

**WFRC Assessment Report  
No. 139271  
The Fire Resistance Performance  
of Linear Gap Sealing Systems With  
Respect to BS 476: Part 20: 1987**

Report for

**Soudal NV**

**Everdongenlaan 18-20  
B-2300 Turnhout  
Belgium**

***W*arrington  
**FIRE**  
*research***

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## Executive Summary

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| <b>Objective</b>              | This report presents an appraisal of the fire resistance performance of linear gap sealing systems which have been previously subjected to a fire resistance test in accordance with the French requirement of 'l'arrêté du 3 août 1999'.  |
| <b>Report Sponsor</b>         | Soudal NV  |
| <b>Address</b>                | Everdongenlaan 18-20<br>B-2300 Turnhout<br>Belgium   |
| <b>Summary of Conclusions</b> | It can be concluded that the previously fire tested linear gap sealing systems would be expected to provide the integrity and insulation performances tabulated within this report, if subjected to a fire resistance test utilising the general principles of BS 476: Part 20: 1987 in conjunction with additional guidelines from prEN 1366-4. |
| <b>Valid until</b>            | 1 <sup>st</sup> May 2009   |

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## Introduction

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This report presents an appraisal of the fire resistance performance of linear gap sealing systems which have been previously subjected to a fire resistance test in accordance with the French requirement of 'l'arrêté du 3 août 1999'.

### 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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### Supporting Construction/ Installation

It is assumed that the proposed gap seals will be fitted within vertical separating elements of similar construction to those tested, using a similar method of installation.

### Seal Specification

It is also assumed that all materials used will be identical to those of the previously tested specimens, other than where specified in this report.

## Proposals

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It is proposed that based upon the proven performance of the sealing systems previously fire tested under the reference RS03-007/A, the sealing systems listed in Table 1 of this report will provide the stated fire performances, if subjected to a fire resistance test utilising the general principles of BS 476: Part 20: 1987 in conjunction with additional guidelines from prEN 1366-4.

## Basic Test Evidence

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The report referenced RS03-007/A relates to a fire resistance test performed in accordance with 'l'arrêté du 3 août 1999' on eleven linear gap sealing systems.

The test construction comprised a concrete wall which incorporated eleven linear gaps of 2500 mm height. The thickness of the wall construction was staggered such that six of the gaps were of 150 mm depth and five of the gaps were of 200 mm depth. The gaps were primed prior to installation of the seals and then sealed on both faces of the wall using a polyurethane backing rod and Firecyl FR, Firesilicone B1 FR or Soudaseal FR. Full details of the tested seals are provided in Table 1 of this report.

The individual performance of each of the tested seals shall be considered within this report.

## Assessed Performance

|                                      |   |
|--------------------------------------|---|
| <b>BS 476: Part 20: 1987</b>         | <p>There is not, as yet, any specified British Standard fire test method for evaluating gap seals which are designed to act as an effective barrier to the penetration of fire and to reinstate the necessary fire resistance performance of a separating element. However, the fire resistance of walls and floors is determined by tests utilising the general principles given in BS 476: Part 20: 1987, and for this reason Warrington Fire Research Centre has historically used the principles of that Standard to evaluate the performance of gap sealing systems. Some additional guidelines are adopted from the draft European document referenced prEN 1366-4, relating to the testing of these types of sealing systems.</p>  |
| <b>Comparison of Test Procedures</b> | <p>In order to evaluate the likely performance of the specimens if they were subjected to a test utilising the principles of BS 476: Part 20: 1987 (and guidelines from prEN 1366-4), it is necessary to provide a comparison between the critical aspects of these test methods and the French test method specified within 'l'arrêté du 3 août 1999'.</p>   |
| <b>Heating Regime</b>                | <p>The furnace temperature/time curves and allowable percentage tolerances specified by the French and British standards are similar and allow for a close correlation. Similar positional requirements also apply for the furnace temperature measurement equipment used in both test methods.</p>   |
| <b>Pressure Conditions</b>           | <p>During the test referenced RS03-007/A the specimens were subjected to a maximum positive pressure within the furnace chamber of <math>20 \text{ Pa} \pm 5 \text{ Pa}</math> relative to the laboratory atmosphere.</p> <p>The draft European document prEN 1366-4 which, in the absence of any defined pressure conditions for such elements within BS 476: Part 20: 1987 is used as a basis for the control of the furnace atmospheric conditions, requires a pressure of <math>15 \pm 2 \text{ Pa}</math> to be maintained at the mid-height of the seal. Given that this test method only requires a seal height of 900 mm, the maximum pressure to which such a specimen would normally be subjected is calculated to be in the region of <math>19 \text{ Pa} \pm 2 \text{ Pa}</math>.</p> <p>For the purposes of this appraisal the furnace atmospheric pressure requirements of the French test method are therefore considered to be comparable with those of the British Standard.</p> |

**Installation** The previously tested specimens had an overall height of 2500 mm compared with a height of 900 mm which is required by the guidelines adopted from prEN 1366-4. Although the length of seal is not considered to be too critical to the fire performance, the gap width and depth being of greater significance, due to a pressure gradient within the furnace, a seal of greater height will allow for a greater pressure differential along the specimen which could arguably provide slightly more onerous conditions.

