

Exova Warringtonfire  
Holmesfield Road  
Warrington  
WA1 2DS  
United Kingdom

T : +44 (0) 1925 655 116  
F : +44 (0) 1925 655 419  
E : warrington@exova.com  
W: www.exova.com



Testing. Advising. Assuring.

**Title:**

The Fire Resistance Performance of a Single-Acting, Single-Leaf modified Doorset Referenced X285, if Tested in Accordance with BS 476: Part 22: 1987

**WF Assessment Report No.**

389688B

**Prepared for:**

**CHEMOLLI S.A.S. di Eros  
Chemolli & C.**

Via Fitta, 1 - 38062 – Arco  
(TN), Italy

**Date:** 20<sup>th</sup> October 2017

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## Executive Summary

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<b>Objective</b>	This report presents an appraisal of the fire resistance performance of a modified single-acting, single-leaf doorset referenced X285 , if subjected to a fire resistance test in accordance with Clause 6 of BS 476: Part 22: 1987.
<b>Sponsor</b>	<b>CHEMOLLI S.A.S. di Eros Chemolli &amp; C.</b>
<b>Address</b>	Via Fitta, 1 - 38062 – Arco (TN), Italy
<b>Summary of Conclusions</b>	It can be concluded that the proposed modified doorset should be capable of providing at least 30 minutes integrity and insulation performance, if subjected to a fire resistance test in accordance with Clause 6 of BS 476: Part 22: 1987, from each direction separately.
<b>Valid until</b>	21 <sup>st</sup> October 2022

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## Introduction

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This report presents an appraisal of the fire resistance performance of a modified single-acting; single-leaf doorset referenced X285.

The doorset is required to provide at least 30 minutes integrity and insulation performance, if subjected to a fire resistance test in accordance with Clause 6 of BS 476: Part 22: 1987, from each direction separately.

### FTSG

The data referred to in the supporting data section has been considered for the purpose of this appraisal which has been prepared in accordance with the Fire Test Study Group Resolution No. 82: 2001.

## Assumptions

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### General Construction

It is assumed that the general construction of the doorset and the materials used in the construction will, unless specifically detailed in this report, be identical to those of the tested assembly. The doorset shall also be constructed in a similar manner, with regards to the attachment of various parts.

### Supporting Construction

It is assumed that the doorset shall be fixed to a masonry or reinforced concrete supporting construction which is capable of maintaining adequate support for the required period of 30 minutes.

### Door Gaps

It is assumed that the door leaf to frame clearance gaps shall not exceed those of the previously fire tested assembly.

### Installation

It is assumed that the doorset will be installed by competent installers in a similar manner to that used when installing the fire tested assembly.

## Proposals

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The test referenced RINA0116FR was performed in accordance with UNI EN 1634-1: 2014, on two specimens of the proposed single-acting, single-leaf doorset referenced X285, one opening towards and other opening away from the heating conditions of the test.

It is proposed that the tested X285 doorset is assessed to provide increased leaf dimensions of up to 2768 mm high (at 1024 mm wide) or 1177 mm wide (at 2407 mm high) subject to a maximum leaf area of 2.83m<sup>2</sup> with a reduced 30 minutes integrity and insulation performance criteria in accordance with Clause 6 of BS 476: Part 22: 1987

It is further proposed that the assessed doorset will include an arched head and face fixed mirrors to the closing face to provide 30 minutes integrity and insulation performance criteria in accordance with Clause 6 of BS 476: Part 22: 1987.

Details of the proposed 30 minutes doorset as previously discussed are included within Annex A

## Basic Test Evidence

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### RINA0116FR

A fire resistance test in accordance with UNI EN 1634-1 on two specimens of a single-acting, single-leaf doorset referenced X285, one inward opening and one outward opening.

The doorsets were of identical specification and both had overall nominal dimensions of 2450 mm high by 1100 mm wide, with a door leaf having dimensions of 2407 mm high by 1024 mm by 70 mm thick.

Both the inward opening and outward opening doorsets satisfied the integrity and insulation ( $I_1$ ) performance criteria for a period of 69 minutes at which time the test was discontinued without failure.

## Assessed Performance

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The previous fire test was performed in accordance with EN 1634-1. Testing experience has demonstrated that this represents a more arduous test compared with BS 476: Part 22: 1987.

### Heating Conditions

Although the two test methods specify a near identical temperature/time heating curve, the furnace thermocouples specified by the EN test method are less responsive to temperature rise compared with those specified for a test to BS 476: Part 22: 1987. The consequence of this is that it is necessary for the furnace to be worked harder for a test to EN 1634-1 in order to maintain the specified furnace temperature, particularly during the early stages of the test due to the required rapid temperature increase.

### Furnace Pressure

EN 1634-1 requires the neutral pressure axis within the furnace to be maintained at a height of 500 mm above the threshold of the doorset. For a test in accordance with BS 476 the neutral pressure axis is specified at a height of 1000 mm. Based a furnace pressure gradient of 8.5 Pa per metre height (as assumed by both test methods), the pressure across the upper edge of a doorset for a test in accordance with EN 1634-1 would therefore be nominally 4.25 Pa greater than for the same test performed in accordance with BS 476: Part 22: 1987.

