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Fire resistance test report

Issuing laboratory: Warringtonfire Testing and Certification Limited

Test standard:	BS EN 1634-1:2014+A1:2018
Test sponsor:	Consort Architectural Hardware
Product:	Hardware testing timber doors
Report number:	536715/R
Test date:	18 September 2023
Version:	1

Warringtonfire, accredited for compliance with ISO/IEC 17025:2017 – Testing

Approved Body Number 0833

Quality management

Version	Date	Information about the report		
1	11 March 2024	Description	Initial issue	
			Prepared by	Authorised by
		Name	Peter White	Graham Edmonds
		Signature		

Signed for and on behalf of Warringtonfire Testing and Certification Limited

Executive summary

This report documents the findings of the fire resistance test of doorsets in accordance with BS EN 1634-1:2014+A1:2018 with deviations as described in Table 3.

Warringtonfire Testing and Certification Limited (Warringtonfire) performed the test on 18 September 2023 at the request of Consort Architectural Hardware

Table 1 provides a summary of the test specimen, Table 2 gives details of the supporting construction and Table 3 describes the summary of the test results.

Table 1 Test specimen

Item	Detail	Opening direction
Doorset A	60 Minute timber doorset	Towards the furnace
Doorset B	60 Minute timber doorset	Towards the furnace
Latching conditions	Engaged Bottom Latch on Doorset A Disengaged	

Table 2 Supporting construction

Item	Detail		
Supporting construction	150 mm thick low-density concrete wall with a low-density concrete lintel at the head as described in section 7.2 of EN 1363-1: 2020.		
Dimensions	Width	3000 mm	
	Height	3000 mm	
	Thickness	150 mm	
Aperture dimensions		**Width**	**Height**
	Doorset A	1020 mm	2100 mm
	Doorset B	1020 mm	2100 mm
Restraint conditions	Restrained on all edges		

Table 3 Summary of test results

Item	Criteria		Results
Doorset A	Integrity		75 minutes
	Insulation	I_1	75 minutes*
		I_2	75 minutes*
Doorset B	Integrity		68 minutes
	Insulation	I_1	68 minutes*
		I_2	68 minutes*
Notes:			
The test results for the specimen only apply to the tested orientation. The test was discontinued after 76 minutes. '*' indicates failure due to integrity failure.			

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1. Introduction

This report documents the findings of the fire resistance test of doorsets in accordance with BS EN 1634-1:2014+A1:2018.

Warringtonfire performed the test on 18 September 2023 at the request of the test sponsor listed in Table 4.

Table 4 Test sponsor(s) details

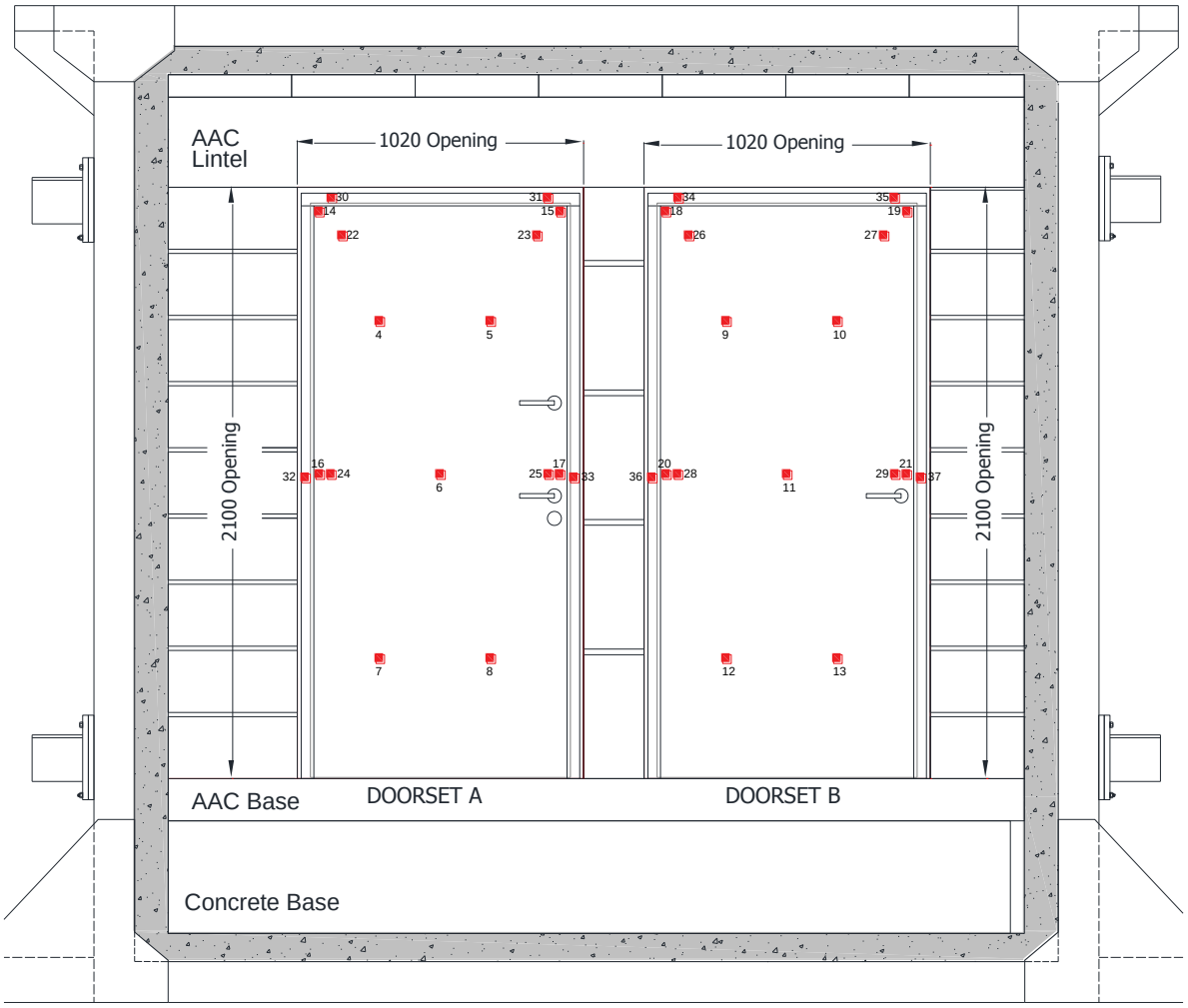
Test sponsor(s)	Address
Consort Architectural Hardware	Consort Architectural Hardware Ltd. 25/31 Lower Loveday Street Birmingham, B19 3SB United Kingdom

2. Test specimen and supporting construction.

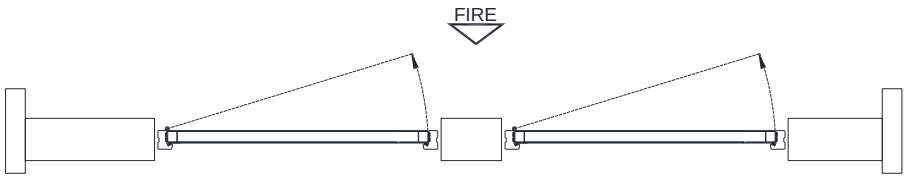
2.1 Drawings of test assembly

The description of the test specimen and supporting construction are detailed in Section 0 and illustrated in Figure 1 to Figure 314. All measurements are in millimetres – unless indicated otherwise.

The drawings were supplied by the test sponsor and verified by Warringtonfire (unless stated otherwise in Section 2.2).

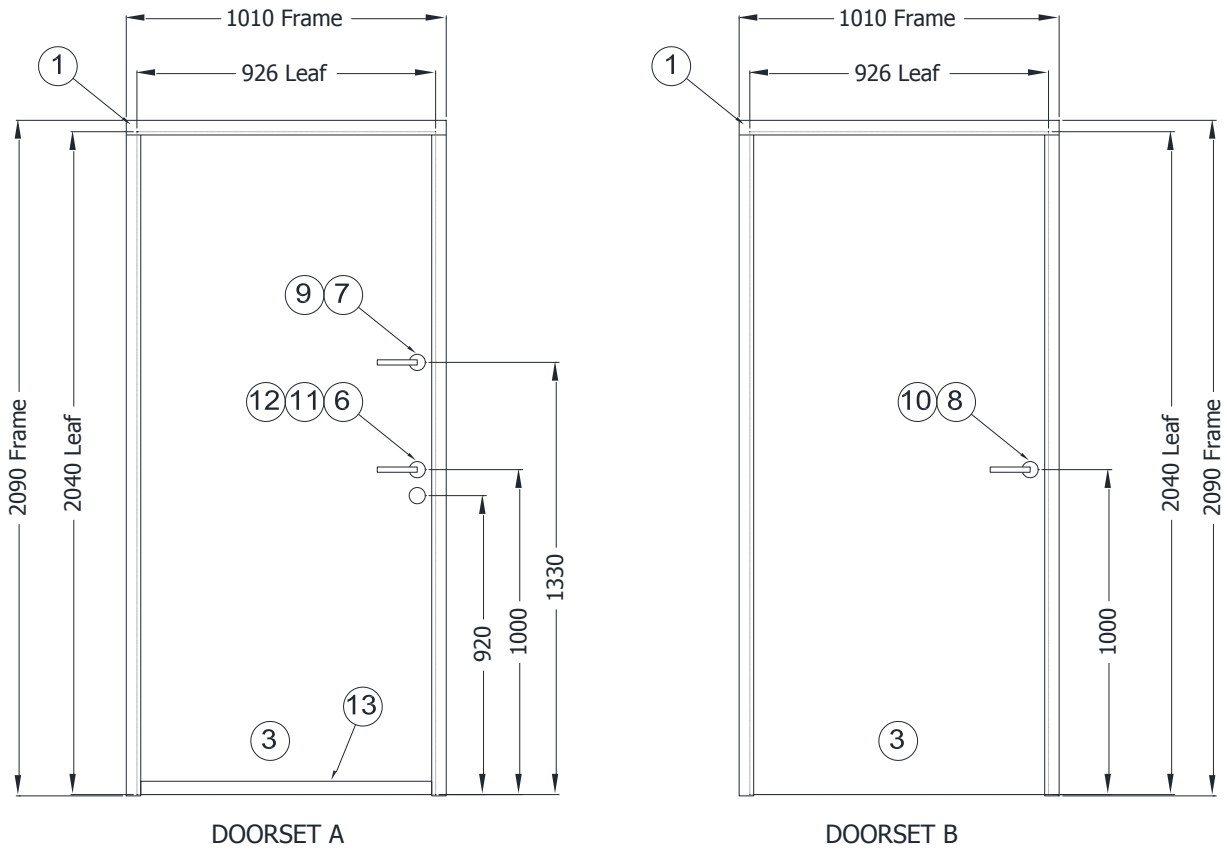


GENERAL ELEVATION OF TEST CONSTRUCTION
UNEXPOSED FACE



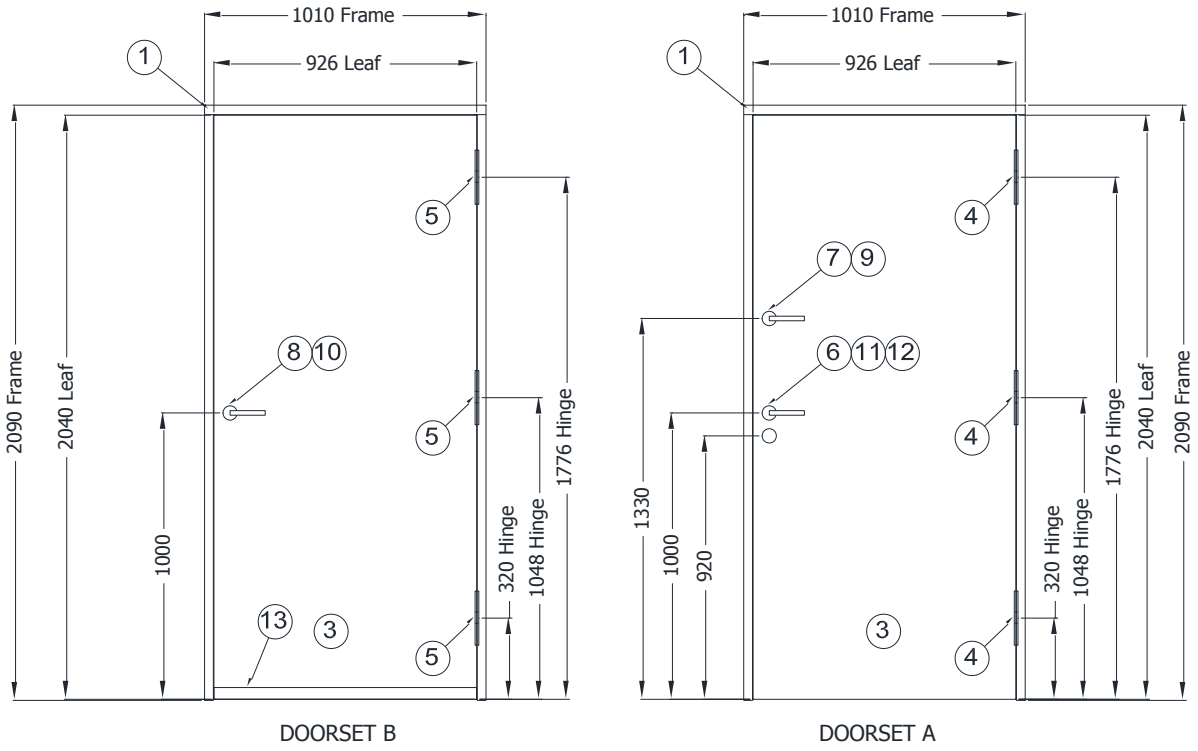
HORIZONTAL SECTION THROUGH TEST CONSTRUCTION

