

Title:

The Air Leakage Performance
of Timber Doorsets fitted with
NOR710 Series Smoke Seals in
Accordance with BS 476: Part
31, Section 31.1: 1983

**WF Assessment Report
No:**

196984 Issue 4

Prepared for:

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Executive Summary

Objective	This report provides an appraisal of the expected air leakage performance of timber doorsets when fitted with a smoke seal arrangement comprising several variants of NOR710 series smoke seals, if it were to be tested in accordance with BS 476: Part 31, Section 31.1: 1983.
Report Sponsor	Norseal Limited
Address	Norseal House 5 Regents Drive Prudhoe Northumberland, NE42 6PX
Summary of Conclusions	It can be concluded that the air leakage of the timber doorsets incorporating the NOR710 smoke seal variants in the arrangement as described within this report, should not exceed 3 m ³ /m/h when tested in accordance with BS 476: Part 31, Section 31.1: 1983, when subjected to a pressure of 25 Pa from either direction.
Valid until	1 st February 2023

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Introduction

This report provides an appraisal of the expected air leakage performance of timber doorsets when fitted with a smoke seal arrangement comprising several variants of NOR710 series smoke seals, if it were to be tested in accordance with BS 476: Part 31, Section 31.1: 1983.

Guidance with respect to the performance of fire doors required to resist the passage of smoke at ambient temperature conditions is given in Amendment 6160, October 1993 to BS 5588: Parts 2, 3, 6 and 10: 1983.

'A fire door required to resist the passage of smoke at ambient temperature conditions should, when tested in accordance with BS 476: Section 31.1 with the threshold taped and subjected to a pressure of 25 Pa, have a leakage not exceeding 3 m³/m/h. The threshold gap should be sealed by a seal either with a leakage rate not exceeding 3 m³/m/h at 25 Pa or just contacting the floor.'

In the absence of other criteria, this guidance has been adopted in reporting the previous test results and also for the purposes of this appraisal.

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

It is assumed that the design and specification of the smoke seals will be identical to those detailed in this report or tested within WF Report No. 175378 issue 3.

It is assumed that the doorsets and seals will be installed by competent installers.

This report considers only the air leakage performance of the doorsets (with regards to the performance of the smoke seals). The report shall not be used to demonstrate the fire performance of the proposed doorsets when incorporating the proposed seals. It is assumed that separate suitable test evidence and approval relating to the fire resistance performance of the doorset has been obtained. Additionally, it is assumed that the door leaves are themselves impermeable to smoke. Durability of the seal used in the proposed configuration is not considered within this report.

It is assumed that the clearance gaps (leaf to frame gaps) of the proposed doorsets shall be no greater than tested for the smoke seals considered in this report.

Doors may be latched or unlatched but it is assumed that the doorset which incorporates the seals is fully closed such that the stop mounted NOR710 seals are fully compressed along both frame jambs and along the frame head. A door closer must be fitted to the door of sufficient strength/power to fully close the door, overcoming any latch fitted, such that full compression of the seals is enabled.

Proposals

It is proposed that the timber doors when fitted with a specific configuration of NOR710 smoke seal, fitted to the landing face of the doorstep, shall satisfy the aforementioned guidance with respect to having an air leakage not exceeding 3 m³/m/h. It is also proposed that the 'back blade' of the NOR710 seal may be removed for the stop mounted application. In this stop face mounted configuration it is proposed that the leaf to frame clearance gap may be up to 5 mm.

It is proposed that for the standard, as tested, (i.e. reveal mounted application) that the leaf to frame gap may be up to 4 mm.

Details of the proposed door seal configuration and positions are detailed with this report.

Primary Test Evidence

WR Report No. 175378 issue 3

To evaluate the performance of a specimen of a single-acting, single-leaf, doorset when fitted with a smoke seal within the door frame jambs, head and threshold, and subjected to a test utilising the test method detailed within BS 476: Part 31, Section 31.1: 1983.

The doorframe was fitted with smoke seals referenced 'NOR710' which was Self adhered and continuous along the rebate of the door frame jambs and head and a drop down threshold seal referenced 'NOR810'. The specimen also included a Dorma Door Controls Ltd door closer, referenced 'TS73V'. Full details of the exact manner of installation are included in the Schedule of Components.

