Determination of the windload suction resistance of Stonel brick surfaced external cladding panel system according to ETAG 034

Requested by: Stonel Oy

VTT EXPERT SERVICES LTD

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Assignment

Determination of the windload suction resistance of Stonel brick surfaced external cladding panel system according to ETAG 034

Structure tested

The customer delivered a test specimen to VTT Expert Services for wind suction test on the 25th of October 2012. The test specimen size was 2190 mm x 2190 mm. The external surface of the panel consisted of brick surfaced concrete panels of size 1200 mm x 600 mm, which were jointed together with mortar. The surface mass of the panel was about 40 kg/m^2. A steel sheet (with stamped nails going to mortar joints of panel) was fixed on the backside of the panel. The panels were hanged from the profiled horizontal parts of steel sheet to the horisontal rails with spacing of 600 mm. The horisontal rails were fixed to vertical rails spacing of 600 mm with screws. These vertical rails were fixed with one screw to fixing steel parts which were supported from the back substrate structure. Drawing of the specimen is illustrated in Appendix1 where the fixing system is described in detail and some photos over the specimen are presented in Appendix 3.

Installation and measurements

The test specimen with wooden frame was installed into test opening of the test chamber. The wind load suction test was carried out on the 26th of October 2012at research hall of VTT Expert Services Ltd in the address Kemistintie 3, 02150 Espoo).

Methods and equipment

The windload test was carried out according to ETAG 034 (April 2012) /1/, point 5.4.1.1. The load steps were according to procedure: first two times with 300 Pa pulses, then with 500 Pa pulse, then with 1000 Pa pulse and then with 200 Pa increased step pulses up to failure.

Results

The cladding brick element wall and its fixing part behaved very elastically up to 2600 Pa and the measured residual deflections were below three mm. However, after loading pulse of 2600 Pa there was a slight mark indicating that failure starts with the buckling of the web of the vertical fixing rail. After pulse of 2800 Pa there was permanent deflection in the vertical rail. At greater load pulses the measured maximum and also residual deflections increased gradually showing the above mentioned buckling behaviour and permanent signs of the buckling were clearly seen in the web of the vertical rails.

At load pulse of 3200 Pa a vertical crack appeared into upper part of the brick element wall. At 3400 Pa the vertical crack of the brick wall increases. Also there were some permanent deflections also in the horizontal fixing rails.

The final failure of the cladding wall was reached at 3200 Pa when the load pulse of 3600 Pa was tried. The final deflections increased in the vertical and in the horisontal fixing rails and the cladding brick element was broken in so called “envelope” manner. The deflections noticed in the test are presented as a load/time-deflection curves in Appendix 2. Some photos of tests arrangements and of tests are presented in Appendix 3.

Espoo, December 7, 2012

Mikko Nyman
Team Leader

Pekka Sipari
Senior Expert

VTT Expert Services Ltd. is a Notified Body No. 0809

Reference

/1/ ETAG 034, Edition April 2012. Guideline for European technical Approval of Kits for external Wall Claddings, Part I: Ventilated Cladding Kits comprising Cladding Components and associated Fixings

Appendices

Appendix 1. Test specimen (in Finnish)

