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Testing. Advising. Assuring.

Title:

The Performance of Timber
Doorsets when Tested to
BS EN 1634-1:2008

Report No:

WF No. 333237 Issue 4

Prepared for:

Theuma doors & frames

Zandstraat 10
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Belgium

Date:

19th September 2013

TABLE OF CONTENTS

SECTION	PAGE
EXECUTIVE SUMMARY.....	3
INTRODUCTION	4
ASSUMPTIONS	4
PROPOSALS.....	4
BASIC TEST EVIDENCE	5
ASSESSED PERFORMANCE.....	6
CONCLUSIONS.....	9
REVIEW	10
VALIDITY.....	10
DECLARATION BY THEUMA DOORS & FRAMES.....	11
SIGNATORIES.....	12
APPENDIX	13

Executive Summary

Objective	This report presents an appraisal of timber based doorset designs, similar to the basic design of doorsets previously fire tested and reported, considering double and single leaf configurations, and variations of glazed panels.
Report Sponsor	Theuma doors & frames
Address	Zandstraat 10 B-3460 Bekkevoort Assent Belgium
Summary of Conclusions	<p>It can be concluded that timber doorsets as discussed in this report should be capable of providing 30 integrity and insulation (where appropriate) performance if subjected to a test in accordance with BS EN 1634-1:2008.</p> <p>This assessment represents our opinion as to the performance likely to be demonstrated on a test in accordance with BS EN 1634-1: 2008, on the basis of the evidence referred to above. We express no opinion as to whether that evidence, and/or this assessment, would be regarded by any Building Control authority as sufficient for that or any other purpose. This assessment is provided to the client for its own purposes and we cannot opine on whether it will be accepted by Building Control authorities or any other third parties for any purpose.</p>
Valid until	13 th September 2023

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Introduction

This report presents an appraisal of a timber based doorset design, similar to the basic design of doorsets previously fire tested and reported, but considering double and single leaf configurations, and variations of glazed panels.

The doorset design is required to be capable of providing a performance of 30 minutes integrity with respect to BS EN 1634-1:2008.

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

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 be capable of supporting the doorset for at least the required fire resistance period.

Doorset Construction

It is also assumed that the doorsets will be constructed in the same manner as for the assembly tested under the reference listed in the body of this report, unless otherwise appraised within this report. All materials of construction, unless specified otherwise in this report, are assumed to be as for the tested assemblies.

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.

Closing forces

It is assumed that the doorsets will be fitted with a closing device which is capable of fully closing the doorset from any position and overcoming the latch mechanism unless otherwise detailed within this report. It is further assumed that the doorsets will be in the closed and latched position.

Proposals

Doorset size

It is proposed that a timber based doorset, similar to the previously tested doorsets described and discussed in this report, can be used with maximum dimensions of the door leaves of width – 1040 mm; and height - 2400 mm, either as single or double door configuration to achieve the required fire resistance performance of 30 minutes integrity should it be tested in accordance with BS EN 1634-1:2008.

Supporting construction

It is proposed that the doorset can be installed in a flexible supporting construction (both metal stud and timber stud (gypsum plaster) board partitions) as well as rigid supporting constructions.

Door frame It is proposed that a steel door frame, similar to the tested door frames will be used, made from galvanised steel or standard steel, with thickness 1.0 – 1.5 mm, filled with glass wool, back-filled with gypsum plaster or concrete mix, factory filled with gypsum plasterboard strips and thin Palusol strips, or hollow frames.

Glazing detail It is further proposed that the door leave may contain a glazed panel of maximum dimensions of width – 650 mm; height - 1725 mm. Glazing systems which can be incorporated in these doors, if these have been proven by test results to be suitable for this type of door (e.g. Certifire approved glazing systems for timber doors).

Basic Test Evidence

WF No. 158455 The test referenced WF No. 158455 included two single-acting doorsets, mounted within a non-standard flexible supporting construction, in accordance with BS EN 1634-1: 2000.