Figure 1 General Elevation of Thermocouple Positions – Unexposed Face



GENERAL ELEVATION OF DOORSETS
UNEXPOSED FACE

Figure 2 General Elevations of Doorsets Unexposed Face



GENERAL ELEVATION OF DOORSETS
EXPOSED FACE

Figure 3 General Elevations of Doorsets Exposed Face

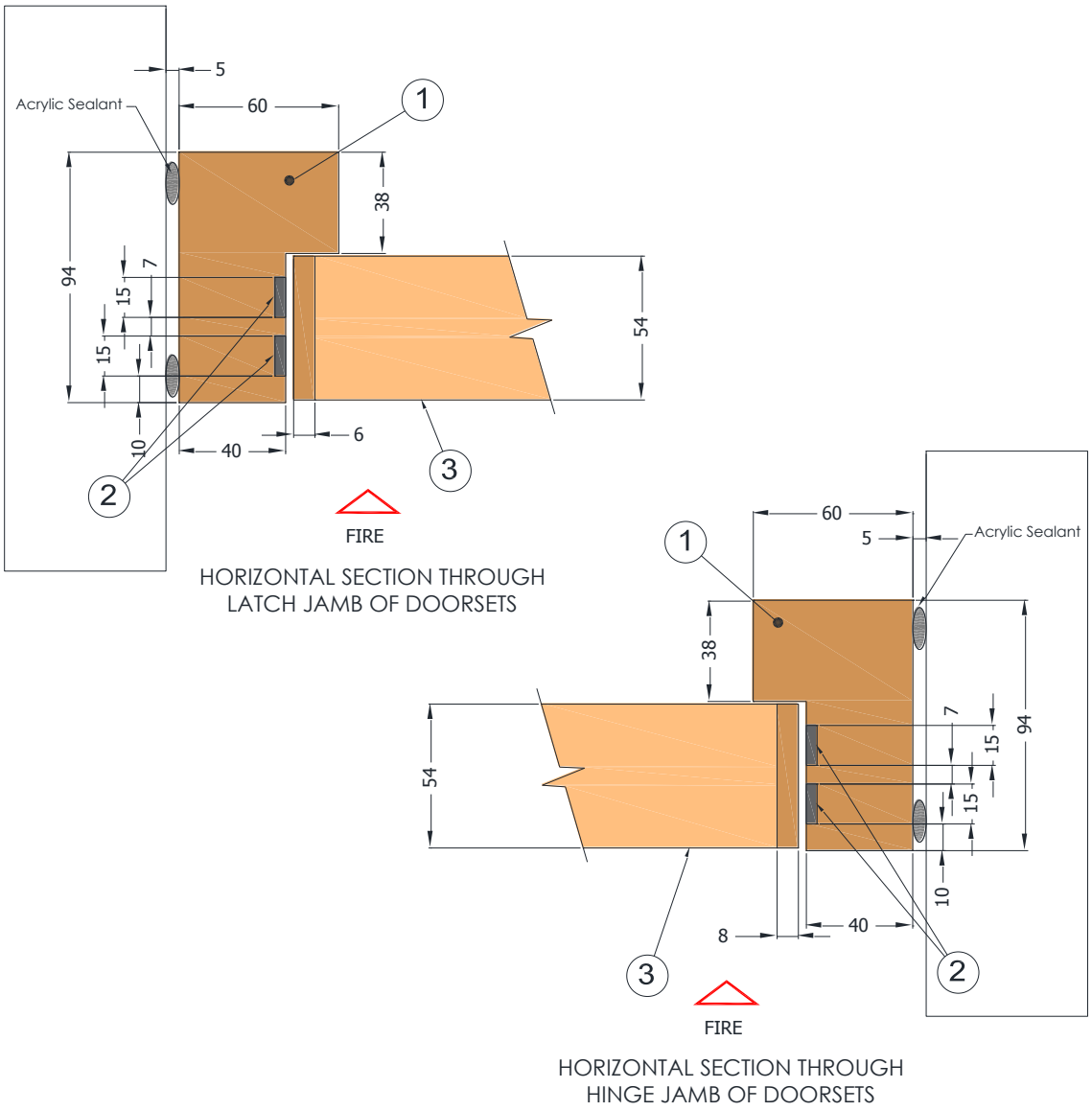


Figure 4 Horizontal Section Through Doorsets

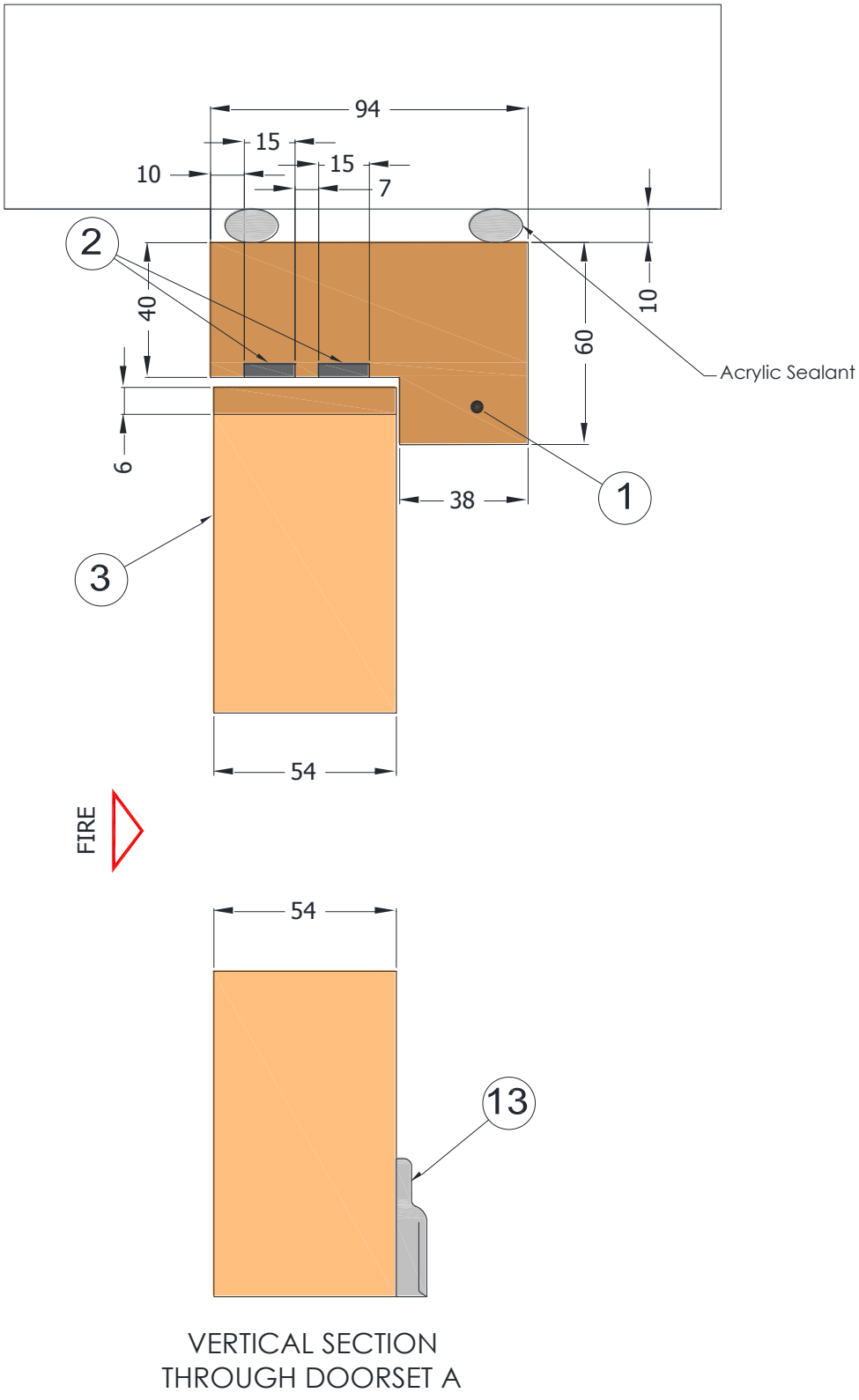
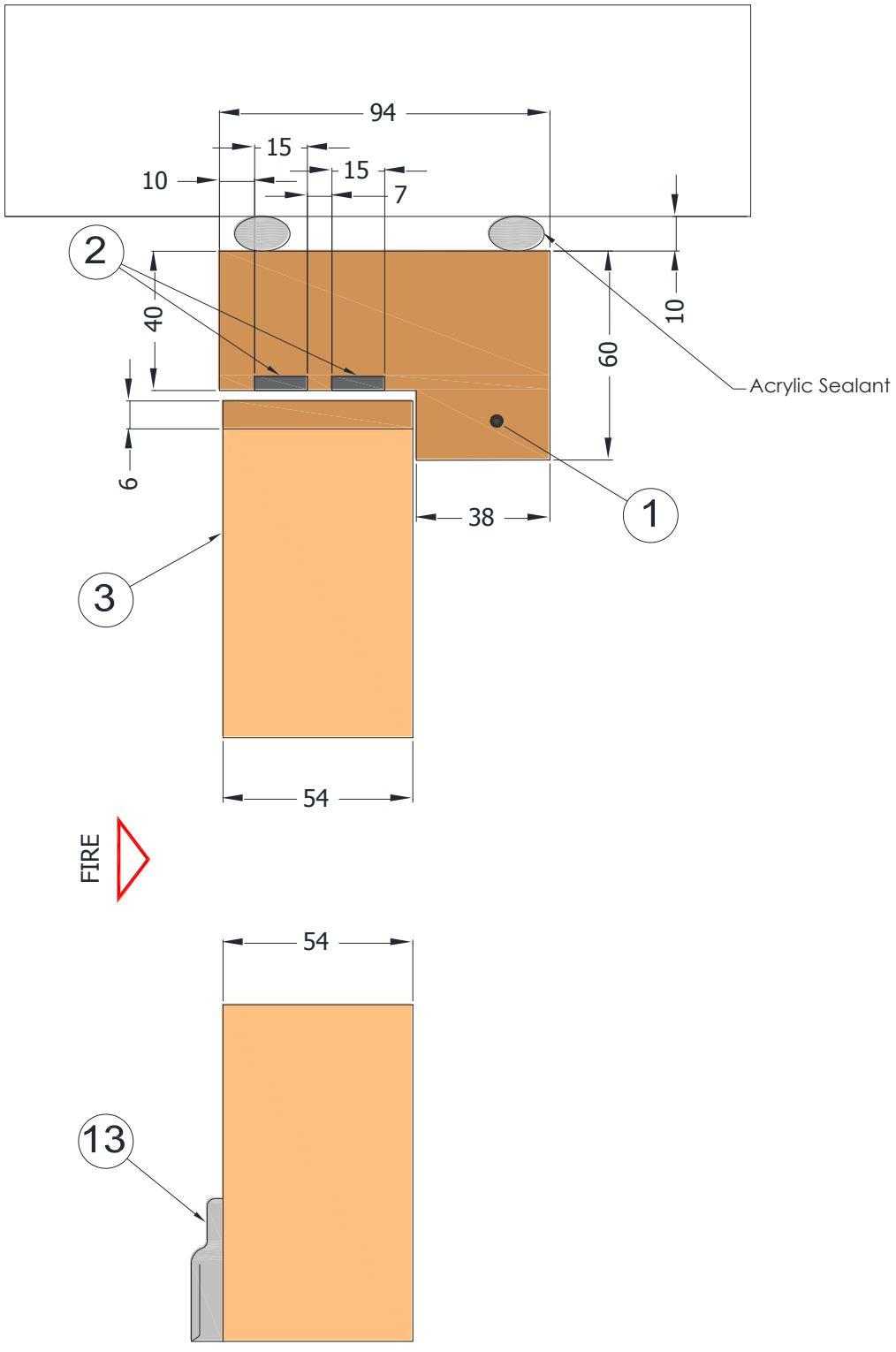


Figure 5 Vertical Section Through Doorset A



VERTICAL SECTION
THROUGH DOORSET B

Figure 6 Vertical Section Through Doorset B

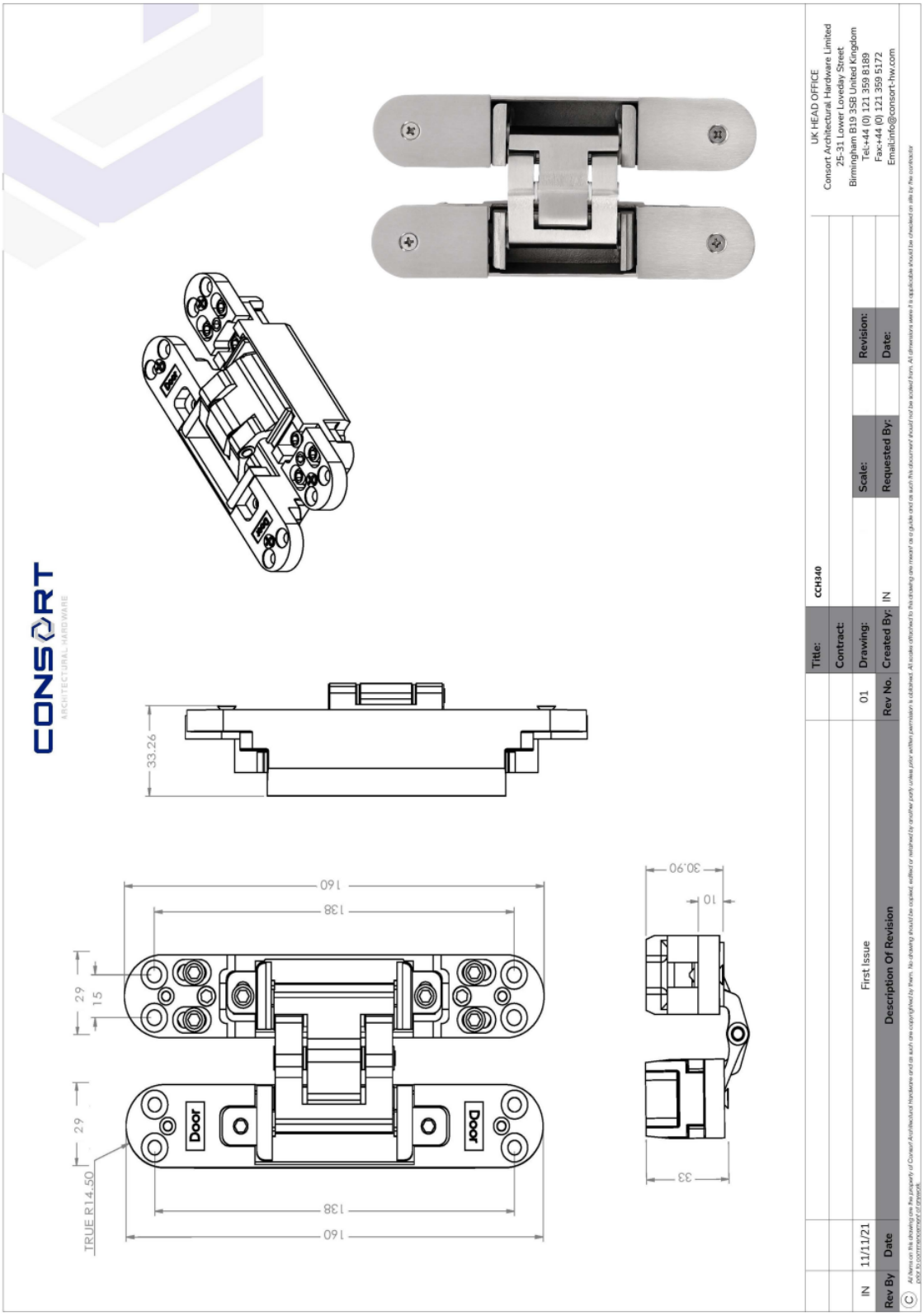


Figure 7 Hinge Detail (Item 4)

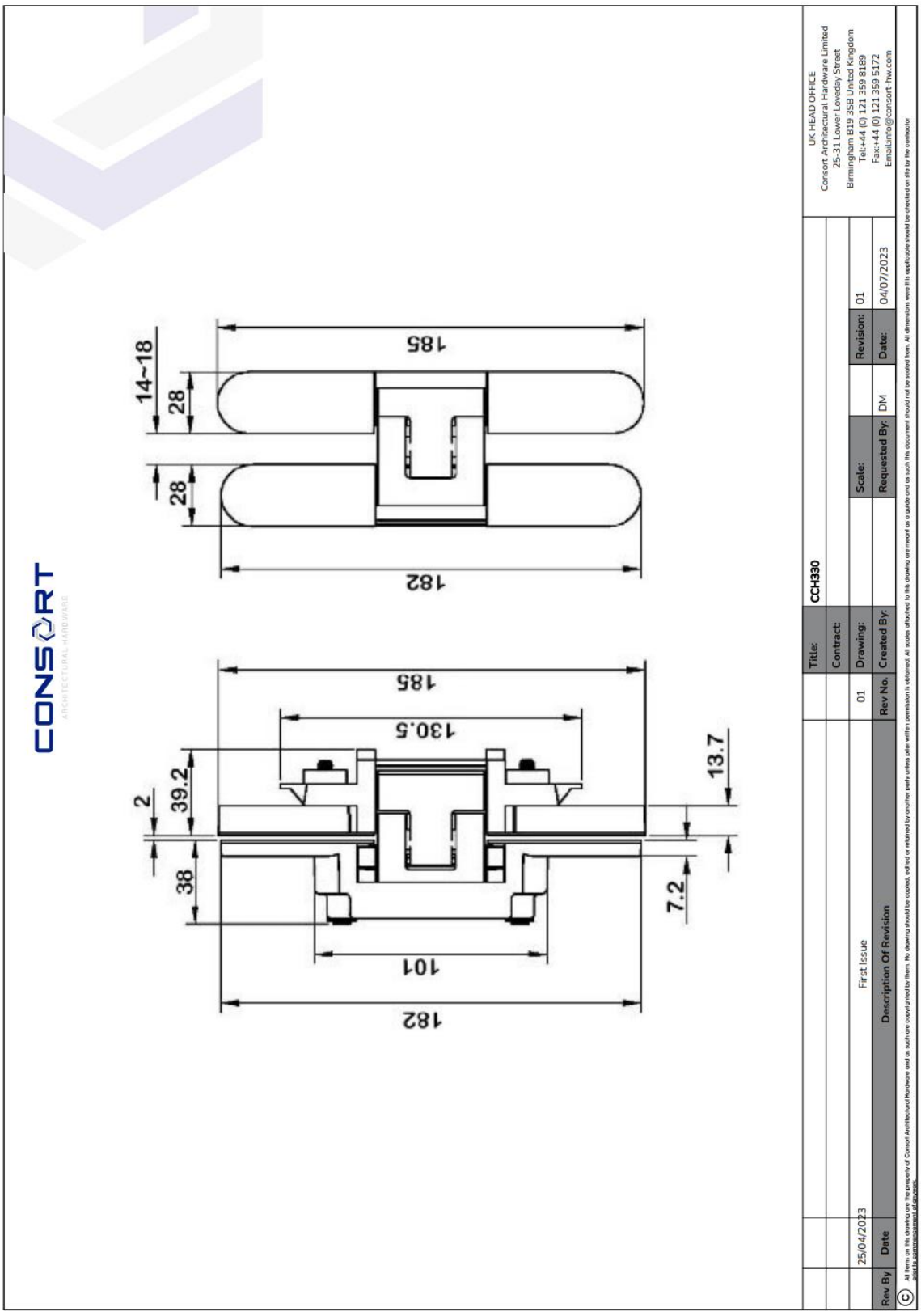


Figure 8 Hinge Detail (Item 5)

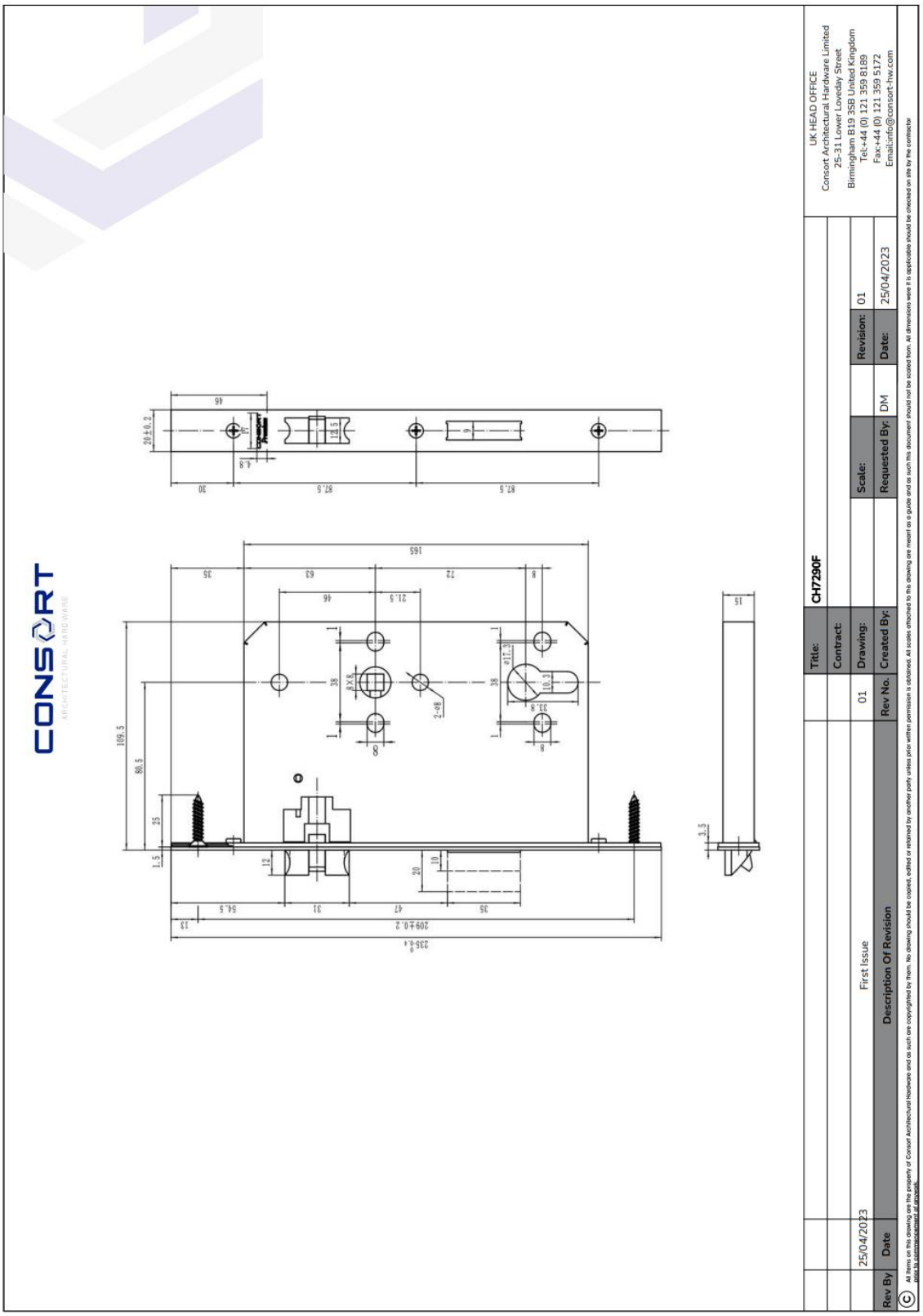


Figure 9 Lockset Detail (Item 6)

