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Order No.: Z210210105

FIRE TESTING LABORATORY VESELÍ NAD LUŽNICÍ
Testing Laboratory No. 1026 accredited by ČIA
workplace Veselí nad Lužnicí

FIRE RESISTANCE TEST REPORT

No. Pr-21-2.093-En

Issued on 2021-06-11

For product

Loadbearing wall

SYSTEM 3E EKO+ loadbearing wall

Sponsor: **SYSTEM 3E S.A.**
Rondo ONZ 1,
00-124 Warszawa
Poland

Test method:

ČSN EN 1365-1
» Fire resistance tests for loadbearing elements
- Part 1: Walls «

Test Report includes 28 pages
(6 pages of text + 4 Annexes)

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1 INTRODUCTION

The fire resistance test of the loadbearing wall was performed based on the order of company *SYSTEM 3E S.A.* in Fire Testing Laboratory PAVUS, a.s. Veselí nad Lužnicí.

In case of dispute, the Czech version of this Test report shall prevail.

The test was prepared, performed and assessed on the base of following documents:

[1] ČSN EN 1365-1:2013 Fire resistance tests for loadbearing elements - Part 1: Walls

[2] ČSN EN 1363-1:2020 Fire resistance tests - Part 1: General requirement

[3] ČSN EN 1363-2:2000 Fire resistance tests - Part 2: Alternative and supplementary procedures

[4] ČSN EN 13501-2:2017 Fire classification of construction products and building elements - Part 2: Classification using test data from resistance fire tests, excluding ventilation services

[5] Specimen-related technical documentation delivered by the test sponsor.

For the purposes of this document, the definitions given in [1] ÷ [4] together with following abbreviations apply:

ČIA	Český institut pro akreditaci, o.p.s. (Czech Institute for Accreditation)
ATL	accredited testing laboratory
TC	thermocouple
TM	thermometer (sheathed TC)
PTM	plate thermometer fit with a TM ∅ 2 mm
EF	exposed specimen face
UF	unexposed specimen face
RTC	roving thermocouple

2 SUBJECT MATTER OF TEST

The subject matter of the test was a loadbearing wall made of SYSTEM 3E EKO+ elements with total dimensions of 3 150 mm (width) × 3 200 mm (height) x 352 mm (thickness without plaster). The wall was provided with a layer of adhesive with reinforcing mesh on one side *).

Description of the construction:

The wall was made of perlite-cement SYSTEM 3E EKO+ elements (blocks TYPE-S1 - Basic construction element a TYPE-S0 - Basic lower element) with nominal density in dry conditions (310 ± 10 %) kg/m^3. The blocks were made with grooves of 50 mm in depth on the horizontal sides so that the individual blocks overlap each other by half length of the block in the bond pattern. The outer dimensions of the block in the wall area were 704 x 352 x 300 mm (length x width x height). The blocks on the top and bottom edge of the wall had one side without grooves and their height was 250 mm. SYSTEM 3E EKO+ elements were executed as a dry set masonry, without the use of mortar or adhesive.

The layer of adhesive Weber KS143 with the fibreglass reinforcing mesh Weber PH913 of approximately 7 mm in total thickness (Weber, Saint-Gobain Construction Products) was applied on one side of the wall. *)

The right and left vertical edge were not fixed enabling the free specimen movement. The gap between the specimen and test frame of 30 mm in width was filled with mineral wool.

Description and drawing documentation delivered by the test sponsor is documented in Annex C.

The specimen of loadbearing wall was assembled as per [1] cl. 7 and Annex C of this Test Report.

The tested specimen was manufactured by the company SYSTEM 3E S.A.

The Testing Laboratory did not participate in choosing the materials used for test specimen assembly.
The specimen was delivered to the Fire Testing Laboratory on April 7th, 2021 in accordance with delivered documentation. The assembly into the test frame was performed by the test sponsor on April 14th-15th, 2021.

*) The layer of adhesive Weber KS143 with the fibreglass reinforcing mesh was applied on both sides of test specimen, however during loading of the specimen, the adhesive was separated on UF and the test was performed after its removal (see cl. 4).

3 TEST PERFORMANCE

3.1 General

The fire resistance test was performed as per [1] on May 4th, 2021 in the testing hall PO 1 in wall furnace with inner dimensions of 3 000 mm (width) × 3 000 mm (height) × 1 500 mm (depth).

The specimen was mounted into the structural opening in masonry made of aerated concrete blocks of 250 mm in thickness. Between the right and the left vertical edge of the test specimen and the test frame, a gap of 30 mm in thickness was left and it was filled with mineral wool type Rockwool providing sealing and ensuring a free movement of loaded construction according to [1] cl. 7.3.

The load of **170 kN/m** prescribed by test sponsor was continuously applied to the test specimen through rigid steel spread transom 15 minutes before the commencement of the test as per [1] cl. 10.1. Prior to the testing, the construction was in equilibrium state with stabilized deflection. The test load was applied axially in the load bearing part of the specimen with a top pin edge.

Direction of heat exposure from the side with plaster.

Impact test was performed in accordance with [3] cl. 7.

Height of the specimen was 3200 mm. Height of exposed face was 3000 mm.

Used testing and gauging equipment is stated in Annex A.

Sponsor representative was not present at the test.

3.2 Furnace control

The test furnace was heated with a set of oil burners. In-furnace temperatures were measured by the help of PTMs and recorded at minute intervals. The measuring wires of PTM were distributed uniformly in a distance of 100 mm from the exposed specimen face according to [1] cl. 9.1.1. In-furnace temperatures were controlled so that they conformed to the relation according to [2] cl. 5.1.1, within the specified limits (see [2] cl. 5.1.2):

$$T = 345 \log (8t + 1) + 20$$

where T (°C) = required in-furnace temperature in time °C
t (min) = time since the test beginning

The test furnace positive pressure was measured and controlled so that the values respond of conditions according to [1] cl. 9.2 and [2] cl. 5.2.1 and 9.2.1.

3.3 Specimen measuring

The specimen unexposed face temperatures were taken using K-type disc TCs and recorded at minute intervals. The TCs were fixed on the specimen surface according to [1] cl. 9.1.2.2 and 9.1.2.3.

The vertical contraction was measured by two deflectometers on specimen vertical edges according to [1] cl. 9.3.1 and [2] cl. 9.3.

The rate of the horizontal deflection was measured by laser length meter from fixed positions forming the reference plane according to [1] cl. 9.3.2 and [2] cl. 9.3.

One RTC (see [2] cl. 4.5.1.3) was available to measure points where higher temperatures were expected.

The measured points of deflections and the TC positions are described and figured in Annex B.

The initial test conditions met the standard values as per [2] cl. 10.3.

3.4 Ambient temperature

During the test, the ambient temperature was measured using one K-type TM (see [2] cl. 4.5.1.5) according to the conditions of [2] cl. 5.6.

3.5 Conditioning

From the specimen delivery to the Fire Testing Laboratory until the test performance, the specimen was stored in the enclosed ambient of testing hall at the air temperature of (20 ± 5) °C and at relative air humidity of (50 ± 5) %.

4 TEST COURSE

Time (min):	Test observation:
-30.	Application of the load;
	UF - loud cracking inside the specimen during the loading, the adhesive with reinforcing mesh separated from the blocks in most of the area. The test load was removed from the specimen. Upon sponsor´s agreement the adhesive was removed from UF by employees of ATL and TCs were applied on the blocks directly. Cracks in some blocks, especially on the top edge of the specimen;
	EF - cracks in the adhesive with the reinforcement mesh after the loading, separation and bulging of adhesive in some places;
-15.	Re-application of the load: 170 kN/m;
0.	Commencement of the test - ignition of burners;
9.	UF - smoke from the gaps between the blocks;
15.	UF - smoke has stopped, slightly yellowed area along the vertical gaps between blocks;
77.	EF - adhesive with reinforcing mesh fell away in the whole area;
120.	Without any visible changes;
180.	Without any visible changes;
240.	Without any visible changes;
242.	UF - application of the first impact to the specimen - no failure of any criterion (loadbearing capacity, integrity, insulation);
244.	UF - application of the second impact to the specimen - no failure of any criterion (loadbearing capacity, integrity, insulation);
	Removal of the test load after the second impact;
246.	UF - application of the third impact to the specimen without load - no failure of any criterion (loadbearing capacity, integrity, insulation);
248.	End of the test upon sponsor´s agreement.

Horizontal specimen deflections are described in Annex B.

In-furnace temperatures met the requirements of [1] and [2]. Time relations to the measured temperatures are specified in Annex B.

5 TEST RESULTS

5.1 Limit state attainment criteria

✦ **Loadbearing capacity** (according [1] cl. 11.2 and [2] cl. 11.1). This criterion represents the time in completed minutes for which the test specimen continues to maintain its ability to support the test load during the test. For the purposes of this standard, failure to support the load is deemed to have occurred when one of the following criteria have been exceeded:

a) Limiting vertical contraction (negative elongation) $C = \frac{h}{100}$ mm; or

b) Limiting rate of vertical contraction (negative elongation) $\frac{dC}{dt} = \frac{3h}{1000}$ mm . min^{-1}

h is the initial height in mm.

for h = 3200 mm is **C = 32,0** mm and **dC/dt = 9,6** mm . min^{-1}.