Appendix 2. Deflections

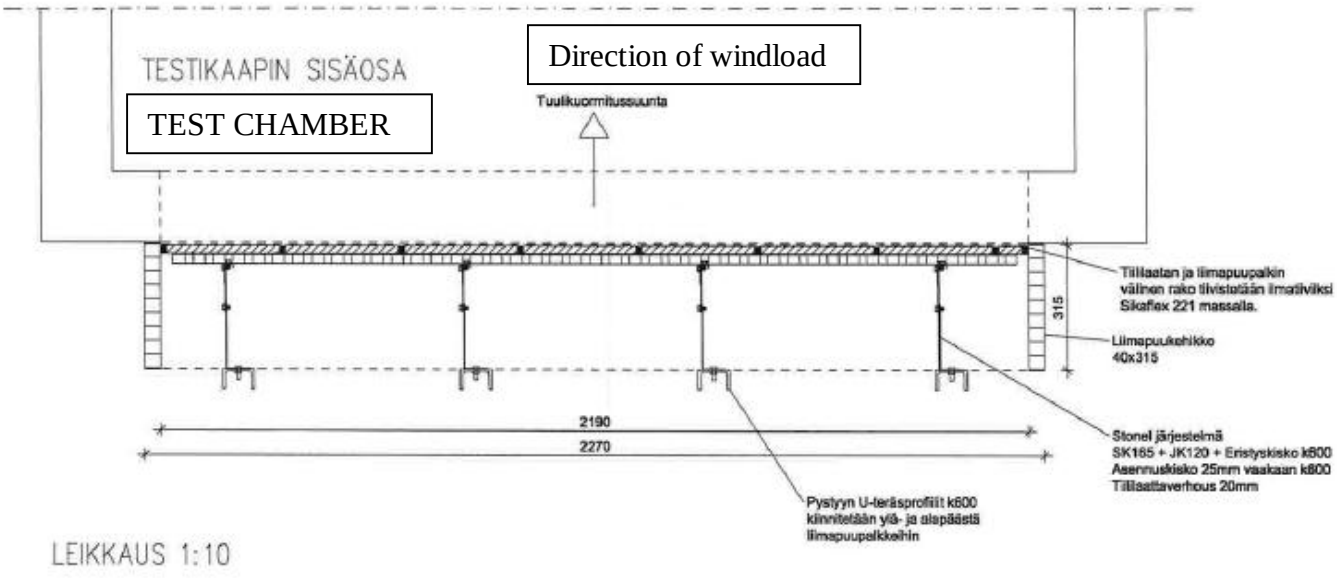
Appendix 3. Photos over test

Distribution

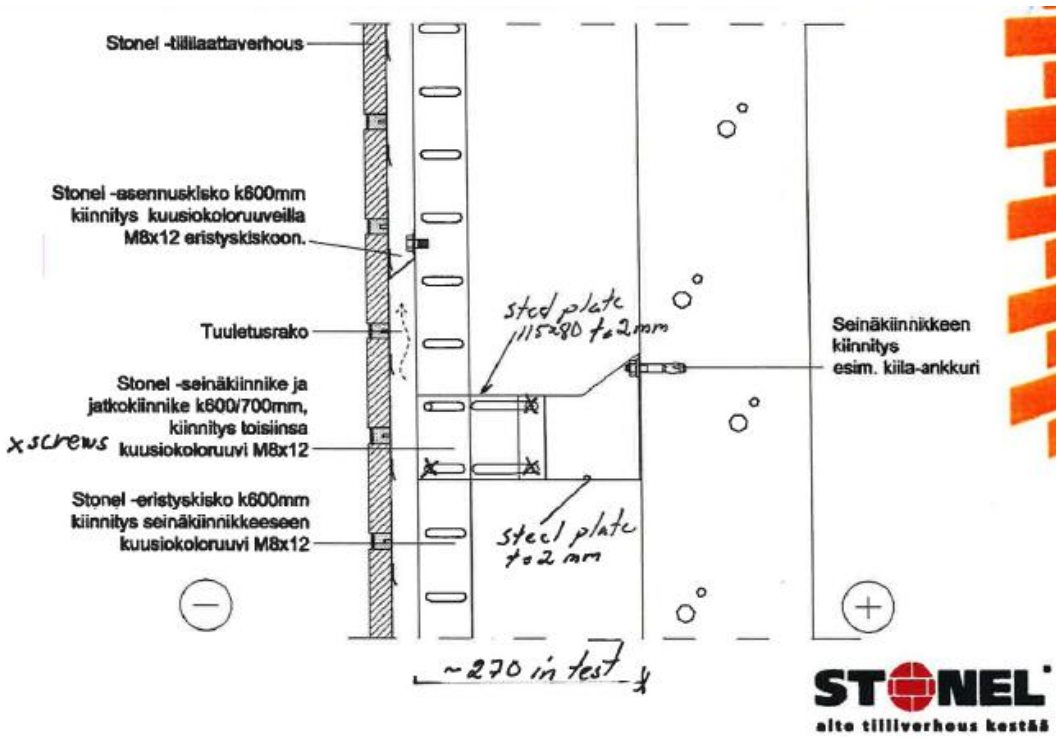
Customer	Original
Archive	Original

STONEL BRICK SURFACED EXTERNAL CLADDING PANEL SYSTEM:

