
Title

The Fire Resistance Performance of Doorsets When Fitted With 'Perko Powermatic R108' Jamb Mounted Concealed Door Closers if Tested in Accordance with BS EN 1634-1: 2014 + A1: 2018

WF Assessment Report No.:

553540 Issue 1

Original Issue Date:

5th September 2025

Valid Until:

5th September 2030

Prepared for:

Samuel Heath & Sons Plc

Leopard Street

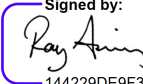
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The issue/revision number stated on the front of this report supersedes all previous issues/revisions, if applicable. Previous issues/revisions of the report, if applicable, cannot be used once an updated report has been issued/revised under a new revision.

Signatories and Revision History

Issue No.	Date	FM No.	Report scope and Signatures
1	05/09/2025	553540	Initial report issued to Samuel Heath & Sons Plc, replaces AR 416132.
Assessor		Reviewer	
Name: * A.Green-Morris		Name: * R.Anning	
Signature:		Signature:	
 Signed by: E988A69B8C424DA...		 Signed by: 144229DE9F3343A...	

*For and on behalf of Warringtonfire

Executive summary

This report presents an assessment of the fire resistance performance of the door hardware as fire tested and described in the report the Appendix when modified as detailed in Section 3 of this report.

This assessment report is subject to the requirements and limitations described in Sections 2 and 8.

The assessment in Section 5 of this report found that if the door hardware as tested and described in the report had been modified as proposed, it is expected that it would have been capable of providing the required fire resistance performance as outlined in section 5 if tested in a similar manner to BS EN 1634-1:2014+A1:2018.

This report represents our opinion as to the performance likely to be demonstrated on a test in accordance with the test standard specified above, on the basis of the test evidence referred to in this report. We express no opinion as to whether that evidence, and/or this report would be regarded by any Building Control authorities or any other third parties as sufficient for that or any other purpose.

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1. Introduction

This report presents an assessment of the fire resistance performance of the door hardware as fire tested and described in the report and when modified as detailed in Section 3 of this report.

2. Assessment framework

An assessment is an opinion of the likely performance of a component or element of structure if it was subjected to a standard fire test.

This assessment report has been carried out in accordance with the Passive Fire Protection Forum (PFPF) 'Guide to Undertaking Technical Assessments of the Fire Performance of Construction Products Based on Fire Test Evidence - 2021' and has been written in accordance with the general principles outlined in BS EN 15725: 2023; *Extended application reports on the fire performance of construction products and building elements, as applicable*.

This scope document cannot be used as supporting documentation for either a CE or UKCA marking application for doorsets nor can the conclusion be used to establish a formal classification against EN13501-2.

The scope presented in this report relates to the behaviour of the element under the particular conditions of the test; they are not intended to be the sole criterion for considering the potential fire hazard of the door assembly in use.

This report has been prepared and checked by product assessors with the necessary competence, who subscribe to the principles outlined in the Passive Fire Protection Forum (PFPF) 'Guide to Undertaking Technical Assessments of the Fire Performance of Construction Products Based on Fire Test Evidence - 2021'. The aim of the PFPF guidelines is to give confidence to end-users that assessments that exist in the UK are of a satisfactory standard to be used for building control and other purposes.

This report uses established empirical methods of extrapolation and experience of fire testing similar elements, in order to extend the scope of application by determining the limits for the designs based on the tested constructions and performances obtained. The scope is an evaluation of the potential fire resistance performance, if the variations specified herein were to be tested in accordance with test standard specified.

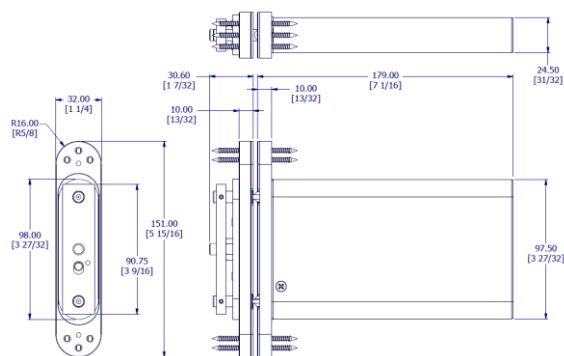
This report has been written using appropriate test evidence generated at UKAS accredited laboratories, to the relevant test standard. The supporting test evidence has been deemed appropriate to support the stated design and is summarised in Section 3 and Appendix A.