- **Integrity** (according to [2] cl. 11.2). This criterion means the time in completed minutes for which the test specimen continues to maintain its separating function during the test without either:
  a) causing the ignition of a cotton pad applied in accordance with [2] cl. 10.4.5.2; or
  b) permitting the penetration of a gap gauge as specified in [2] cl. 10.4.5.3; or
  c) resulting in sustained flaming.
- **Insulation** (according to [2] cl. 11.3). This criterion represents the time in completed minutes for which the test specimen continues to maintain its separating function during the test without developing temperatures on its unexposed surface which either:
  a) increase the average temperature above the initial average temperature by more than 140 K; or
  b) increase the temperature at any location (incl. RTC) above the initial average temperature by more than 180 K.
- **Radiation** (according to [1] cl. 9.4 and [3] cl. 8). This criterion of radiation is fulfilled until the measured radiation does not exceed the value of 15 kW.m^{-2}.

5.2 Expression of test results

Criterion	Partial criterion	Value measured	Partial criterion evaluation
Loadbearing capacity	Limiting vertical contraction	**244 min**, not attained	**244 min**
	Limiting rate of vertical contraction	**244 min**, not attained	**244 min**
Integrity	Cotton pad	**247 min**, no failure	**244 min** [2)]
	Penetration of gap gauge	**247 min**, no failure	**244 min** [2)]
	Sustained flaming	**247 min**, no failure	**244 min** [2)]
Insulation	Average temperature	**247 min**, not attained	**244 min** [2)]
	Maximum temperature	**247 min**, not attained	**244 min** [2)]
Radiation [1)]	Heat flux 15 kW.m^{-2}	**247 min**, not attained	**244 min** [3)]

Note: [1)] There is no requirement to measure the radiation from a surface with a temperature below 300 °C because the radiation from such a surface is low (see [3] cl. 8.1).

[2)] Failure of loadbearing capacity automatically means failure of integrity and insulation criterion (see [2] cl. 11.4.1) - removal of the test load.

[3)] Failure of integrity automatically means failure of radiation criterion (see [4] cl. 5.2.4)

Based on the removal of the test load from the specimen before the third impact (see [3] cl. 7) it is not possible to determinate loadbearing capacity criterion after the 244th minute.

Impact test was performed according to [3] cl. 7 on the centre of the test specimen, the 1st and the 2nd impact was performed in 242nd min and 244th min, when the specimen was fully loaded. Removal of the test load was after the 2nd impact and then the 3rd impact was performed in 246th min. No criteria failed during or after the impact test.

5.3 Field of direct application

The results of the fire test are directly applicable to similar constructions where one or more of the changes listed below are made and the construction continues to comply with the appropriate design code for its stiffness and stability:

- decrease in height;
- increase in the thickness of the wall;
- increase in the thickness of component materials;
- increase in the number of horizontal joints;
- decrease in the applied load;
- increase in the width.

5.4 Application of test results

The test results refer only to the tested specimen including the way of its mounting into the construction.

This report details the method of specimen construction, the test conditions as well as the results obtained when the specific component of construction described herein was tested following the procedure outlined in ČSN EN 1363-1, ČSN EN 1363-2 and in ČSN EN 1365-1. Any significant deviation with respect to size, constructional details, load, stresses, edge or end conditions apart of those allowed in the field of direct application is not covered by this report.

The Report and Annex sheets
are valid with the embossed stamp only.

Elaborated by: .....
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Approved by: .....
Jiří KÁPL
ATL Manager

ANNEX A: TESTING AND GAUGING DEVICES, MEASUREMENT UNCERTAINTY

Test equipment:	Registration number:
Vertical furnace PO 1 (+ equipment for furnace temperature and pressure control)	0127
Furnace pressure probes	0012
Load test frame	0158
Gap gauge ∅ 6 mm	0112
Gap gauge ∅ 25 mm	0113
Cotton pad frame	0014
Pump of hydraulic loading system	0010

Gauging equipment:	Metrological registration number:
Differential pressure gauge AMR DPS	3 09 10
Datalogger ALMEMO 5990-2	3 10 34
PTM - in-furnace temperature (TM K ∅ 2 mm)	3 10 10
TM K ∅ 3 mm - ambient temperature	3 10 09
TC (K) - UF temperature	3 10 12
RTC (K) + THERM 2260	3 10 06
Tape measure	3 01 05
Stop-watch	3 05 06
Thermohygrograph D3120	3 13 05
Laser length meter Bosh	3 01 46
Slide caliper	3 01 49
Cable sensors WDS	3 01 40, 3 01 42
Hydraulic cylinders	3 07 54, 3 07 55

Metrological relationships of the device are specified in the metrological registration card of the device, which is expressly identified by the metrological registration number of the device.

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

Quantity measured			**Extended measurement uncertainty**
Name	Symbol	Unit	
Time from the start of test	*t*	*(min)*	*3,4 10^{-2}min, pro t ≤ 240 min*
Integrity disruption time		*(min)*	*< 0,5 min*
Temperature: TC or K-type TM + compensation cable (both of the 2nd tolerance class) + THERM 5500 - 3	*T*	*(°C)*	*$\sqrt{(6,40.10^{-6}.T^2 + 1,57.10^{1}\ °C^2)}$, pro 40 °C ≤ T < 375 °C* *$\sqrt{(8,04.10^{-5}.T^2 + 7,84\ °C^2)}$, pro 375 °C ≤ T ≤ 1000 °C*
Ambient to in-furnace pressure difference	*p*	*(Pa)*	*$\sqrt{(5,3.10^{-4}.p^2+1,1.10^{-5}Pa^2)}$*
Loading stress of pressure hydraulic cylinders	*F*	*(kN)*	*< 0,9 kN*
Axial contraction of vertical loadbearing elements of specimen	-	*(mm)*	*0,8 mm*
Deflection (horizontal distortions)		*(mm)*	*1,8 mm*

The specified extended measurement uncertainties are a product of standard measurement uncertainty and of the extension coefficient k = 2, which, for normal distribution, corresponds to the coverage probability of 95 %.
The standard measurement uncertainty has been determined in accordance with the EA-4/16 and with the GUM document.

ANNEX B: MEASURING

The results of measured dimensions and actual material properties

Item: **SYSTEM 3E EKO+ element**
Description: **perlite-cement block**
Thickness: **200x100x100 mm**

			Specimen		
			1	**2**	**3**
Dimension of the specimen	a	mm	199,0	200,0	199,0
	b	mm	100,5	99,0	100,5
	thickness	mm	102,0	100,0	101,0
Weight 1	m_1	g	733,6	719,4	704,7
Cubic density		$kg.m^{-3}$	**359,6**	**363,3**	**348,9**
in dry condition		$kg.m^{-3}$	**321,8**	**323,1**	**307,5**
Surface density		$kg.m^{-2}$	**36,7**	**36,3**	**35,2**
Weight 2	m_2	g	656,5	639,8	621,1
Moisture		%	**11,74**	**12,44**	**13,46**

Resultant values:	
Thickness of the specimen:	**101,00 mm**
Cubic density:	**357,27 $kg.m^{-3}$**
Cubic density in a dry condition:	**317,48 $kg.m^{-3}$**
Surface density:	**36,08 $kg.m^{-2}$**
Specific moisture before test:	**12,55 %**

Key:

m_1	Weight before fire resistance test	
m_2	Weight after heating acording [2] clause F.3.2	
Moisture	Specific moisture before test	$((m_1-m_2)/m_2)*100)$

FURNACE TEMPERATURE AND PRESSURE, AMBIENT TEMPERATURE (T_a)