Guidance with respect to the performance of fire doors required to resist the passage of smoke at ambient temperature conditions is given in Amendment 6160, October 1993 to BS 5588: Parts 2, 3, 6 and 10: 1983:

'A fire door required to resist the passage of smoke at ambient temperature conditions should, when tested in accordance with BS 476: Section 31.1 with the threshold taped/sealed and subjected to a pressure of 25 Pa, have a leakage not exceeding 3 m³/m/h. The threshold gap should be sealed by a seal either with a leakage rate not exceeding 3 m³/m/h at 25 Pa or just contacting the floor.'

The recorded leakage at 25Pa did not exceed 0.5m³/m/h (either pre or post cycling) and therefore was deemed to comply with the requirements.

CF629

A CERTIFIRE approval relating to the smoke leakage performance of NOR710 seals. The approval certifies that the above seals are suitable for use with single-acting door assemblies required to restrict smoke leakage at ambient temperatures as defined in Appendix B of Approved Document B, 'Fire Safety' to the Building Regulations 1991. It is applicable to latched and unlatched, single leaf and double leaf assemblies consisting of timber faced and edged leaves with timber, cellulosic or mineral cores in timber frames with or without intumescent edge seals. It is only applicable to assemblies that have been approved, or have been shown by test, to achieve the required period of fire resistance.

Assessed Performance

The proposed seal is CERTIFIRE approved for smoke sealing applications under the CERTIFIRE Certificate reference CF629.

CERTIFIRE approval of products represents a higher level of attestation and quality control than simple type testing and the CERTIFIRE approval of the seals is awarded on the basis of:

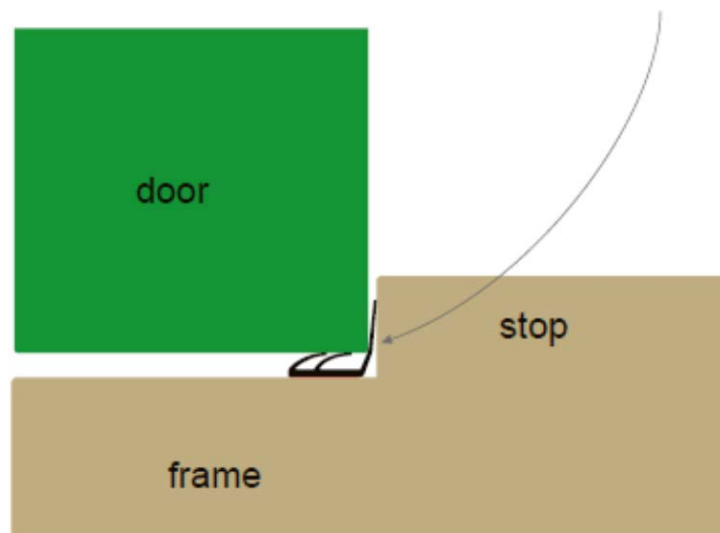
- A design appraisal against TS35 and TS21
- Initial type testing
- Manufacturing frequency checks
- Ageing and durability tests
- Evidence of technical support
- Clear and unambiguous labelling of seals
- Production surveillance under ISO 9001: 2000
- Ongoing audit tests in accordance with TS35

Based on the high level of attestation and approval, the smoke leakage performance of doorsets incorporating any the specified seal, when fitted in a 'standard' manner would therefore not be in doubt.

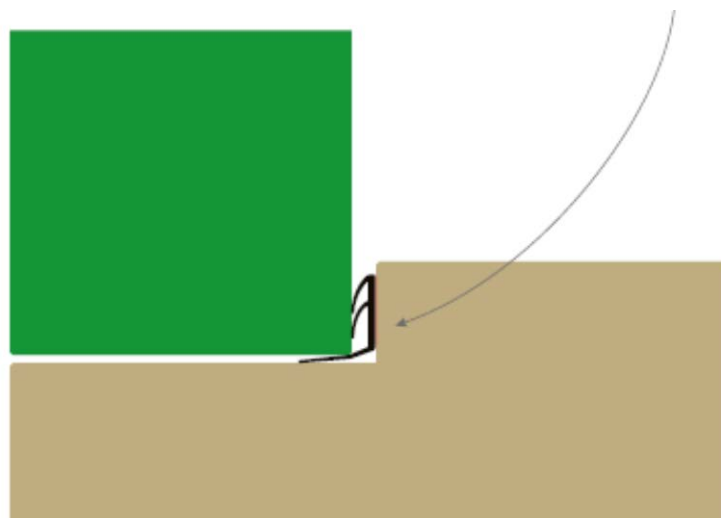
However, due to the non-standard installation of the seals, consideration needs to be given to their combined ability to contribute to the doorsets smoke leakage performance.

