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TNO Building and Construction Research



Nederlandse Organisatie voor
toegepast-natuurwetenschappelijk
onderzoek / Netherlands Organisation
for Applied Scientific Research

TNO report

2002-CVB-R05883

**Fire resistance of a VETROTECH Vetroflam
Stadip EW 60 glazing in steel Jansen Economy 50
frame according to NEN 6069:1997 and NEN-EN
1364-1**

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Project name Fire resistance
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1 SUBJECT

Window-/frame construction consisting of a Vetroflam Stadip EW 60 glazing in a steel Jansen Economy 50 frame.

2 TESTS PERFORMED

Fire resistance according to NEN 6069:1997 in connection with NEN-EN 1364-1.

3 SPONSOR

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4 PLACE AND DATE OF TEST

4.1 Place of the test

The test was performed at the Centre for Fire Research of TNO Building and Construction Research in Rijswijk, The Netherlands.

4.2 Dates regarding the test

The supporting construction was built on July 25th, 2002;
The window-/frame construction was assembled on August 2nd, 2002; and
The test was performed on August 2nd, 2002.

5 DATE AND NUMBER OF REPORT

September, 2002-CVB-R5883.

6 CONSTRUCTION TESTED

6.1 General

The test was performed on a window-/frame construction, which was mounted in a testing frame with a concrete lining with internal dimensions 4000 x 3000 mm (width x height). In order to accommodate the window frame, the internal dimension of the frame was reduced to 2350 x 1150 mm (h x w) by using 150 mm blocks of cellular concrete, quality class G4.

The window was constructed from

- a steel Jansen Economy 50 frame; and
- a 12 mm thick Vetroflam Stadip EW 60 glazing.

6.2 Materials

General information regarding the materials used in the construction is presented in the next sections. For more information, refer to the figures 1 and 2.

6.2.1 Frame

Steel Jansen Economy 50 frame, outside measurements 2300 x 1100 mm. The gross dimensions of the cross-section of the frame were 40 x 50 mm (h x w), with a rim measuring 20 mm. The steel thickness of the frame construction was 2 mm.

The frame was constructed to hold a pane with dimension 2200 x 1000 mm (h x w). Technical details of the pane is listed in section 6.2.2. For more details, see figure 1.

6.2.2 Glazing

The double glazing was of type Vetroflam Stadip EW 60 the pane was build up as follows;

- Vetroflam glazing with a thickness of 6 mm;
- A PVB foil with a thickness of 0.76 mm;
- Vetroflam glazing with a thickness of 6 mm.

Setting blocks, type Flammi, were applied with measurements 80 x 10 mm (length x width). The thickness of the various setting blocks was chosen such to allow for a 5 mm gap around the pane.

Glazing beads: type Jansen 402.120Z dimensions 20 x 20 mm; steel thickness 1 mm see also figure 1.

6.2.3 Fixing materials

The window frame was attached by means of 10 steel screw plugs, 120 mm length, on both horizontal posts and vertical posts. Positions of plugs are shown in Figure 1.

6.2.4 Sealant materials

The rim of the frame and one side of the glazing beads were covered with a ceramic tape, 15 x 5 mm (width x thickness).

6.2.5 Support construction

The construction consisted of cellular concrete:

- Mass density 650 kg/m³
- Thickness 15 cm.
- Moisture content 2.5 %

6.3 Assembly of the window

The assembling of the window was done as follows.

- Placement and fixation of the window frame in the test frame. The space between the window frame and the test frame was filled with Rockwool.
- Covering the rim of the frame and the glazing beads with the ceramic fibre liner.
- Setting blocks were placed in the frame.
- Placement of the glass pane in the frame. The pane was adjusted to have equal distance to the rim of the frame on either side.

- Fastening the glazing beads.

7 SAMPLING AND PREPARATION OF TEST SPECIMEN

Centre for Fire Research, TNO Building and Construction Research	Test frame and supporting construction
Vetrotech Saint Gobain	Assembly of test specimen

8 MODE OF TESTING

8.1 Verification of test sample

During the assembly the parts and materials were verified from the supplied drawings.

8.2 Conditioning

In the period between assembling and testing the construction was stored in ambient conditions of temperature (20 ± 5 °C) and relative humidity (50 ± 10 %) in the testing laboratory of the Centre for Fire Research.

8.3 Fire test

8.3.1 Conditions

The test was performed under the conditions as specified in NEN-EN 1364-1.