Time t	Furnace temperatures (°C)									Deviation d_e (%)		T_o	Pressure (in 2,25 m over the furnace floor)			
(min)	T	40	41	42	43	44	45	46	T_{aver}	permit.	actual	(°C)	permitted		actual	deviation
0	20	15	17	19	18	16	16	67	24	-	-	14	-	-	31,9	-
10	678	697	682	702	694	643	706	661	684	±15	2,4	14	14,0	±5	13,2	-0,8
20	781	797	779	796	793	757	791	778	784	±10	0,9	14	14,0	±3	13,5	-0,5
30	842	856	836	856	849	823	850	836	844	±5	0,4	15	14,0	±3	13,0	-1,0
40	885	885	873	888	881	861	882	880	878	±4,2	0,2	15	14,0	±3	14,7	0,7
50	918	929	910	934	921	900	927	914	919	±3,3	0,0	15	14,0	±3	13,6	-0,4
60	945	958	937	960	947	928	953	939	946	±2,5	-0,1	15	14,0	±3	13,3	-0,7
70	968	965	947	966	954	944	962	951	956	±2,5	-0,1	15	14,0	±3	13,7	-0,3
80	988	1001	989	1002	992	993	1000	989	995	±2,5	-0,1	15	14,0	±3	13,6	-0,4
90	1 006	1025	1019	1020	1013	999	1018	1005	1 014	±2,5	0,0	15	14,0	±3	13,4	-0,6
100	1 022	1042	1034	1037	1030	1018	1035	1023	1 031	±2,5	0,1	15	14,0	±3	13,3	-0,7
110	1 036	1054	1047	1049	1043	1031	1047	1036	1 044	±2,5	0,2	15	14,0	±3	13,3	-0,7
120	1 049	1066	1059	1061	1055	1044	1060	1049	1 056	±2,5	0,2	15	14,0	±3	13,4	-0,6
130	1 061	1076	1069	1071	1064	1054	1069	1058	1 066	±2,5	0,2	16	14,0	±3	13,4	-0,6
140	1 072	1083	1074	1080	1074	1065	1079	1071	1 075	±2,5	0,3	16	14,0	±3	14,0	0,0
150	1 082	1088	1079	1086	1080	1074	1086	1080	1 082	±2,5	0,2	16	14,0	±3	13,2	-0,8
160	1 092	1094	1086	1092	1087	1080	1092	1087	1 088	±2,5	0,2	16	14,0	±3	13,0	-1,0
170	1 101	1099	1092	1098	1093	1086	1098	1093	1 094	±2,5	0,2	16	14,0	±3	12,8	-1,2
180	1 110	1104	1096	1102	1097	1090	1102	1098	1 098	±2,5	0,1	17	14,0	±3	13,2	-0,8
190	1 118	1109	1101	1107	1102	1095	1107	1103	1 103	±2,5	0,0	16	14,0	±3	13,0	-1,0
200	1 126	1113	1106	1111	1106	1099	1111	1107	1 107	±2,5	-0,1	16	14,0	±3	12,8	-1,2
210	1 133	1117	1110	1115	1110	1104	1115	1111	1 112	±2,5	-0,2	17	14,0	±3	13,3	-0,7
220	1 140	1120	1113	1118	1113	1107	1117	1114	1 115	±2,5	-0,3	16	14,0	±3	13,1	-0,9
230	1 146	1123	1116	1121	1116	1110	1120	1117	1 117	±2,5	-0,4	17	14,0	±3	12,6	-1,4
240	1 153	1125	1119	1123	1118	1112	1123	1120	1 120	±2,5	-0,5	17	14,0	±3	12,6	-1,4
245	1 156	1125	1119	1123	1118	1112	1123	1120	1 120	±2,5	-0,5	17	14,0	±3	13,3	-0,7
246	1 157	1126	1120	1124	1119	1113	1123	1120	1 120	±2,5	-0,5	18	14,0	±3	13,0	-1,0
247	1 157	1126	1120	1124	1119	1113	1123	1120	1 121	±2,5	-0,6	17	14,0	±3	12,9	-1,1

Temp. and pressure were recorded and documented every minute, the test process is displayed in 10 min interval.
XX PTM joint number

The areas under the temperature curves calculated by trapezoidal method.

T (°C) = average in-furnace temperature determined according to [2] čl. 5.1.1: $T = 345 \log_{10}(8t + 1) + 20$

t (min) = time since test beginning

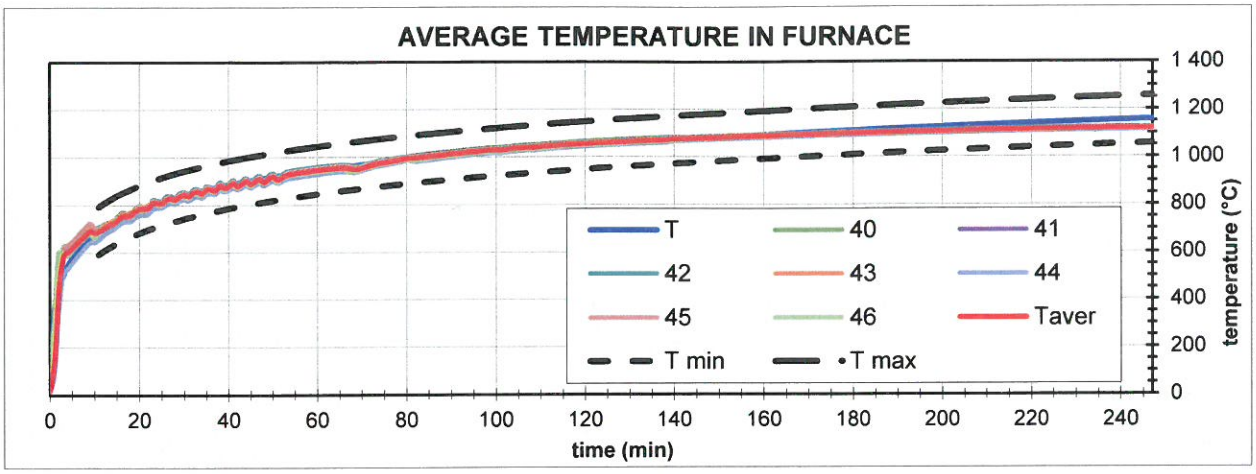
T_s (°C) = actual in-furnace temperature according to [2] čl. 5.1.2

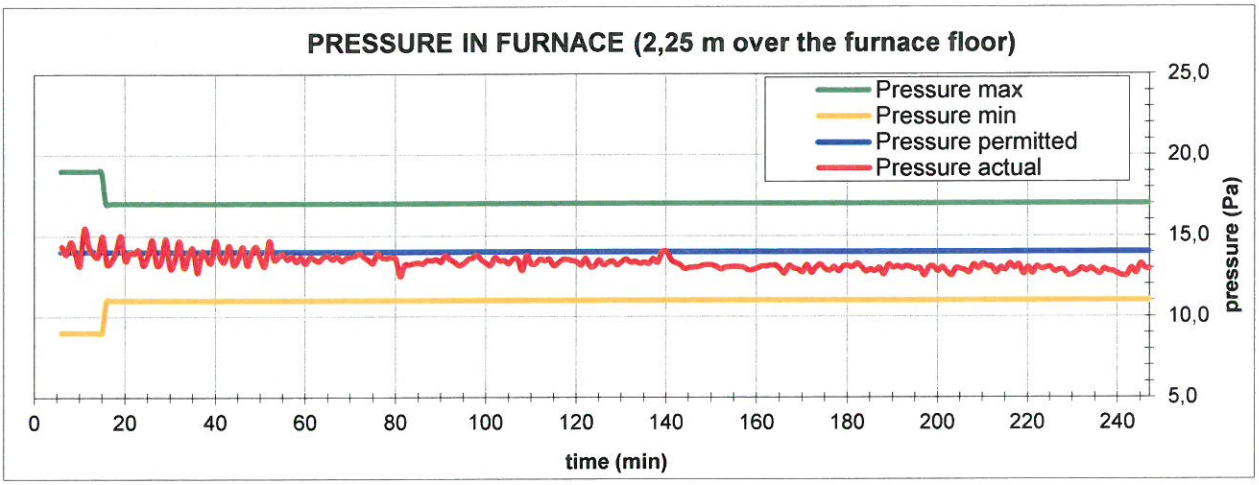
d_e (%) = percentage deviation in the area of the curve of the average in-furnace temperature from the area of the standard temperature curve

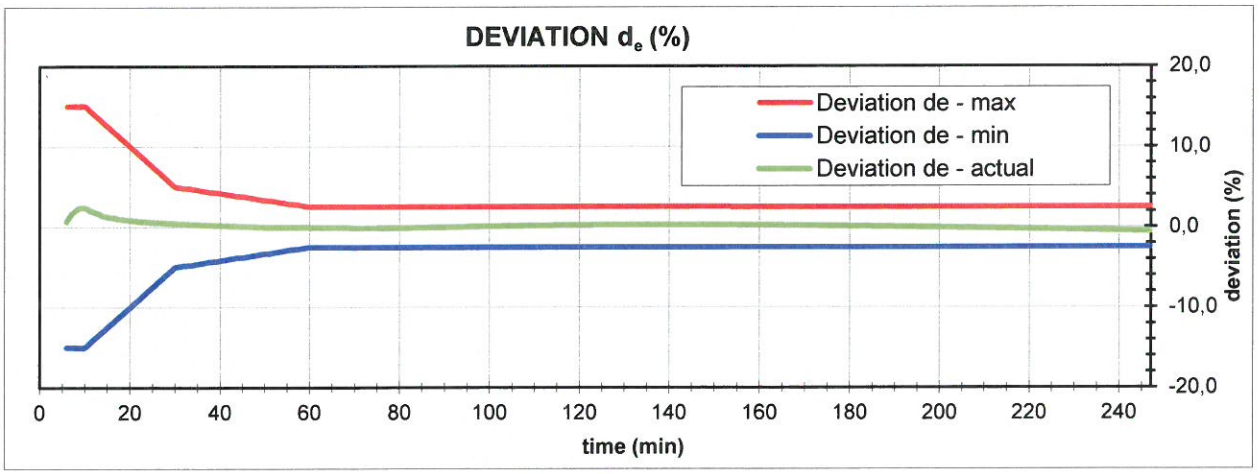
- permitted according to [2] čl. 5.1.2,
- actual according to [2] čl. 5.1.2: $d_e = ((A - A_s)/A_s) * 100$, where

