



TNO report

2006-CVB-R0076

Determination of the fire resistance according to
NEN-EN 1364-1:2001 of a Vetrotech Saint-
Gobain window/frame construction with SGG
Swissflam 30 and SGG Contraflam 30 glazing in a
steel frame

www.tno.nl

T +31 15 276 30 00

F +31 15 276 30 25

Date February 2006

Author(s) P.A. Ram
Dr. Ir. G. van den Berg

Number of pages 11
Number of appendices 4

Sponsor Vetrotech Saint-Gobain International AG
Stauffacherstrasse 128
CH-3000 Bern 22
SWITZERLAND

Project name Fire resistance
Project number 006.55131/01.01

All rights reserved.

No part of this publication may be reproduced and/or published by print, photoprint, microfilm or any other means without the previous written consent of TNO.

In case this report was drafted on instructions, the rights and obligations of contracting parties are subject to either the Standard Conditions for Research Instructions given to TNO, or the relevant agreement concluded between the contracting parties. Submitting the report for inspection to parties who have a direct interest is permitted.

© 2006 TNO

Contents

1	Subject.....	3
2	Investigation.....	3
3	Contractor.....	3
4	Place and date of the investigation.....	3
5	Date and number of the report.....	3
6	Test specimen.....	3
6.1	General	3
6.2	Window/frame construction	4
6.2.1	Steel framework	4
6.2.2	Fixing materials	4
6.2.3	Glazing	4
6.2.4	Sealant materials.....	4
6.3	Supporting construction	4
7	Sampling and manufacturing of the construction.....	5
8	Test specimen inspection.....	5
8.1	General	5
8.2	Conditioning.....	5
8.3	Fire test.....	5
8.3.1	Conditions	5
8.3.2	Measurements.....	5
9	Observations during the heating.....	6
10	Results	6
10.1	Measurement results.....	6
10.2	Measurements uncertainly.....	6
11	Summary.....	7
12	Field of application and conditions.....	8

Appendices

- A Observations
- B Furnace and laboratory conditions
- C Measurements on specimen
- D Photographs

1 Subject

Two window/frame constructions, build up from steel frames, with SGG Swissflam 30 and SGG Contraflam 30 glazing.

2 Investigation

Determination of the fire resistance according to NEN-EN 1364-1:2001.

3 Contractor

Vetrotech Saint-Gobain International AG
Stauffacherstrasse 128
CH-3000 Bern 22
SWITZERLAND

4 Place and date of the investigation

The investigation took place in the laboratory of the Centre of Fire Research of TNO Built Environment and Geosciences in Rijswijk, The Netherlands.

The specimen was mounted in the frame on the December 1st 2004.
The fire test was performed on the December 6th 2004.

5 Date and number of the report

February 2006, Report number 2006-CVB-R0076

6 Test specimen

6.1 General

The left side window/frame construction was assembled from:

- a steel, rectangular, hollow profile 25 x 20 x 2 mm (w x h x t);
- Promatect-H, 40 x 10 mm (h x t);
- steel strip 40 x 3 mm (h x t);
- 17 mm thick SGG Swissflam 30 glazing.

The right window/frame construction was assembled from:

- a steel, rectangular, hollow profile 25 x 20 x 2 mm (w x h x t);
- Promatect-H, 40 x 10 mm (h x t);
- steel strip 40 x 3 mm (h x t);
- 16 mm thick SGG Contraflam 30 glazing.

The frames were screwed into the supporting construction on top and bottom side only, in order to allow deflections on both vertical sides, the so-called “free edges”.

6.2 Window/frame construction

General information regarding the materials used in the construction is presented in the next sections. For more information refer to figure 1 to 3.

6.2.1 Steel framework

The frame was a compound construction of a steel, rectangular, hollow profile with on both side Promatect-H. On the outside there was a steel strip, which was fixed with M6 bolts to the steel profile. The c.t.c. distance was 240 mm. Outer dimensions of the frame 1350 x 2350 mm (w x h). Rim measuring 20 mm.

6.2.2 Fixing materials

The window/frame constructions were mounted to the supporting construction by means of steel screw plugs Ø 10 mm, length 120 mm, on both horizontal posts with 2 steel screw plugs.

The gap around the window/frame constructions to the supporting construction was filled with compressed Rockwool.

6.2.3 Glazing

The left pane was of type SGG Swissflam 30, dimensions 1300 x 2300 mm (w x h), thickness 17 mm.