Doorset A had overall dimensions of 2119 mm high by 1000 mm wide and incorporated a single-acting door leaf of overall dimensions 2070 mm high by 926 mm wide by 40 mm thick. The leaf comprised hardwood stiles and rails and incorporated a particleboard core with MDF facings. The door leaf incorporated a glazed aperture of overall nominal dimensions 200 mm wide by 1200 mm high. The aperture was glazed with a single pane of 7 mm thick Pyrobelite EW30/7 glass. The door leaf was hung within a glass fibre infilled, zinc coated steel frame on three mild steel hinges.

Integrity failure of the doorset occurred after a period of 36 minutes and was attributed to the ignition of a cotton pad applied to the leading edge of the door, where intermittent flaming was observed. Insulation failure was observed after 10 minutes on the glazing, and due to integrity failure on the doorset.

Doorset B had overall dimensions of 2111 mm high by 1000 mm wide and incorporated a single-acting door leaf of overall dimensions 2070 mm high by 926 mm wide by 40 mm thick. The leaf comprised softwood stiles and rails and incorporated a flaxboard core with MDF facings. The door leaf was hung within a gypsum plaster infilled, zinc coated steel frame on three mild steel hinges.

Integrity failure of the doorset occurred after a period of 38 minutes and was attributed to the instance of sustained flaming to an area of the door leaf. Insulation failure was due to integrity failure on the doorset.

The doorsets, which were both latched, were orientated such that they opened towards the heating conditions of the test. The test was terminated after a duration of 49 minutes.

The supporting construction was a non-standard (timber frame) flexible gypsum plasterboard partition.

2012-Efectis-R9322a

The test referenced 2012-Efectis-R9322a included a partially insulated single-acting, single-leaf timber doorset in a flexible supporting construction and was conducted in accordance with EN 1634-1: 2008. The doorset had overall dimensions of 2356 mm high by 1050 mm wide and incorporated a single-acting door leaf of overall dimensions 2315 mm high by 980 mm wide by 40 mm thick. The leaf comprised hardwood stiles and rails and incorporated a particle board core with MDF facings. The door leaf incorporated a glazed aperture of overall nominal dimensions 690 mm wide by 1765 mm high. The aperture was glazed with a single pane of 11 mm thick Pyrobelite 7 EG EW30 glass. The door leaf was hung within a zinc coated steel frame with factory-applied gypsum plaster strips on three mild steel hinges.

The initial integrity failure of the doorset occurred after a period of 30 minutes and was attributed to the instance of sustained flaming on the top corner on the opening side of the door leaf. Insulation failure was observed after 16 minutes on the glazing, and due to integrity failure on the doorset.

The doorset, which was latched, was orientated such that it opened towards the heating conditions of the test. The test was terminated after a duration of 31 minutes.

2010-Efectis-R0037

The test referenced 2010-Efectis-R0037 involved a single-acting, double-leaf timber doorset and was conducted in accordance with EN 1634-1: 2008. The doorset had overall dimensions of 2444 mm high by 2237 mm wide and incorporated single-acting door leaves of overall dimensions 2400 mm high by 1080 mm wide by 40 mm thick. The leaves comprised hardwood stiles and rails and incorporated a particle board core with MDF facings. The door leaves incorporated a glazed aperture of overall nominal dimensions 590 mm wide by 1090 mm high. The aperture was glazed with a single pane of 15 mm thick Pyrostop 30-10 glass. The door leaves were hung within a steel frame with factory-applied Palusol and gypsum plaster strips on four mild steel hinges.

Integrity failure of the doorset occurred after a period of 32 minutes and was attributed to the ignition of a cotton pad when applied to the gap between the door leaves. Sustained flaming was observed from the gap between the door leaves after 39 minutes. Insulation failure was observed after 28 minutes on the doorset.

The doorset, which was latched, were orientated such that it opened towards the heating conditions of the test. The test was terminated after a duration of 39 minutes.

Assessed Performance

Alternative supporting constructions

The doorsets tested under the reference WFRC No. 158455 were mounted within a 94 mm thick timber stud/gypsum board wall. The doorsets tested under the reference 2010-Efectis-R0037 and 2012-Efectis-R9322a were mounted within a 100 mm thick standard steel stud/gypsum board wall, demonstrating the ability of the tested doorsets to provide the required 30 minute fire resistance performance in this type of flexible supporting construction.