Test specimen



Fixing details



STONEL BRICK SURFACED EXTERNAL CLADDING PANEL SYSTEM:

Measured displacements

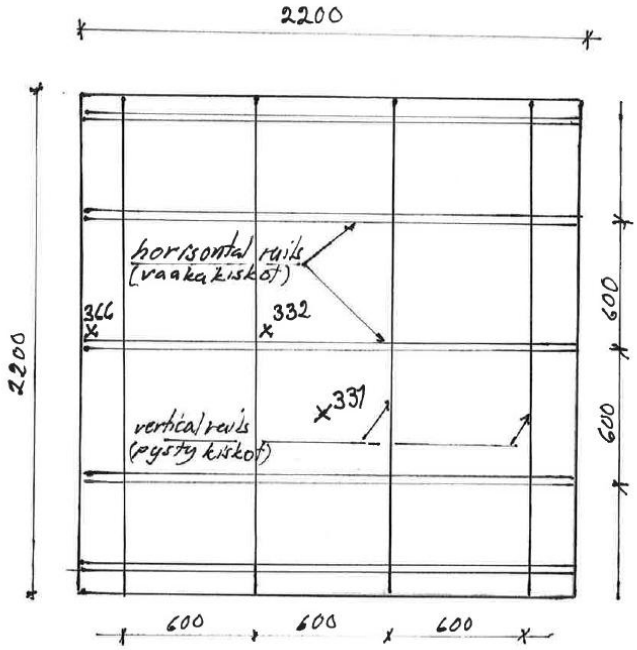


Figure 1. Displacement measurement point 331, 332 and 336 on the test specimen.

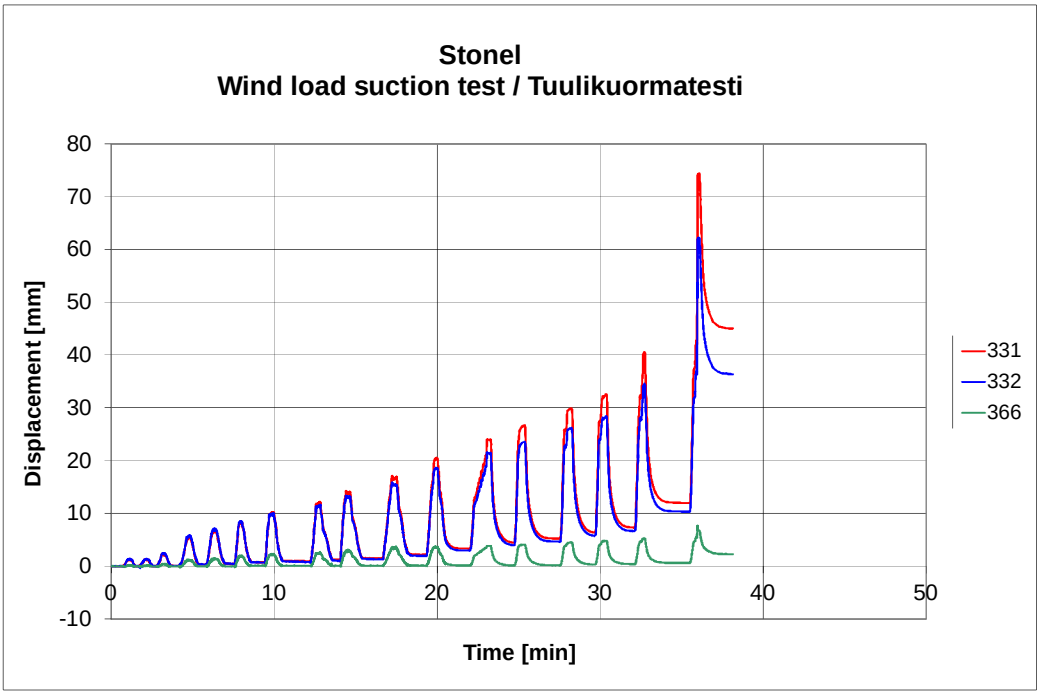


Figure 2. Displacement at measurement points 331, 332 and 336 during windload suction test.