3. Description Of the Products

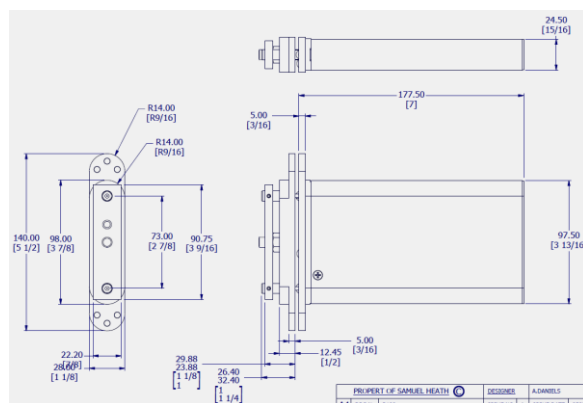
3.1 Perko Closer

The perko style closer is made from steel and is recessed into the door leaf and frame jamb. The closers were identified as being produced at manufacturing plant E/018. Full details are retained on file by Warringtonfire.

The Proposed R108 closer has an identical mechanism and body to the R100 model, with the forends modified to provide a more aesthetic appearance, incorporating 151 x 32 x 10 mm thick brass forends, as opposed to the 140 x 28 x 5 mm-12.5 mm brass forends associated with the R100.



R108



R100

4. General requirements and assumptions

- 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.
- It is also assumed that the doorsets will fully comply with any certification scope or assessed modifications, apart from the modifications specified in this report.
- 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. The application of increased perimeter gaps in accordance with the Field of Direct application of test results, in accordance with BS EN 1634-1: 2014 + A1: 2018 is therefore not permitted in conjunction with this assessment report. It is assumed that the door leaves will be in the closed position.
- It is assumed that the doorsets will be installed in a similar manner to that of the previously tested assembly by competent installers.
- Recessing of any type that may be required for any of the specified hardware shall result in a tight fit, allowing for any intumescent protection where required.
- All door hardware is subject to the acceptance by the chosen door assembly supplier's tested, assessed, or certificated scope, which generally identifies the types of hardware approved, the required specification/design based on the key materials/ maximum size and the application of any additional intumescent protection. On this basis, approval should be sought from the specific door assembly supplier to ensure compliance based on this assessed/certificated scope.
- An appraisal of the hardware variants detailed in this report is based upon product information supplied by the hardware manufacturer, which is retained in the confidential file relating to this report. Warringtonfire have not inspected the devices being appraised and cannot be held responsible for the accuracy of the information provided.
- EN1634-1 was issued originally in 2000, with amended versions issued in 2008, 2014 and 2018. The differences between each version are mainly procedural and are not considered to have a practical impact on the performance of the samples under test. On this basis this evaluation is considered applicable to all versions of EN1634-1 issued prior to the issue of this assessment.
- It is assumed that the end user will have a full understanding of the tested specification as defined in the relevant test report(s) summarised in the Appendix.
- If a design variation or extension to scope is not explicitly detailed within the assessment it should not be assumed to be acceptable by omission.

5. Assessment of proposed modifications

5.1 Proposal

It is proposed to consider the fire resistance performance of timber-based door assemblies, when fitted with the Perko Powermatic R108' Jamb Mounted Concealed Door Closers, for up to 60 minutes fire resistance integrity performance only (and where appropriate insulation performance), if the hardware was to be tested to the requirements of BS EN 1634-1:2014 + A1:2018.

5.1.1 Perko Closer

The main function of a door closer, when used on unlatched timber based doorsets subjected to fire resistance testing is to maintain the door in the fully closed position up until the intumescent in the leaf to frame clearance gaps has been given sufficient time to react.

After a period between 10 and 15 minutes of the test, the intumescent seals will have reacted, thereby providing friction between the leaf and frame and inhibiting the tendency of the door leaf to swing open. It is therefore essential that the closer remains operable up until this point.

The critical aspect to the performance of a concealed closer within a doorset is the amount of leaf material which is required to be removed for fitment of both the closer body in the edge of the door and the armature in the hanging jamb. The metal body and arm of the closer also has an effect on heat transfer which can affect charring and burn-through performance.

Timber based doorsets – 30 minutes

The performances of Doorset A during the test referenced WF Report No. 397894 is cited to display the ability of the R100 concealed jamb-mounted closer referenced to contribute towards the required 30 minute fire resistance performance.

