will most likely have melted or deformed during testing. In view of this the inclusion of the 2No. Fire bolts, consisting of a steel stud in the frame jamb, which locates within a steel plate within the edge of the door leaf, are considered essential to counter any possible excessive dropping or lack of support as a result of any hinge collapse. As a consequence, the Kubica K7080 hinges are only approved for use in conjunction with the fire bolts as discussed later in this report.

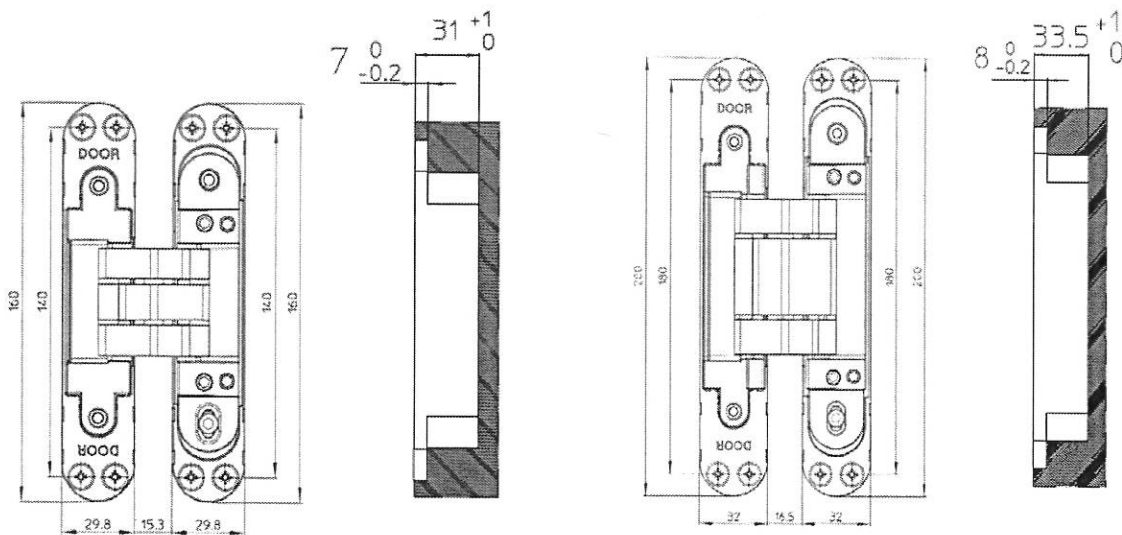
**Intumescent protection**

The tested doorset incorporated 1 mm thickness of 'Interdens' intumescent sheet material wrapped around body of hinge, with none is under face plate, additionally 1 mm thickness of 'Interdens' intumescent beneath the Fire Bolt door leaf catch plate. Therefore this specification shall be applied to all 30 minute doorsets incorporating the K7080 hinges.

The use of the Kubica K7080 with 30 minute timber doorsets is therefore positively appraised, but only in conjunction with the fire bolts as detailed later in this report.

**K7080  
60 minute application**

The K7080 hinge has only been the subject of 30 minute testing within 44 mm timber doorsets, however, the design and materials (Zamak body, hardened steel pins & Teflon bearing surfaces) are similar to those used in the K7120 hinges which were successfully tested for 60 (see below).



**K7080**

**K7120**

As can be seen from the details above, the K7080 and K7120 differ mainly in the size of the hinge itself and its associated load carrying ability. The K7120 was tested with a 60 minute timber doorset to EN1634-1 as detailed in report No. CFR1606091. It can be seen from the observations that the doorset achieved 67 minutes at which time a cotton pad integrity failure was recorded at the bottom hinge location.





The issue associated with the exchange of the K7080 for the tested K7120 relates to the ability of the hinge to support the heavier and thicker 60 minute door throughout the full 60 minute period. However, as the K7120 was again of mainly Zamak construction, even with the increased material, it would likely to be subject to melting and deformation, therefore again the use of steel fire bolts are considered to be the primary mechanism for supporting the door leaves and consequently the change in hinge is unlikely to have a noticeably detrimental effect on this element of the doorsets 60 minute performance

For timber doorsets, one further critical factor when changing from one hinge to another is the size of the hinge. A larger hinge may require more cellulosic material to be removed from the leaf and frame and therefore may provide an easier route for the passage of flames and/or hot gases leading to premature integrity failure. Similarly, the reduction in hinge material present will reduce the level of heat transfer from the hinge into the core of the door leaf; which is the case here.

Additionally, the amount of interruption to the intumescent seal specification at the door leaf to frame perimeter clearance gaps would be reduced from that originally tested, ensuring that the amount or perimeter intumescent by-passing the hinge originally is increased.

The use of the Kubica K7080 with 60 minute timber doorsets is therefore positively appraised, but only in conjunction with the fire bolts as detailed later in this report.