The following details show the proposed arrangement.

'Tested'
NOR710 Seal
Orientation and
Fitment



'Proposed'
NOR710 Seal
Orientation and
Fitment



The proposal requires repositioning the seal from being adhered to the frame reveal to being adhered to the landing face of the stop.

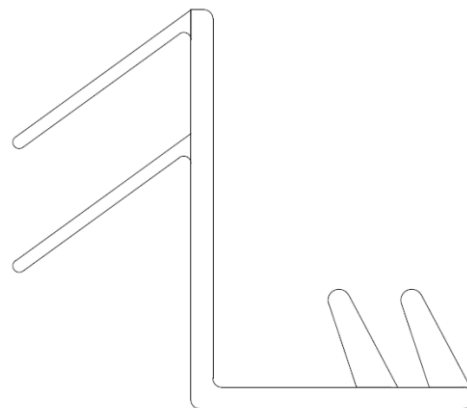
In the standard tested and approved fitment orientation, the NOR710 seal is fitted the face of the frame reveal such that the door leaf 'swipes' across the seal blades. Smoke sealing in this orientation is provided by the effectiveness of the 'air tightness' between the tips of the blades and the door leaf edge. As such the door leaf to frame gap size is critical to the correct functioning of the seal. The tested average leaf to frame gap dimension was 3.5 mm. the proposal requires that the gap dimension, in the 'standard' tested reveal fixed orientation to be an **absolute maximum** of 4 mm. In view of the achieved performance of the seal (with the recorded leakage *significantly* below the failure limit), the fact that at 4 mm the seal will still contact the lipped edge of the leaf and also the fact that the back blade will continue to offer a level of seal regardless of leaf to frame gap, this proposed maximum gap is positively appraised.

The proposed orientation changes the action of the seal from a 'swiping' seal to a compressed seal – with the blades of the seal being compressed between the face of the door leaf and the landing face of the stop. A seal in compression, which does not rely on the dimension of the leaf to frame gap being exactly as specified, could be expected to perform at least as well as, if not better, than an identical seal which is installed in a swiping orientation. The fact that the performance of the proposed compressed seal does not rely on the accuracy of the leaf/frame gap adds confidence in the proposal. For this reason, and for the stop mounted 'compression' configuration only, it is considered acceptable to allow a leaf to frame gap of up to 5 mm.

The seal in the standard swiping orientation performed during test such that the recorded leakage was significantly less than the 'failure' limit. The compressed seal would potentially reduce the expected leakage further which adds confidence to the proposal.

**No Back Blade
Seal Option (Stop
Mounted,
Compression
Action ONLY) –
NOR710STOP**

It is proposed that the NOR710 seal may be provided without the integral back blade feature. The particular seal specification, referenced NOR710STOP will be used for stop mounted fitment only (i.e. with the twin blades being compressed between the leaf face and stop – and not the swiping action mounted option). This option will be a rout-in design as detailed below:



The omission of the back blade does not affect the compression of the remaining twin 'flaps'. It has already been discussed that the use of the seal in compression is expected to be better than the tested configuration where the seal was of a 'swiping' type. The achieved performance of the swiping blade and the fact that the recorded leakage was significantly less than that allowed provides confidence in this proposed design change.

It is therefore expected that the rate of leakage for the doorsets with the sealing specification and options discussed in this report should be less than 3 m³/m/h when subjected to a pressure of 25 Pa from either direction.