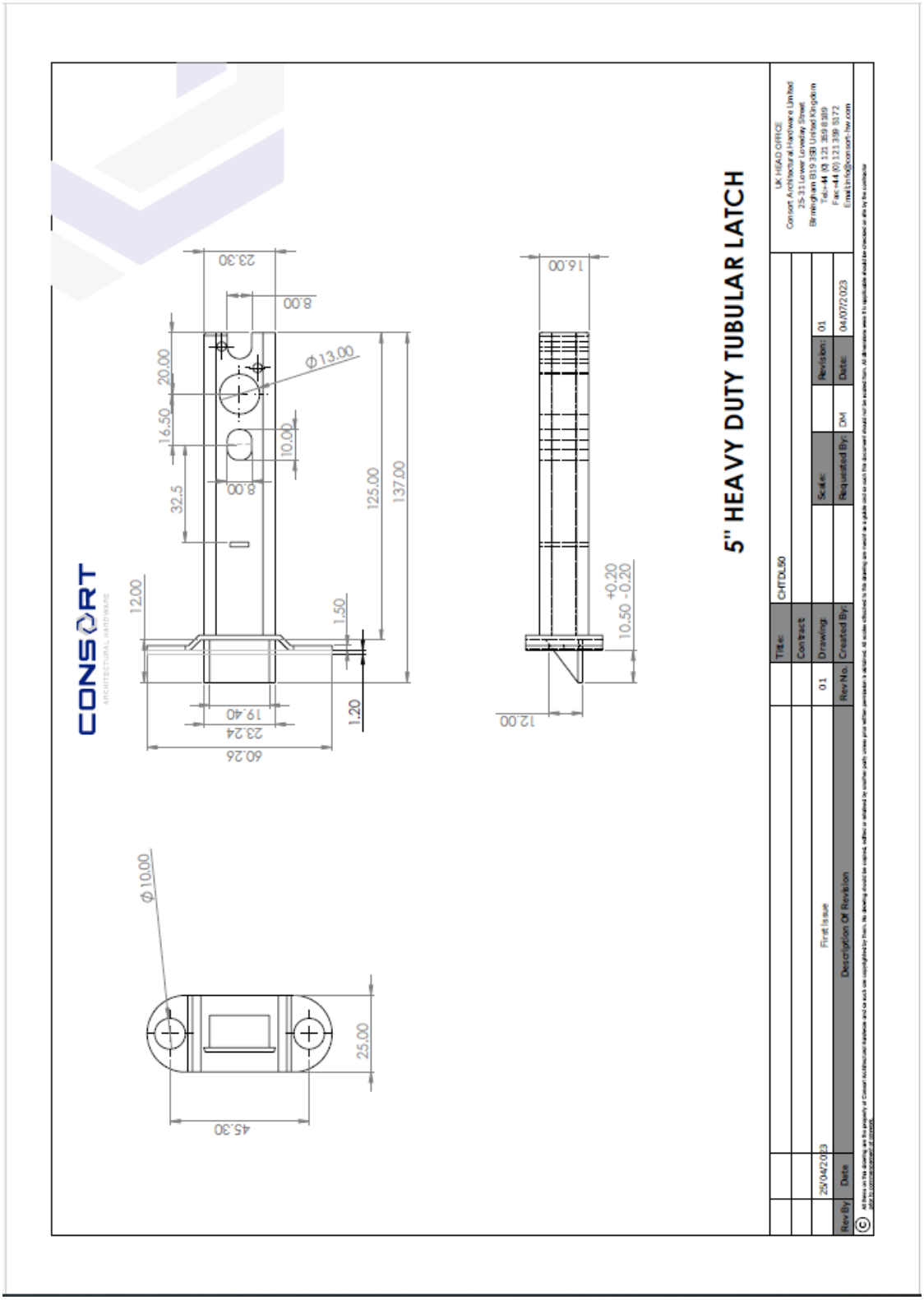


Figure 10 Tubular Latch Detail (Item 7)

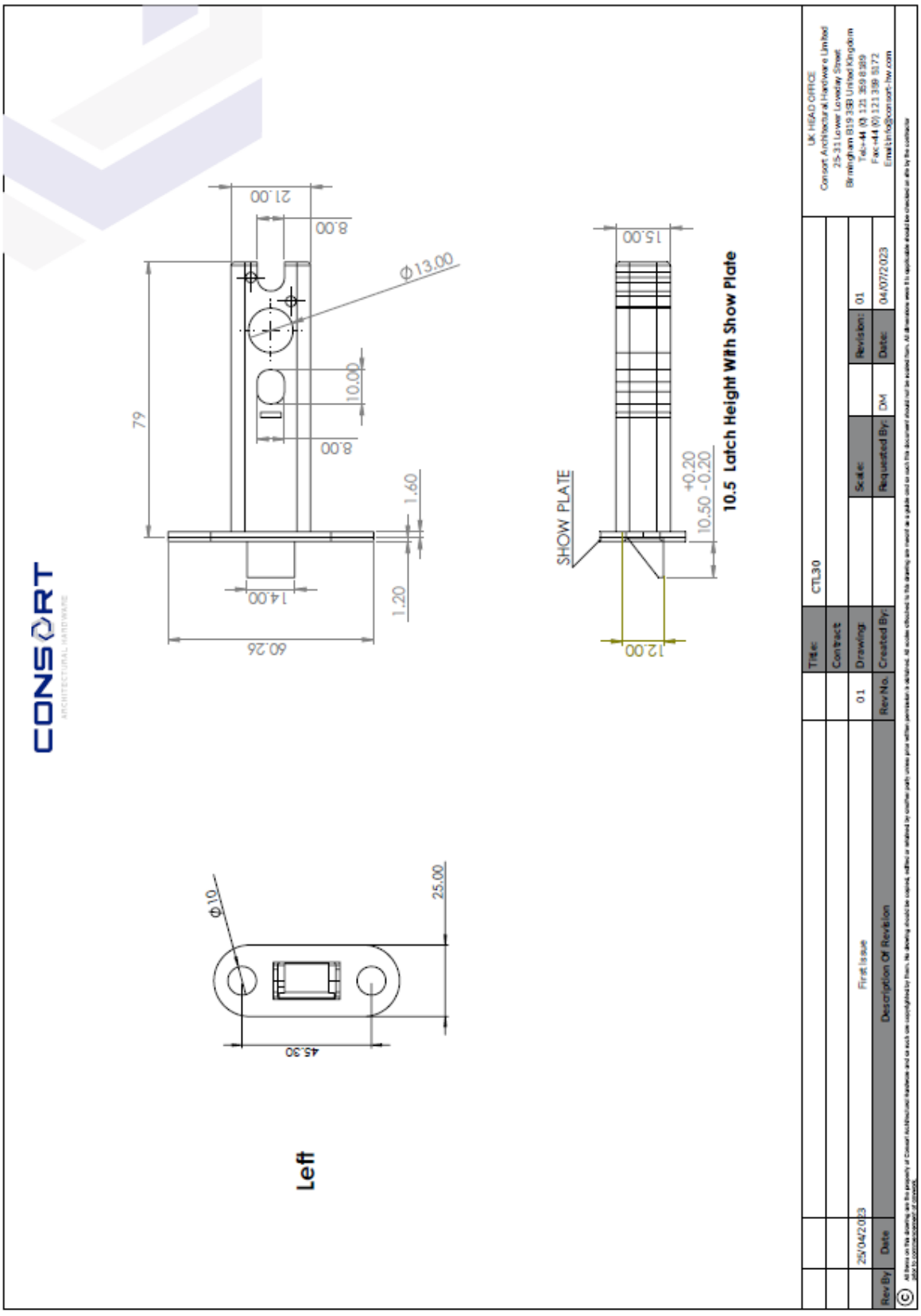


Figure 11 Tubular Latch Detail (Item 8)

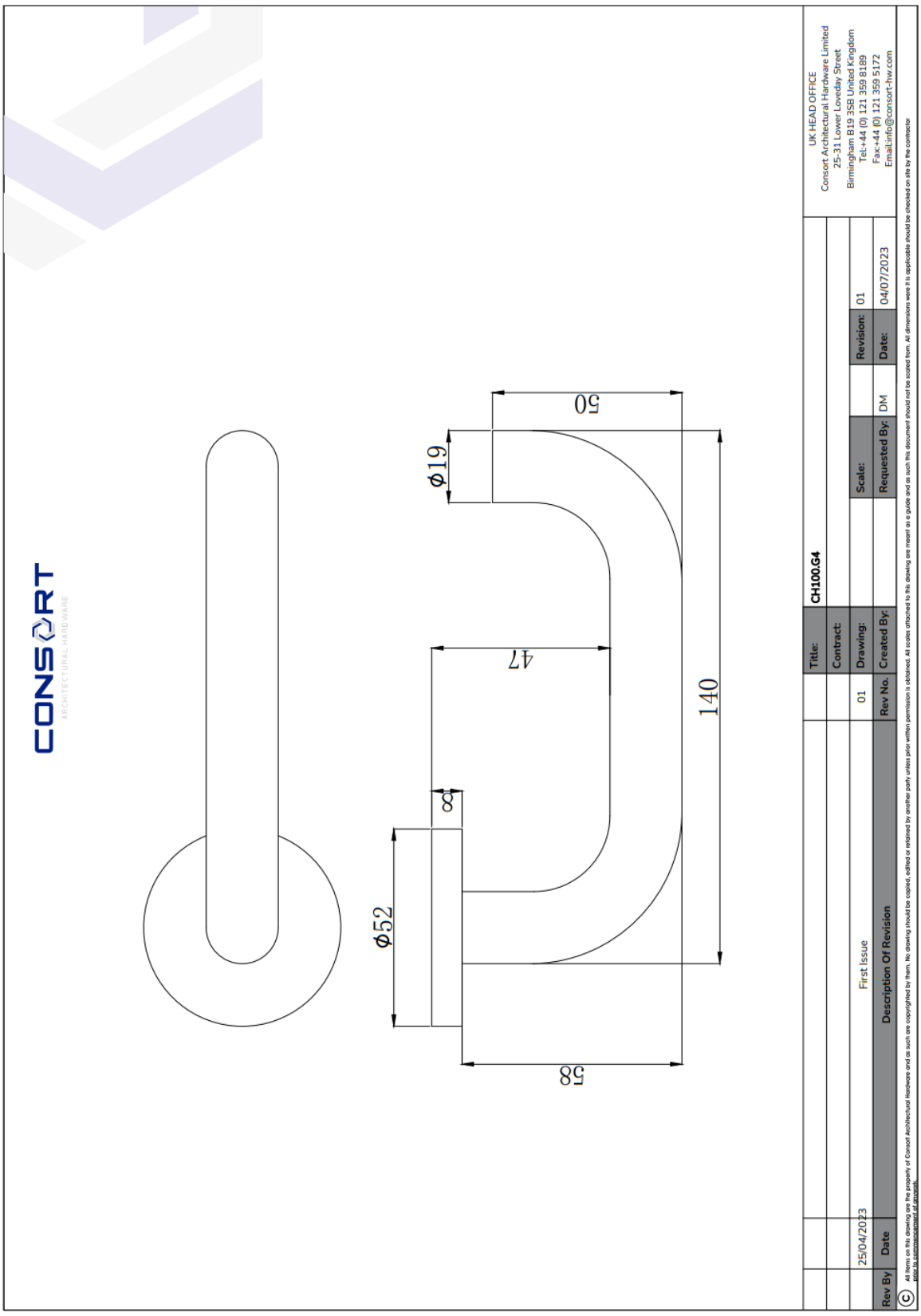


Figure 12 Lever Handle Detail (Item 9)

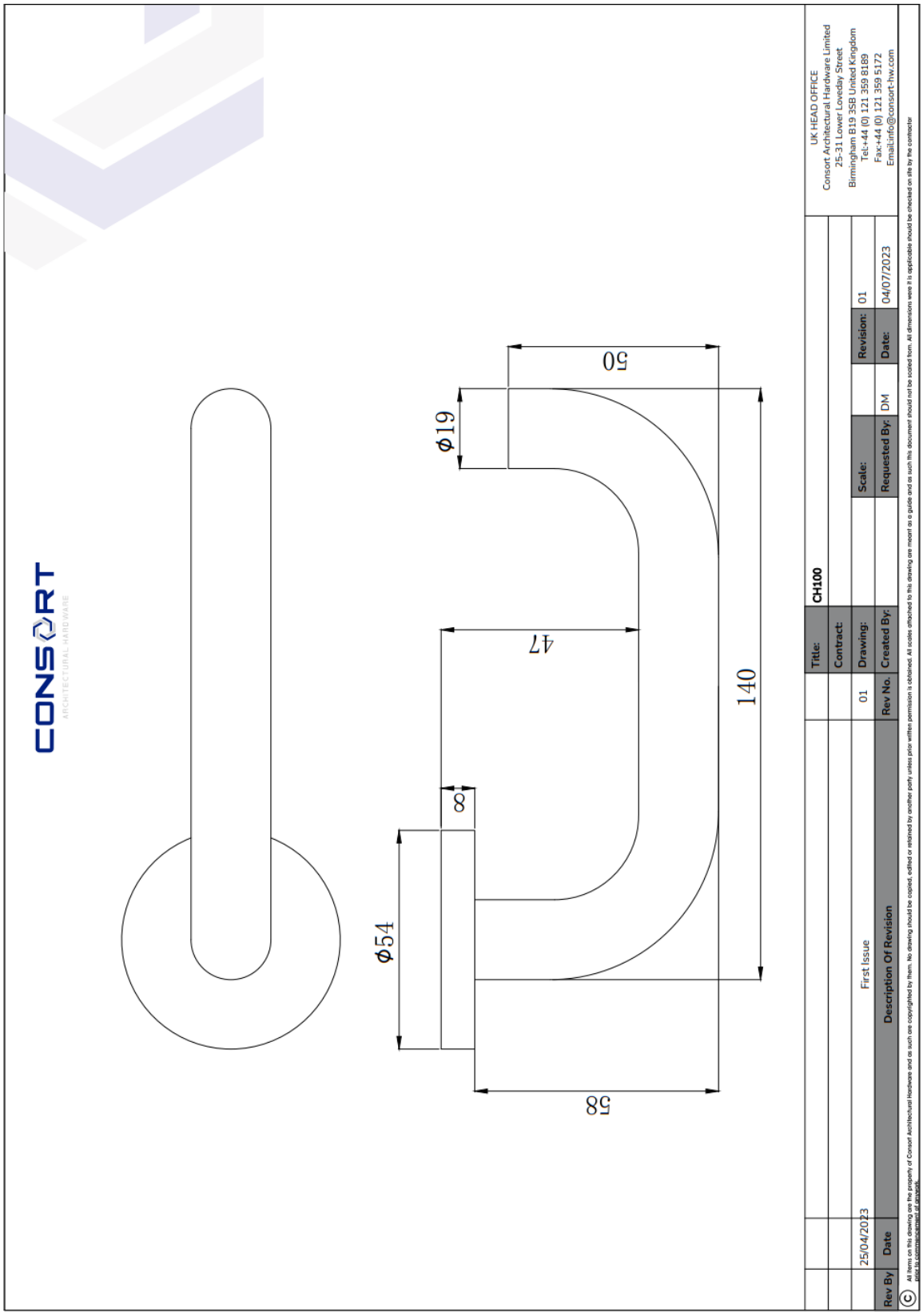


Figure 13 Lever Handle Detail (Item 10)