**K7120  
60 minute  
application**

The tested hinge models included in the report No. CFR1606091 are considered to have suitably demonstrated their abilities to contribute to the performance of the doorsets for well in excess of the required 60 minute level of performance considered by this appraisal.

The hinges were predominantly manufactured from Zamak, and consequently, will most likely have melted or deformed during testing. In view of this the inclusion of the 2No. Fire bolts, consisting of a steel stud in the frame jamb, which locates within a steel plate within the edge of the door leaf, are considered essential to counter any possible excessive dropping or lack of support as a result of any hinge collapse. As a consequence the Kubica K7120 hinges are only approved for use in conjunction with the fire bolts as detailed later in this report.

**Intumescent  
protection**

The tested doorset incorporated 1 mm thickness of 'Interdens' intumescent sheet material wrapped around body of hinge (door and frame), with none is under face plate, additionally 1 mm thickness of 'Interdens' intumescent beneath the Fire Bolt door leaf catch plate. Additionally, it was recorded in the test report that 9 mm of perimeter intumescent material by-passed the hinge on the closing face of the frame rebate. Therefore this specification shall be applied to all 60 minute doorsets incorporating the K7120 hinges.

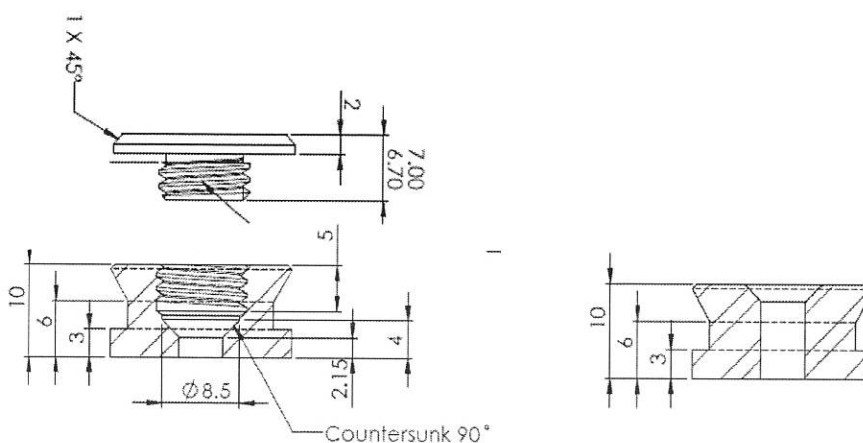
The use of the Kubica K7120 with 60 minute timber doorsets is therefore positively appraised, but only in conjunction with the fire bolts as detailed later in this report.

**FB1 Fire bolts**

The tested 'FB1' fire bolts included in both the doorsets identified in report No. CFR1606091 are considered to have suitably demonstrated their abilities to contribute to the performance of the doorsets for well in excess of the required 30 minute and 60 minute level of performance considered by this appraisal.

**FB2 Fire bolts**

The FB1 and FB2 fire bolts are similar in specification, the only difference being that the FB1 stud tested incorporates a 2 mm screw cap that covers the fixings, as a consequence the overall stud height is 2 mm less on the FB2 version. The steel catch plate is identical for both versions.

**FB1****FB2**

It is proposed that to compensate for the reduction in screw length protruding from the back of the FB2 fire bolt the fixing shall be extended by 5 mm to compensate to ensure retention of the bolt is maintained.

This change in design is not expected to have a detrimental effect on the ability of the fire bolt to retain the door leaf as a result of any potential hinge collapse. The use of the FB2 fire bolt is therefore approved for both 30 minute and 60 minute applications.

**General Requirements****Hinge positioning**

The hinge shall be positioned a minimum of 4 mm from the opening face of door leaf and frame to the edge of the hinge blades, as tested.

The tested doorsets each included two hinges – one positioned 250 mm from the top edge of the door to the centreline of the top hinge, the other positioned 187 mm from the bottom edge of the door to the centreline of the bottom hinge. The hinges shall be located no closer to the top and bottom edge of the door leaf than that tested.

**Fire bolt positioning**

The fire bolts shall be positioned a minimum of 18 mm and a maximum of 22 mm from the opening face of the frame to the centreline of the stud.



The tested doorsets each included two FB1 fire bolts – one positioned 100 mm from the top edge of the door to the centreline of the stud, the other positioned 350 mm from the bottom edge of the door to the centreline of the bottom stud. The fire bolts shall be located no closer to the top and bottom edge of the door leaf than that tested.

### 3<sup>rd</sup> hinge

It has been proposed that an additional hinge may be required in some circumstance. Where necessary a 3<sup>rd</sup> hinge would be incorporated between the hinges top and bottom hinges tested currently.