  A = area under the actual in-furnace temperature curve

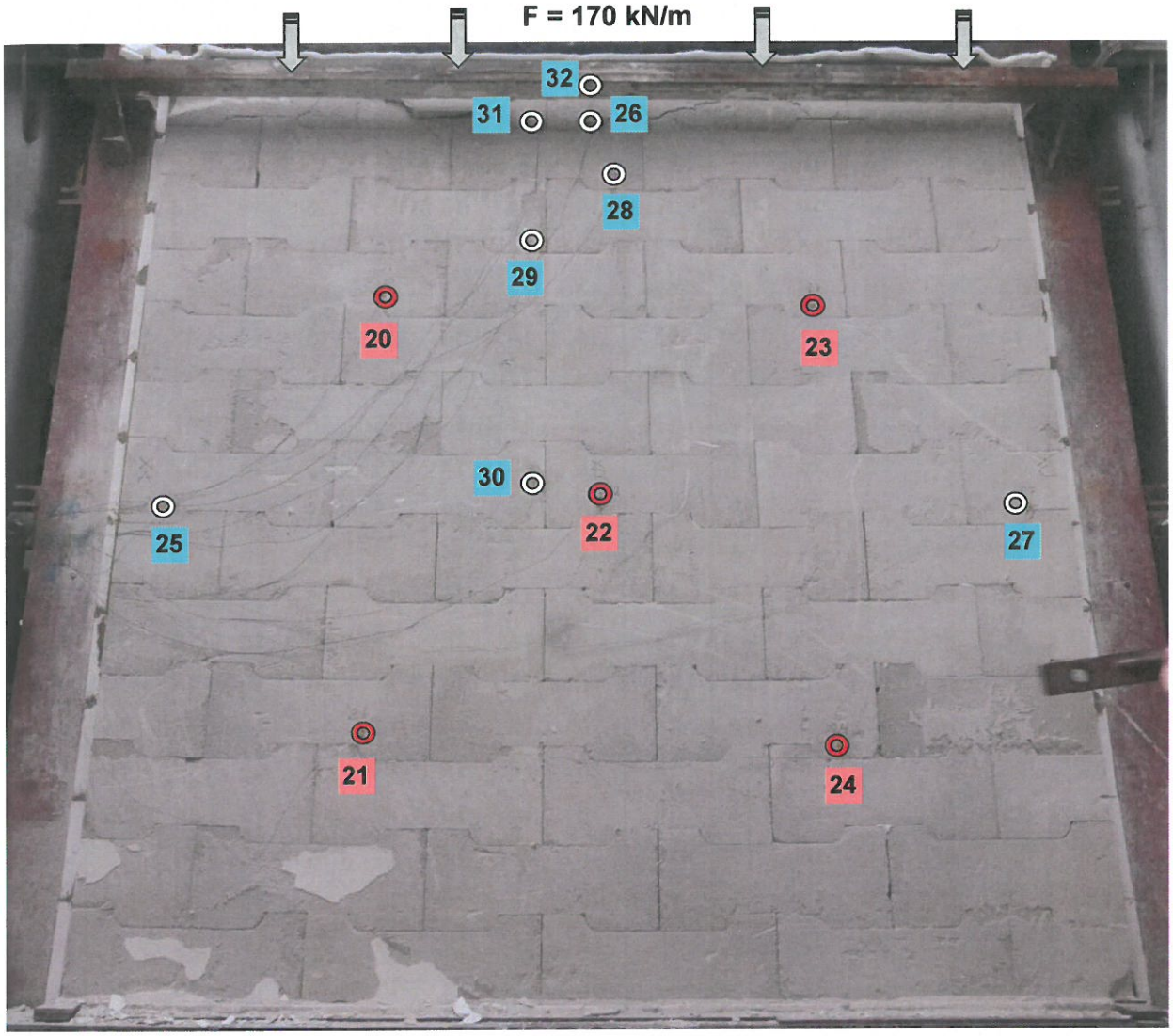
  A_s = area under the standard temperature curve


AVERAGE TEMPERATURE IN FURNACE
T
40
41
42
43
44
45
46
Taver
T min
T max
temperature (°C)
time (min)


PRESSURE IN FURNACE (2,25 m over the furnace floor)
Pressure max
Pressure min
Pressure permitted
Pressure actual
pressure (Pa)
time (min)


DEVIATION d$_e$ (%)
Deviation de - max
Deviation de - min
Deviation de - actual
deviation (%)
time (min)

THE LAYOUT OF TC´s ON UF OF THE SPECIMEN



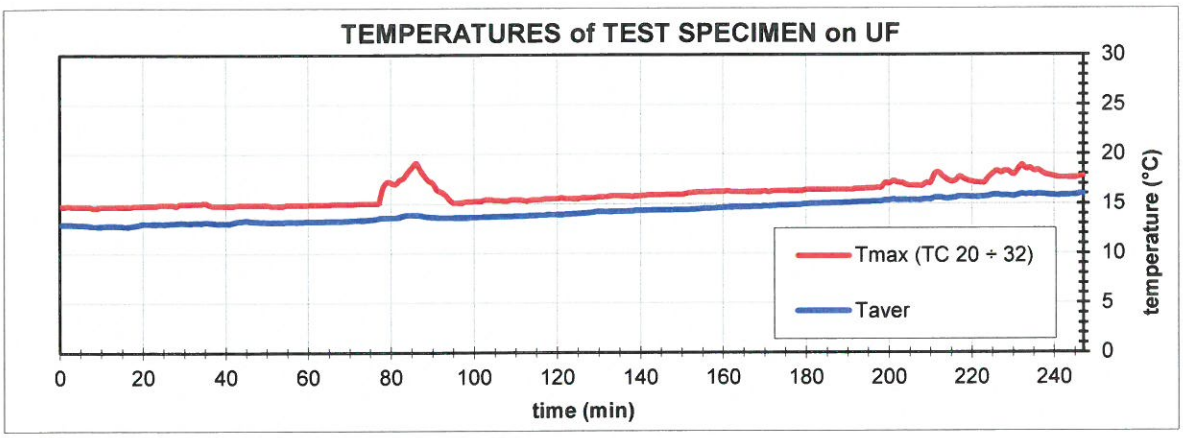
Key:

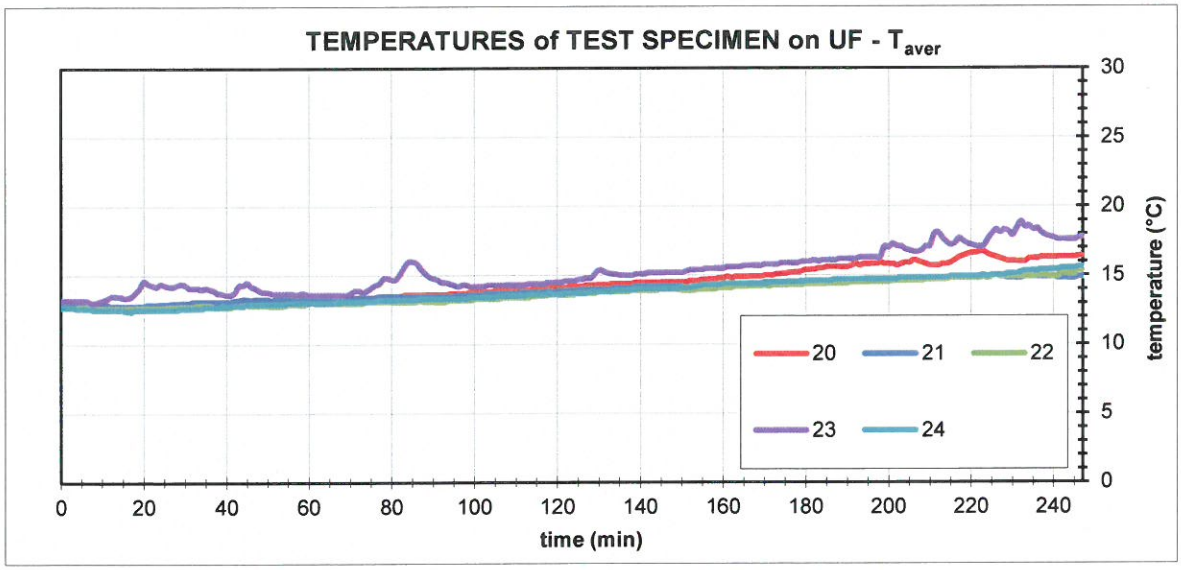
20 ÷ 24	- TC for T_{aver} a T_{max}
25 ÷ 32	- TC for T_{max}