The right pane was of type SGG Contraflam 30, dimensions 1300 x 2300 mm (w x h), thickness 16 mm.

In order to realize an edge cover of 15 mm of the panes in the framework, setting blocks were used with various thicknesses. Dimensions of the Flammi setting blocks 80 x 16 x 5 mm (l x w x t).

The panes were held into the frame with the fixing bolts, which were used together with the compound steel framework construction.

6.2.4 Sealant materials

The rim of the frame and the glazing beads were covered with ceramic tape, type Kerafix Ceramic paper, dimensions 20 x 5 mm (w x t).

Around the pane inside the rim there was intumescent material, type Flexpan 200, dimensions 15 x 2 mm (w x t).

6.3 Supporting construction

The supporting construction existed of aerated concrete of 150 mm thickness. Dimensions of both apertures in the wall: 1390 x 2390 mm (w x h).

Mass density: 625 kg/m³

7 Sampling and manufacturing of the construction

TNO Certification	- sampling at glass manufacturing
TNO Centre for Fire Research	- production of supporting construction
Vetrotech Saint-Gobain International	- window/frame constructions and glazing

8 Test specimen inspection

8.1 General

The material and components used were inspected during assembly on the basis of supplied drawings and data.

8.2 Conditioning

From the moment of installation until the fire test, the specimen was stored in the laboratory of TNO, Centre for Fire Research with the following conditions:

- Ambient temperature: $20 \pm 5^\circ\text{C}$;
- Relative humidity: $50 \pm 10\%$.

8.3 Fire test

8.3.1 Conditions

The fire test was carried out according to NEN-EN 1364-1:2001.

The window/frame constructions were heated at one side using the standard fire curve. The targeted overpressure in the furnace was 0 Pa at 0,5 m (20 Pa at 3,0 m) height.

8.3.2 Measurements

During heating the following measurements were made:

Furnace conditions:

- The gas temperatures in the furnace using 6 plate thermocouples (TPL1 up to TPL6);
- The pressure in the furnace.

Window/frame construction:

- The surface temperatures on the unexposed side of both panes using 10 thermocouples (T1 up to T10);
- The surface temperatures on the unexposed side of both frames using 6 thermocouples (T11 up to T16);

- The heat radiation at a distance of 1,0 m from the geometric centre of the panes;
- The horizontal displacement of the window/frame construction, measured half way up the frames on aerated concrete side.

The positions of the thermocouples on the window/frame constructions are specified in appendix C.

9 Observations during the heating

SGG Swissflam 30

Criterion "average temperature" reached after 50 minutes.

Criterion "maximum temperature" reached after 51 minutes

After a heating time of 72 minutes the test was ended. Criteria "heat radiation" and "integrity" were not reached.

SGG Contraflam 30

Criterion "average temperature" reached after 46 minutes.

Criterion "maximum temperature" reached after 43 minutes

After a heating time of 72 minutes the test was ended. Criteria "heat radiation" and "integrity" were not reached.

More details can be found in the Appendix A.

10 Results

10.1 Measurement results

The measurement results are presented in Appendix B and C.

During the heating the temperature in the laboratory complied to the European standard NEN-EN 1364-1:2001.

10.2 Measurements uncertainly

Due to the nature of fire resistance testing, in which several non-linear effects are present in both the test configuration and the test specimen, which influence each other, it is at this moment not yet possible to give a stated degree of uncertainty of measurement.

11 Summary

The fire resistance of two window/frame constructions is determined. The two window/frame constructions are build up from steel frames and SGG Swissflam 30 and SGG Contraflam 30 glazing.

The fire test was carried out according to NEN-EN 1364-1:2001.
 The results are summarized in Table 1 and 2.

Table 1: Summarized results left window, SGG Swissflam 30

Criterion	Time measured from the start of the test during which, the criterion was reached.
NEN-EN 1364-1:2001	
1. Integrity	
Cotton pad	Not reached
6 mm caliber	Not reached
25 mm caliber	Not reached
Sustained flaming	Not reached
2. Thermal insulation	
Average temperature rise	50 minutes
Maximum temperature rise	51 minutes
Radiation	Not reached
After a heating time of 72 minutes the test was ended	

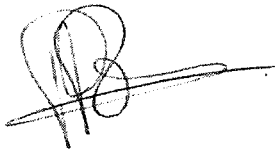
Table 2: Summarized results right window, SGG Contraflam 30