8.3.2 Measurements

During the heating the following data were measured and registered:

- temperatures inside the furnace with 8 plate thermometers, regularly spread over the directly heated surface;
- surface temperatures on the non-directly heated side of the test sample with 11 thermocouples, the positions of the thermocouples are shown in figure 2;
- pressure inside the furnace at 2.7 m height from the floor;
- radiation outside the furnace at 1 m distance from the geometric centre of the test specimen;
- temperature and air velocity outside the furnace.

9 OBSERVATIONS DURING HEATING

After heating of 67 minutes the top side of the glazing came loose from the frame (integrity criterion was exceeded)

For a more detailed description of the observations refer to Appendix A.

10 TEST RESULTS OF THE MEASUREMENTS OF THE FIRE TEST

Test results are given in graphs C1 to C3 of Appendix C.

The placement of the thermocouples on the test specimen is shown in the respective figures. The furnace conditions are presented in Appendix B.

11 SUMMARY

Table 1 summarises the most important results of this test.

Table 1: Test results

Criterion	Time from start of heating, during which the criterion was just fulfilled.	
	NEN 6069:1997	NEN-EN 1364-1
Integrity	67 minutes	67 minutes
Thermal insulation w.r.t. radiation	> 67 minutes	> 67 minutes

Heating was terminated after 68 minutes.

12 CONCLUSIONS

The fire resistance of the tested window construction following NEN 6069:1997 with respect to its separation function is **67 minutes**.

A classification following NEN-EN 1364-1 can formally not be given, because the classification system as described in prEN 13501-2 has not yet been finalised.

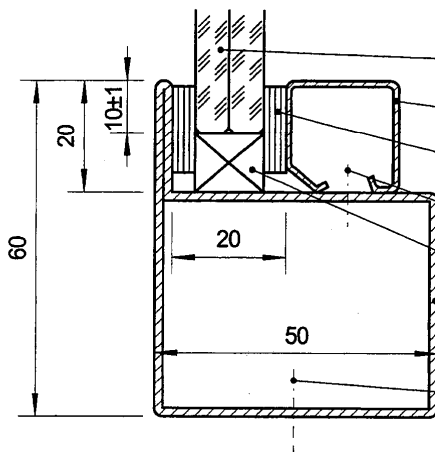
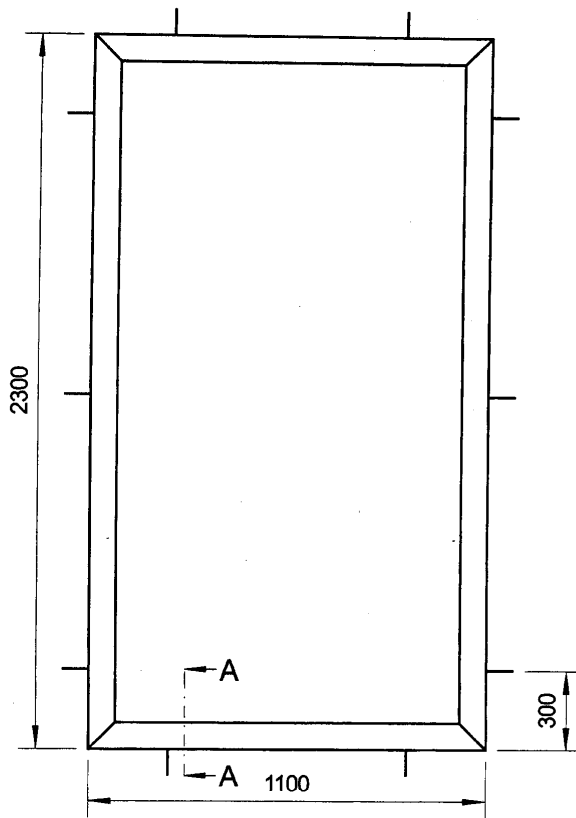
13 FIELD OF APPLICATION AND CONDITIONS

The conclusion applies only to glass/window-frame constructions:

- which are in detail the same as the tested construction, and where the dimensions are not larger than tested;
- fitted in a cellular concrete wall with a thickness of at least 150 mm and a mass per unit volume of $\geq 600 \text{ kg/m}^3$. Other rigid walls of materials like brick or masonry are permitted provide the fire resistance of the wall is not less than that of the window construction tested.