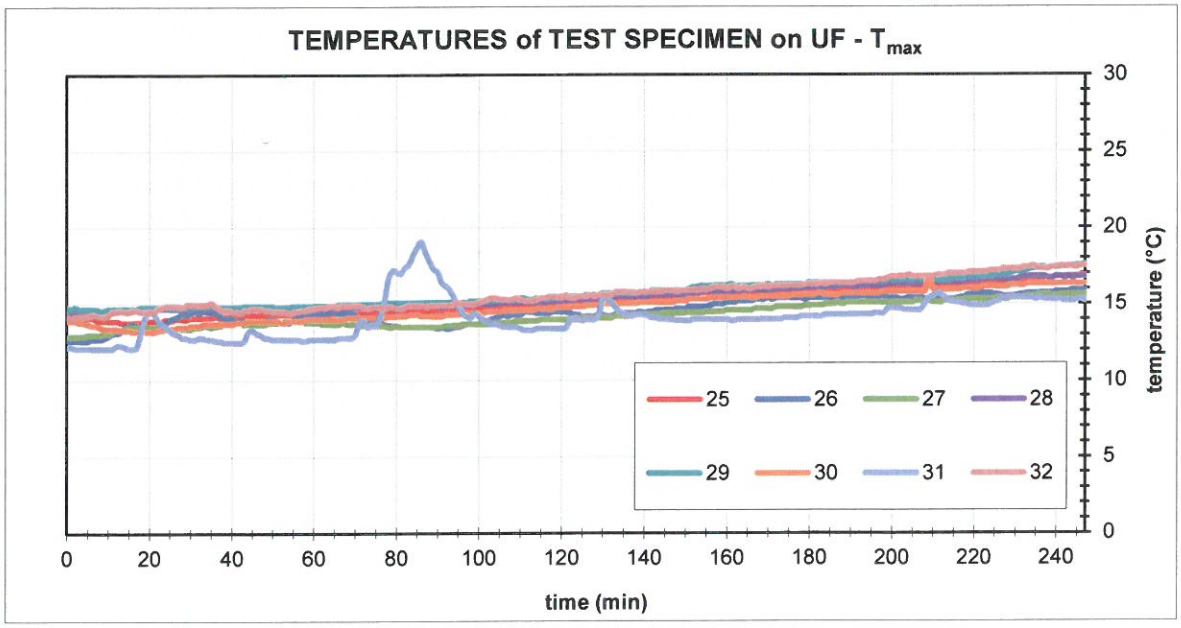
TEMPERATURES of TEST SPECIMEN on UF (°C)

Time t	TC for T_{aver} and T_{max}						TC for T_{max}								T_{max}
(min)	20	21	22	23	24	T_{aver}	25	26	27	28	29	30	31	32	(TC 20 ÷ 32)
0	13	13	13	13	13	13	14	13	13	15	15	14	12	14	15
10	13	13	13	13	13	13	14	13	13	15	15	13	12	14	15
20	13	13	13	15	13	13	14	13	14	15	15	13	15	15	15
30	13	13	13	14	13	13	14	14	13	15	15	14	13	15	15
40	13	13	13	14	13	13	14	14	14	15	15	14	13	15	15
50	13	13	13	14	13	13	14	14	14	15	15	14	13	15	15
60	13	13	13	14	13	13	14	14	14	15	15	14	13	15	15
70	13	13	13	14	13	13	14	14	14	15	15	14	13	15	15
80	14	14	13	15	13	14	15	14	14	15	15	14	17	15	17
90	14	14	13	15	13	14	15	13	14	15	15	14	17	15	17
100	14	14	13	14	13	14	15	14	14	15	15	14	14	15	15
110	14	14	13	14	14	14	15	14	14	15	15	15	13	15	15
120	14	14	14	15	14	14	15	15	14	15	16	15	13	15	16
130	14	14	14	15	14	14	15	14	14	15	16	15	15	16	16
140	15	14	14	15	14	14	15	14	14	16	16	15	14	16	16
150	15	14	14	15	14	14	16	15	14	16	16	15	14	16	16
160	15	14	14	16	14	15	16	15	15	16	16	15	14	16	16
170	15	15	14	16	14	15	16	15	15	16	16	16	14	16	16
180	15	15	14	16	15	15	16	15	15	16	16	16	14	16	16
190	16	15	14	16	15	15	16	15	15	16	16	16	14	16	16
200	16	15	15	17	15	15	16	15	15	16	17	16	15	17	17
210	16	15	15	17	15	15	16	15	15	16	17	16	16	17	17
220	17	15	15	17	15	16	16	16	15	17	17	16	15	17	17
230	16	15	15	18	15	16	16	16	15	17	17	16	15	17	18
240	16	15	15	18	15	16	17	16	16	17	17	16	15	17	18
245	16	15	15	18	16	16	17	16	16	17	18	16	15	17	18
246	16	15	16	18	16	16	17	16	16	17	18	16	15	18	18
247	16	15	15	18	16	16	17	16	16	17	18	16	15	18	18

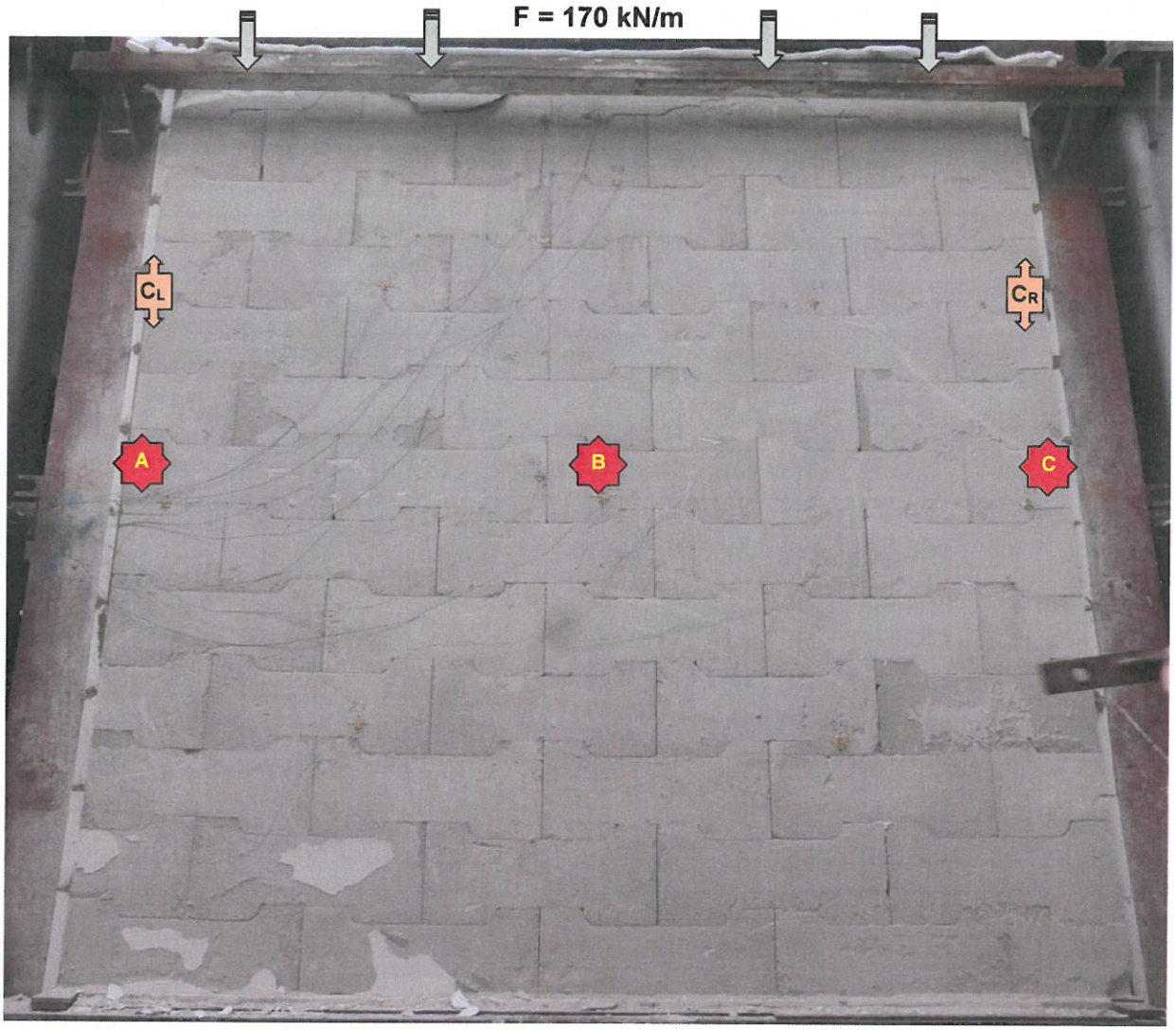
Temp. were recorded and documented every minute but the test process is displayed in 10 min interval.
XX TC joint number in accordance with General view in Annex B.