The doorset comprised 44 mm thick solid graduated density chipboard construction, with 8 mm hardwood lippings to the vertical edges and was hung within a softwood frame on three stainless steel hinges. The door leaf was unlatched and the doorset mounted such that it opened towards the heating conditions of the test.

The R100 main closer body was mounted within the door leaf, 782 mm from the bottom of the jamb to the centre-line of the closers body. The main body and frame armature were protected by and intumescent kit, incorporating both mono ammonium phosphate and graphite-based sheet material, referenced R97-XX

The single 15 mm wide perimeter intumescent fire seal was fully cut-through by the frame armature.

Doorset A achieved an integrity performance of 42 minutes at which time sustained flaming was reported at the top hanging edge. Doorsets was blanked off at 44 minutes without failure attributed to, or coincident with the R100 closers, to allow the testing of doorsets B to continue

The test observations do not record any instance during the 30 minute classification period that would indicate that the closer failed to maintain the door leaf in the closed position for the required period.

Based on the performance of the doorset included in the test, it is therefore reasonable to consider that the R100 concealed jamb-mounted closer unit may be fitted to other, previously proven, timber/mineral-based doorsets required to provide 30 minute fire resistance performances.

The performances of Doorset A during the test referenced WF Report No. 401347 is cited to display the ability of the R108 concealed jamb-mounted closer referenced to contribute towards the required 30 minute fire resistance performance.

The doorset comprised 44 mm thick solid graduated density chipboard construction, with 8 mm hardwood lippings to the vertical edges and was hung within a softwood frame on three stainless steel hinges. The door leaf was unlatched and the doorset mounted such that it opened towards the heating conditions of the test.

The R108 main closer body was mounted within the door leaf at a notional 740 mm from the bottom of the door to the centre-line of the closers body. The main body and frame armature were protected by the following intumescent kit:

- i. reference : SHR 100
- ii. closer body : Wrapped in 1 layer of 1.5 mm thick self-adhesive MAP (mono-ammonium phosphate) intumescent.
- iii. closer body rear : 1 layer of 1.5 mm thick self-adhesive MAP intumescent.
- iv. closer foreends : 1 layer (2 pieces) of 1.5 mm thick self-adhesive MAP intumescent applied to the rear of closer foreends.
- v. frame plate body : 2 No. strips (1 either side) of 1.5 mm thick self-adhesive MAP intumescent.



The single 15 mm wide perimeter intumescent fire seal was fully cut-through by the frame armature.

Doorset A achieved an integrity performance of 30 minutes at which time sustained flaming was reported at the middle of the leading edge. Doorset A was blanked off at 36 minutes without failure attributed to, or coincident with the R108 closer, to allow the testing of doorsets B to continue

The test observations do not record any instance during the 30 minute classification period that would indicate that the closer failed to maintain the door leaf in the closed position for the required period.

Based on the performance of the doorset included in the test, it is therefore reasonable to consider that the R108 concealed jamb-mounted closer unit may be fitted to other, previously proven, timber-based doorsets required to provide 30 minute fire resistance performances if fitted with the manufacturer's SHR 100 intumescent protection kit which comprises pre-cut, self-adhesive intumescent sheet material, as identified above.

Timber based doorsets – 60 minutes

The performances of the doorset during the test referenced WF Report No. 330214 issue 2 is cited to display the ability of the R100 concealed jamb-mounted closer referenced to contribute towards the required 60 minute fire resistance performance.

The doorset comprised 54 mm thick solid graduated density chipboard construction, with 8 mm hardwood lippings to the vertical edges and was hung within a hardwood frame on three stainless steel hinges. The door leaf was unlatched and the doorset mounted such that it opened towards the heating conditions of the test.

The R100 main closer body was mounted within the door leaf, 815 mm from the bottom of the jamb to the centre-line of the closers body. The body and frame armature were bedded on intumescent paste. 2No. 15 mm wide perimeter intumescent fire seals were incorporated within the frame, positioned 9 mm apart, consequently approximately 5 mm of perimeter seal by-passed the armature on each side.

The doorset achieved an integrity performance of 66 minutes at which time sustained flaming was reported at the glazing aperture. Further sustained flaming was recorded at the top edge of the door at 58 minutes. The test was discontinued at 62 minutes without failure attributed to, or coincident with the R100 closers.

The test observations do not record any instance during the 60 minute classification period that would indicate that the closer failed to maintain the door leaf in the closed position for the required period.

The full-scale testing of the R100 establishes the ability of the R100/108 mechanism to retain the door in the closed position in both the 30 and 60 minute timber-based door applications.

