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Determination of smoke control leakage of a two fire dampers type "SC60-COSMO" manufactured by RF-Technologies NV

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1. GENERAL

1.1 REPORT

This report describes the construction method, test conditions and results obtained when the specific construction element described herein was tested. Any significant deviation regarding dimensions, construction details, loads, stresses, edge or end conditions is not covered by this report.

1.2 SUBJECT

Test of two fire damper of type SC60-COSMO manufactured by RF-Technologies NV.

1.3 INVESTIGATION

The valves are tested with a pressure differential of 300 Pa across the valves. This is achieved by connecting a volume flow station to the valves. With this volume flow station, the possible leakage through the valves is also measured.

This leakage is measured at Sa (ambient) and at S200 (medium temperature). The pressure of the smoke box was regulated based on EN 1634-3+C1:2007.

The construction was tested for the criteria Leakage (S).

1.4 SPONSOR AND MANUFACTURER

Table 1.1: Spo	nsor and manufacturer
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Sponsor and manufacturer of fire damper	Rf-Technologies NV
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1.5 LOCATION AND DATE REGARDING THE EXAMINATION

The research was conducted at the laboratory of Efectis Nederland BV in Bleiswijk, the Netherlands.

Table 1.2: Date of the examinat

Assembly-of the test specimen	27 th of March 2023
Smoke control test	28 th of March 2023





1.6 APPLIED STANDARDS

Table 1.3: references

European standard	Part
EN 1363-1:2020	Fire resistance tests – Part 1: General requirements
EN 1634-3:2004 + C1:2007	Fire resistance tests for door and shutter assemblies - Part 3: Smoke control doors and shutters
Egolf position paper	006-2019
EN 1366-2:2015	Fire resistance tests for service installations - Part 2: Fire dampers
NEN 6075: 2020	Determination of the resistance to smoke movement between spaces

2. TEST SPECIMEN

2.1 GENERAL

For the dimensions and specifications of the materials and components of the examined construction, also see the figures in chapter 8. Details of the assembly of the construction are given in the paragraphs below.

2.2 TEST SPECIMEN

The test specimens were two fire dampers of type SC60-COSMO with a fusible link manufactured by Rf-Technologies NV and mounted into an associated supporting construction.

2.2.1 Test Frame

The test frame was constructed of hollow steel profiles with an aperture of $3.4 \times 3.4 \text{ m}$ (w x h) and an insertion width of 100 mm.

2.2.2 Supporting Construction

The test specimen was built into an associated supporting construction, being an 18 mm plywood partition.

Table 2.1: Specifications su	pporting construction
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Specifications standard associated flexible supporting construction	
Overall dimensions	3600 x 3600 x 100 mm (w x h x t)
Aperture	800 x 800 mm (w x h)
Material	Steel and plywood
Number of layers plywood	One layer of 18 mm plywood
Fixing	Galvanized board screws 4 x 40 mm





2.2.3 Fire dampers



2.2.4 Connecting ducts

Specifications	
Manufacturer	Lindab
Material	Steel
Dimensions	400 x 1.5 mm (l x t), ø 200 mm





2.2.5 Fusible link

Specifications	
Manufacturer	Rf-Technologies NV
Туре	SC-D203
Product name	Connecting plate
Material	Brass
Dimensions	0.3 mm thickness
Location	On the unexposed side
Function	To release (and close) damper in case of fire
Fixing	Clicked into the connecting profile

2.2.6 Location operating mechanism

The operating mechanisms of both fire dampers were located on the exposed side.

2.3 METHOD OF ASSEMBLY

The method of assembly was as follows:

- Mounting the flexible wall;
- Positioning the dampers;
- Filling the gaps between dampers and wall.

3. ASSEMBLY AND MANUFACTURING OF THE CONSTRUCTION

Table 3.1: Assembly and manufacturing of the construction

Efectis Nederland BV	Test frame and support construction
Rf-Technologies NV	Producing and mounting of fire damper

4. RESEARCH METHOD

4.1 VERIFICATION OF THE SPECIMEN

The materials and components used were inspected during assembly on the basis of the supplied drawings and data. Efectis Nederland BV was not involved in the selection or sampling of the materials.



4.2 CONDITIONING OF TEST SPECIMEN

4.2.1 Conditioning

From the moment of assembly until the smoke control test the specimen was stored in the laboratory of Efectis Nederland BV under the following conditions.

Table 4.1: Laboratory conditions during conditioning

Conditions during conditioning	
Ambient temperature:	20 ± 5°C
Relative humidity:	50 ± 10 %

4.3 LEAKAGE TEST

4.3.1 Determination of leakage of connecting duct and measuring station (System leakage)

In accordance with EN 1366-2 prior to the smoke control test the leakage of the connecting ducts and measuring system at 300 Pa was measured.