The flexible supporting constructions used in the tests described under reference 2010-Efectis-R0037 and 2012-Efectis-R9322a are of the standard construction as described in the EN 1363-1:2011. They can therefore be considered to be representative of all flexible supporting constructions, provided it can be demonstrated they provide a fire resistance performance of at least 30 minutes.

A rigid supporting construction such as that described in EN 1363-1 will tend to restrain any bowing of the metal door frame, providing there is adequate fixing, whereas a flexible supporting construction such as that described in EN 1363-1 will bow in sympathy with it exaggerating the mismatch between the materials of the door leaf and the frame. It therefore follows that the described doorsets can also be mounted in a rigid supporting construction.

Door frame variations

The doors have been tested with galvanised steel frames, standard steel frames, of thickness 1.0 – 1.5 mm, filled with glass wool, back-filled with gypsum plaster, of factory filled with gypsum plasterboard strips and thin Palusol strips. All variations demonstrated a good performance in the fire tests, and it can be considered acceptable to be used with all variations of the door.

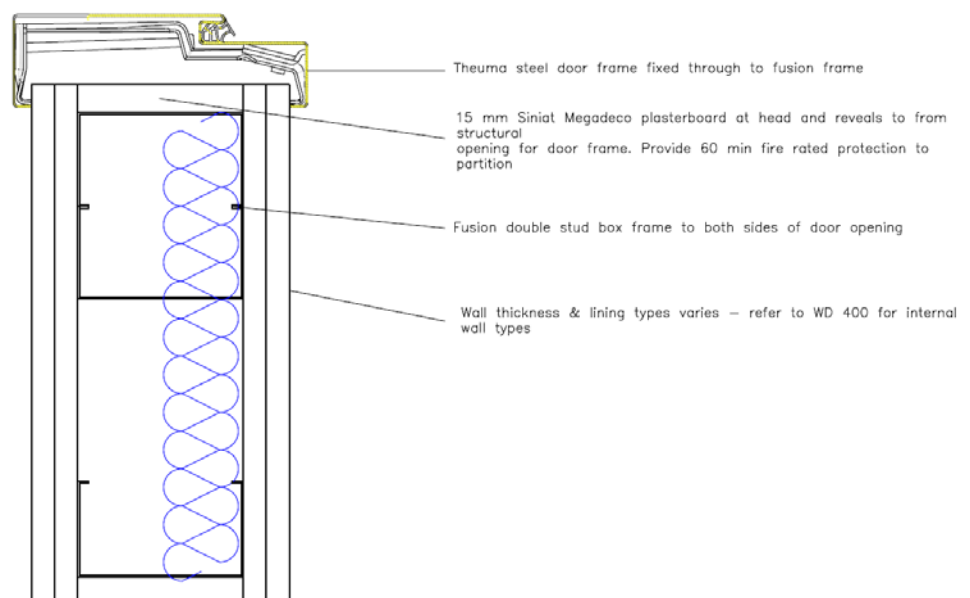
Mortar/concrete backfill

The frames may also be backfilled with either sand cement mortar or concrete. A backfill with these materials is expected to provide a similar or improved level of stability and heat sink to the tested gypsum plaster backfill and can consequently be positively appraised.

Hollow steel frames

Doorset A in the test referenced WF No. 158455 incorporated steel frames with a glass fibre backfill. This backfill will have contributed marginally to the insulation performance of the frame, and nothing to the stability to the frame, so its effect on the integrity performance of the doorset will have been negligible. This leads to the conclusion that had the frame been hollow, an integrity (but not insulation) performance in excess of the required 30 minute period would still be anticipated. A frame construction as schematically represented in the drawing below can therefore be considered an acceptable proposal for a doorset with a fire resistance performance of at least 30 minutes.

Figure 1



Door leaf dimensions

The tests described under reference 2010-Efectis-R0037 and 2012-Efectis-R9322a are for the described doorsets in standard flexible supporting constructions, and offer the widest field of application. As the test results did not show a significant overrun compared to the required 30 minutes, and a double door configuration is generally considered as more onerous compared to a single door configuration, the maximum dimensions of the door leaves must be taken as:

Width – 1080 mm

Height - 2400 mm

Either as single or double door configuration.