The performances of Doorset B during the test referenced WF Report No. 401347 is cited to display the ability of the R108 concealed jamb-mounted closer referenced to contribute towards the required 60 minute fire resistance performance.

The doorset comprised 54 mm thick solid graduated density chipboard construction, with 8 mm hardwood lippings to the vertical edges and was hung within a hardwood frame on three stainless steel hinges. The door leaf was unlatched and the doorset mounted such that it opened towards the heating conditions of the test.

The R108 main closer body was mounted within the door leaf at a notional 740 mm from the bottom of the door to the centre-line of the closers body. The main body and frame armature were protected by the following intumescent kit:

- | | |
|-----------------------|---|
| i. reference | : SHR 100 |
| ii. closer body | : Wrapped in 1 layer of 1.5 mm thick self-adhesive MAP (mono-ammonium phosphate) intumescent. |
| iii. closer body rear | : 1 layer of 1.5 mm thick self-adhesive MAP intumescent. |
| iv. closer forends | : 1 layer (2 pieces) of 1.5 mm thick self-adhesive MAP intumescent applied to the rear of closer forends. |
| v. frame plate body | : 2 No. strips (1 either side) of 1.5 mm thick self-adhesive MAP intumescent. |



2No. 15 mm wide perimeter intumescent fire seals were incorporated within the frame rebate, positioned centrally, 9 mm apart. Approximately 3.5 mm of the intumescent by-passed the armature on each side.

Doorset B achieved an integrity performance of 67 minutes at which time the test was terminated without failure attributed to, or coincident with the R108 closer.

The test observations do not record any instance during the 60 minute classification period that would indicate that the closer failed to maintain the door leaf in the closed position for the required period.

Based on the performance of the doorset included in the test, it is therefore reasonable to consider that the closer unit may be fitted to other, previously proven, timber-based doorsets required to provide 60 minute fire resistance performances. if fitted with the manufacturer's SHR 100 intumescent protection kit which comprises pre-cut, self-adhesive intumescent sheet material, as identified above and additionally, the perimeter intumescent within the frame/door edge shall by-pass the forend or armature by a minimum of 3.5 mm wide on each side.

Intumescent Protection for timber based doorsets

It is a requirement of this appraisal that the concealed jamb-mounted closers must be installed within the doorsets such that the same level of intumescent protection is provided.

For both 30 and 60 minute timber-based applications, the R108 closer unit shall utilise the manufacturer's SHR 100 intumescent protection kit which comprises pre-cut, self-adhesive intumescent sheet material, as identified on page 10 and 11.

Additionally, for 60 minute timber based doorsets applications only, the perimeter intumescent within the frame/door edge shall by-pass the forend or armature by a minimum of 3.5 mm wide on each side.

5.1.2 Proposed Doorsets – All Hardware

As stated in this report, the doorset, in the required configuration, will be previously tested and its performance is therefore not in doubt.

All door hardware is subject to the acceptance by the chosen door assembly supplier's tested, assessed or certificated scope, which generally identifies the types of hardware approved, the required specification/design based on the key materials/ maximum size and the application of any additional intumescent protection.

On this basis approval should be sought from the specific door assembly supplier to ensure compliance based on this assessed/certificated scope.

5.1.3 Alternative Doorsets – All Hardware

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 based doorset, including door frame, intumescent seals and associated ironmongery should have achieved up to 60 minutes integrity and, where applicable, insulation when tested by a UKAS approved laboratory to BS EN 1634-1:2014 +A1:2018.

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:

- 30 Minute timber-based doorsets
 - Door frame minimum density - 460 kg/m³
 - Door leaves shall have a minimum thickness of 44 mm for 30 minute applications.
 - Leaf to frame clearance gaps not to exceed 3 mm maximum.
 - Lipping density - 640 kg/m³.
- 60 Minute timber-based doorsets
 - Door frame minimum density - 640 kg/m³
 - Door leaves shall have a minimum thickness of 54 mm for 60 minute applications.
 - Leaf to frame clearance gaps not to exceed 3 mm maximum.
 - Lipping density - 640 kg/m³.

6. Conclusions

Should the recommendations given in this report be followed, it can be concluded that timber doorsets, which have previously been successfully fire tested to EN 1634-1 by a laboratory accredited to IS/IEC 17025 (under International Laboratory accreditation Cooperation (ILAC) membership), and have achieved up to 60 minutes, as discussed in this report, may be fitted with the Perko Powermatic R108' Jamb Mounted Concealed Door Closers, without detracting from the overall integrity performance (and insulation where relevant) of the doorset.