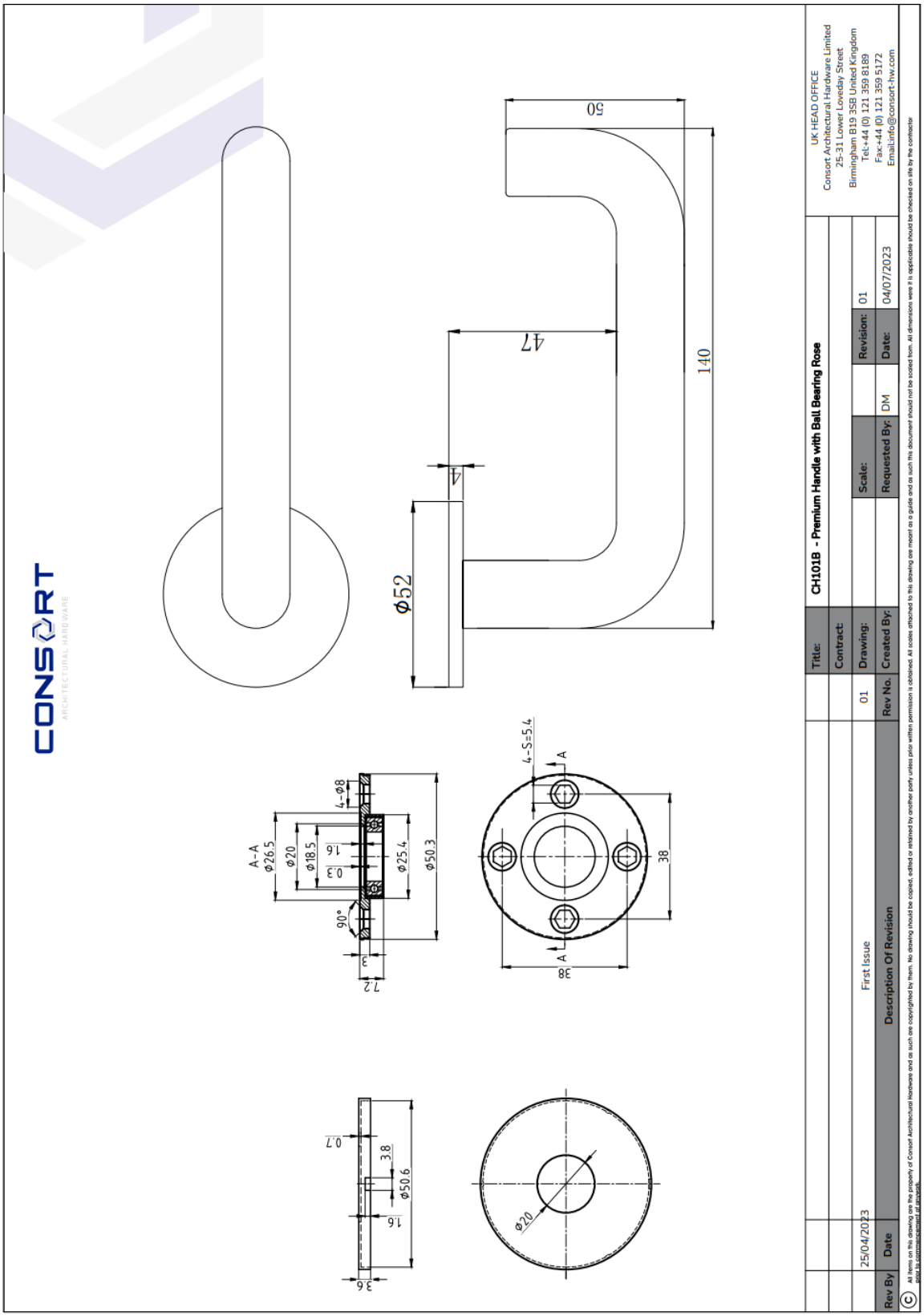


Figure 14 Lever Handle Detail (Item 11)

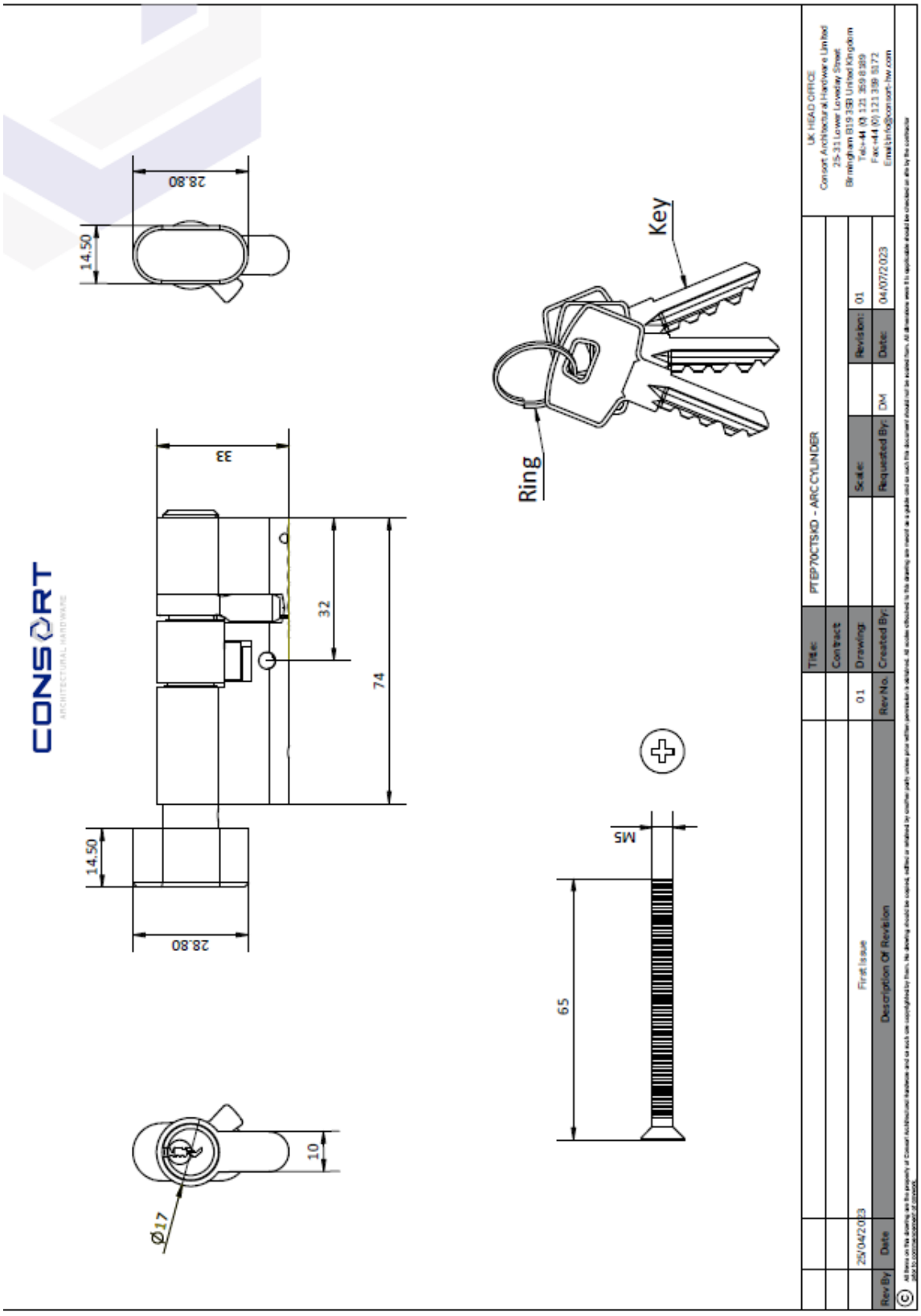


Figure 15 Cylinder Drawing client drawing

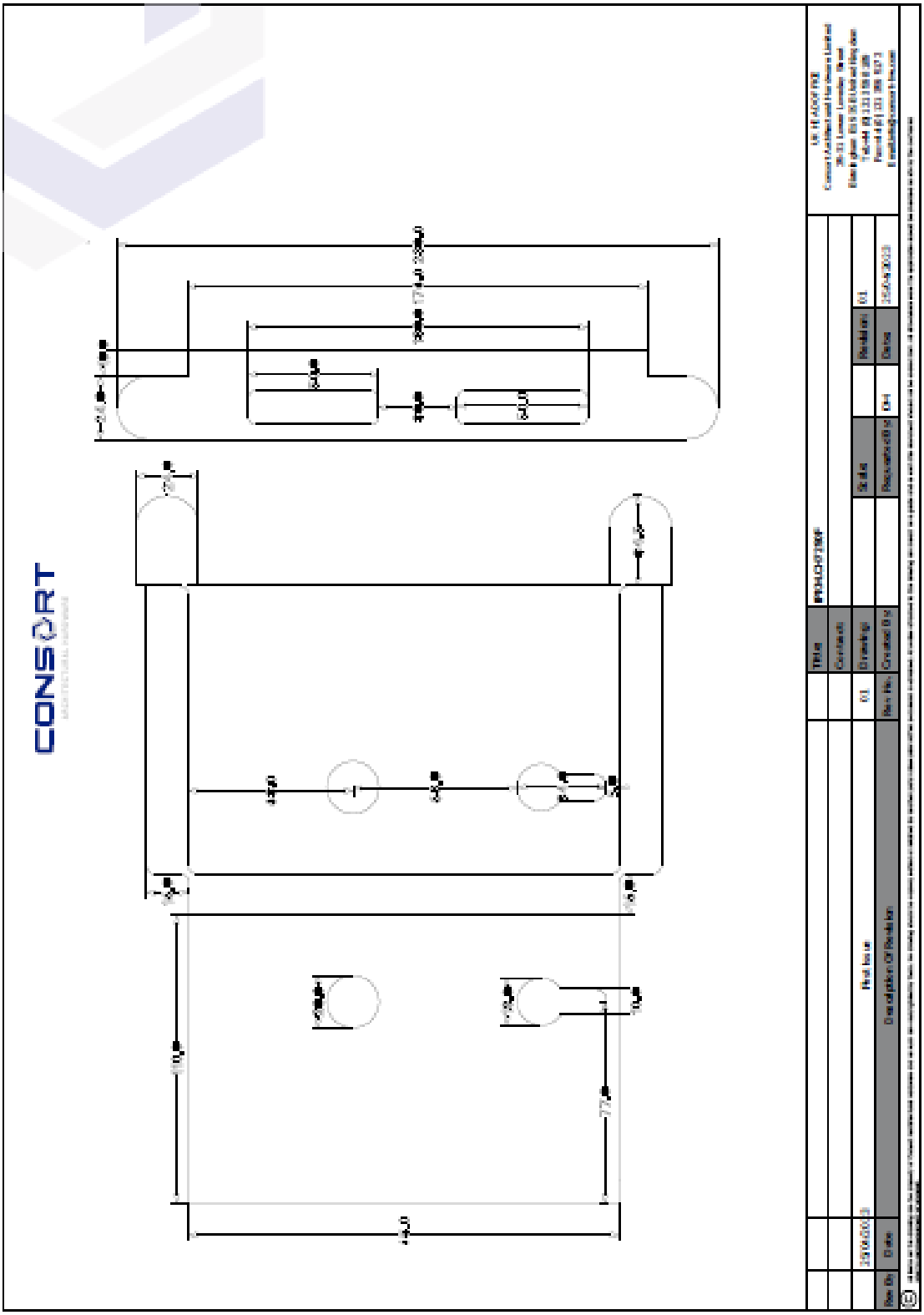


Figure 16 IPKM.CH7290F

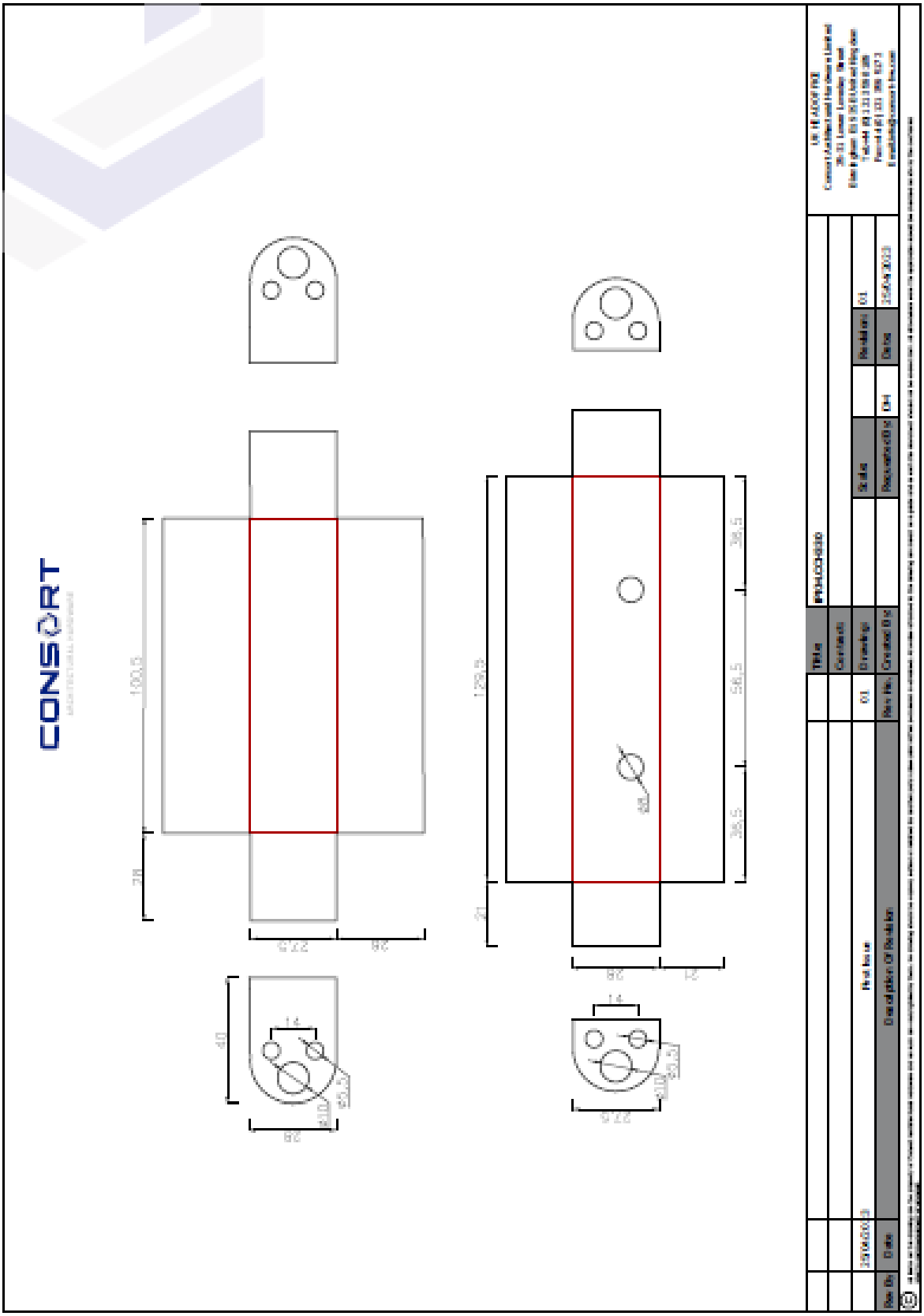


Figure 17 IPKM.CCH330

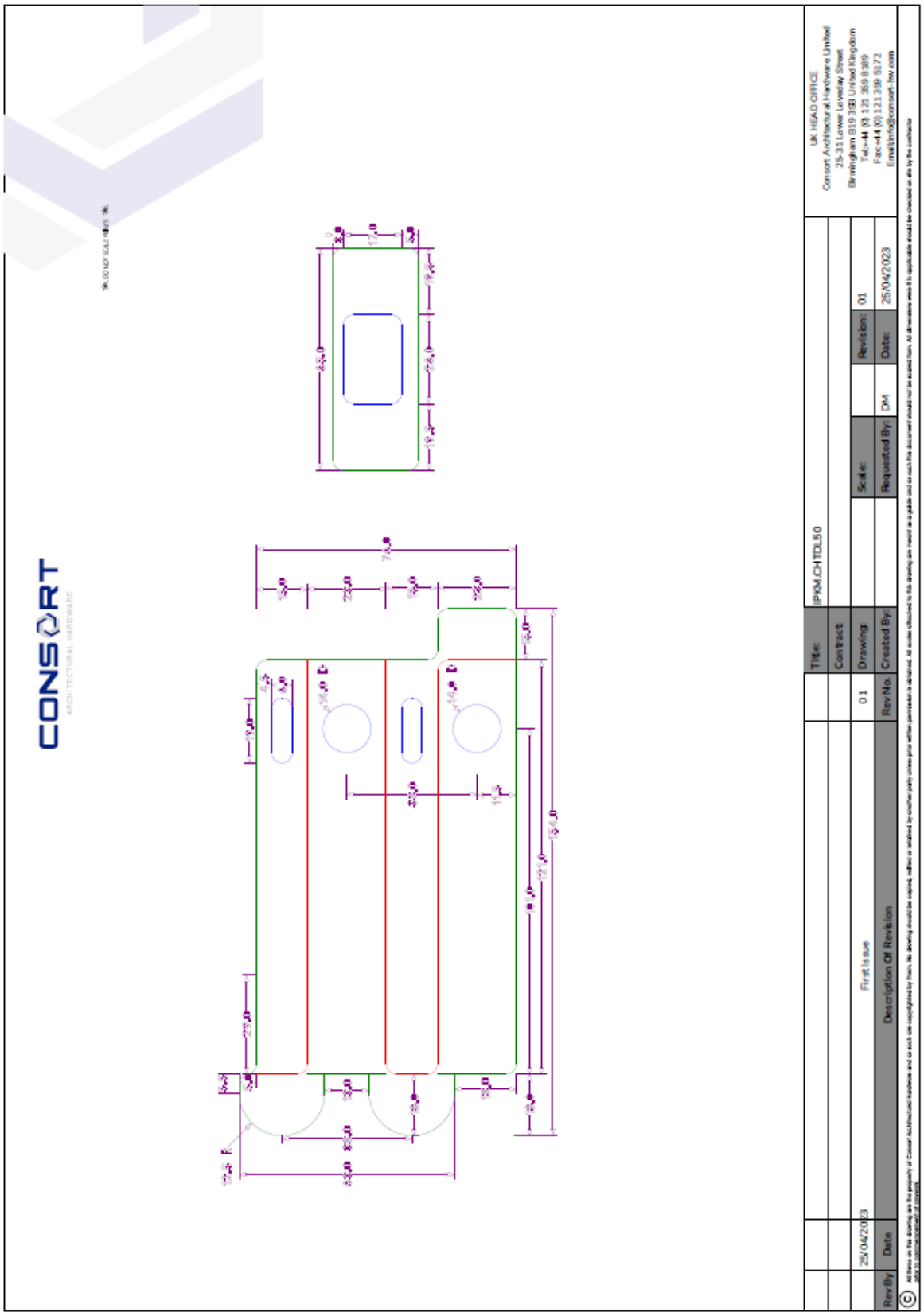


Figure 18 IPKM.CHTDL50

Schedule of components

Table 5 details the schedule of components which describes the test specimen and lists the components used in the construction of the test specimen. These were provided by the test sponsor and surveyed by Warringtonfire.