Glazing detail

The tests demonstrated the ability of the door leaves (with particle board core) to accommodate a glazed panel, without compromising the fire resistance performance. Based on the test results, the maximum dimensions of the glazing must be taken as:

Width – 650 mm

Height - 1725 mm

Provided (in smaller doors) that at least a 137.5 mm large part of the door remains outside of the glazed panel.

The similarity in construction, performance and stability between Doorsets A & B demonstrated in the test referenced WF No. 158455 provides confidence that either door type may incorporate glazed apertures as detailed or no apertures, as required.

The tests have been done with slightly different glazing systems. Considering the behaviour these different systems demonstrated in the fire tests discussed it can be considered acceptable to allow other glazing systems to be incorporated in these doors, if these have been proven by test results to be suitable for this type of door (e.g. Certifire approved glazing systems for timber doors) subject to the maximum size associated with the glass or glazing system and the maximum sizes permitted in the leaf as stated above (Whichever is smaller).

Facings/finishes

The tested doorsets incorporated MDF facings without decorative veneer, laminate or paint finish. The Direct Field of Application given in EN 1634-1: 2008 states that decorative facings and finishes up to 1.5 mm thick, may be added to the faces of doorsets, but may not wrap around the edges of the leaf. On the basis of this rule the use of decorative veneer, laminate or paint finishes in addition to the existing MDF faces (and leaf thickness) may therefore be considered acceptable.

Opposite opening direction

The tested doorsets were installed such that they opened towards the heating conditions of the test. As described in the BS EN 1634-1: 2008 if the door leaf opens towards the fire, then the top and bottom edges of the leaf will tend to bow towards the fire and away from the door stop. This provides the opportunity for the passage of flames and hot gasses to escape from the furnace, aided by positive pressure from within the furnace causing premature integrity failure. This is exacerbated by the contrary bowing of the metal frame. It can therefore be concluded that the required 30 minutes integrity (but not necessarily insulation) performance of the doorsets when opening in either direction is expected.

Insulation performance

In the described tests the door leaves fulfilled the insulation criteria until integrity failure occurred. Insulation failure before integrity failure was due to the behaviour of the glazed panels (where present). It can therefore be concluded that when a glazing system is used the choice of this system will determine the insulation performance of the door leaf.

Considering the symmetrical construction of the door leaf it can be expected that the insulation performance of the door leaf (excluding any glazed panel) will be at least 30 minutes, when the door is tested opening away from the fire (opposite direction of tested)

Considering the test results, the tested door frame constructions will not cause premature insulation criteria failure if they are constructed in the way as described in the test reports. This includes the following variations:

- 1.0 – 1.5 mm steel frames, back-filled with gypsum plaster, cement or mortar, or factory filled with gypsum plasterboard strips and thin Palusol strips.
- 1.0 mm steel frames, filled with mineral wool

Conclusions

Timber doorsets as discussed in this report should be capable of providing 30 integrity and insulation (where appropriate, depending on choice of glazing and door frame) performance if subjected to a test in accordance with BS EN 1634-1: 2000.

Examples of door constructions covered by this assessment (and the previous assessment referenced WF 161952) are given in the Appendix to this report.

This assessment represents our opinion as to the performance likely to be demonstrated on a test in accordance with BS EN 1634-1: 2008, on the basis of the evidence referred to above. We express no opinion as to whether that evidence, and/or this assessment, would be regarded by any Building Control authority as sufficient for that or any other purpose. This assessment is provided to the client for its own purposes and we cannot opine on whether it will be accepted by Building Control authorities or any other third parties for any purpose.

Review

It has been confirmed by Theuma doors & frames that there have been no changes to the material specification of the construction considered in the original appraisal referenced WF Assessment Report No. 333237, issued 19th September 2015.

The data used for the original appraisal has been re-examined and found to be satisfactory. The procedures adopted for the original assessment have also been re-examined and are similar to those currently in use.

Therefore, with respect to the assessment of performance given in WF Assessment Report No. 333237 Issue 3, the contents should remain valid for a further 5 years.

This review is based on information used to formulate the original assessment. No other information or data has been provided by Theuma doors & frames which could affect this review.