- The (system) leakage for fire damper (A) type SC60-COSMO was 0.1 m³/h at 300 Pa.

4.3.2 Determination of leakage at ambient temperature (Cold leakage test)

To meet the S classification this test was carried out prior to the smoke control test.

- The (cold) leakage for fire damper (B) type SC60-COSMO was 0.2 m³/h at 300 Pa;

4.4 MEASUREMENTS

4.4.1 Laboratory conditions

During the smoke control test, the test conditions in the laboratory were as given below.

Table 4.2: Laboratory conditions during smoke control test

Laboratory conditions		
Ambient temperature:	10 - 40°C	
Relative humidity:	50 ± 10 %	

4.4.2 Heating curve

The temperature of the smoke control box followed the heating curve as described in 1634 3:2004 + C1:2007. The temperatures inside the smoke control box during the test are given in appendix A.

4.4.3 Pressure

The pressure of the plenums during the test are given in appendix A.

4.4.4 Leakage

During the smoke control test the leakage measured and registered. The leakage of the dampers A and B are given in appendix A.

4.4.5 Pressure measuring station

The pressure in the measuring station for damper A and B are given in appendix A





5. RESULTS OF THE SMOKE CONTROLE TEST

5.1 OBSERVATIONS DURING HEATING

Table 5.1: Observations during the smoke control test

Observations	Observations	
The numbers	refer to the time and position of the observation	
Time (min)	Observations	
0	Start of heating	
25:04	Damper A closed at 190 °C	
25:57	Damper B closed at 190 °C	
45	End of heating after consulting with client	





5.2 CLOSING TIME DAMPERS

Fire damper A closed 25:57 minutes after the start of the test and fire damper B after 25:04 minutes.

5.3 PHOTOGRAPHS

Photographs taken during the smoke control test and after the smoke control test are shown in appendix B.

5.4 UNCERTAINTY OF MEASUREMENT

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

6. SUMMARY OF THE TEST RESULTS

6.1 SUMMARY OF TESTED SPECIMEN

The smoke control was determined of two fire dampers of type SC60-COSMO with a fusible link manufactured by Rf-Technologies NV and mounted into an associated supporting construction.

6.2 SUMMARY OF TEST RESULTS

6.2.1 Performances

Table 6.1: Performances backdraft damper A

Performances	Criteria	Time (completed minute)	Result
Leakage at medium temperature	Maximum leakage rate measured at medium temperature \leq 200 m ³ / (h m ²)	24.5	4.8 m³/ (h m²)

Table 6.2: Performances backdraft damper B

Performances	Criteria	Time (completed minute)	Result
Leakage at medium temperature	kage at headium herature Maximum leakage rate measured at medium temperature ≤ 200 m ³ / (h m ²)		2.1 m³/ (h m²)

Table 6.3: Performances fire damper A

Performances	Criteria	Time (completed minute)	Result
Leakage at medium temperature	Maximum leakage rate measured at medium temperature \leq 200 m ³ / (h m ²)	45	2.2 m³/ (h m²)





Table 6.4: Performances fire damper B

Performances	Criteria	Time (completed minute)	Result
Leakage at medium temperature	Maximum leakage rate measured at medium temperature \leq 200 m ³ / (h m ²)	45	0.5 m³/ (h m²)

After a heating period of 24.5 minutes both backdraft dampers deformed caused by medium temperature air flow. Within two minutes the fire dampers were activated.

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7. DRAWINGS



Figure 1: Test setup







- 1. Tunnel in steel
- Two semi-circular blades
 Intumescent strip around the tunel
 Rubber sealing ring
 Fusible link 72°

- 6. 2 blocking hooks 7. Backdraft damper

Figure 2: Overview of damper SC-60 Cosmo







Dn / Par	Х
100	18
125	31
160	49
200	69

Figure 3: Dimensions of damper SC-60 Cosmo





APPENDIX A: MEASUREMENT OF TEST CONDITIONS

- Figure A.1: Smoke control box temperature
- Figure A.2: Plenums pressure
- Figure A.3: Leakage damper A and damper B



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Figure A.1: Smoke control box temperature

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Figure A.2: Plenums pressure







Figure A.3: Leakage damper A and damper B





APPENDIX B: PHOTOGRAPHS



Photo C. 1: Installation of the specimens (SC60-COSMO)



Photo C. 2: Specimen at the exposed side







Photo C. 3: Measurement equipment



Photo C. 4: Measurement equipment







Photo C. 5: Closing time damper B



Photo C. 6: Closing time damper B



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Photo C. 7: Specimens after test (exposed side)



Photo C. 8: Damper B (exposed side)







Photo C. 9: Damper A (exposed side)