PHOTOS OVER TESTS

Photo 1. Test element external surface.

Photo 2. Test element from backside.

Photo 3. Fixing detail.

Photo 4. Start of failure with buckling of web of vertical rail.

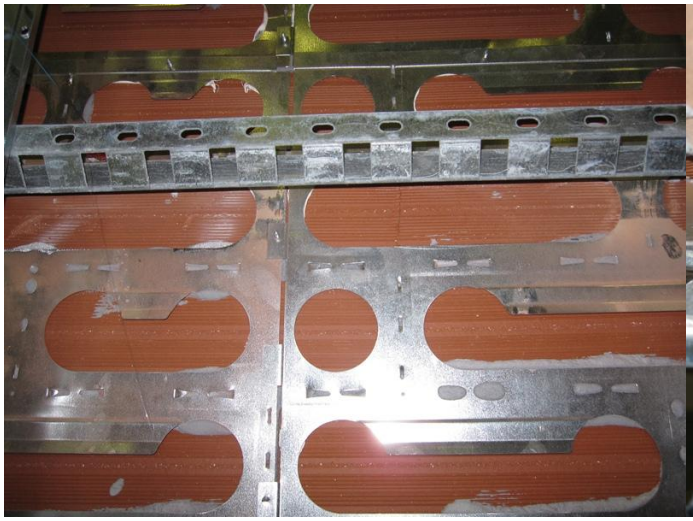


Photo 5. Vertical crack in upper part of element at load pulse 3200 Pa.

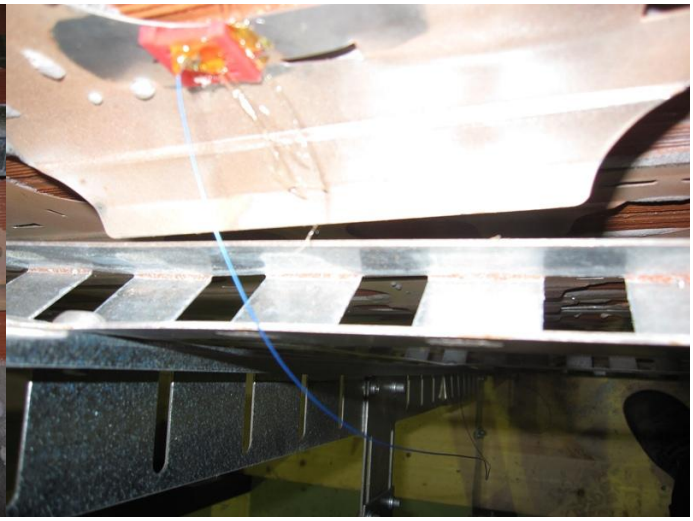


Photo 6. Final failure. Horisontal rail deformed and element partly loosened from horisontal fixing rail.

Photo 7. Deformed vertical rail after final failure.

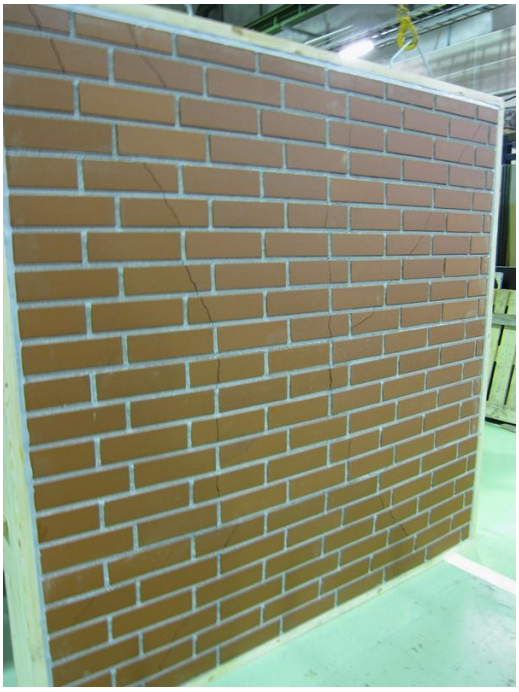


Photo 8. Envelope failure type of brick element.