The original appraisal report was performed in accordance with the principles of the UK Fire Test Study Group Resolution 82: 2001. This review has therefore also been conducted using the principles of Resolution 82: 2001.

Validity

This assessment is issued on the basis of test data and information available at the time of issue. If contradictory evidence becomes available to Exova Warringtonfire the assessment will be unconditionally withdrawn and Theuma doors & frames 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 13th September 2023, 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.

Declaration by Theuma doors & frames

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

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

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

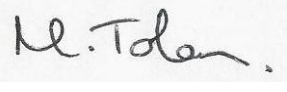
We are not aware of any information that could adversely affect the conclusions of this assessment.


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

Signed:

For and on behalf of:

Signatories


Responsible Officer (Issue 4)
M. Tolan* - Certification Engineer


Approved (Issue 4)
R. Anning* - Principal Certification Engineer

* For and on behalf of Exova Warringtonfire.

Report Issued: 19 th September 2013
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Issue No:2	Re-Issue Date: 24 th September 2013
Revised By: F. Paap	Approved By: D. Forshaw
Reason for Revision: Correction of typographic errors	

Issue No:3	Re-Issue Date: 13 th September 2018
Revised By: M. Tolan	Approved By: A. Kearns
Reason for Revision: Report reviewed and revalidated.	

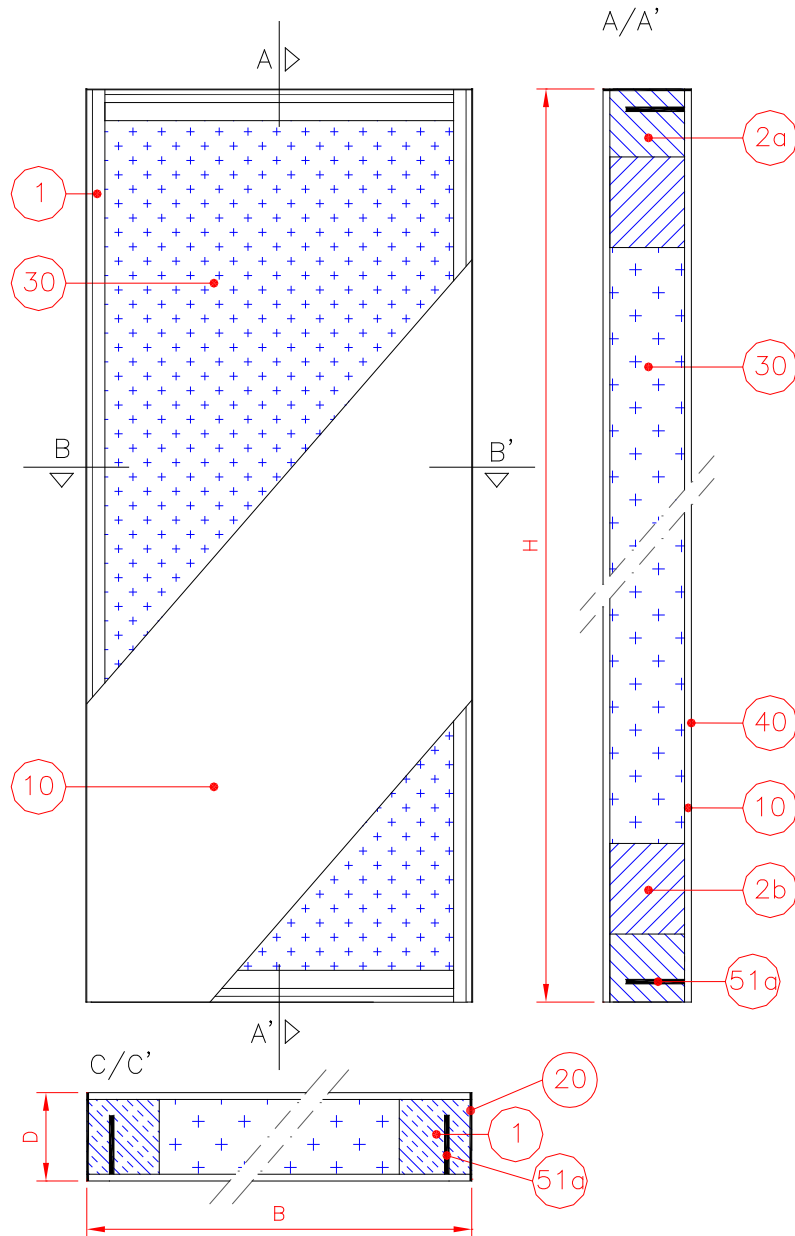
Issue No:4	Re-Issue Date: 24 th September 2018
Revised By: M. Tolan	Approved By: R. Anning
Reason for Revision: Revised detail provided by the client for Figure 1	