All measurements were verified by Warringtonfire unless stated otherwise in the schedule of components. All components marked with an "*" have not been verified by Warringtonfire.

Table 5 Schedule of components

Door frame

1. Door frame	
Material	Sapele, hardwood
Density	620 ~ 660 kg/m^3, nominal
Moisture content	Frame A – 11.2 % Frame B – 12.7 %
Overall size	94 mm x 60 mm, with 56 mm x 20 mm deep rebate
Jamb to Head jointing method, fixing detail and location	Stub mortice & screwed, using 75 mm long x 4.6 mm diameter countersunk head wood screws
Frame Fixing Method to Supporting Construction	
Fixing method	Through screwed and plugged
Type	Countersunk head wood screws
Material	Steel screws with plastics plugs
Overall size	4.8 mm diameter x 100 mm long
Spacing	6 No. nominally 50 mm above and below each hinge position and 4 No. equally spaced along the unhinged jamb
Frame to structural opening gaps	Doorset A – 5 mm at jambs, 10 mm at head Doorset B – 5 mm at jambs, 10 mm at head
Does the fixing penetrate intumescent seal within frame reveal	Yes
Packing Material	Wood packers, protruding from either side
2. **Intumescent to frame reveal**	
Manufacturer	Pyroplex Ltd
Reference	CF 355
Material	Graphite intumescent strip within a polyvinyl chloride (PVC) carrier
Overall section size	15mm wide x 4mm thick
Application method	Self-adhered into grooves within rebate of frame and the strips were interrupted at furniture positions

Fire stopping

Frame to supporting construction fire stopping detail	
Manufacturer	Rockwool
Reference	FirePro Acoustic Intumescent Sealant
Material	Intumescent Acrylic Sealant
Overall dimension	Approximate 10 mm bead
Application method	Cartridge gunned around perimeter of the door frame to both faces
Sealant to fire stopping detail	
Manufacturer	Morgan Advanced Materials
Reference	Superwool Plus
Material	High temperature insulation wool
Thickness	25 mm, uncompressed
Density	96 kg/m3 (stated)
Fixing method	Compressed within the gap between the specimen and the restraint frame

Door leaf

3. Door Leaf	
Manufacturer	Halspan
Reference	Prima
Quantity of leaves on doorset	1
Average moisture content	Leaf A – 10.3 % Leaf B – 11.2 %
Overall leaf size	926 mm wide x 2040 mm high x 54 mm thick
Core construction	Chipboard
Lippings	Hardwood 6 mm thick, to vertical edges only
Species	Sapele
Density	620 ~ 660 kg/m^3, nominal
Adhesive to lipping	
Manufacturer	Polyvine
Type	Formalhyde
Reference	Casamite
Curing method	Cold press
Application method	Brushed
Presence of Mechanical Fixings	No

Hardware

4. Hinges (Doorset A)	
Supplier	Consort
Reference	CCH340
Quantity	3
Primary material	Stainless steel
Type	3D adjustable concealed hinge
Size	See client drawing (Figure 7)
Fixing method	Screw fixing
Position of each hinge relative to the head of the leaf	See figure 3
Details of intumescent protection	IPKM.CCH340 1 mm Graphite
Interruptions to Intumescent within the frame reveal	Yes
5. **Hinges (Doorset B)**	
Supplier	Consort
Reference	CCH330
Quantity	3
Primary material	Stainless steel
Type	3D adjustable concealed hinge
Size	See client drawing (Figure 8)
Fixing method	Screw fixed
Position of each hinge relative to the head of the leaf	See figure 3
Details of intumescent protection	1mm graphite (IPKM.CCH330)
Interruptions to Intumescent within the frame reveal	Yes

6. Lockset / Latch (Doorset A)	
Manufacturer	Consort
Reference	CH7290F
Material:	-
Lockcase	Stainless Steel
Forend plate	Stainless Steel
Latch bolt	Stainless Steel
Lock bolt	Stainless Steel
Overall sizes:	-
Central Lockcase	109.5x165x15mm
Forend plate	235x20x3.5mm
Latch bolt	12x31x12.5mm
Lock bolt	35x20x9mm
Fixing method	Screw fixed into position
Latch force	5.7 N
Operation of latch bolt	Disengaged
Operation of lock bolt	Disengaged
Details of intumescent protection	1mm graphite IPKM.CH7290F
Interruptions to Intumescent within the frame reveal	No
Location of centre of the spindle relative to the bottom of the leaf	Centre of the spindle measures 1000 mm from the bottom of the leaf

7. Tubular latch (Doorset A)	
Manufacturer	Consort
Reference	CHTDL50
Material	Steel
Overall sizes:	-
Central Lockcase	125x23x16mm
Forend plate	60x25x1.5mm
Latch bolt	19.4x12x10.5mm
Fixing method	Screw fixed into position
Latch force	16.9 N
Operation of latch bolt	Engaged
Details of intumescent protection	1mm graphite IPKM.CHTDL50
Interruptions to Intumescent within the frame reveal	No
Location of centre of the spindle relative to the bottom of the leaf	Centre of the spindle measures 1330 mm from the bottom of the leaf

8. Tubular latch (Doorset B)	
Manufacturer	Consort
Reference	CTL30
Material	Steel
Overall sizes:	
Central Lockcase	79x21x15mm
Forend plate	56x25x1.5mm
Latch bolt	12x10.5x14mm
Fixing method	Screw fixed into position
Latch force	27.1 N
Operation of latch bolt	Engaged
Details of intumescent protection	1mm graphite IPKM.CTL30
Interruptions to Intumescent within the frame reveal	No
Location of centre of the spindle relative to the bottom of the leaf	Centre of the spindle measures 1000 mm from the bottom of the leaf
9. **Lever handle (1)**	
Manufacturer	Consort
Reference	CH100.G4
Material	Stainless Steel
Overall size	19 mm diameter x 140 mm length x 58 mm projection
Escutcheon size	52 mm diameter x 8 mm thickness
Fixing method, fixing material, sizes, quantity and location	Bolt through fixings
Details of intumescent protection	None Fitted
10. **Lever handle (2)**	
Manufacturer	Consort
Reference	CH100
Material	Stainless Steel
Overall size	19 mm diameter x 140 mm length x 58 mm projection
Escutcheon size	54 mm diameter x 8 mm thickness
Fixing method, fixing material, sizes, quantity and location	Bolt through fixings
Details of intumescent protection	None Fitted

11. **Lever handle (3)**	
Manufacturer	Consort
Reference	CH101 Ball Bearing Model
Material	Stainless Steel
Overall size	20 mm diameter x 140 mm length x 67 mm projection
Escutcheon size	52 mm diameter x 4 mm thickness
Fixing method, fixing material, sizes, quantity and location	Bolt through fixings
Details of intumescent protection	None Fitted
12. **Cylinder**	
Manufacturer	ARC
Reference	PTEP70CTSKD
Material	Brass
Overall size	74mm x 33mm x 14.5 mm
13. **Door bottom seal**	
Manufacturer	Raven
Type	Automatic door bottom seal
Reference	RP60
Material	Aluminium
Section size	41 mm x 9 mm
Fixing method	Concealed screw fix

Masonry Blockwork	
Type	Single skin / Aerated block
Material	Autoclaved aerated concrete blocks
Thickness	150 mm
Density	760 kg/m3
Fixing method	Ordinary sand/cement mortar, mix 3:1
AAC Lintel	
Type	Steel reinforced concrete lintel
Material	Autoclaved aerated concrete
Thickness	150 mm
Density	670 kg/m3
Overall size	250 mm wide x 3000 mm long
AAC Base	
Material	Steel reinforced autoclaved aerated concrete
Density	670 kg/m3
Thickness	150 mm
Overall size	600 mm wide x 3000 mm long
Concrete Base	
Type	Steel reinforced concrete lintel
Material	Autoclaved aerated concrete slabs
Density	670 kg/m3
Overall size	3000 mm long x 600 mm deep x 150 mm thick

2.2 Supporting construction

Table 6 details the supporting construction used for this fire resistance test.

Table 6 Supporting construction

Item	Detail		
Supporting construction	150 mm thick low-density concrete wall with a low-density concrete lintel at the head as described in section 7.2 of EN 1363-1: 2020.		
Dimensions	Width	3000 mm	
	Height	3000 mm	
	Thickness	150 mm	
Aperture dimensions		**Width**	**Height**
	Doorset A	1020 mm	2100 mm
	Doorset B	1020 mm	2100 mm
Restraint conditions	Restrained on all edges		

3. Test procedure

Table 7 details the test procedure for this fire resistance test.

Table 7 Test procedure

Item	Detail		
Test standard	The test was performed in accordance with BS EN 1634-1:2014+A1:2018.		
Product standard and/or EAD	**EN 16034: 2014**		
EGOLF agreements and/or recommendations	Certain aspects of some fire test specifications are open to different interpretations. EGOLF have identified a number of these areas and have agreed on resolutions which define a common agreement of interpretations between fire test laboratories that are members of the group. If such resolutions apply to this test, they have been followed.		
Deviations from test method	None		
Instrumentation and equipment	The instrumentation was provided in accordance with BS EN 1634-1:2014+A1:2018, BS EN 1363-1:2020, and where appropriate BS EN 1363-2:1999.		
Pre-test conditioning	The specimen's storage, construction, and test preparation took place in the test laboratory over a total, combined time of 3 days. Throughout this period of time both the temperature and the humidity of the laboratory were measured and recorded as being within a range of from 19.5°C to 30.5°C and 40% to 69% respectively.		
Functionality test	Gap measurements	According to clause 10.1.2 of BS EN 1634-1:2014+A1:2018, these measurements were completed before the start of the fire test. They are shown in Figure 32 and Table 20 and Table 21 in Appendix C.	
	Operability test	According to clause A.2.2 of EN 16034, the door(s) were subjected to a series of 25 opening and closing cycles of at least 90° for side-hung doorset(s).	
	Final setting	According to clauses 10.1.4 of BS EN 1634-1: 2018 and A.2.2 of EN 16034, the door(s) were subjected to 1 cycle which was completed.	
Pre-test measurements		**Doorset A**	
	Latching force (Top)	5.5 N	
	Latching force (Bottom)	16.7 N	
		Doorset B	
	Latching force	21.3 N	
Installation details	Delivery date of the test specimen		
	Start date for construction of supporting construction	13 September 2023	
	Completion date for construction of supporting construction	14 September 2023	
	Start date for installation of test specimen	15 September 2023	
	Completion date for installation of test specimen	15 September 2023	

Item	Detail		
	Supporting construction constructed by	Representatives of Warringtonfire	
	Doorset installed by	Representatives of Warringtonfire	
Symmetry	Asymmetrical: • Doorset A opened into the furnace. • Doorset B opened into the furnace. The direction of exposure was decided by the test sponsor.		
Ambient laboratory temperature	Start of the test	18.0 °C	
	Minimum temperature	17.0 °C	
	Maximum temperature	18.0 °C	
Sampling / specimen selection	Appendix E includes the sampling report. A representative of Warringtonfire sampled and selected the following components of the tested specimen:		
	Component	**Sample reference**	**Date of sampling**
	CCH 340	536466	08/09/2023
	CCH 330	536466	08/09/2023
	CTL30	535191	28/07/2023
	CHTDL50	535191	28/07/2023
	CH100.G4	536466	08/09/2023
	CH101 Ball Bearing Model	536466	08/09/2023
	RP60	536466	08/09/2023
	CH7290F	532206	15/05/2023

4. Test measurements and results

Table 8 summarises the results achieved by the test specimen against the performance criteria listed in BS EN 1634-1:2014+A1:2018 for the following parameters:

- Integrity – The specimen must retain its separating function, without causing either ignition of a cotton pad when applied, or permitting the penetration of a gap gauge as specified in BS EN 1634-1: 2014 + A1:2018, or resulting in sustained flaming on the unexposed surface.
- Insulation (I_1) – The test specimen must be evaluated against the maximum temperature rise criteria specified in EN 1363-1: 2020 (180°C).
- Insulation (I_2) – The mean temperature rise (ΔTm) of the unexposed surface must not be greater than 140°C and the maximum temperature rise (ΔTM) must not be greater than 180°C, with the exception that the limit for temperature rise for any frame member or transom member adjacent to the leaf/leaves of the doorset or openable window must be 360°C. Insulation failure also occurs simultaneously with integrity failure as specified in BS EN 1634-1: 2014 + A1:2018.

Appendix A includes observations of any significant behaviour of the specimen and details of the occurrence of the relevant performance criteria.

Appendix B details the location of the instrumentation used during the test.

Appendix C includes details of the measurements taken during the test.

Appendix D includes photographs of the test specimen before, during and after the test.

Appendix E includes the sampling report.

Table 8 Detailed test results

Criteria	Doorset A	Doorset B
Thermal insulation		
Supplementary procedure – I_1	**75 minutes***	**68 minutes ***
ΔTM = 180°C	75 minutes*	68 minutes *
ΔTM = 180°C on the frame	75 minutes *	68 minutes *
Normal procedure – I_2	**75 minutes***	**68 minutes ***
ΔTm = 140°C	75 minutes*	68 minutes *
ΔTM = 180°C	75 minutes *	68 minutes *
ΔTM = 360°C on the frame	75 minutes*	68 minutes *
Integrity	**75 minutes**	**68 minutes**
Sustained flaming	75 minutes	68 minutes
Failure with gap gauge	No integrity failure for this criteria at the termination of the test	No integrity failure for this criteria at the termination of the test
Cotton pad failure	No integrity failure for this criteria at the termination of the test	No integrity failure for this criteria at the termination of the test
Notes:		
The test results for the specimen only apply to the tested orientation. The test was discontinued after 76 minutes. '*' indicates failure due to integrity failure.		

5. Application of test results

5.1 Field of direct application

The field of direct application of the test results for these test specimens is set forth in paragraph 13 of the European standard EN 1634-1:2014+A1:2018.

The field of direct application may only be defined following the identification of classification(s). The field of (direct and, where applicable, extended) application should be included in the classification report.

5.2 Validity

This document is the original version of this test report and is written in English. In case of doubt, the original version prevails over a translation. This document is issued subject to Warringtonfire's standard terms and conditions, which are available at: *Terms and Conditions | Element*.

The test results relate to the behaviour of the test specimens of a product under the particular conditions of the test; they are not intended to be the sole criteria for assessing the potential fire hazard of the product in use, nor can the results be extrapolated and applied to other products.

Reports are statements of fact(s) prepared in accordance with the referenced version of the standard(s) stated in Section 3 of this report. Reports are based upon the information provided to Warringtonfire. Warringtonfire takes no responsibility for the accuracy or completeness of such information.

The results stated in this report apply to the test specimens as received.

This report details the method of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in BS EN 1634-1:2014+A1:2018, BS EN 1363-1:2020, and where appropriate BS EN 1363-2:1999.

Any significant deviation with respect to size, constructional details, loads, stresses, edge or end conditions other than those allowed under the field of direct application in the relevant test method is not covered by this report.

Any differences in relation to the aforementioned characteristics may significantly affect the performance and will therefore invalidate the application of the test results to the variant product. It is recommended that any proposed variation to the tested configuration or product should be referred to the test sponsor. The test sponsor should then obtain appropriate documentary evidence of compliance from Warringtonfire or another accredited testing authority. The supplier of the product is responsible for ensuring that the product which is supplied for use is identical to the test specimens that were tested.

5.3 Uncertainty of measurement

Because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty of measurement of fire resistance, it is not possible to provide a stated degree of accuracy of the result.

Appendix A Test observations

Table 9 shows the observations of any significant behaviour of the specimen during the test.

Table 9 Test observations

Min	Sec	System	Observation
00	00	Doorset A & B	Commencement of test
02	00	Doorset A & B	Steam/Smoke release coming from the perimeter of both doorseets
28	00	Doorset A	Steam/Smoke release from the top hinge corner on Doorset A
33	00	Doorset A	Steam/Smoke release coming from the thumb turn and handle on Doorset A
40	00	Doorset A	Black discolouration on the top hinge position of both doorsets and on the lockset and thumbturn on Doorset A
55	00	Doorset A & B	Steam/Smoke has worsened on the perimeter of both doorsets
58	00	Doorset A & B	Black discolouration around the perimeter of both doorsets
68	**00**	**Doorset B**	**Sustained flaming on the top hinged edge of Doorset B. This means sustained flaming integrity failure is deemed to have occurred.**
75	**00**	**Doorset A**	**Top lockset on Doorset A is sustained flaming. This means sustained flaming inegrity failure is deemed to have occurred.**
76	**00**	**Doorset A & B**	**End of test**

Appendix B Instrumentation locations

Figure 19 shows the instrumentation locations for this fire resistance test.