Ing. R.D. Scheepe

Ing. P.B. Reijman



Vetroflam Lam EW 60, 1000 x 2200 mm
(Vetroflam 6 / PVB 0,76 / Vetroflam 6)

Bead Jansen 402.120 Z

Ceramic tape 5 x 15 mm

Stud Jansen 405.002

Setting block, Flammi, 12 x 10 x 80 mm

Profile Jansen Economy 50, 01.564

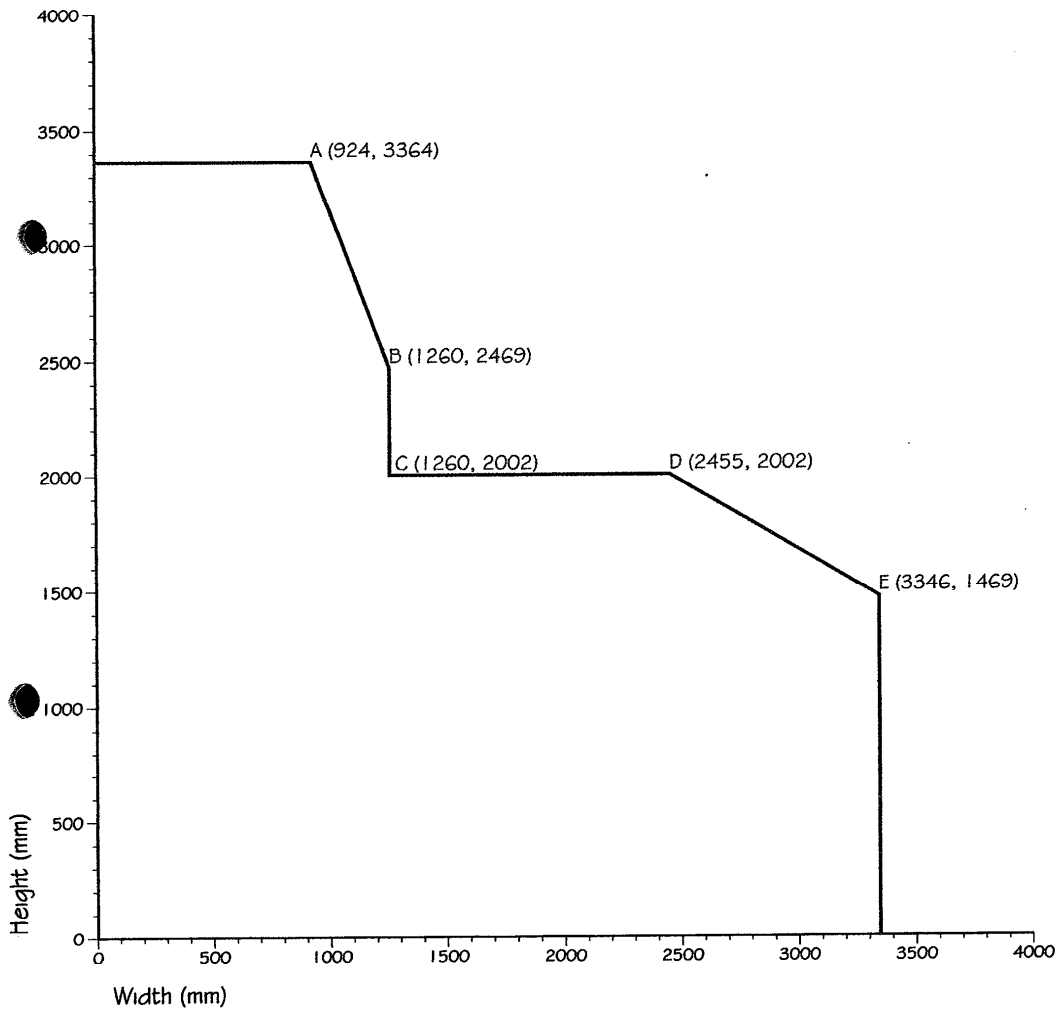
steel screw with plastic dowel

sizes in mm

TNO Fire test to EN 1364-1
"Vetroflam Lam, EW 60"

"View of unexposed side; section A-A"





INTERNATIONAL FIRE CONSULTANTS LTD 20 Park Street, Princes Risborough, Buckinghamshire, HP27 9AH, United Kingdom Tel: +44 (0) 1844 275500. Fax: +44 (0) 1844 274002, Email: ifc@intfire.com, Website: www.intfire.com		This drawing is Copyright© Contractors must check all dimensions. Any discrepancies must be reported before work proceeds. Only work to dimensions stated on drawing.
Assessment IFCA/03102A Vetrotech Saint-Gobain	Vetroflam 60 Minute Fire Resisting Steel System with Clipped Beads	Job number : 6631/11 Drawn by : CSP / Checked by : HW Not To Scale / December 2004
		03102A/09