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

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Appendix

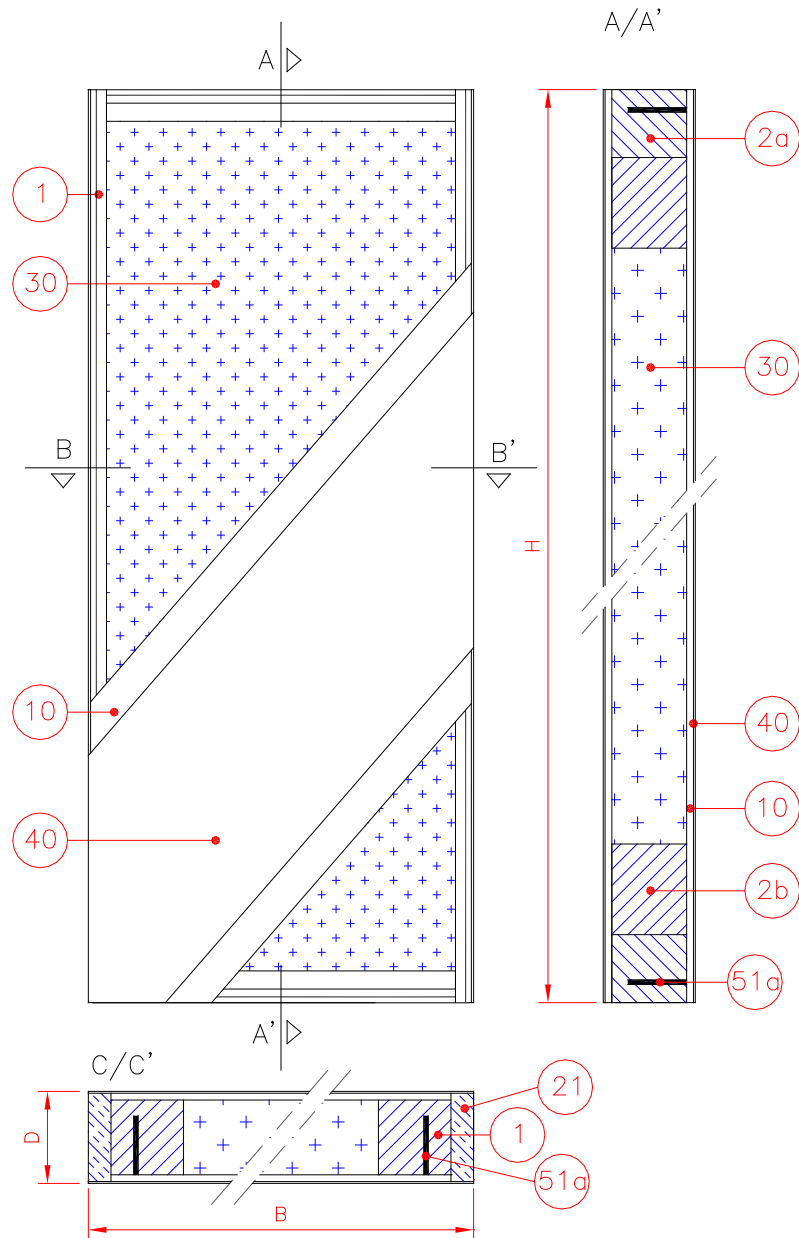
Flush door, EBC lacquered, fire rated 30 min type CK