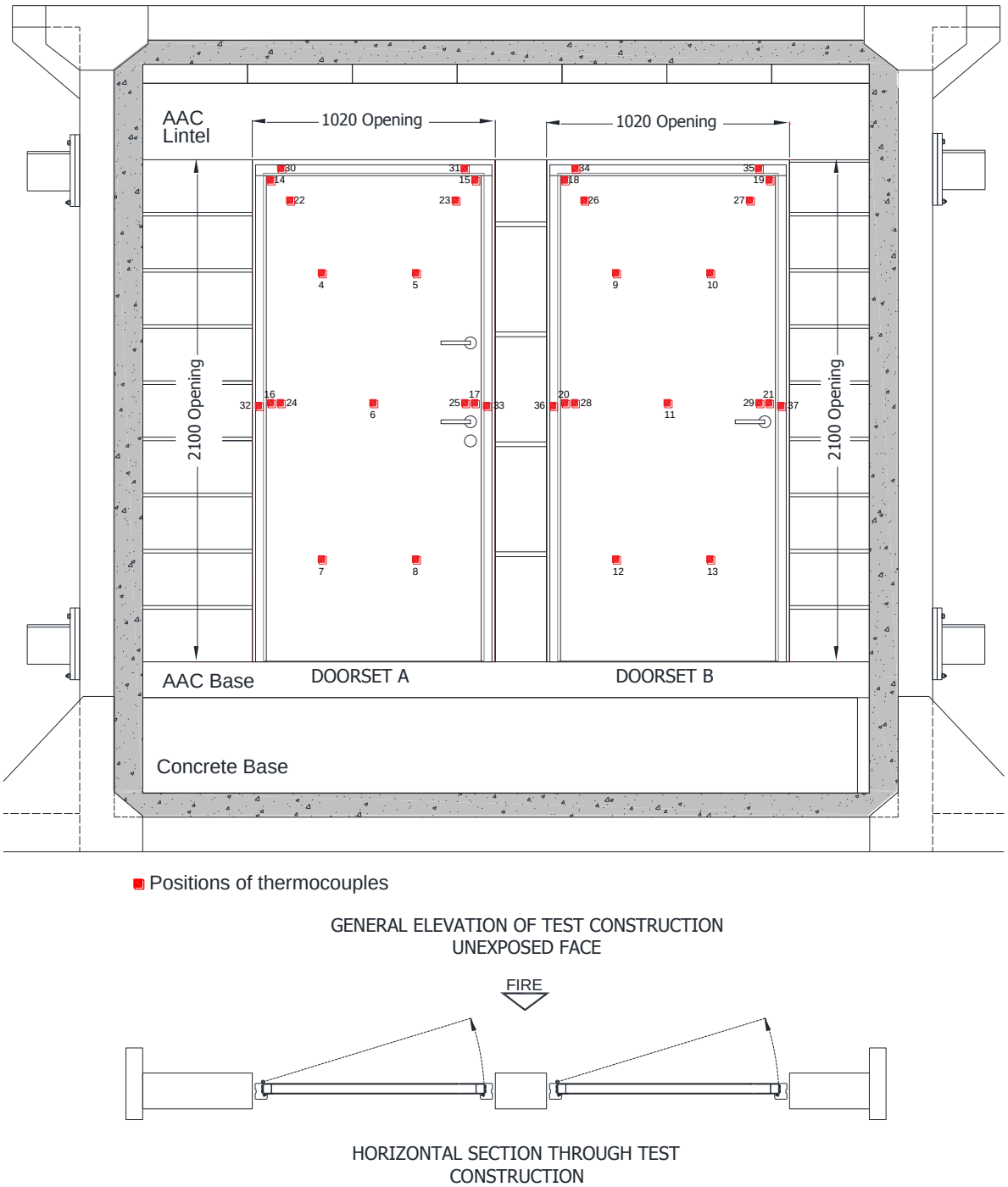


Figure 19 Instrumentation locations

Appendix C Test data

C.1 Furnace temperature and deviation

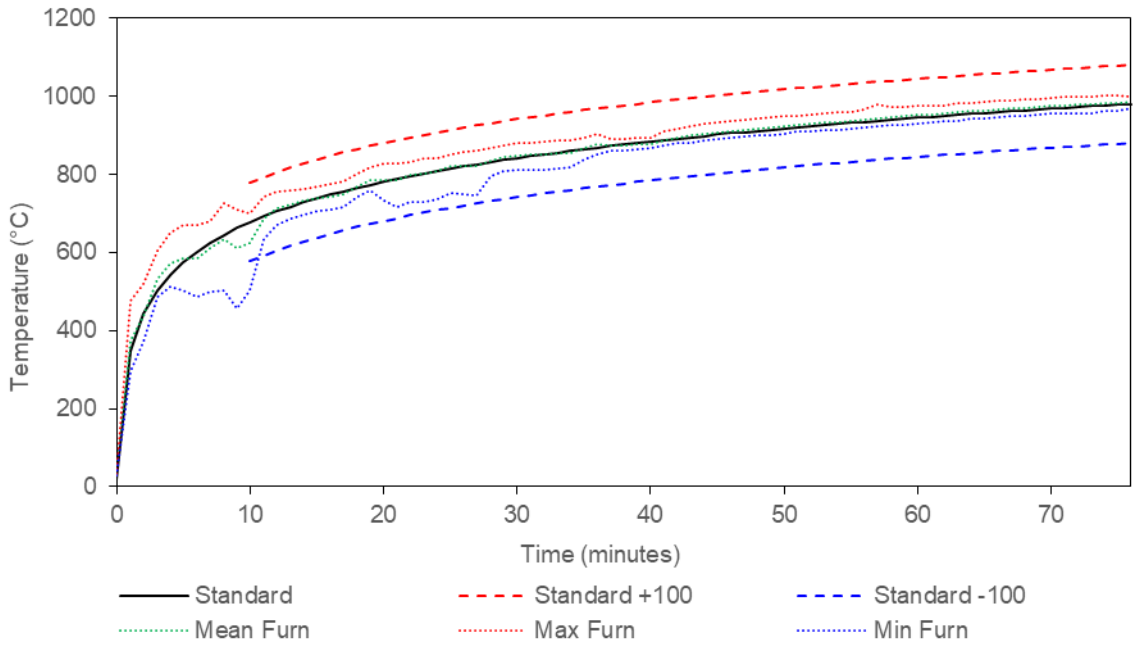


Figure 20 Furnace thermocouple temperature vs time

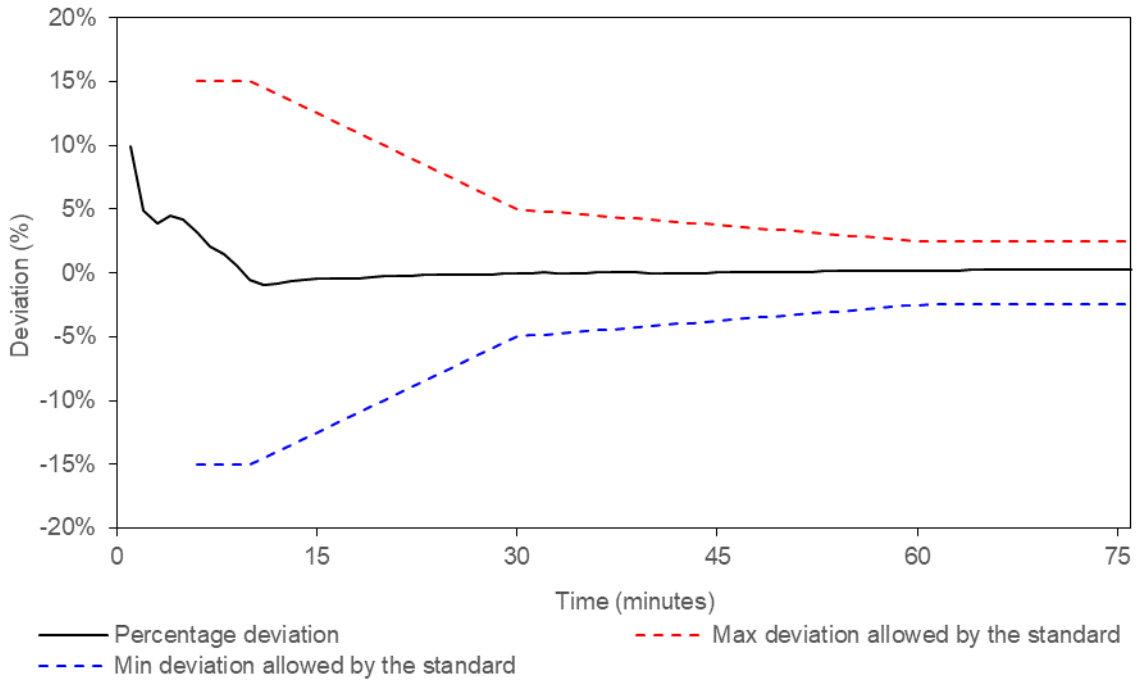


Figure 21 Percentage deviation of exposure severity vs time

C.2 Furnace pressure

The furnace pressure was taken at 2150 mm above the sill of the test specimen.

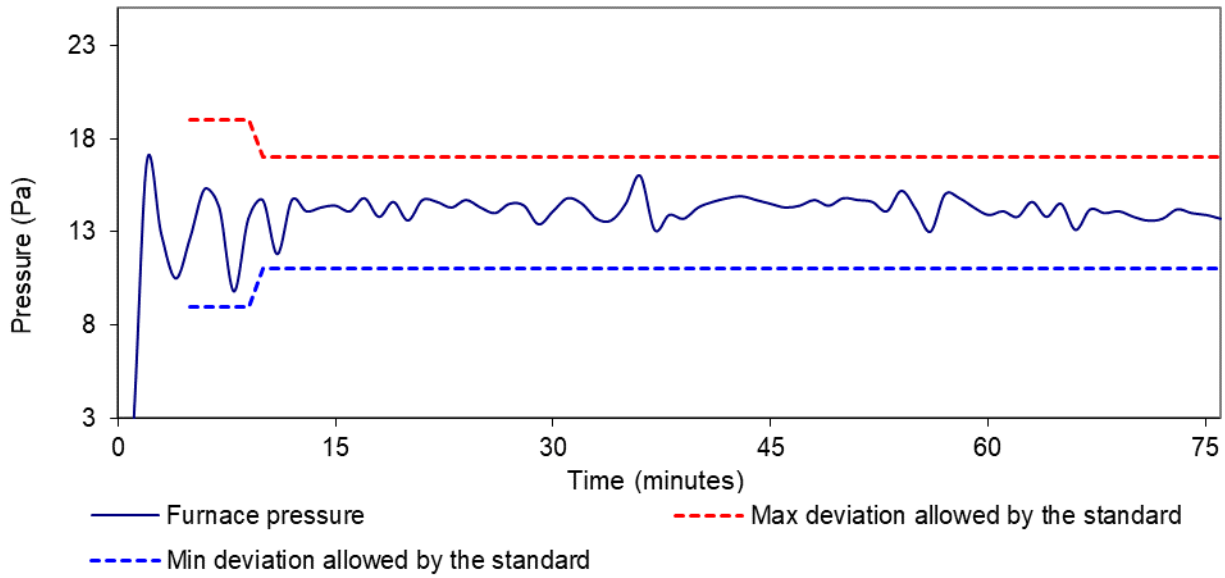


Figure 22 Furnace pressure

C.3 Specimen temperatures

Table 10 Individual And Mean Temperatures Recorded On The Unexposed Surface Of Doorset A

Time (mins)	Tc 004 (°C)	Tc 005 (°C)	Tc 006 (°C)	Tc 007 (°C)	Tc 008 (°C)	Average (°C)
0	21.0	21.0	21.0	21.0	21.0	21.0
3	21.0	21.0	21.0	21.0	21.0	21.0
6	21.0	21.0	21.0	21.0	21.0	21.0
9	21.0	21.0	21.0	21.0	21.0	21.0
12	21.0	22.0	21.0	21.0	21.0	21.2
15	22.0	23.0	22.0	23.0	22.0	22.4
18	24.0	25.0	25.0	25.0	24.0	24.6
21	27.0	28.0	27.0	28.0	26.0	27.2
24	30.0	31.0	30.0	30.0	28.0	29.8
27	33.0	34.0	32.0	33.0	31.0	32.6
30	36.0	38.0	36.0	36.0	33.0	35.8
33	40.0	41.0	39.0	39.0	36.0	39.0
36	43.0	45.0	42.0	43.0	40.0	42.6
39	46.0	48.0	46.0	46.0	44.0	46.0
42	50.0	51.0	49.0	50.0	47.0	49.4
45	53.0	55.0	53.0	53.0	51.0	53.0
48	56.0	58.0	57.0	57.0	55.0	56.6
51	60.0	61.0	61.0	61.0	59.0	60.4
54	63.0	65.0	64.0	64.0	63.0	63.8
57	67.0	68.0	68.0	68.0	67.0	67.6
60	70.0	71.0	71.0	71.0	71.0	70.8
63	73.0	73.0	74.0	74.0	74.0	73.6
66	76.0	76.0	76.0	77.0	77.0	76.4
69	79.0	79.0	79.0	80.0	80.0	79.4
72	81.0	82.0	81.0	82.0	82.0	81.6
76	84.0	84.0	83.0	85.0	85.0	84.2

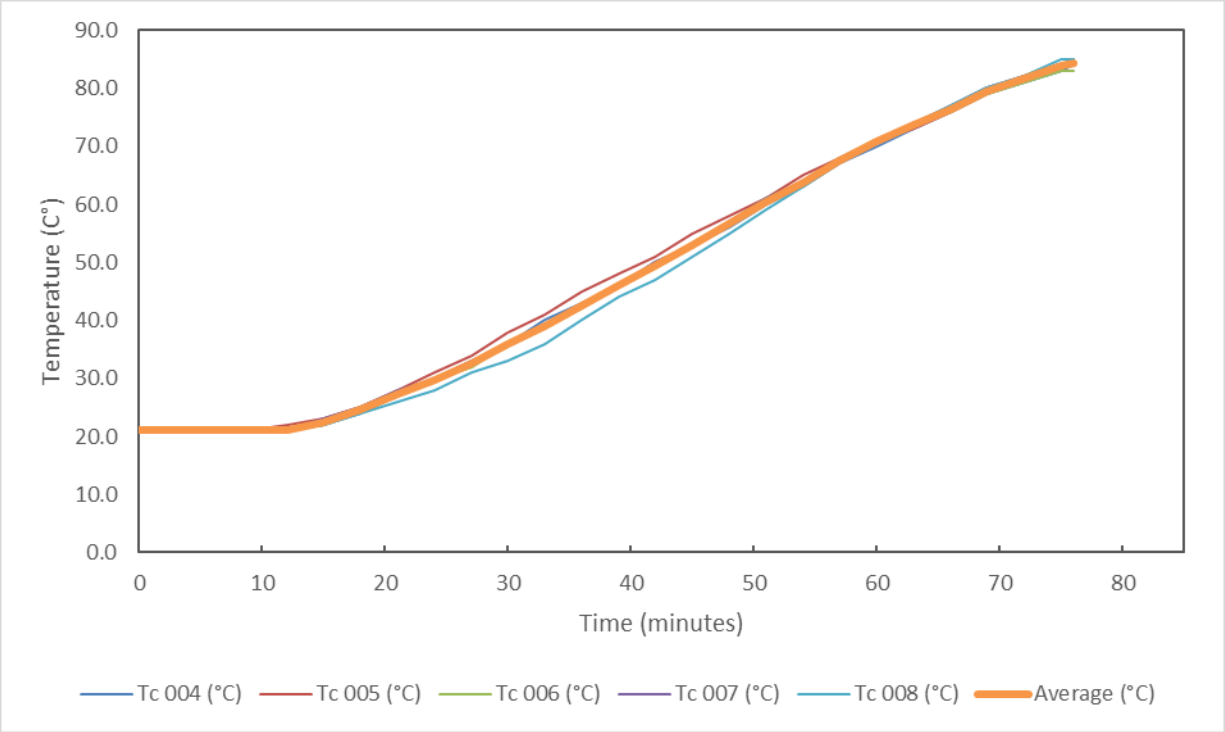


Figure 23 Individual And Mean Temperatures Recorded On The Unexposed Surface Of Doorset A

Table 11 Individual And Mean Temperatures Recorded On The Unexposed Surface Of Doorset B

Time (mins)	Tc 009 (°C)	Tc 010 (°C)	Tc 011 (°C)	Tc 012 (°C)	Tc 013 (°C)	Average (°C)
0	21.0	21.0	19.0	21.0	21.0	20.6
3	21.0	22.0	19.0	21.0	21.0	20.8
6	21.0	21.0	19.0	21.0	21.0	20.6
9	21.0	21.0	18.0	21.0	21.0	20.4
12	21.0	21.0	18.0	22.0	21.0	20.6
15	23.0	22.0	18.0	24.0	23.0	22.0
18	25.0	24.0	18.0	27.0	25.0	23.8
21	28.0	27.0	19.0	30.0	28.0	26.4
24	31.0	30.0	19.0	33.0	31.0	28.8
27	35.0	33.0	20.0	36.0	34.0	31.6
30	39.0	37.0	20.0	39.0	36.0	34.2
33	43.0	41.0	21.0	42.0	40.0	37.4
36	46.0	44.0	21.0	46.0	43.0	40.0
39	50.0	48.0	22.0	49.0	47.0	43.2
42	54.0	52.0	22.0	52.0	51.0	46.2
45	57.0	55.0	23.0	55.0	54.0	48.8
48	61.0	59.0	24.0	59.0	58.0	52.2
51	64.0	62.0	25.0	62.0	61.0	54.8
54	68.0	66.0	25.0	65.0	65.0	57.8
57	71.0	69.0	26.0	68.0	68.0	60.4
60	74.0	72.0	26.0	71.0	71.0	62.8
63	77.0	75.0	27.0	75.0	75.0	65.8
66	80.0	78.0	28.0	78.0	77.0	68.2
69	83.0	80.0	28.0	80.0	80.0	70.2
72	79.0	83.0	28.0	83.0	82.0	71.0
75	70.0	85.0	27.0	85.0	84.0	70.2
76	71.0	85.0	26.0	86.0	85.0	70.6