7. Declaration

We the undersigned confirm that we have read and comply with obligations placed on us by the Passive Fire Protection Forum (PFPF) Guide to undertaking technical assessments and engineering evaluations based on fire test evidence 2021 Industry Standard Procedure

We confirm that any changes to a component or element of structure which are the subject of this assessment have not to our knowledge been tested to the standard against which this assessment has been made.

We agree to withdraw this assessment from circulation should the component or element of structure, or any of its component parts be the subject of a failed fire resistance test to the standard against which this assessment is being made.

We understand that this assessment is based on test evidence and will be withdrawn should evidence become available that causes the conclusion to be questioned. In that case, we accept that new test evidence may be required.

We are not aware of any information that could affect the conclusions of this assessment. If we subsequently become aware of any such information, we agree to ask the assessing authority to withdraw the assessment.

(in accordance with the principles of FTSG Resolution No. 82: 2001)

Signed: 
C2219F96F24B415...

Name: Adam Daniels

Position: Technical Director

Date: 08-Sep-2025

For and on behalf of:

8. Limitations

This assessment report:

- Does not provide an endorsement by Warringtonfire of actual products supplied.
- Has been prepared based on information provided by the Applicant. Warringtonfire has not verified the accuracy or completeness of that information and will not be responsible for any errors or omissions that might be incorporated into this report as a result.
- Any figures included in this report are provided for illustrative purposes only and may not fully reflect the actual scope being assessed. Warringtonfire cannot guarantee the accuracy of the drawings against the scope being assessed. The scope of this report is limited to assessments of the modifications to the tested systems as described in Section 3.
- This report addresses itself solely to the elements and subjects discussed and do not cover any other criteria or modifications. All other details not specifically referred to should remain as tested or assessed.
- This report is issued on the basis of test data and information to hand at the time of issue. If contradictory evidence becomes available to Warringtonfire, the assessment will be unconditionally withdrawn, and the applicant will be notified in writing. Similarly, the assessment should be re-evaluated if the assessed construction is subsequently tested since actual test data is deemed to take precedence.
- This assessment has been carried out in accordance with Fire Test Study Group Resolution No. 82: 2001.
- Opinions and interpretation expressed herein are outside the scope of UKAS accreditation.
- This assessment report relates only to those aspects of design, materials and construction that influence the performance of the element(s) under fire resistance test conditions that are stipulated in the standard this assessment concludes to. It does not purport to be a complete specification ensuring fitness for purpose and long-term serviceability. It is the responsibility of the client to ensure that the element conforms to recognised good practice in all other respects and that, with the incorporation of the guidance given in this assessment, the element is suitable for its intended purpose.
- This report represents our opinion as to the performance likely to be demonstrated on a test in accordance with the standard to which this assessment concludes, on the basis of the test evidence referred to in this report. We express no opinion as to whether that evidence, and/or this report would be regarded by any Building Control authorities or any other third parties as sufficient for that or any other purpose.
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9. Validity

This assessment report is not valid unless signed by all signatories identified within the Signatories and Revision History section of this report.

This assessment report is not valid unless it incorporates the declaration given in Section 7 duly signed by the applicant.

The assessment is valid initially for a period of five years after which time it is recommended that it be submitted to the assessing authority for re-evaluation.

Appendix A

Summary of supporting data

The summaries in this section are for information only. It is assumed that the end user will have a full understanding of the tested specification as defined in the relevant test report.

Where of the test evidence used in the evaluation is over 5 years old. In accordance with industry guidance, the evidence has been reviewed to consider its suitability. Warringtonfire are satisfied that there have been no significant revisions to the relevant test standards which would render the evidence irrelevant.