**Performance Criteria** The relevant performance criteria specified by both standards require the specimens to act as effective barriers to the passage of flame, hot gases and excessive heat transfer viz integrity and insulation.

The criteria of performance for the two test methods with respect to integrity and insulation are judged using similar principles, which may be summarised as follows:

**Integrity**

- a) Collapse.
- b) Cotton pad test.
- c) Gap formation.
- d) Sustained flaming on the unexposed face.

**Insulation**

- a) The mean unexposed face temperature rise is not to exceed 140°C above its initial value.
- b) The maximum unexposed face temperature rise not to exceed 180°C above the initial mean unexposed face value.

In addition, for the French test method loss of insulation performance can also be determined by the ignition of hot gases passing through the construction, by a pilot flame.

**Fire Performance Previously Tested Specimens** A brief specification of the tested specimens is provided within Table 1 of this report. This report should, however, only be used in conjunction with the report referenced RS03-007/A which provides full details of the tested specimens.

**Specimen A** Observations contained within the test report referenced RS03-007/A indicate that the integrity performance requirements were satisfied for a period of 332 minutes after which time a gap in excess of the maximum size permissible was observed. Cotton pad tests were performed on regular basis after a period of 207 minutes. The maximum temperature requirements were satisfied for a period of 270 minutes after which time a temperature rise in excess of 180°C was recorded on the unexposed face.

The maximum fire performance which would normally be required for any fire resistance application is 240 minutes and on this basis the proposed sealing system may be appraised for 240 minutes integrity and insulation performance, this being a conservative evaluation based upon the results achieved.

**Specimen B**

Observations contained within the test report referenced RS03-007/A indicate that the integrity performance requirements were satisfied for the test duration of 360 minutes. The maximum temperature requirements were satisfied for a period of 267 minutes after which time all thermocouples had detached from the unexposed face which did not permit any further evaluation against this criteria.

The proposed sealing system may therefore be appraised for 240 minutes integrity and insulation performance, this being a conservative evaluation based upon the results achieved.

**Specimen C**

The integrity performance requirements were satisfied by this specimen for the test duration of 360 minutes. The maximum temperature requirements were satisfied for a period of 180 minutes after which time all thermocouples had detached from the unexposed face which did not permit any further evaluation against this criteria. The maximum temperature recorded after this period was, however, well within the maximum permissible by the Standard.

The proposed sealing system may therefore be appraised for 240 minutes integrity and 180 minutes insulation performance, this being a conservative evaluation based upon the results achieved.

**Specimen D**

The integrity performance requirements were satisfied by this specimen for the test duration of 360 minutes. The maximum temperature requirements were satisfied for a period of 251 minutes after which time a temperature rise in excess of 180°C was recorded on the unexposed face.

The proposed sealing system may therefore be appraised for 240 minutes integrity and insulation performance, this being a conservative evaluation based upon the results achieved.

**Specimen E**

The integrity performance requirements were satisfied by this specimen for a period of 298 minutes after which time ignition of a cotton pad occurred when applied to the unexposed face. The maximum temperature requirements were satisfied for a period of 192 minutes after which time all thermocouples had detached from the unexposed face which did not permit any further evaluation against this criteria.

The proposed sealing system may therefore be appraised for 240 minutes integrity and 180 minutes insulation performance, this being a conservative evaluation based upon the results achieved.

**Specimen F**

The integrity performance requirements were satisfied by this specimen for a period of 360 minutes after which time ignition of a cotton pad occurred when applied to the unexposed face. The maximum temperature requirements were satisfied for a period of 284 minutes after which time all thermocouples had detached from the unexposed face which did not permit any further evaluation against this criteria.

The proposed sealing system may therefore be appraised for 240 minutes integrity and insulation performance, this being a conservative evaluation based upon the results achieved.

**Specimen G**

The integrity and insulation performance requirements were satisfied by this specimen for the test duration of 360 minutes.