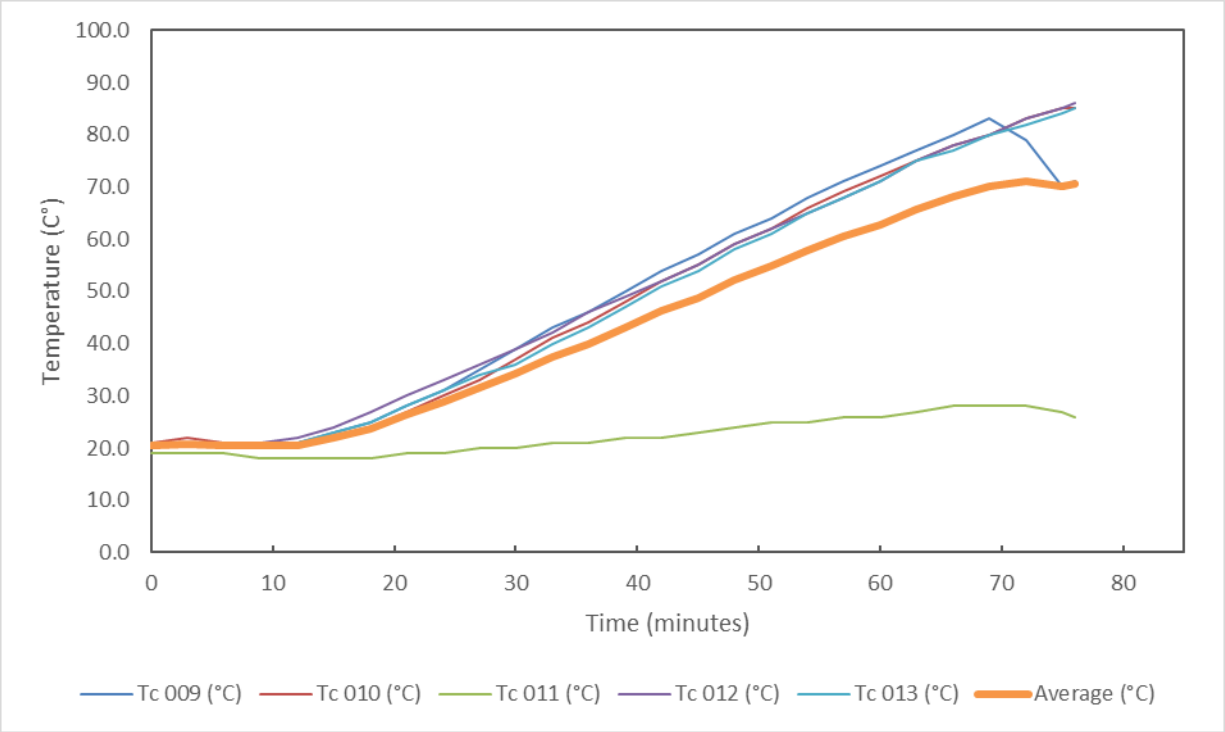


Figure 24 Individual And Mean Temperatures Recorded On The Unexposed Surface Of Doorset B

Table 12 Individual Temperatures Recorded On The Leaf Of Doorset A 25 mm Away From The Edges

Time (mins)	Tc 014 (°C)	Tc 015 (°C)	Tc 016 (°C)	Tc 017 (°C)
0	22.0	22.0	21.0	22.0
3	24.0	25.0	21.0	22.0
6	25.0	28.0	21.0	22.0
9	26.0	30.0	21.0	23.0
12	31.0	30.0	22.0	25.0
15	39.0	34.0	25.0	29.0
18	48.0	41.0	29.0	35.0
21	59.0	51.0	33.0	41.0
24	68.0	62.0	38.0	46.0
27	76.0	70.0	42.0	51.0
30	79.0	75.0	46.0	56.0
33	82.0	77.0	52.0	61.0
36	83.0	79.0	59.0	69.0
39	85.0	80.0	65.0	76.0
42	86.0	79.0	69.0	79.0
45	88.0	79.0	71.0	79.0
48	87.0	76.0	73.0	80.0
51	87.0	77.0	75.0	83.0
54	86.0	78.0	76.0	85.0
57	87.0	80.0	78.0	86.0
60	87.0	81.0	79.0	89.0
63	91.0	84.0	82.0	93.0
66	97.0	87.0	84.0	96.0
69	102.0	90.0	87.0	102.0
72	118.0	99.0	91.0	119.0
75	181.0	175.0	96.0	160.0
76	216.0	149.0	99.0	176.0

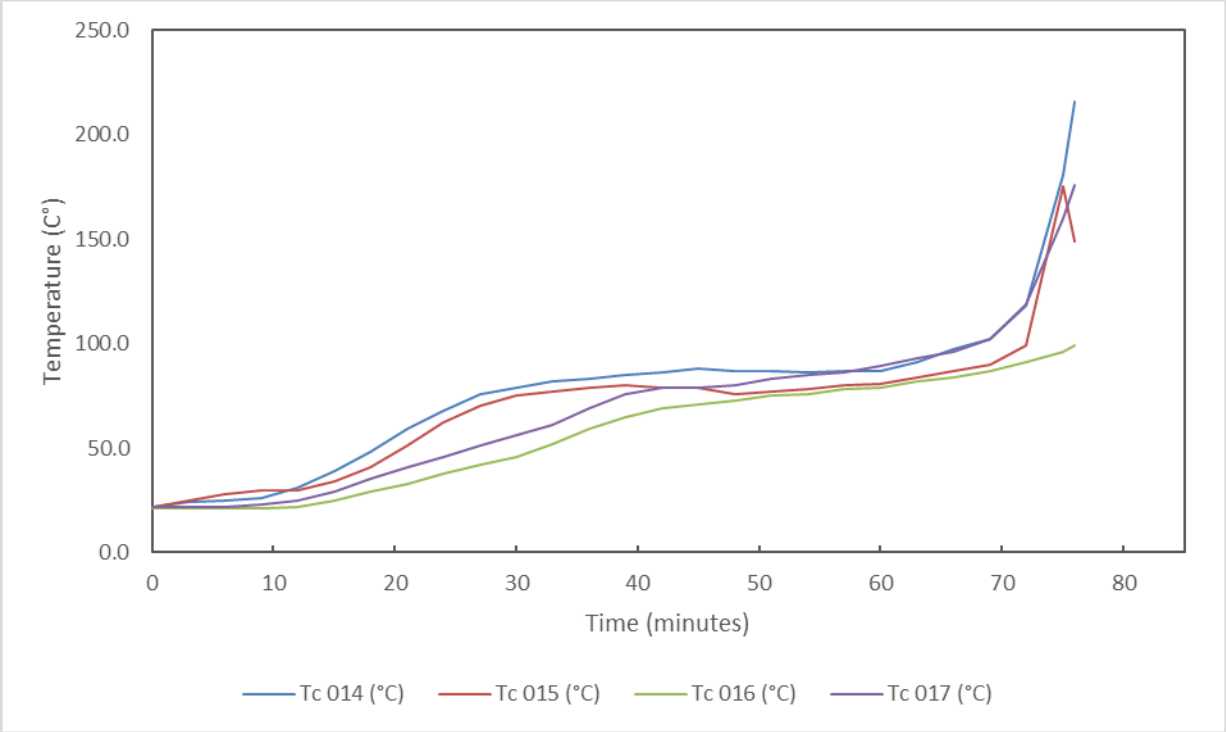


Figure 25 Individual Temperatures Recorded On The Leaf Of Doorset A 25 mm Away From The Edges

Table 13 Individual Temperatures Recorded On The Leaf Of Doorset B 25 mm Away From The Edges

Time (mins)	Tc 018 (°C)	Tc 019 (°C)	Tc 020 (°C)	Tc 021 (°C)
0	22.0	23.0	22.0	23.0
3	23.0	61.0	25.0	29.0
6	23.0	60.0	24.0	28.0
9	24.0	52.0	23.0	27.0
12	28.0	50.0	23.0	28.0
15	34.0	52.0	26.0	31.0
18	41.0	60.0	29.0	36.0
21	50.0	67.0	33.0	41.0
24	58.0	76.0	38.0	47.0
27	66.0	83.0	43.0	54.0
30	72.0	86.0	48.0	58.0
33	78.0	87.0	54.0	62.0
36	81.0	85.0	62.0	66.0
39	83.0	82.0	67.0	69.0
42	85.0	81.0	71.0	72.0
45	85.0	81.0	73.0	75.0
48	84.0	80.0	75.0	78.0
51	84.0	80.0	77.0	80.0
54	85.0	81.0	79.0	83.0
57	85.0	84.0	81.0	88.0
60	88.0	90.0	83.0	98.0
63	94.0	94.0	85.0	106.0
66	109.0	101.0	88.0	114.0
69	202.0	125.0	92.0	125.0
72	62.0	146.0	95.0	140.0
75	18.0	104.0	100.0	168.0
76	18.0	110.0	106.0	180.0

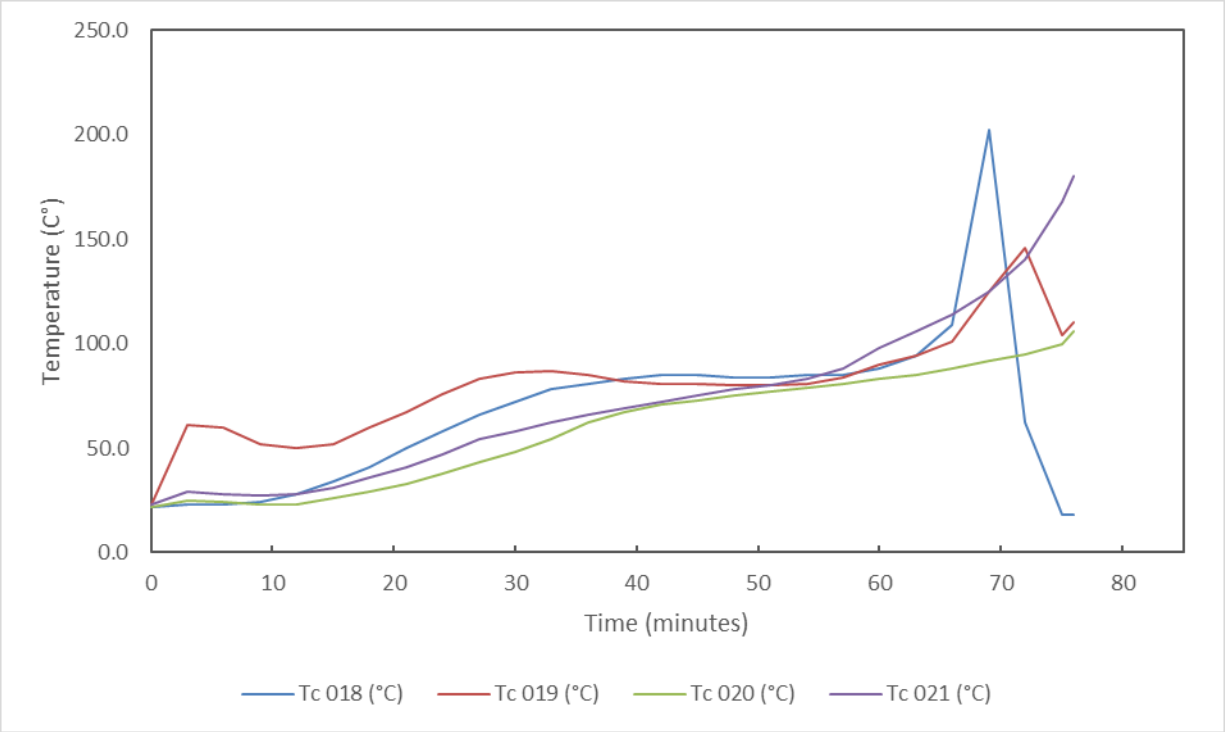


Figure 26 Individual Temperatures Recorded On The Leaf Of Doorset B 25 mm Away From The Edges

Table 14 Individual Temperatures Recorded On The Leaf Of Doorset A 100 mm Away From The Edges

Time (mins)	Tc 022 (°C)	Tc 023 (°C)	Tc 024 (°C)	Tc 025 (°C)
0	17.0	18.0	17.0	18.0
3	18.0	18.0	17.0	18.0
6	18.0	18.0	17.0	18.0
9	18.0	18.0	17.0	18.0
12	18.0	19.0	18.0	19.0
15	21.0	21.0	20.0	22.0
18	25.0	24.0	23.0	26.0
21	30.0	28.0	27.0	31.0
24	35.0	32.0	30.0	35.0
27	39.0	35.0	34.0	39.0
30	43.0	39.0	37.0	43.0
33	46.0	43.0	40.0	47.0
36	48.0	46.0	43.0	52.0
39	50.0	49.0	46.0	57.0
42	53.0	52.0	49.0	62.0
45	55.0	54.0	51.0	66.0
48	57.0	57.0	54.0	69.0
51	57.0	59.0	57.0	72.0
54	59.0	62.0	60.0	76.0
57	60.0	64.0	63.0	79.0
60	62.0	67.0	66.0	83.0
63	66.0	69.0	70.0	85.0
66	69.0	72.0	72.0	87.0
69	72.0	74.0	75.0	90.0
72	75.0	78.0	78.0	92.0
75	78.0	84.0	80.0	95.0
76	80.0	69.0	81.0	95.0

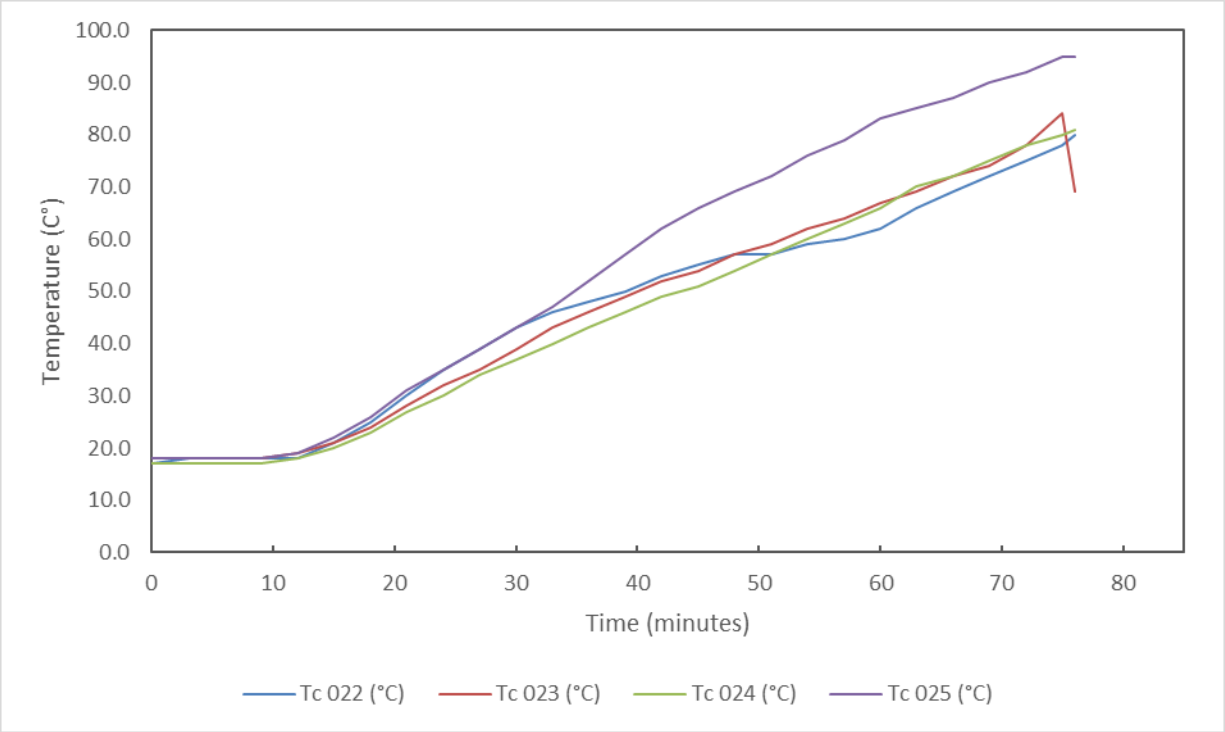


Figure 27 Individual Temperatures Recorded On The Leaf Of Doorset A 100 mm Away From The Edges

Table 15 Individual Temperatures Recorded On The Leaf Of Doorset B 100 mm Away From The Edges

Time (mins)	Tc 026 (°C)	Tc 027 (°C)	Tc 028 (°C)	Tc 029 (°C)
0	18.0	18.0	18.0	22.0
3	18.0	27.0	18.0	23.0
6	18.0	23.0	18.0	23.0
9	18.0	21.0	18.0	22.0
12	19.0	21.0	19.0	23.0
15	23.0	23.0	21.0	25.0
18	28.0	27.0	25.0	29.0
21	34.0	32.0	29.0	33.0
24	40.0	37.0	33.0	37.0
27	45.0	42.0	37.0	42.0
30	49.0	46.0	41.0	46.0
33	52.0	50.0	44.0	49.0
36	55.0	53.0	47.0	52.0
39	57.0	56.0	50.0	55.0
42	59.0	57.0	52.0	57.0
45	60.0	59.0	54.0	60.0
48	62.0	61.0	57.0	63.0
51	64.0	63.0	59.0	65.0
54	66.0	65.0	62.0	68.0
57	68.0	67.0	65.0	71.0
60	70.0	70.0	67.0	74.0
63	72.0	73.0	70.0	77.0
66	75.0	76.0	73.0	80.0
69	79.0	79.0	76.0	83.0
72	61.0	65.0	77.0	83.0
75	72.0	60.0	78.0	87.0
76	83.0	62.0	79.0	88.0