The testing incorporated hinges at the high and low positions, thus demonstrating their performance in the positive and negative pressure zones, therefore a 3<sup>rd</sup> hinge located between them would not be subject to these extremes in pressure and therefore can be considered to be over lower risk.

The 3<sup>rd</sup> hinge shall be positioned no closer than 100 mm to any other hinge and the requirements for intumescent protection shall be maintained. On this basis, the use of a third hinge is positively appraised.

### Suitable doorsets

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 hinges to be used safely:

The timber doorset, including door frame, intumescent seals and associated ironmongery should have achieved 30 or 60 minutes integrity and, where applicable, insulation when tested by a UKAS approved laboratory (or assessed by Exova Warringtonfire) to EN 1634-1:2008 or BS 476: Part 22: 1987.

The critical aspects of the doorset construction in terms of the performance of the proposed hinges are considered to be the material of the door frame, the leaf to frame clearance gaps and the lipping material to the door leaf. 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 shall be followed:

#### 30 minutes:

- a) Door frame hardwood, minimum density - 640 kg/m<sup>3</sup> with a minimum section thickness of 44 mm.
- b) Leaf to frame clearance gaps not to exceed 3 mm average and 4.2 mm maximum
- c) Lipping hardwood, density - 640 kg/m<sup>3</sup> minimum.
- d) Door leaf thickness – 44 mm minimum

#### 60 minutes:

- a) Door frame hardwood, minimum density - 640 kg/m<sup>3</sup> with a minimum section thickness of 44 mm.
- b) Leaf to frame clearance gaps not to exceed 3.2 mm average and 3.7 mm maximum.
- c) Lipping hardwood, minimum density - 640 kg/m<sup>3</sup>.
- d) Door leaf thickness – 54 mm minimum

1 mm thickness of 'Interdens' intumescent sheet material wrapped around body of hinge to both the door and frame, with 1 mm thickness of 'Interdens' intumescent beneath the Fire Bolt door leaf catch plate.

Additionally, for 60 minute applications only, 9 mm pf perimeter intumescent material shall by-pass the hinge on the closing face, or stop-side of the frame rebate as applicable.

If the proposed doorset is to be used in double-leaf configurations, the test or assessment for the doorset must relate to this configuration.

## Conclusions

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Should the recommendations given in this report be followed, it can be concluded that previously fire tested (or assessed by Exova Warringtonfire) timber doorsets which have achieved 30 or 60 minutes integrity in accordance with BS 476: Part 22: 1987 or BS EN 1634-1, as discussed in this report, may be fitted with the 'Kubica' concealed hinge models detailed and fire bolts, without detracting from the overall integrity (and insulation where relevant) performance of the doorset.

## Validity

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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 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 6<sup>th</sup> October 2021, 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

### Test Report No. CFR1606091

This report describes a fire resistance test in accordance with BS EN 1634-1: 2014, which was conducted on two specimens of unlatched, single-acting, single-leaf timber doorset.

For the purposes of the test the doorsets were referenced Left-hand and Right-hand doorsets.

Left-hand doorset - had overall dimensions of 2258 mm high by 1022 mm wide and incorporated a door leaf of overall dimensions 2204 high x 927 wide x 44 thick. The door leaf was hung within a hardwood door frame on two concealed hinges, referenced Kubica K7080. The door leaf comprised multi-layered particleboard with hardwood lippings to the vertical edges.

Left-hand doorset - had overall dimensions of 2258 mm high by 1020 mm wide and incorporated a door leaf of overall dimensions 2204 high x 927 wide x 54 thick. The door leaf was hung within a hardwood door frame on two concealed hinges, referenced Kubica K7120. The door leaf comprised multi-layered particleboard with hardwood lippings to the vertical edges.

1mm Interdens intumescent strip is wrapped around body of hinge but none is under face plate.

The Kubica hinges were not subject to independent sample selection prior to testing.

The doorsets satisfied the performance criteria specified in BS EN 1634-1: 2014 for the following periods:

<b>Test Results:</b>		<b>Left-Hand</b>	<b>Right-Hand</b>
<b>Integrity</b>	Sustained Flaming	36 minutes	68 minutes
	Cotton wool pad	33 minutes	67 minutes
	Gap gauge	36 minutes*	69 minutes*
<b>Insulation</b>		33 minutes	64 minutes

\* No failure at time test was terminated

Test date : 9<sup>th</sup> June 2016

Test sponsor : Royde & Tucker Ltd



## Declaration by Royde & Tucker Ltd

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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:



Signed:


For and on behalf of:


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## Signatories

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Responsible Officer R. Anning* - Senior Certification Engineer


Approved M. Tolan* - Certification Engineer

\* For and on behalf of **Exova Warringtonfire**

Report Issued: 7 <sup>th</sup> October 2016
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The assessment report is not valid unless it incorporates the declaration duly signed by the applicant.

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