B	Door width	
H	Door height	
D	Door thickness	~ 40 mm
1	Frame stile	~ 35 x 33 mm redwood
2a	Frame rail	~ 32x 33 mm pine
2b	Frame rail	~ 40x 33 mm pine
10	Top sheet	Thickness 3mm
20	Edge banding	

30	core	Solid core
40	top	EBC lacquered
51a	Palusol	26x2mm

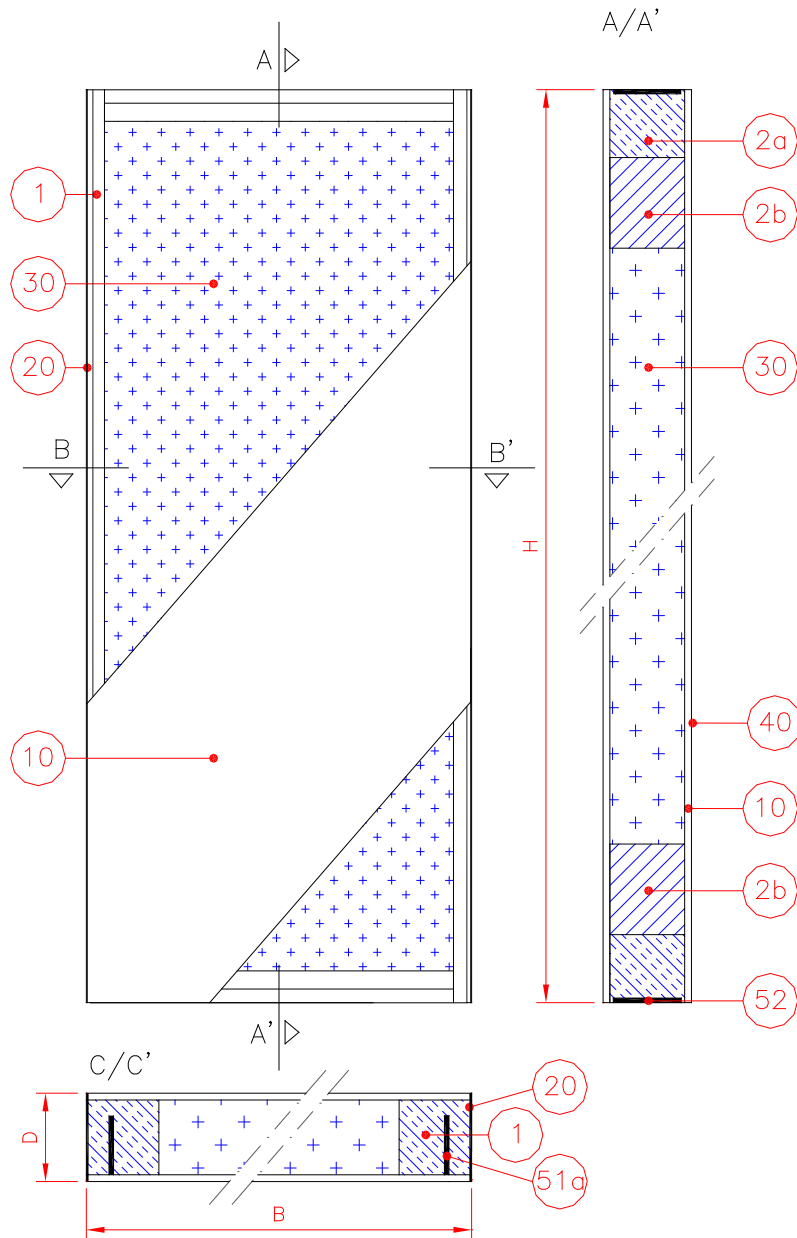
Flush door, HPL with lippings, fire rated 30 min type CK



B	Door width	
H	Door height	
D	Door thickness	~ 40 mm
1	Frame stile	~ 35 x 33 mm pine
2a	Frame rail	~ 32x 33 mm pine
2b	Frame rail	~ 40x 33 mm pine
10	Top sheet	Thickness 3mm
21	lip	Hardwood