THE LAYOUT OF MEASURED DEFLECTION POINTS on UF of the SPECIMEN



Key:

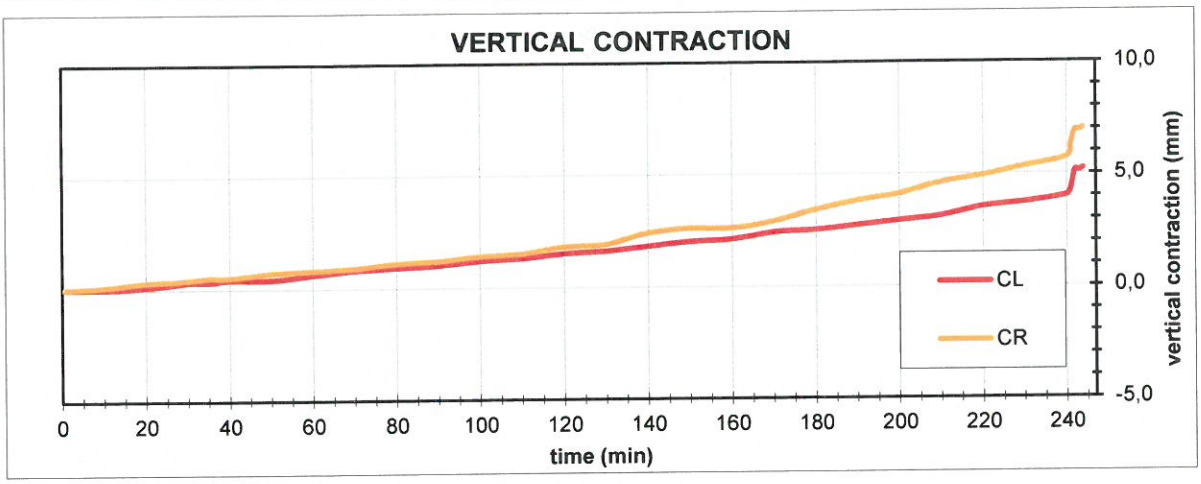
A ÷ C - horizontal deflection measurement points

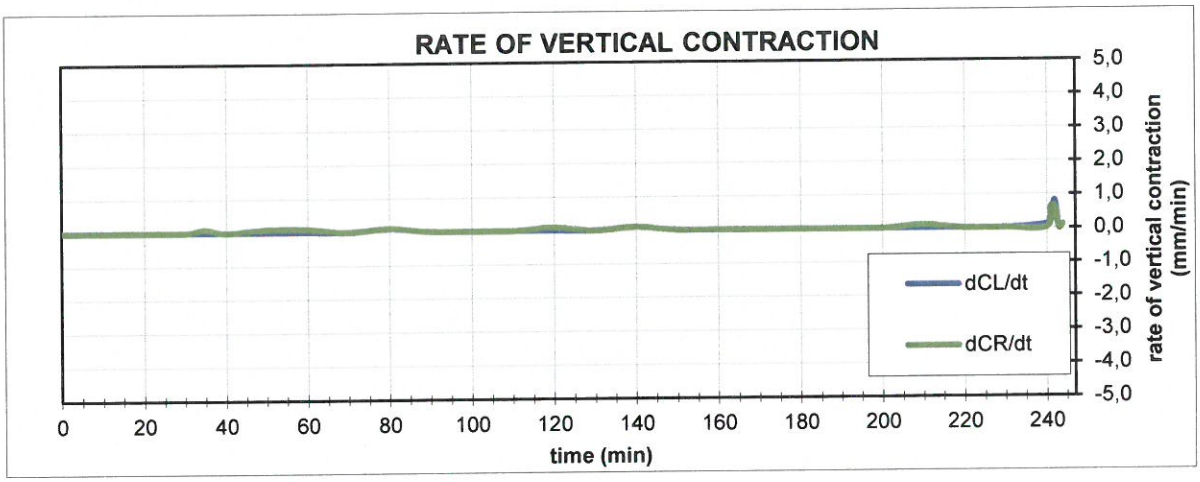
C_L, C_R - vertical contraction measurement points

VERTICAL CONTRACTION of the SPECIMEN (mm)

Time	Vertical contraction			Rate of vertical contraction		
t	C_L	C_R	C_{aver}	dC_L/dt	dC_R/dt	dC/dt_{aver}
(min)	(mm)	(mm)	(mm)	($mm.min^{-1}$)	($mm.min^{-1}$)	($mm.min^{-1}$)
0	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**
10	**0,0**	**0,1**	**0,1**	**0,0**	**0,0**	**0,0**
20	**0,1**	**0,3**	**0,2**	**0,0**	**0,0**	**0,0**
30	**0,3**	**0,4**	**0,4**	**0,0**	**0,0**	**0,0**
35	**0,3**	**0,5**	**0,4**	**0,0**	**0,1**	**0,1**
40	**0,4**	**0,5**	**0,5**	**0,0**	**0,0**	**0,0**
50	**0,4**	**0,7**	**0,6**	**0,0**	**0,1**	**0,1**
60	**0,6**	**0,8**	**0,7**	**0,0**	**0,1**	**0,1**
70	**0,8**	**0,9**	**0,9**	**0,0**	**0,0**	**0,0**
80	**0,9**	**1,1**	**1,0**	**0,1**	**0,1**	**0,1**
90	**1,0**	**1,2**	**1,1**	**0,0**	**0,0**	**0,0**
100	**1,2**	**1,4**	**1,3**	**0,0**	**0,0**	**0,0**
110	**1,3**	**1,5**	**1,4**	**0,0**	**0,0**	**0,0**
120	**1,5**	**1,8**	**1,7**	**0,0**	**0,1**	**0,1**
130	**1,6**	**1,9**	**1,8**	**0,0**	**0,0**	**0,0**
140	**1,8**	**2,4**	**2,1**	**0,1**	**0,1**	**0,1**
150	**2,0**	**2,6**	**2,3**	**0,0**	**0,0**	**0,0**
160	**2,1**	**2,6**	**2,4**	**0,0**	**0,0**	**0,0**
170	**2,4**	**2,9**	**2,7**	**0,0**	**0,0**	**0,0**
180	**2,5**	**3,4**	**3,0**	**0,0**	**0,0**	**0,0**
190	**2,7**	**3,8**	**3,3**	**0,0**	**0,0**	**0,0**
200	**2,9**	**4,1**	**3,5**	**0,0**	**0,0**	**0,0**
210	**3,1**	**4,6**	**3,9**	**0,0**	**0,1**	**0,0**
220	**3,5**	**4,9**	**4,2**	**0,0**	**0,0**	**0,0**
230	**3,7**	**5,3**	**4,5**	**0,0**	**0,0**	**0,0**
240	**4,0**	**5,7**	**4,9**	**0,1**	**0,0**	**0,1**
241	4,3	6,3	5,3	0,3	0,6	0,5
242	5,1	6,9	6,0	0,8	0,6	0,7
243	5,1	6,9	6,0	0,0	0,0	0,0
244	5,2	7,0	6,1	0,1	0,1	0,1
245	*	*	*	*	*	*
246	*	*	*	*	*	*
247	*	*	*	*	*	*

Contraction was recorded and documented every minute but the test process is displayed in 10 min interval.
Values - means vertical specimen reduction
Values + means vertical specimen extension
C_i - measurement of contraction on vertical wall side (i - sign of specimen side)
Limiting vertical contraction: C = h / 100 = 3200 / 100 = **32,0 mm**
dC/dt - limiting rate of vertical contraction
Limiting rate of vertical contraction: dC/dt = 3h / 1000 = 3 * 3200 / 1000 = **9,6 mm/min**
h - is the initial height (mm) of the test specimen
* Not measured due to removal of the test load before the third impact according to [3] cl. 7.