A.1 Primary Evidence

Test Report Reference WF 330214 Issue 2	
Report sponsor	Samuel Heath & Sons Plc
Test laboratory	Warringtonfire Holmesfield Road Warrington WA1 2DS United Kingdom
Test date	19 th June 2013
Test standard	BS EN 1634-1:2008
Specimen summary	The doorset had overall dimensions of 2085 mm high by 1013 mm wide and incorporated a door leaf of overall dimensions 2040 mm high by 930 mm wide by 54 mm thick. The door leaf was hung within a hardwood door frame on three steel hinges. The door leaf comprised a three layer particle board Halspan core with hardwood lippings to the vertical edges. The doorset incorporated a concealed door closer referenced 'R100 Perko-Powermatic controlled door closer' which was fitted within the trailing edge of the door leaf with approximately 10 mm clearance between the door closer and the glazed aperture. The door leaf incorporated an aperture of overall cut out dimensions 216 mm wide by 1016 mm high. The aperture was glazed with a pane of 6 mm thick 'Pyran® S' glass of overall nominal dimensions 200 mm wide by 1000 mm high. The glazed pane was protected via a CF291 glazing system and retained in place via screw fixed hardwood glazing beads. The test was discontinued after a period of 62 minutes. Warrington Fire Research Centre was not involved in any selection or sampling procedures of the specimen or any of the components.
Test results	
	Doorset
	Integrity 17 minutes
	Insulation 3 minutes

Test Report Reference 397894			
Report sponsor	Samuel Heath & Sons Plc.		
Test laboratory	Warringtonfire Holmesfield Road Warrington WA1 2DS United Kingdom		
Test date	2 nd May 2018		
Test standard	BS EN 1634-1:2014		
Specimen summary	The purposes of the test, the doorsets were referenced Doorset A and Doorset B. Doorset A had overall dimensions of 2080 mm high by 1000 mm wide incorporating a door leaf with overall dimensions 2040 mm high by 933 mm wide by 44 mm thick. The door leaf was of a solid graduated density chipboard construction, with 8 mm hardwood lippings to the vertical edges. The leaf was hung within a softwood frame on three steel butt hinges, opening towards the heating conditions of the test. The doorset was fitted with a Perko 'Powermatic R100' concealed closer. The closer was fitted on the hinged edge with the closer body morticed into the leaf. The centre line of the closer was positioned nominally 782 mm from the notional floor level. The doorset was unlatched for the duration of the test. Doorset A had overall nominal dimensions 2090 mm high by 1040 mm wide incorporating a door leaf with overall dimensions 2051 mm high by 974 mm wide by 45 mm thick. The door leaf was formed from 1.5 mm thick galvanised steel facings with a paper honeycomb core. The leaf was hung within a profiled steel door frame such that it opened away from the heating conditions of the test. The doorset was fitted with a Perko 'Powermatic R100' concealed closer. The closer was fitted on the hinged edge with the closer body morticed into the leaf. The centre line of the closer was positioned nominally 782 mm from the notional floor level. The doorset was unlatched for the duration of the test. The test was discontinued after a period of 243 minutes. A representative of Warrington Certification sample selected the concealed closers on the 13th December 2017.		
Test results		Doorset A	Doorset B
	Integrity	42 minutes	35 minutes
	Insulation	42 minutes	5 minutes

A.2 Secondary Evidence

Test Report Reference 401347	
Report sponsor	Samuel Heath & Sons Plc.
Test laboratory	Warringtonfire Holmesfield Road Warrington WA1 2DS United Kingdom
Test date	6 th April 2019
Test standard	An investigation which utilised the general principles including heating and pressure conditions given in BS EN 1363-1: 2012.
Specimen summary	The purpose of the test was to provide an indication of the performance of two 'Perko Powermatic R108' jamb mounted concealed door closers fitted to 30 and 60 minute small scale fire rated timber-based doorsets. For the purpose of the test the doorset were referenced Doorset A and Doorset B. Doorset A briefly had overall nominal dimensions 1488 mm high by 615 mm wide incorporating a door leaf with overall dimensions 1440 mm high by 545 mm wide by 44 mm thick. The door leaf was of a solid graduated density chipboard construction; with 8 mm hardwood lipping's to the vertical edges and was hung within a softwood frame with a single 15 x 5 mm perimeter intumescent fire seal positioned centrally within the frame rebate. The door was hung on two Butt Hinges. Doorset B briefly had overall nominal dimensions 1488 mm high by 615 mm wide incorporating a door leaf with overall dimensions 1440 mm high by 545 mm wide by 54 mm thick. The door leaf was of a solid graduated density chipboard construction; with 8 mm hardwood lipping's to the vertical edges and was hung within a hardwood frame with 2No. 15 x 5 mm perimeter intumescent fire seal positioned centrally within the frame rebate (9 mm apart). The door was hung on two Butt Hinges. The test was discontinued after a period of 67 minutes without failure of Doorset B. The closers were identified as being produced at manufacturing plant E/018. Full details are retained on file by Warringtonfire. The closers were not independently sampled prior to testing.