### Performance Criteria

The integrity performance criteria of both test methods are near identical, both requiring the specimen to be evaluated for sustained flaming and for impermeability using the 'cotton pad' and the 6 mm and 25 mm gap gauges.

The insulation performance criteria specified for  $I_1$  within EN 1634-1 imposes a limitation on the mean temperature rise of the door leaf of 140°C. Any individual temperature rise recorded on the door leaf or frame must not exceed 180°C. The same temperature rise limitations are imposed by BS 476: Part 22: 1987.

For the  $I_1$  performance criteria specified within EN 1634-1, the thermocouples shall be placed no closer than 25 mm to the edge of the door leaf. Under BS 476: Part 22: 1987, this distance is increased to 50 mm.

Although the temperature rise requirements of the two standards are therefore identical, the option for the thermocouples to be positioned in closer to proximity to the edge of the door leaf results in a potential reduction in the period of insulation performance under EN 1634-1, compared with BS 476: Part 22: 1987.

### Summary of Comparison

The two test methods are very similar in most respects but differences in the furnace instrumentation, the specified furnace pressure and different surface thermocouple positioning requirements result in a more onerous testing regime under EN 1634-1.

The previously tested doorset would therefore be expected to provide at least 30 minutes integrity and insulation performance if subjected to a fire test in accordance with Clause 6 of BS 476: Part 22: 1987, from each direction separately.

### Leaf Sizes

The doorset tested under the reference RINA0116FR incorporated two specimens of a single-acting, single-leaf doorset referenced X285, one inward opening and one outward opening.

Each leaf had dimensions of 2407 mm high by 1024 mm wide by 70 mm thick and both demonstrated their ability to provide 69 minutes integrity and insulation performance in accordance with UNI EN 1634-1

It is proposed that the maximum leaf dimensions may be increased, to 2768 mm high (at 1024 mm wide) or 1177 mm wide (at 2407 mm high), subject to a maximum area of 2.83 m<sup>2</sup> for an integrity period of 30 minutes.

The doorsets tested under reference RINA0116FR achieved 69 minutes integrity and insulation performance when tested in accordance with UNI EN 1634-1. This represents an overrun for the required 30 minutes of 130 %.

The distortion data recorded at 30 minutes noted a maximum overall distortion of 6 mm measured at point 'B' located at the top lock edge corner of the inward opening door leaf.

Taking into account both the overrun and the distortion data in accordance with the PFPF rules we can permit an increase in leaf width, leaf height and leaf area as follows:

2768 mm high (at 1024 mm wide) or 1177 mm wide (at 2407 mm high), subject to a maximum area of 2.83 m<sup>2</sup>

### Arched head

The proposed door leaf design incorporates an arched head detail utilising 170 mm radii to the top hang and lock edge corners as shown below:

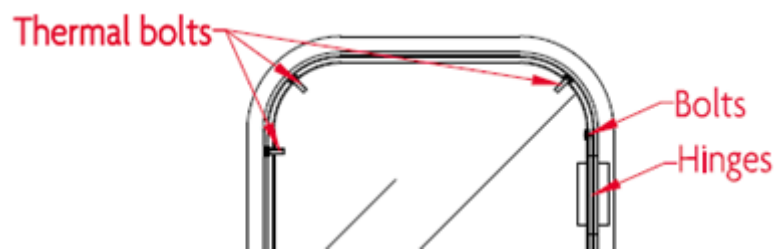


The arched head arrangement may experience greater fire induced distortions / deflections which can lead to a loss of impermeability between the leaf and frame.

The use of the proposed 4No rails to the top edge of the door leaf in lieu of the previously tested 2No rails would be expected to result in a more dimensionally stable door leaf, which would be expected to experience smaller deflections / distortions during the required 30 minutes test period.

Smaller deflections are considered beneficial since the vulnerable leaf / frame gaps will be less prone to detrimental erosion if they remain more stable.

Furthermore a Chemolli Firebolt A2 thermal bolt has been included to each arched detail as shown below:



It is therefore considered that the arched head arrangement to the X285 door leaf when modified as previously discussed would not be deleterious to the required 30 minutes integrity and insulation performance in accordance with BS 476: Part 22 and on this basis is positively appraised.

## Mirror

It is further proposed that the modified X285 door leaf as previously discussed may be provided with the addition of a decorative mirror without detracting from the fire resistance performance for a period of 30 minutes.

The proposal requires that a 6 mm thick mirror is bonded to the closing face of the door leaf with contact adhesive.