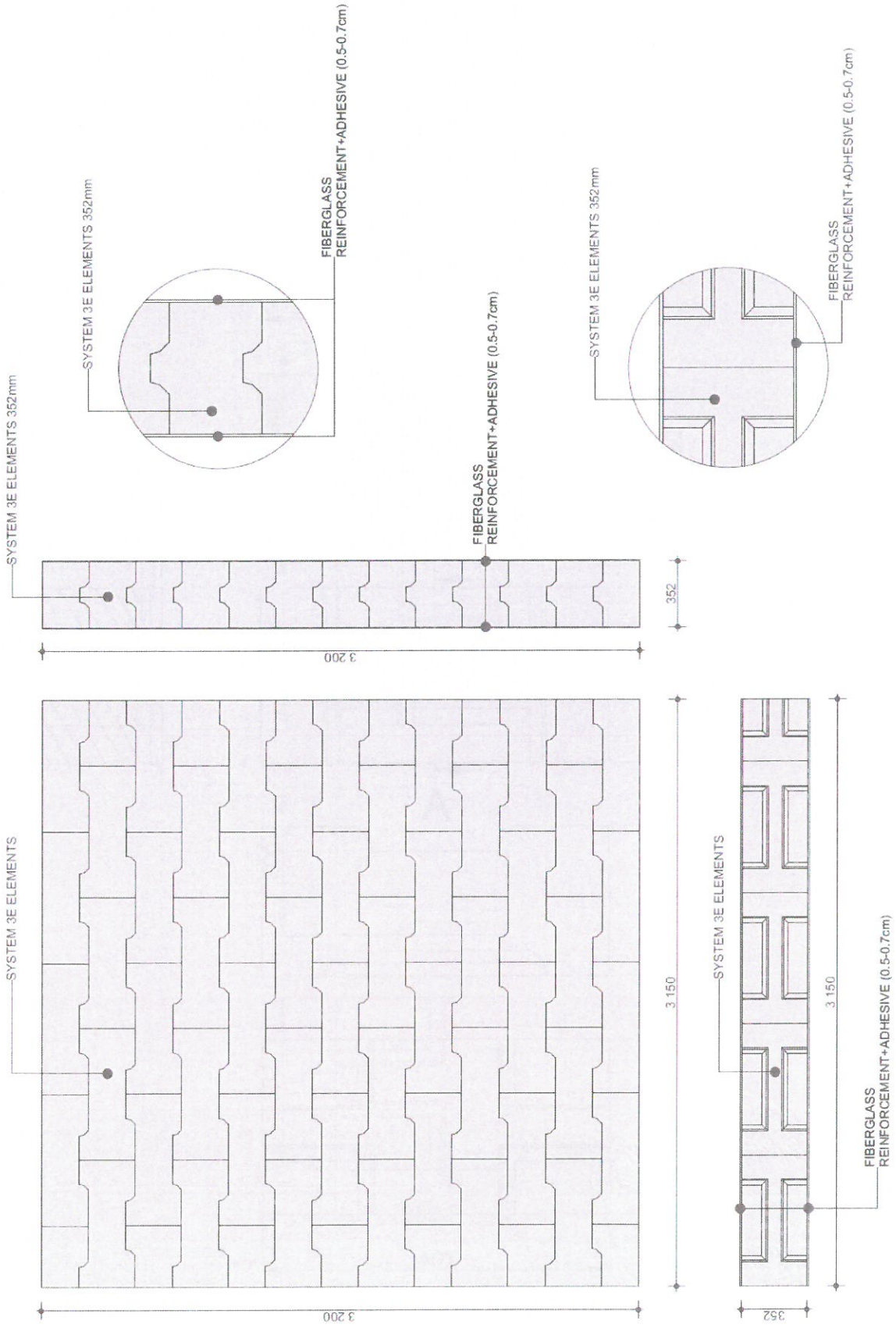
HORIZONTAL DEFLECTION (mm)

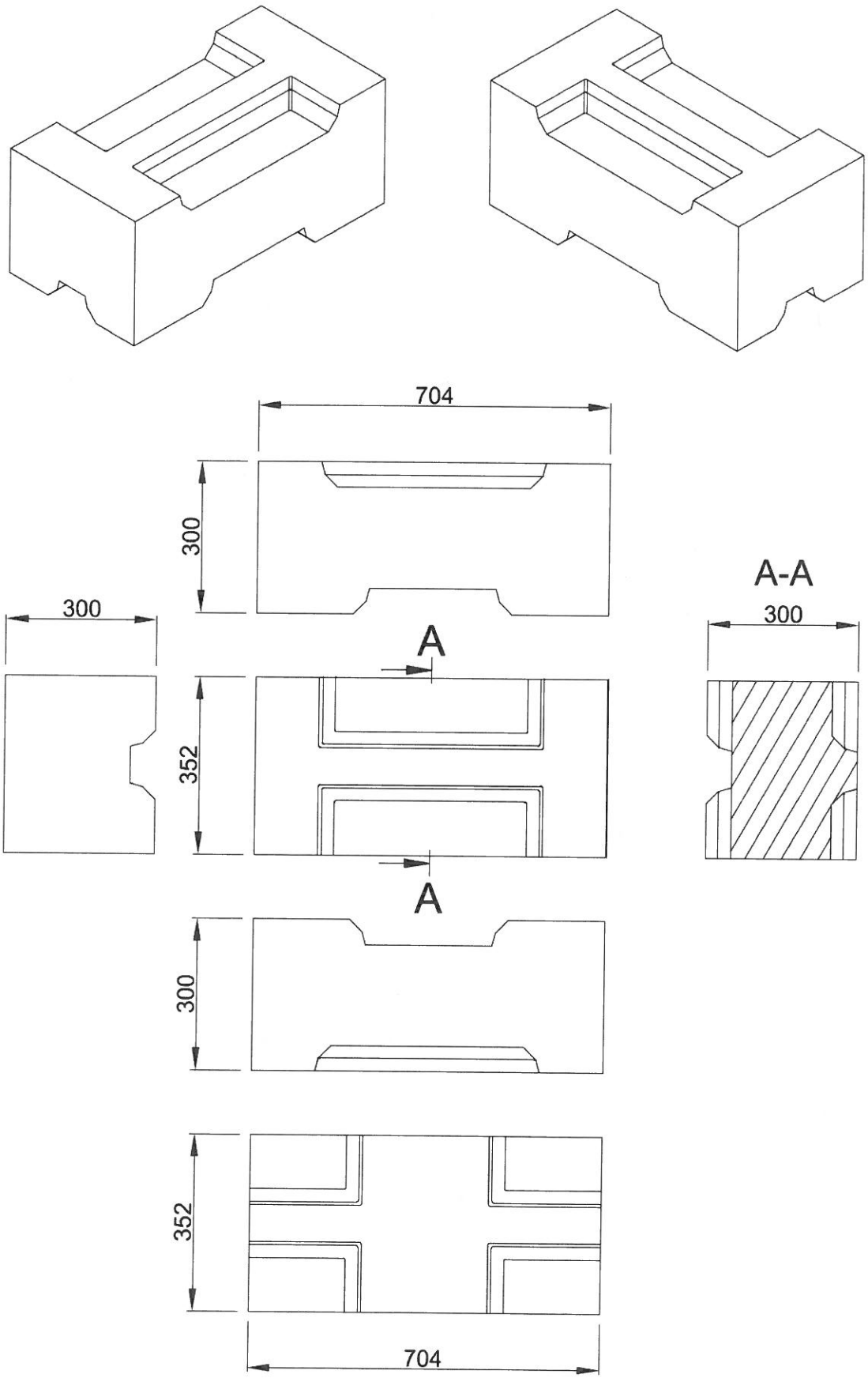
Time (min)	Positions of measurement (deflection in mm)		
	A	B	C
0	0	0	0
15	2	0	-1
30	2	-1	-1
45	0	-1	-2
60	-1	-1	-2
75	0	-1	-1
90	-1	-2	-2
105	-1	-2	-2
120	-1	-2	-3
135	-1	-3	-3
150	-2	-3	-3
165	-2	-3	-5
180	-2	-3	-5
195	-3	-5	-5
210	-4	-7	-6
225	-5	-6	-7
240	-6	-8	-8

Positive values - deflection into the furnace
Negative values - deflection away from the furnace
Measured points position is on General view in Annex B.