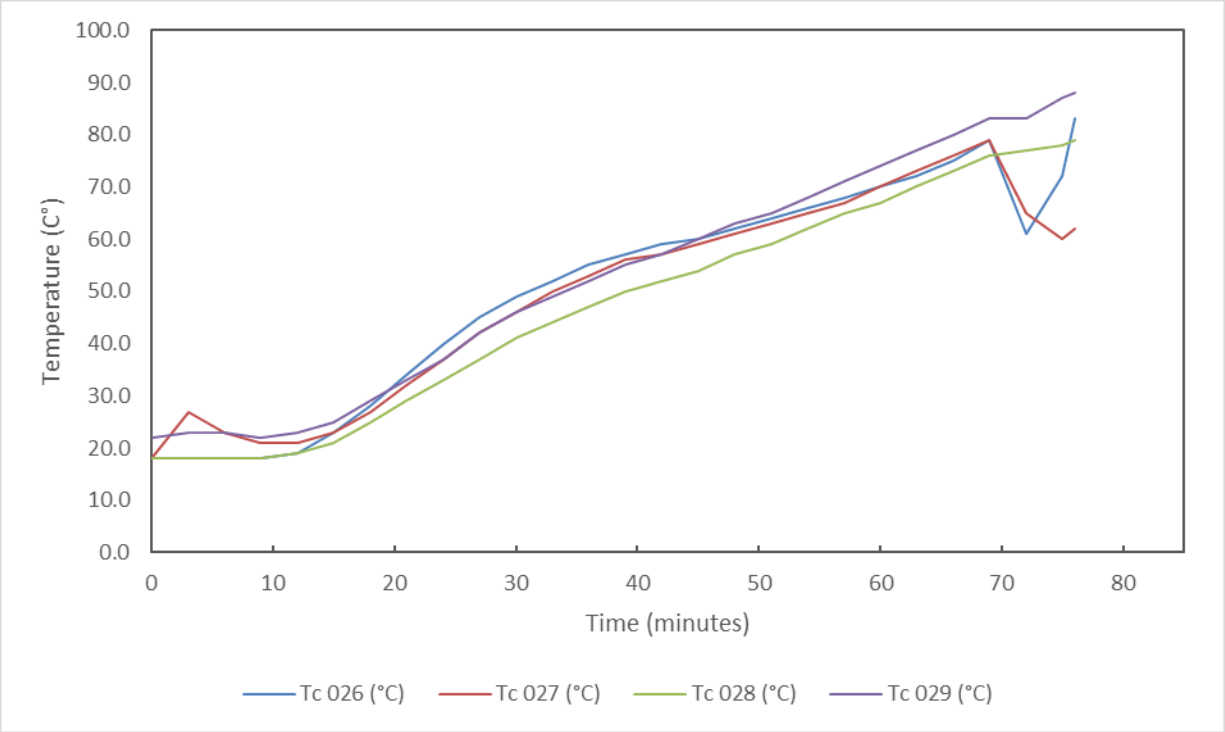


Figure 28 Individual Temperatures Recorded On The Leaf Of Doorset B 100 mm Away From The Edges

Table 16 Individual Temperatures Recorded On The Unexposed Surface Of Door Frame A

Time (mins)	Tc 030 (°C)	Tc 031 (°C)	Tc 032 (°C)	Tc 033 (°C)
0	22.0	22.0	22.0	22.0
3	23.0	23.0	22.0	22.0
6	23.0	22.0	22.0	22.0
9	23.0	23.0	22.0	22.0
12	24.0	23.0	22.0	22.0
15	25.0	24.0	22.0	22.0
18	26.0	25.0	22.0	22.0
21	29.0	26.0	23.0	23.0
24	32.0	29.0	23.0	23.0
27	36.0	31.0	24.0	24.0
30	39.0	32.0	25.0	25.0
33	42.0	33.0	26.0	27.0
36	43.0	33.0	27.0	28.0
39	48.0	33.0	29.0	30.0
42	50.0	34.0	30.0	31.0
45	55.0	35.0	31.0	33.0
48	58.0	36.0	32.0	34.0
51	57.0	38.0	34.0	36.0
54	59.0	39.0	35.0	37.0
57	60.0	41.0	36.0	39.0
60	58.0	43.0	37.0	40.0
63	60.0	46.0	38.0	42.0
66	63.0	51.0	40.0	43.0
69	68.0	53.0	41.0	44.0
72	81.0	57.0	43.0	45.0
75	99.0	83.0	44.0	47.0
76	103.0	73.0	45.0	41.0

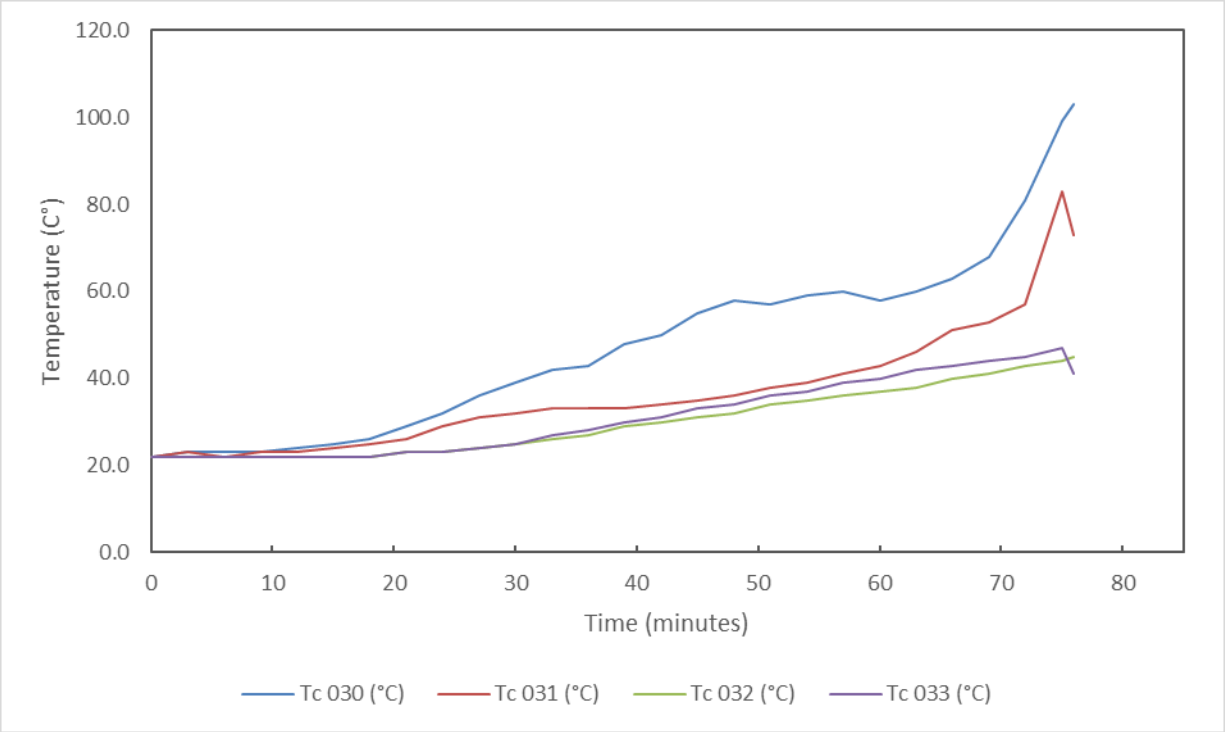


Figure 29 Individual Temperatures Recorded On The Unexposed Surface Of Door Frame A

Table 17 Individual Temperatures Recorded On The Unexposed Surface Of Door Frame B

Time (mins)	Tc 034 (°C)	Tc 035 (°C)	Tc 036 (°C)	Tc 037 (°C)
0	23.0	23.0	20.0	21.0
3	23.0	36.0	21.0	21.0
6	23.0	37.0	20.0	21.0
9	23.0	34.0	20.0	21.0
12	23.0	31.0	20.0	21.0
15	24.0	31.0	20.0	21.0
18	24.0	36.0	20.0	21.0
21	26.0	39.0	21.0	22.0
24	27.0	42.0	21.0	22.0
27	29.0	45.0	21.0	23.0
30	31.0	48.0	22.0	24.0
33	33.0	48.0	22.0	24.0
36	35.0	44.0	23.0	25.0
39	38.0	44.0	25.0	26.0
42	41.0	48.0	26.0	27.0
45	42.0	51.0	28.0	29.0
48	43.0	50.0	30.0	30.0
51	44.0	48.0	31.0	32.0
54	45.0	45.0	33.0	34.0
57	48.0	45.0	35.0	35.0
60	52.0	50.0	36.0	37.0
63	56.0	52.0	38.0	39.0
66	64.0	55.0	39.0	41.0
69	115.0	61.0	40.0	43.0
72	69.0	73.0	38.0	45.0
75	77.0	78.0	35.0	38.0
76	87.0	88.0	34.0	37.0

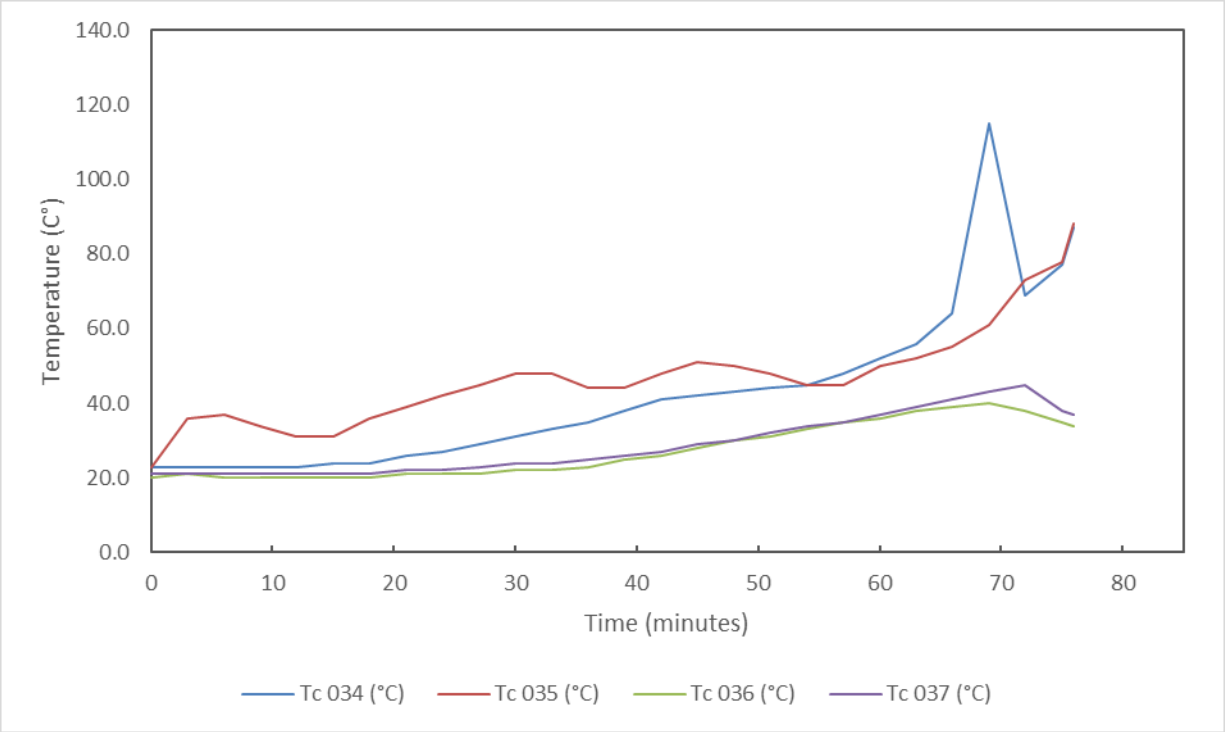


Figure 30 Individual Temperatures Recorded On The Unexposed Surface Of Door Frame B

C.4 Specimen deflections

Table 18 and Table 19 detail the deflection measurements of the test specimen at locations given in Figure 31.

Negative measurements show movement of the test specimen away from the furnace. Positive measurements show movement of the test specimen towards the furnace.

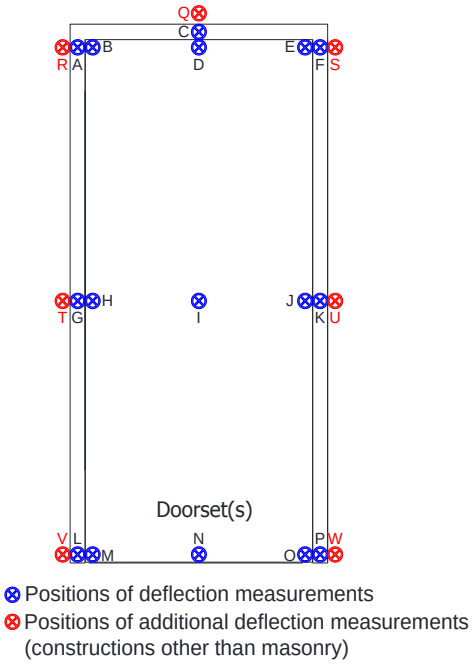


Figure 31 Position of deflection measurements

Table 18 Deflections – Doorset A

	Deflections (mm)															
Time (mins)	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	-6	3	2	4	12	4	4	-6	-3	-2	5	-43	-11	3	-13	2
20	-13	1	-4	-6	6	2	2	-6	-7	-5	-5	-46	-12	5	-13	-1
30	-8	-10	-11	-6	8	1	1	-1	-3	5	4	-28	-4	13	-2	-3
40	-6	-6	-7	-4	10	3	3	0	-2	9	4	-28	-6	10	-1	-2
50	-4	-4	-1	-2	4	4	4	2	2	10	6	-31	-1	13	0	1
60	-1	-10	-4	-5	2	-17	-17	-20	-40	-10	-10	-45	-9	1	-5	6
70	3	-12	-6	-5	2	-17	-17	-22	-53	-13	-11	-45	-12	-2	-9	-2
Max	-13	-12	-11	-6	12	-17	-17	-22	-53	-13	-11	-46	-12	13	-13	6

Table 19 Deflections – Doorset B

	Deflections (mm)															
Time (mins)	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	-3	-3	-2	4	11	0	-4	1	0	-6	5	-3	-4	-4	-4	7
20	-7	0	-7	-2	-8	-7	0	2	-13	-11	-8	-10	-12	-9	-7	-3
30	1	9	-3	-3	7	-2	-7	-6	-6	-10	-5	-4	-4	-3	-7	4
40	3	11	-2	-1	7	1	-4	-4	4	-8	-4	-4	-2	3	-2	8
50	7	13	8	9	10	3	-2	-3	5	-8	-4	-3	-2	6	-1	8
60	-7	-5	-10	-14	-8	1	-22	-20	-44	-24	-14	-5	-11	-22	-10	-1
Max	-7	13	-10	-14	11	-7	-22	-20	-44	-24	-14	-10	-12	-22	-10	8

C.5 Gap measurements

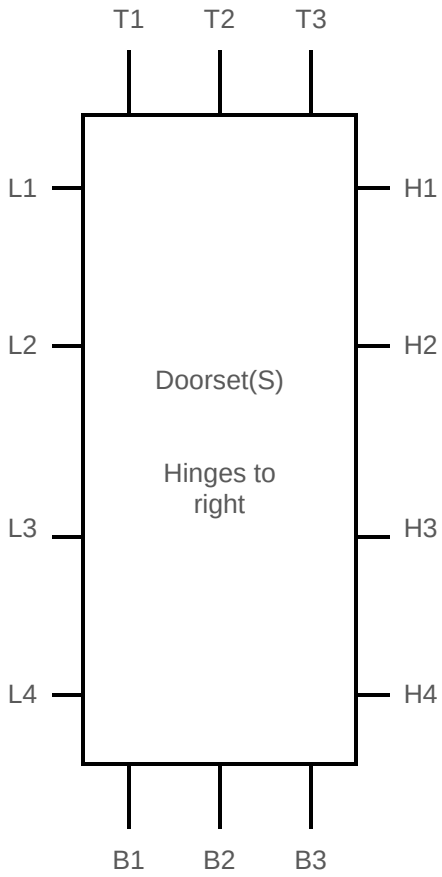


Figure 32 Gap measurements, Doorset A and B (unexposed side shown)

Table 20 Measured and calculated gap sizes for Doorset A

Doorset A (mm)					
Hinge side	**Primary**	**Leaf to stop**	**Leading edge**	**Primary**	**Leaf to stop**
H1	**3.9**	**0.2**	**L1**	**2.6**	**0.3**
H2	3.9	0.6	L2	2.8	0.4
H3	2.4	0.2	L3	3.2	0.4
H4	3.2	0.2	L4	2.2	0.4
Mean	3.3		**Mean**	2.7	
Max	3.9		**Max**	3.2	
Min	2.4		**Min**	2.2	
Max permitted	5.6		**Max permitted**	4.9	
Top edge	**Primary**	**Leaf to stop**	**Threshold**	**Primary**	
T1	3.7	0.2	B1	8.3	
T2	4.0	0.2	B2	6.7	
T3	3.8	0.2	B3	7.1	
Mean	3.8		**Mean**	7.4	
Max	4.0		**Max**	8.3	
Min	3.7		**Min**	6.7	
Max permitted	5.9		**Max permitted**	9.8	

Table 21 Measured and calculated gap sizes for Doorset B

Doorset B (mm)					
Hinge side	**Primary**	**Leaf to stop**	**Leading edge**	**Primary**	**Leaf to stop**
H1	**3.3**	**0.9**	**L1**	**2.9**	**0.7**
H2	2.9	0.9	L2	2.5	1.0
H3	2.3	0.6	L3	2.3	0.9
H4	2.0	1.2	L4	1.9	0.9
Mean	2.6		**Mean**	2.4	
Max	3.3		**Max**	2.9	
Min	2.0		**Min**	1.9	
Max permitted	5.0		**Max permitted**	4.6	
Top edge	**Primary**	**Leaf to stop**	**Threshold**	**Primary**	
T1	2.8	0.3	B1	7.7	
T2	3.0	0.8	B2	7.2	
T3	2.8	0.3	B3	7.2	
Mean	2.9		**Mean**	7.4	
Max	3.0		**Max**	7.7	
Min	2.8		**Min**	7.2	
Max permitted	4.9		**Max permitted**	9.5	

Appendix D Photographs

Figure 33 Unexposed face of the specimen before the start of the test

Figure 34 Exposed face of the specimen before the start of the test

Figure 35 Unexposed face of the specimen at 20 minutes of testing

Figure 36 Unexposed face of the specimen at 40 minutes of testing

Figure 37 Unexposed face of the specimen at 60 minutes of testing

Figure 38 Unexposed face of the specimen at 68 minutes of testing

Figure 39 Unexposed face of the specimen at 76 minutes of testing

Figure 40 Exposed face of the specimen at the end of the test

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