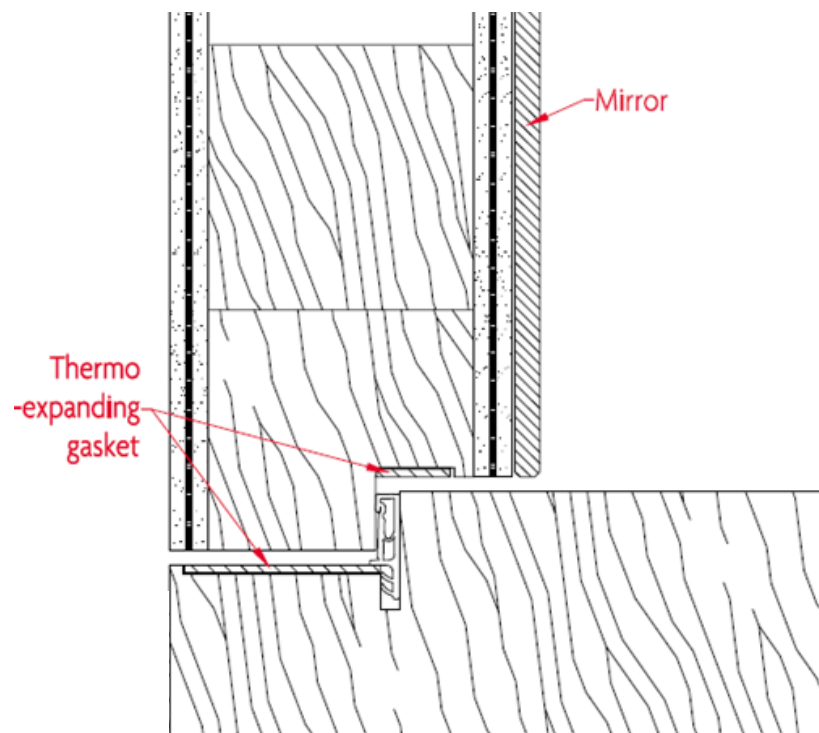
The mirror will not extend beyond the closing face of the door leaf or return over the leaf edges, so will not interfere with the activation of effectiveness of the intumescent seals at the perimeter of the door leaf.

Should the fire exposed face of the door leaf include the proposed 6 mm thick mirror it would initially inhibit the ignition of the door leaf face. Whilst this is only likely to occur for a few minutes, in doing so the charring of the exposed face of the door leaf will be delayed. The facing will eventually detach from the leaf and provide no further benefit after that time.

As the mirror is bonded only to the door leaf it will eventually detach from the leaf itself and provide no further benefit after such time.

Should the unexposed face of the door leaf include the proposed 6 mm thick mirror it would be expected to provide additional stiffness to the door leaf providing greater dimensional stability and resistance to bowing during exposure to fire.

It is therefore considered that the inclusion of the mirror as previously discussed when positioned as shown below would not be deleterious to the required 30 minutes integrity and insulation performance required in accordance with BS 476: Part 22 and on this basis is positively appraised.



## Conclusion

It can be concluded that the proposed modified X285 doorset should be capable of providing at least 30 minutes integrity and insulation performance, if subjected to a fire resistance test in accordance with Clause 6 of BS 476: Part 22: 1987, from each direction separately.



## Validity

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This assessment is issued on the basis of test data and information available at the time of issue. If contradictory evidence becomes available to Exova Warringtonfire the assessment will be unconditionally withdrawn and **CHEMOLLI S.A.S. di Eros Chemolli & C.** 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 21<sup>st</sup> October 2022, after which time it is recommended that it be returned for re-appraisal.

The appraisal is only valid provided that no other modifications are made to the tested construction other than those described in this report.

## Summary of Primary Supporting Data

### RINA0116FR

A fire resistance test in accordance with UNI EN 1634-1 on two specimens of a single-acting, single-leaf doorset referenced X285, one inward opening and one outward opening.

The doorset had overall nominal dimensions of 2450 mm high by 1100 mm wide, with a door leaf having dimensions of 2407 mm high by 1024 mm by 70 mm thick.

The door leaf briefly comprised a 54 mm thick S2.54 Chemolli panel of 650 kg/m<sup>3</sup> nominal density surrounded by Oak stiles and rails of 760 kg/m<sup>3</sup> nominal density with facings to both sides comprising a central layer of 1 mm thick aluminium with a density of 2700 kg/m<sup>3</sup> sandwiched between 2No. layers of 3.5 mm thick MDF with a density of 800 kg/m<sup>3</sup>. The door leaf was hung within a door frame comprising Oak sections. Intumescent seals referenced Promaseal LFCSK 15 x 1.8 mm were included within the assembly. The door leaf included four Chemolli Firebolt A1, three Chemolli Firebolt A2 and two Chemolli Firebolt A5 thermally activated bolts.

<b>Test Results:</b>		<b>Doorset A</b>	<b>Doorset B</b>
<b>Integrity</b>	Sustained flaming	69 minutes*	69 minutes*
	Gap gauge	69 minutes*	69 minutes*
	Cotton Pad	69 minutes*	69 minutes*
<b>Insulation</b>	(I <sub>1</sub> )	69 minutes*	69 minutes*
	(I <sub>2</sub> )	69 minutes*	69 minutes*

\*The test was stopped at 69 minutes without failure to Doorset A or Doorset B

Test date : 25<sup>th</sup> September 2015

Test sponsor : Chemolli Fire

## Declaration by CHEMOLLI S.A.S. di Eros Chemolli & C.

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

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

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

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


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


Signed:

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For and on behalf of:  
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## Signatories

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Responsible Officer
M Tolan* - Certification Engineer