**Frame Mounted
and Stop
Mounted Variants
– NOR710FR,
NOR710SR and
NORL710SR
Variants**

It is proposed that the NOR710FR (frame mounted), NOR710SR (stop mounted) and NORL710SR (large stop mounted) seals variants may be utilised. These referenced seals are detailed below:



NOR710FR



NOR710SR



NORL710SR

The proposed seals are all basically variants of the seals already discussed in this report – the main difference being the inclusion of a 'kerf' to fit within a routed groove within the frame or stop (depending on mounting variant). The interface of the twin flaps and back blades remains identical to the variant tested and already assessed, and so it is expected that the smoke leakage performance of these variants will remain less than 3 m³/m/h when subjected to a pressure of 25 Pa from either direction.

Conclusions

It can be concluded that the air leakage of the timber doorsets incorporating the NOR710 smoke seal variants in the arrangement as described within this report, should not exceed 3 m³/m/h when tested in accordance with BS 476: Part 31, Section 31.1: 1983, when subjected to a pressure of 25 Pa from either direction.

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 **warringtonfire** the assessment will be unconditionally withdrawn and **Norseal Limited** 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 1st February 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.

Summary of Primary Supporting Data

WF Report No. 175378 issue 3

To evaluate the performance of a specimen of a single-acting, single-leaf, doorset when fitted with a smoke seal within the door frame jambs, head and threshold, and subjected to a test utilising the test method detailed within BS 476: Part 31, Section 31.1: 1983.

Guidance with respect to the performance of fire doors required to resist the passage of smoke at ambient temperature conditions is given in Amendment 6160, October 1993 to BS 5588: Parts 2, 3, 6 and 10: 1983:

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In the absence of other criteria, this guidance has been adopted in reporting the results of this test. The leakage rates at other pressures are also included in this report.

The specimen doorset had overall nominal dimensions of 2096 mm high by 1037 mm wide and incorporated a door leaf of overall dimensions 2043 mm high by 940 mm wide by 46 mm thick. The doorset was fixed within a plywood faced, timber studded partition, to form the test construction.

The doorframe was fitted with smoke seals referenced 'NOR710' which was Self adhered and continuous along the rebate of the door frame jambs and head and a drop down threshold seal referenced 'NOR810'. The specimen also included a Dorma Door Controls Ltd door closer, referenced 'TS73V'. Full details of the exact manner of installation are included in the Schedule of Components.

In accordance with the CERTIFIRE Technical Schedule TS21 the assembly was initially tested utilising the method detailed within BS 476: Part 31, Section 31.1: 1983 and then subjected to 100,000 opening and closing cycles. On completion of the cycling the assembly was again evaluated by test to the method detailed within BS 476: Part 31, Section 31.1: 1983.

Test Results:

Condition	Leakage Rate at + 25 Pa (m ³ /m/h)	Leakage Rate at - 25 Pa (m ³ /m/h)
Pre-cycled threshold taped	0.38	0.39
Pre-cycled drop down threshold seal engaged	0.47	0.46
Post-cycled drop down threshold seal	0.50	0.46

Test dates : Pre-cycle 28th July and post-cycle 4th August 2008

Test sponsor : Norsound Limited

CF629

A CERTIFIRE approval relating to the smoke leakage performance of NOR710 seals. The approval certifies that the above seals are suitable for use with single-acting door assemblies required to restrict smoke leakage at ambient temperatures as defined in Appendix B of Approved Document B, 'Fire Safety' to the Building Regulations 1991. It is applicable to latched and unlatched, single leaf and double leaf assemblies consisting of timber faced and edged leaves with timber, cellulosic or mineral cores in timber frames with or without intumescent edge seals. It is only applicable to assemblies that have been approved, or have been shown by test, to achieve the required period of fire resistance.

Declaration by Norseal Limited

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 **warringtonfire** to withdraw the assessment.

Signed:

For and on behalf of:

Signatories



Responsible Officer

A Kearns* - Technical Manager



Approved

D Hankinson* - Principal Certification Engineer

* For and on behalf of **warringtonfire**

Report Issued: 17th September 2010

Issue 2 (17th December 2010) – change to design, gap dimensions and positioning of seal

Issue 3 (11th January 2018) – addition of seal variants

Issue 4 (3rd April 2020) – correction to latching arrangement in assumptions

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

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