The proposed sealing system may therefore be appraised for 240 minutes integrity and insulation performance, this being a conservative evaluation based upon the results achieved.

**Specimen H**

The integrity performance requirements were satisfied by this specimen for a period of 360 minutes after which time ignition of a cotton pad occurred when applied to the unexposed face. The maximum temperature requirements were satisfied for a period of 180 minutes after which time the thermocouples had started to detach from the unexposed face which did not permit any further evaluation against this criteria.

The proposed sealing system may therefore be appraised for 240 minutes integrity and 180 minutes insulation performance, this being a conservative evaluation based upon the results achieved.

**Specimens I, J  
and K**

The integrity and insulation performance requirements were satisfied by these specimens for the test duration of 360 minutes.

The proposed sealing systems may therefore be appraised for 240 minutes integrity and insulation performance, this being a conservative evaluation based upon the results achieved.

**Conclusions**

It is expected that the sealing systems listed in Table 1 of this report will provide the stated fire performance if subjected to a fire resistance test utilising the general principles of BS 476: Part 20: 1987 in conjunction with additional guidelines from prEN 1366-4.

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## 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 Warrington Fire Research Centre the assessment will be unconditionally withdrawn and Soudal NV 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 May 2009, 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.

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## Summary of Primary Supporting Data

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### RS03-007/A

A fire resistance test performed in accordance with 'l'arrêté du 3 août 1999' on eleven linear gap sealing systems.

The test construction comprised a concrete wall which incorporated eleven linear gaps of 2500 mm height. The thickness of the wall construction was staggered such that six of the gaps were of 150 mm depth and five of the gaps were of 200 mm depth. The gaps were primed prior to installation of the seals and then sealed on both faces of the wall using a polyurethane backing rod and either Firecryn FR, Firesilicone B1 FR or Soudaseal FR.

Test date : 14th March 2003

Test sponsor : Soudal NV

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## Declaration by Soudal NV

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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.

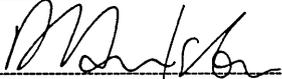
If we subsequently become aware of any such information we agree to cease using the assessment and ask Warrington Fire Research Centre to withdraw the assessment.

Signed:

\_\_\_\_\_  
For and on behalf of:

\_\_\_\_\_

## Signatories

|   |
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|  |
| Responsible Officer   |
| D Hankinson* - Technical Consultant   |

|   |
|---|
|  |
| Approved  |
| C Johnson* - Technical Officer  |

\* For and on behalf of Warrington Fire Research Centre.

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| Report Issued: 29 <sup>th</sup> April 2004 |
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The assessment report is not valid unless it incorporates the declaration duly signed by the applicant.

Table 1: Description of tested seals and required fire performances with respect to BS 476: Part 20: 1987

| Test Ref. | Sealant Ref.       | Seal Width | Seal Depth | PU backing | Wall Thickness | Primer           | Integrity (minutes) | Insulation (minutes) |
|-----------|--------------------|------------|------------|------------|----------------|------------------|---------------------|----------------------|
| A         | Soudaseal FR       | 30         | 30         | Ø50        | 150            | Primer 150       | 240                 | 240                  |
| B         | Soudaseal FR       | 10         | 10         | Ø30        | 150            | Primer 150       | 240                 | 240                  |
| C         | Firesilicone B1 FR | 30         | 30         | Ø50        | 150            | Primer 150       | 240                 | 180                  |
| D         | Firesilicone B1 FR | 10         | 10         | Ø30        | 150            | Primer 150       | 240                 | 240                  |
| E         | Firecryl FR        | 20         | 20         | Ø40        | 150            | Firecryl primer* | 240                 | 180                  |
| F         | Firecryl FR        | 10         | 10         | Ø30        | 150            | Firecryl primer* | 240                 | 240                  |
| G         | Soudaseal FR       | 10         | 10         | Ø30        | 200            | Primer 150       | 240                 | 240                  |
| H         | Firesilicone B1 FR | 30         | 30         | Ø50        | 200            | Primer 150       | 240                 | 180                  |
| I         | Firesilicone B1 FR | 10         | 10         | Ø30        | 200            | Primer 150       | 240                 | 240                  |
| J         | Firecryl FR        | 20         | 20         | Ø40        | 200            | Firecryl primer* | 240                 | 240                  |
| K         | Firecryl FR        | 10         | 10         | Ø30        | 200            | Firecryl primer* | 240                 | 240                  |

All Seals applied flush with both faces of wall construction. All dimensions in mm.  
\*Firecryl Primer comprises a mixture of 20% Firecryl FR and 80% Water