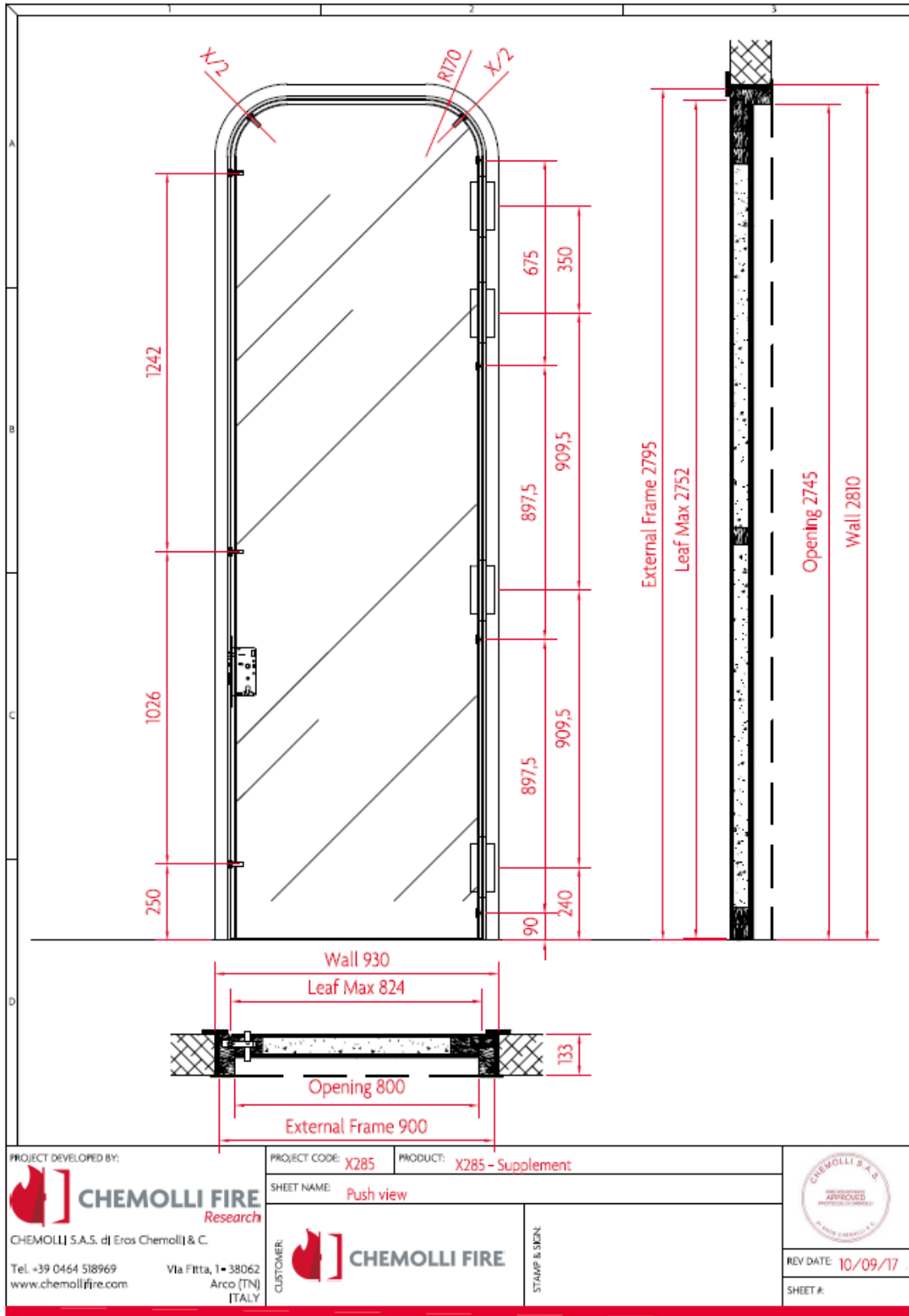

Approved
A Kearns * - Technical Manager

\* For and on behalf of Exova Warringtonfire.

Report Issued: 20 <sup>th</sup> October 2017
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## Annex A



PROJECT DEVELOPED BY:



**CHEMOLLI FIRE**  
Research

CHEMOLLI S.A.S. di Eros Chemolli & C.

Tel. +39 0464 518969  
www.chemollifire.com

Via Fitta, 1 - 38062  
Arco (TN)  
ITALY

PROJECT CODE: X285

PRODUCT: X285 - Supplement

SHEET NAME: Push view

CUSTOMER:



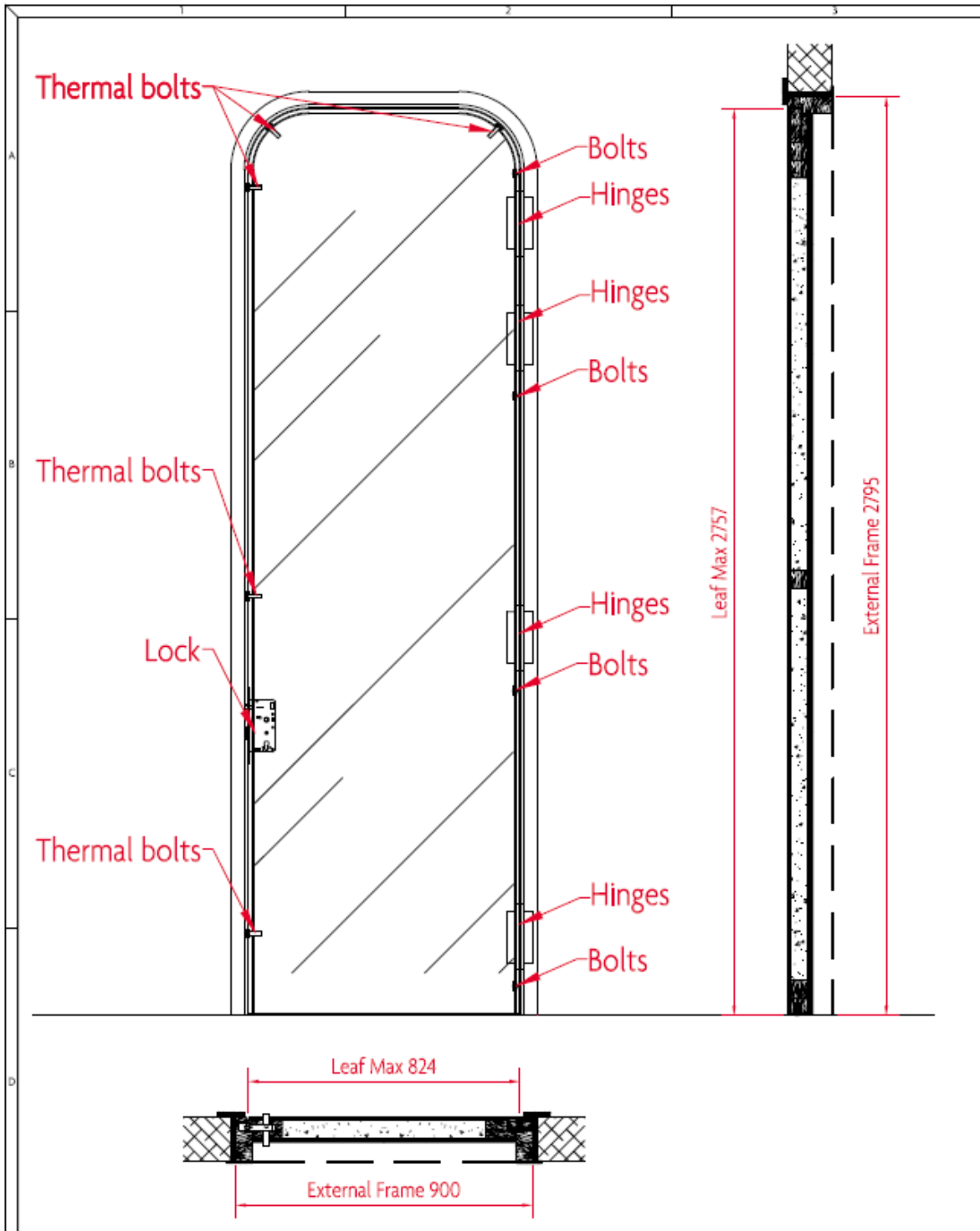
**CHEMOLLI FIRE**




STAMP & SIGN



REV DATE: 10/09/17

SHEET #:

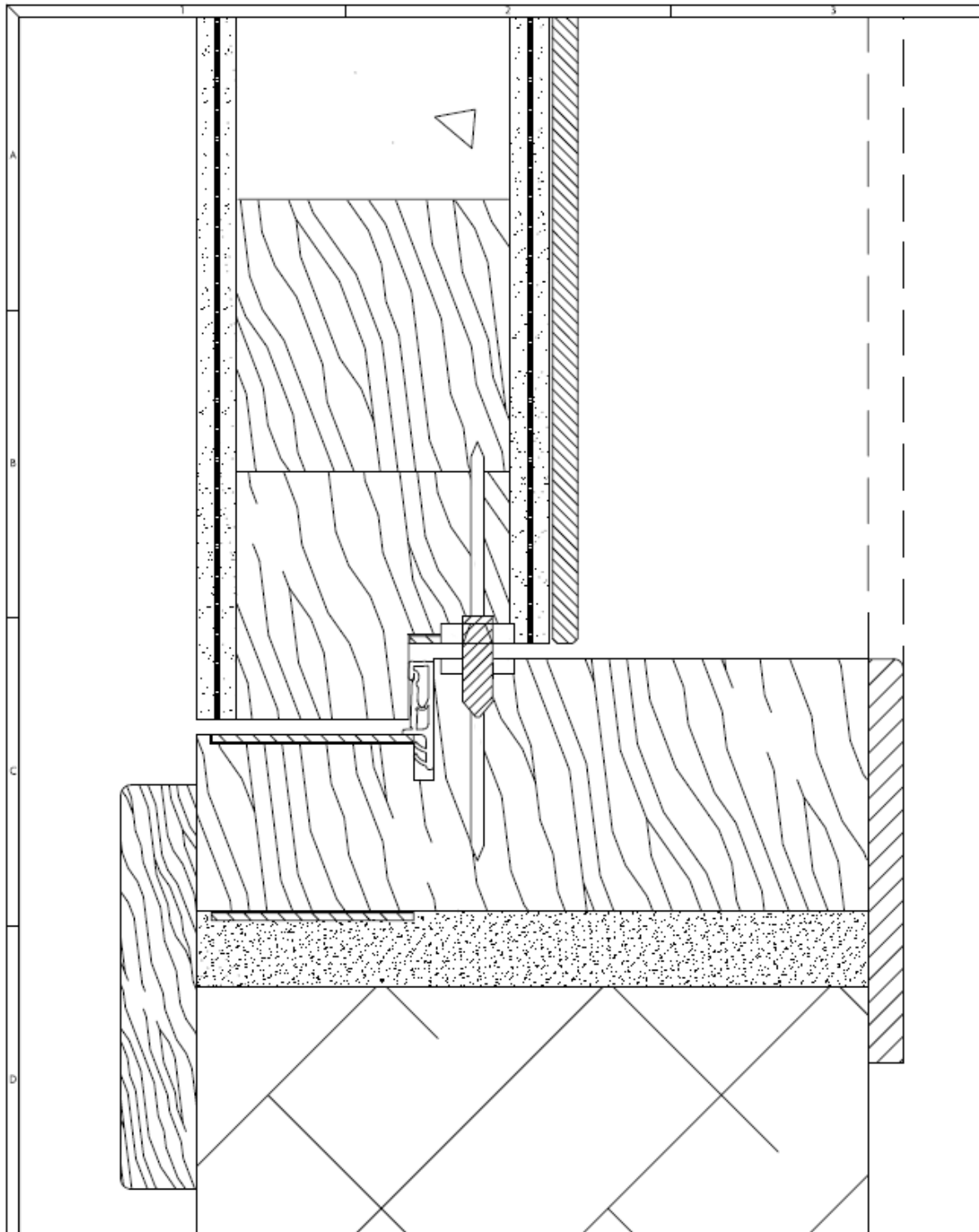


PROJECT DEVELOPED BY:  <b>CHEMOLLI FIRE</b> Research CHEMOLLI S.A.S. di Eros Chemolli & C. Tel. +39 0464 518969    Via Fitta, 1 - 38062 Arco (TN) ITALY www.chemollifire.com	PROJECT CODE: X285    PRODUCT: X285 - Supplement	 APPROVED PROJECTS TO DRAW
	SHEET NAME: Push view	
CUSTOMER:  <b>CHEMOLLI FIRE</b>	STAMP & SIGN:	