Criterion	Time measured from the start of the test during which, the criterion was reached.
NEN-EN 1364-1:2001	
3. Integrity	
Cotton pad	Not reached
6 mm caliber	Not reached
25 mm caliber	Not reached
Sustained flaming	Not reached
4. Thermal insulation	
Average temperature rise	46 minutes
Maximum temperature rise	43 minutes
Radiation	Not reached
After a heating time of 72 minutes the test was ended	

12 Field of application and conditions

The summary formulated in chapter 11 is only valid for window/frame constructions, which are the same in detail to the investigated construction, including materials and means of assembly used. Also the following conditions have to be met:

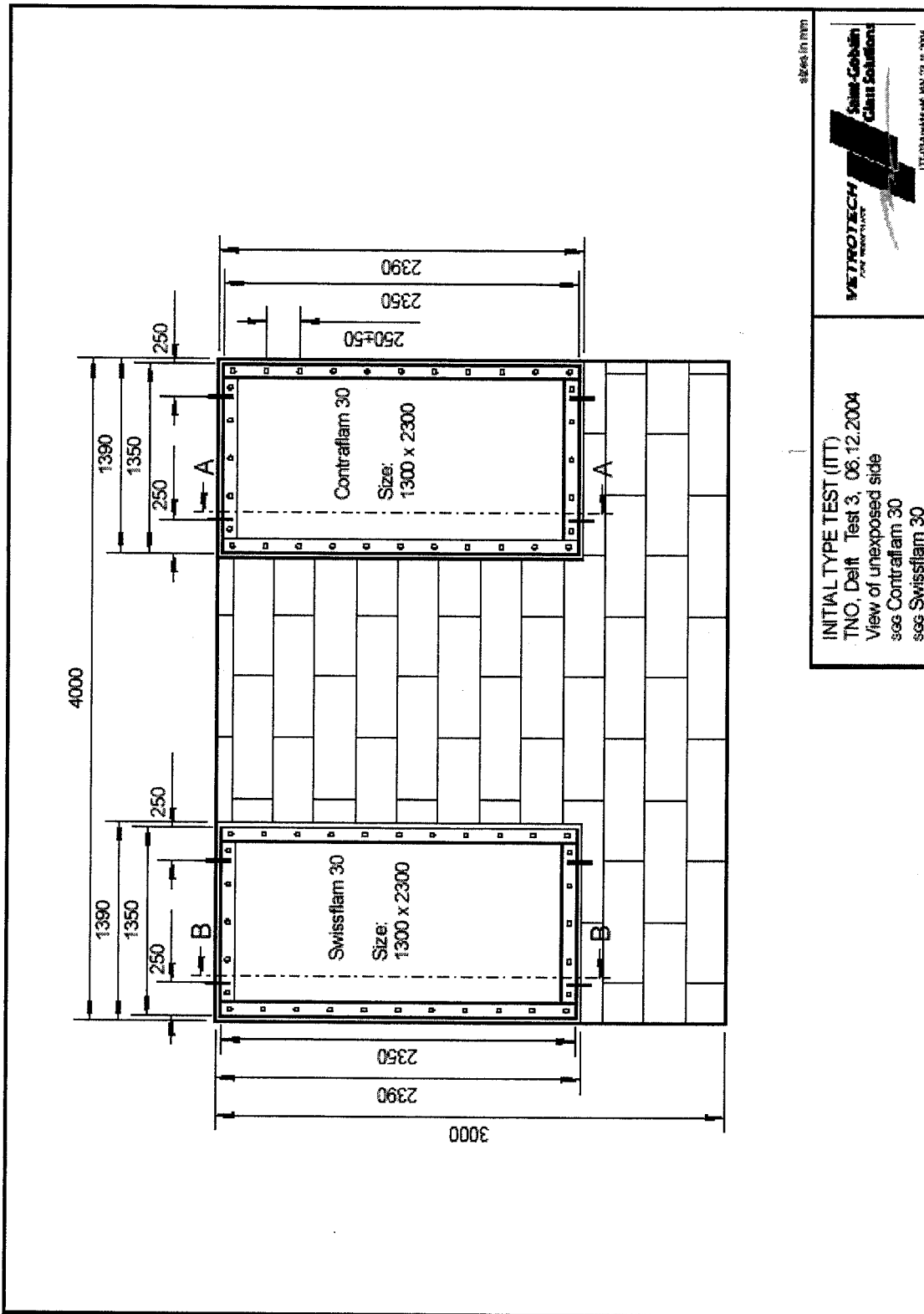
- a) Type of glass with dimensions, w x h, are the same or smaller as investigated;
- b) The frames are the same as described in 6.2 in the test report;
- c) Mounted in a supporting construction with a thickness of at least 150 mm and a minimum density of 625 kg/m³.