30	core	Solid core
40	HPL	
51a	Palusol	26x2 mm

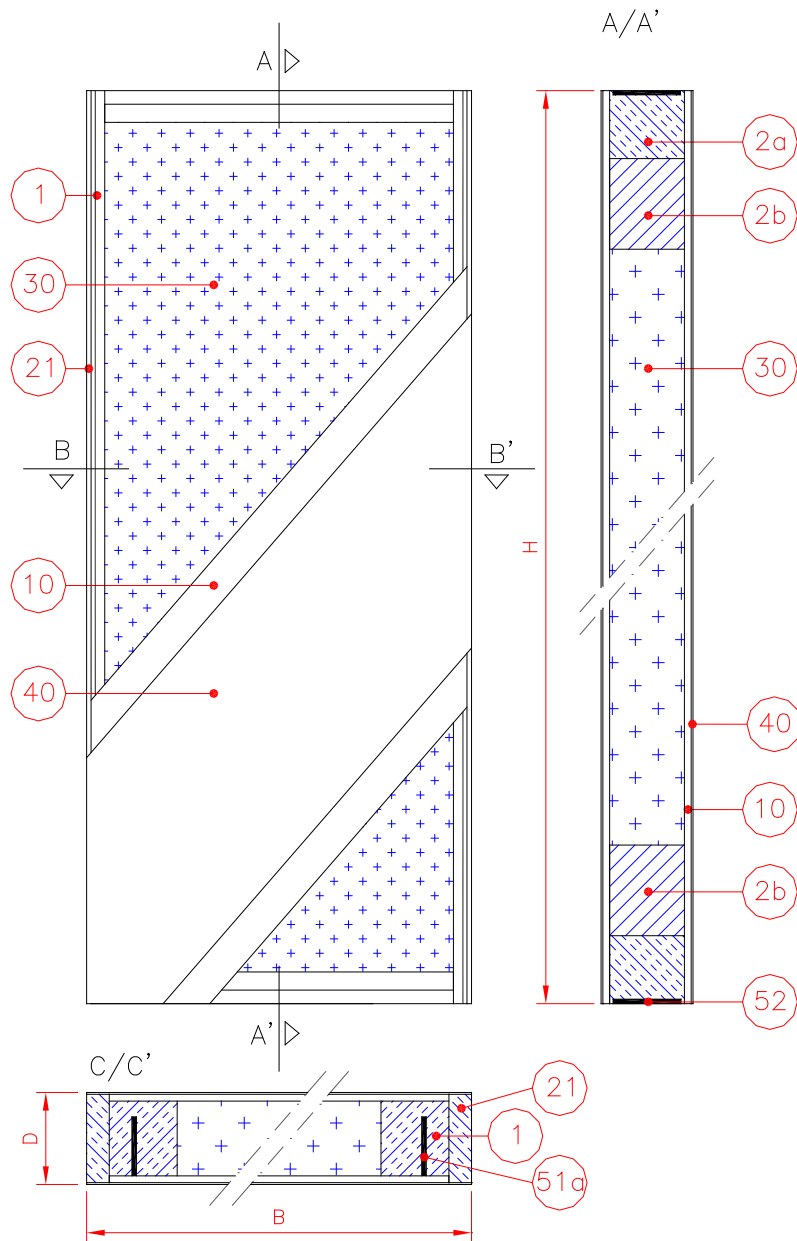
Flush door, EBC lacquered, fire rated 30 min type CA



B	Door width	
H	Door height	
D	Door thickness	~ 40 mm
1	Frame stile	~ 35 x 33 mm redwood
2a	Frame rail	~ 32x 33 mm redwood
2b	Frame rail	~ 40x 33 mm pine
10	Top sheet	Thickness 3mm
20	Edge banding	

30	core	Solid core
40	top	EBC lacquered
51a	palusol	26x2mm
52	graphite	30x2 mm

Flush door, HPL with lipping, fire rated 30 min type CA



B	Door width	
H	Door height	
D	Door thickness	~ 40 mm
1	Frame stile	~ 35 x 33 mm redwood
2a	Frame rail	~ 32x 33 mm redwood
2b	Frame rail	~ 40x 33 mm pine
10	Top sheet	Thickness 3mm
21	lipping	hardwood

30	core	Solid core
40	Top sheet	HPL
51a	palusol	26x2mm
52	graphite	30x2 mm