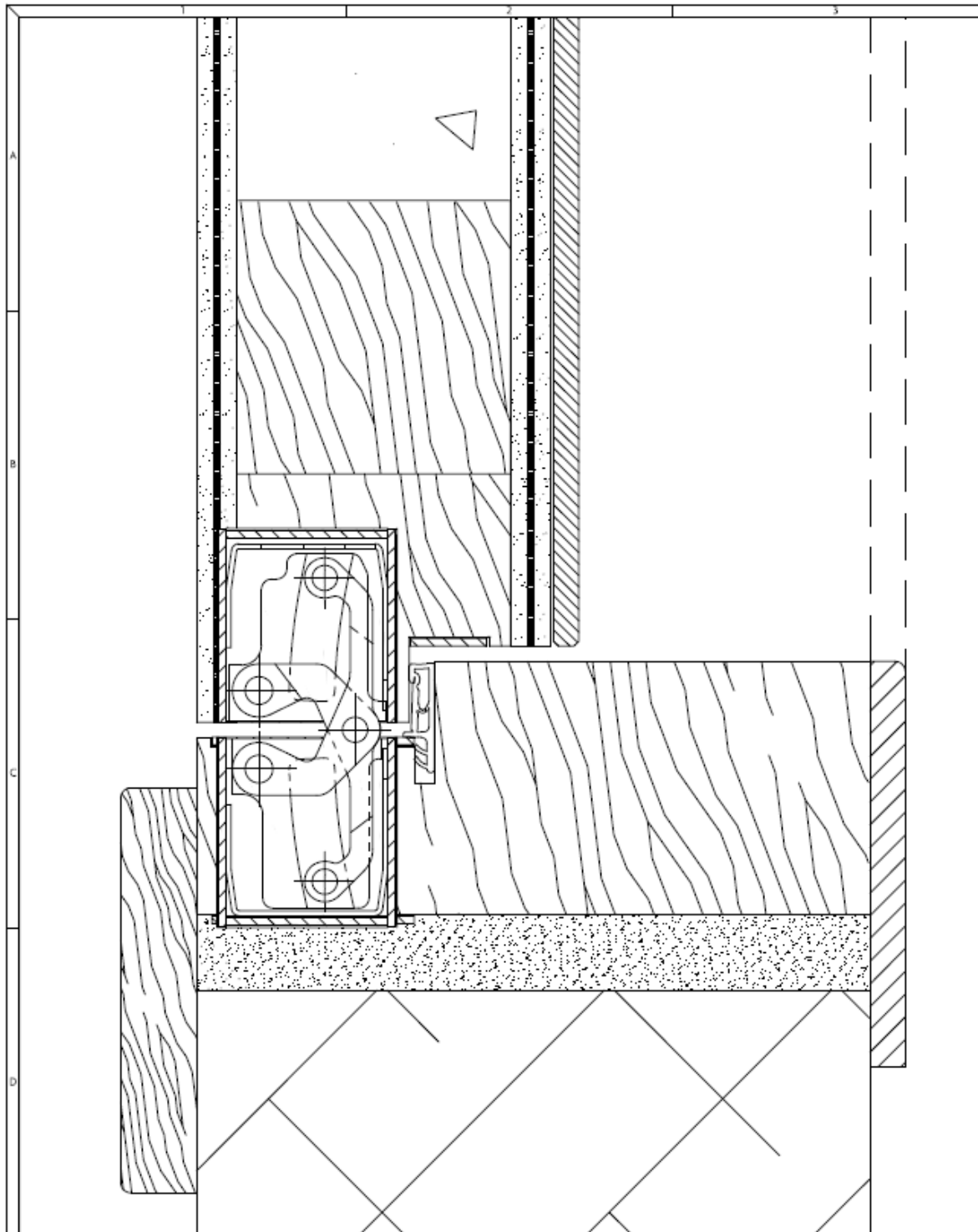







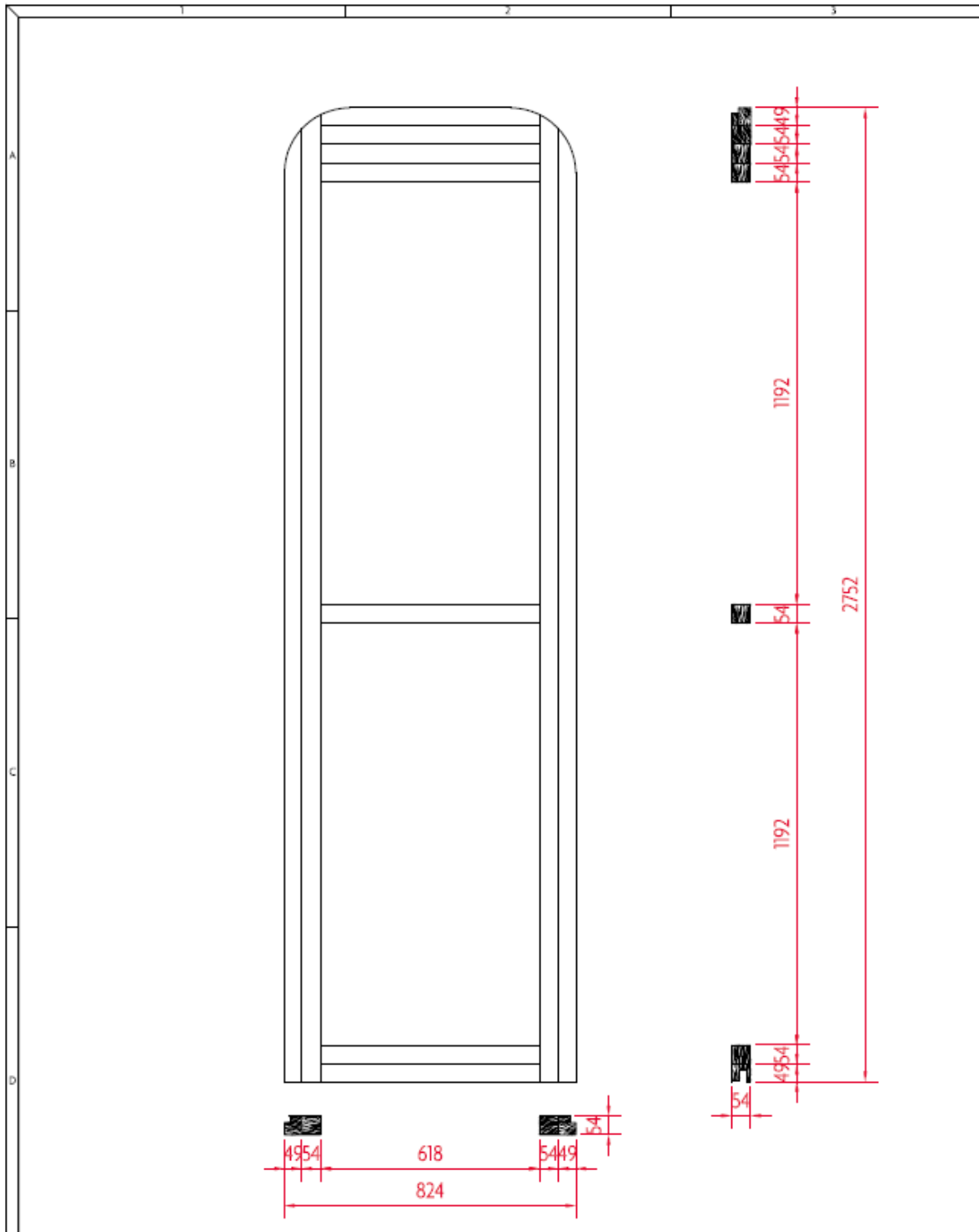







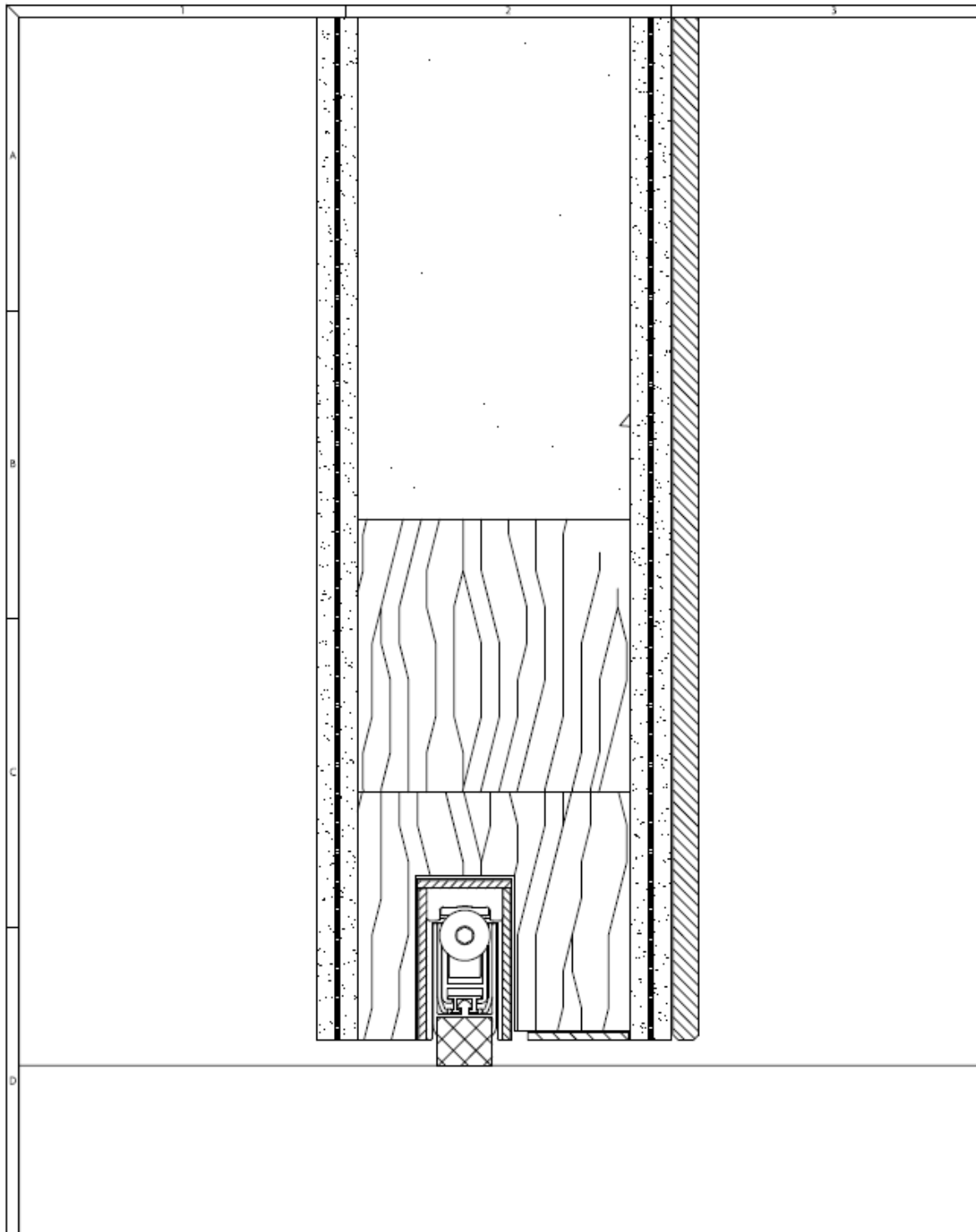
PROJECT DEVELOPED BY:		PROJECT CODE: X285	PRODUCT: X285 - Supplement
 <b>CHEMOLLI FIRE</b> Research		SHEET NAME: Chemolli-Firebolt A1	
CHEMOLLI S.A.S. di Eros Chemolli & C. Tel. +39 0464 518969 www.chemollifire.com		CUSTOMER:  <b>CHEMOLLI FIRE</b>	STAMP & SIGN.
Via Fitta, 1 • 38062 Arco (TN) ITALY		CHEMOLLI S.A.S. INGEGNERI APPROVATI PER IL CONTROLLO QUALITÀ E PER LE VERIFICHE REV DATE: 10/09/17 SHEET #:	



PROJECT DEVELOPED BY:  <b>CHEMOLLI FIRE</b> Research CHEMOLLI S.A.S. di Eros Chemolli & C. Tel. +39 0464 518969 www.chemollifire.com		PROJECT CODE: <b>X285</b> PRODUCT: <b>X285 - Supplement</b>	 REV DATE: <b>10/09/17</b> SHEET #:
CUSTOMER:  <b>CHEMOLLI FIRE</b> Via Fitta, 1 • 38062 Arco (TN) ITALY	SHEET NAME: <b>Hinge</b>	STAMP & SIGN:	



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Tel. +39 0464 518969 www.chemollifire.com		Via Fitta, 1 • 38062 Arco (TN) ITALY	
SHEET NAME: Internal structure		STAMP & SIGN	
		REV DATE: 10/09/17	
SHEET #:		SHEET #:	



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	<b>SHEET NAME:</b> Drop down seal	<b>CUSTOMER:</b>  <b>CHEMOLLI FIRE</b>	
<b>Via Fitta, 1 • 38062 Arco (TN) ITALY</b>			<b>SHEET #:</b>