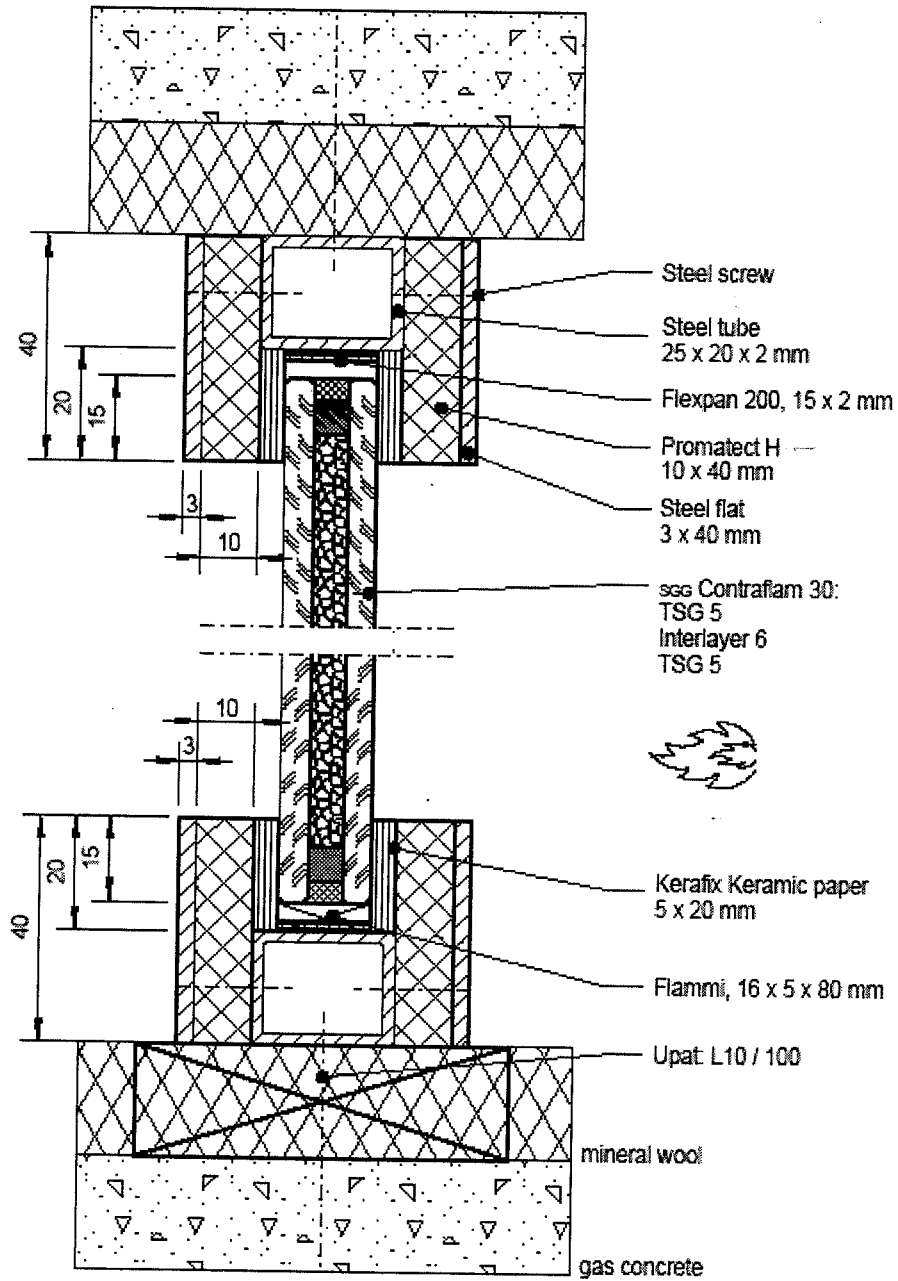


P.A. Ram



Dr. Ir. G. van den Berg





sizes in mm

INITIAL TYPE TEST (ITT)
 TNO, Delft Test 3
 Section A-A
 sgg Contraflam 30



ITT-03-04-002-CP30-WF-WK 23.11.2004