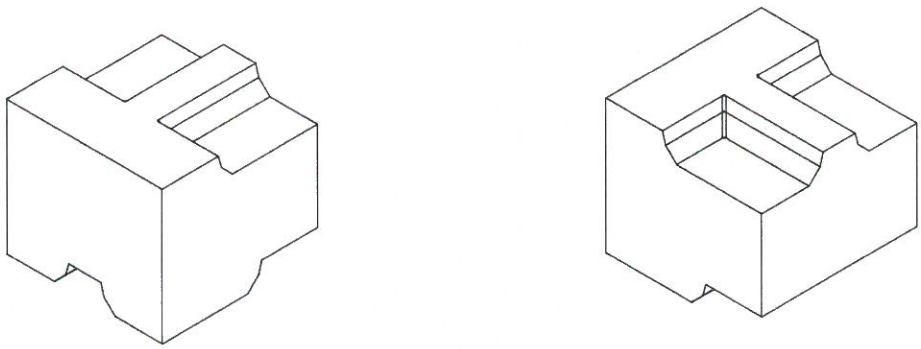
ANNEX C: DOCUMENTATION

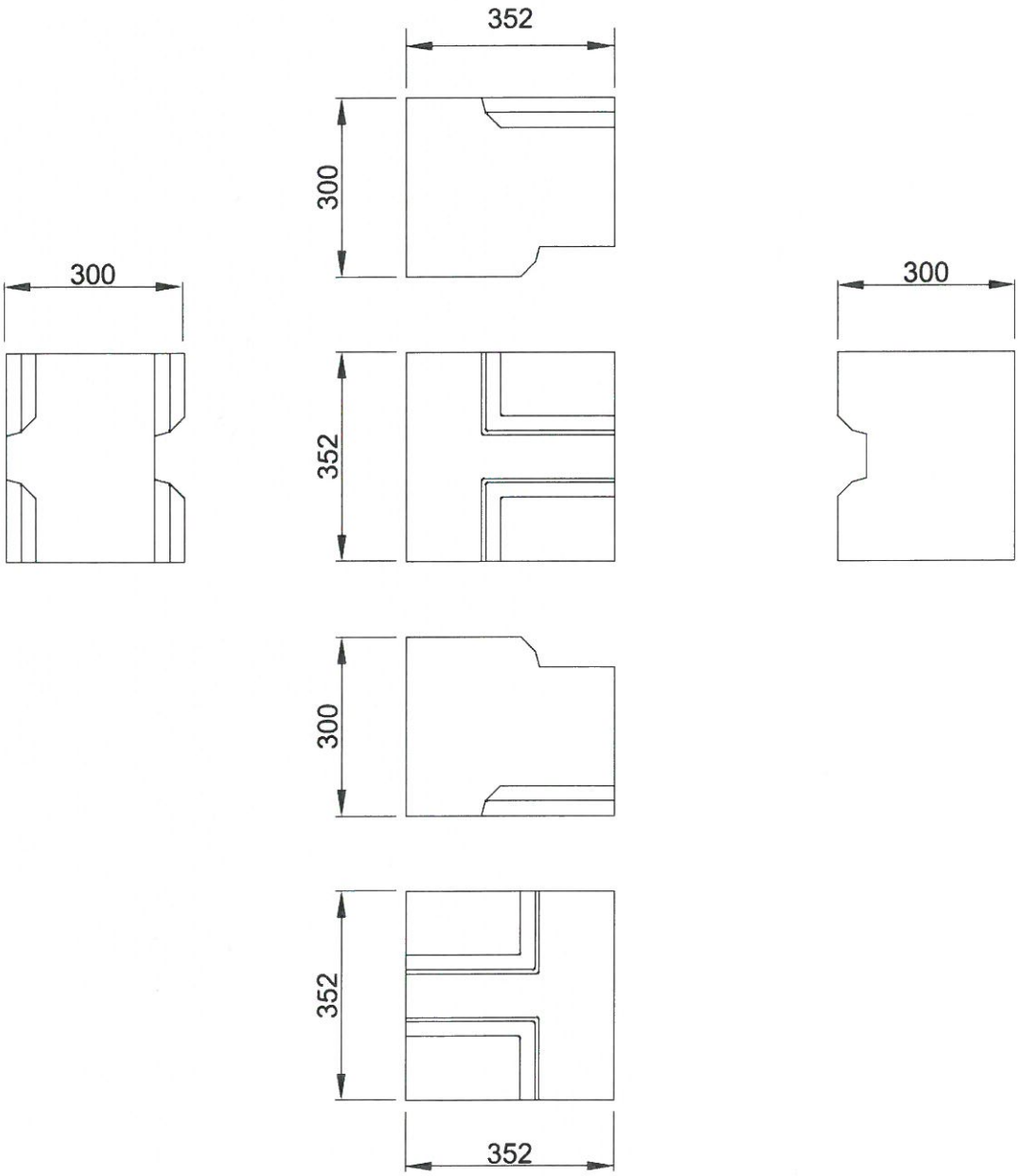
Technical documentation of the specimen delivered by the test sponsor



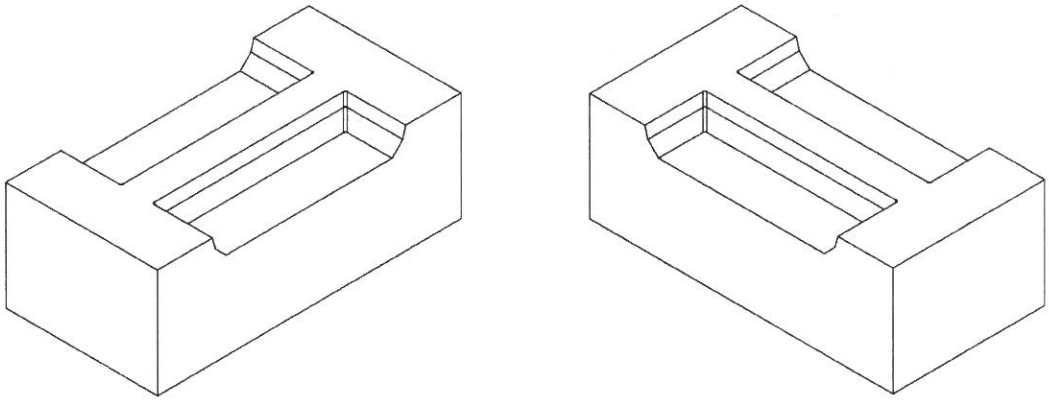


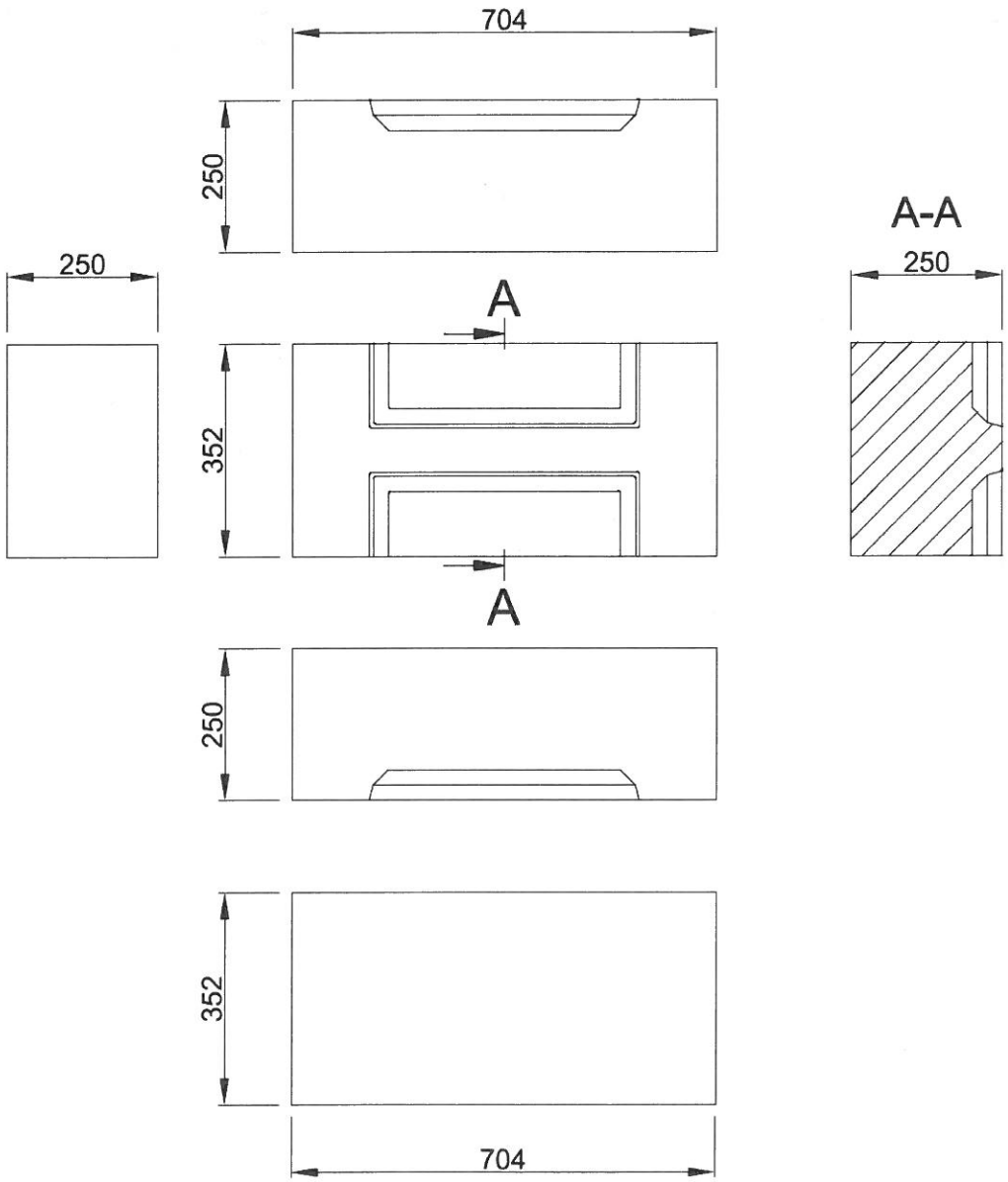
BASIC CONSTRUCTION ELEMENT TYPE - S1



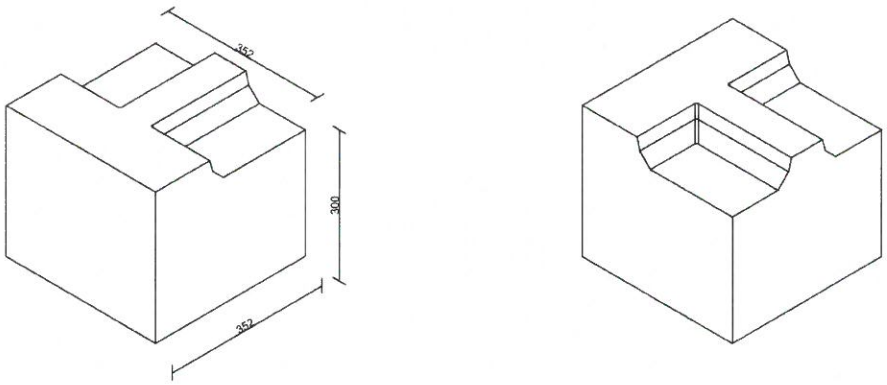


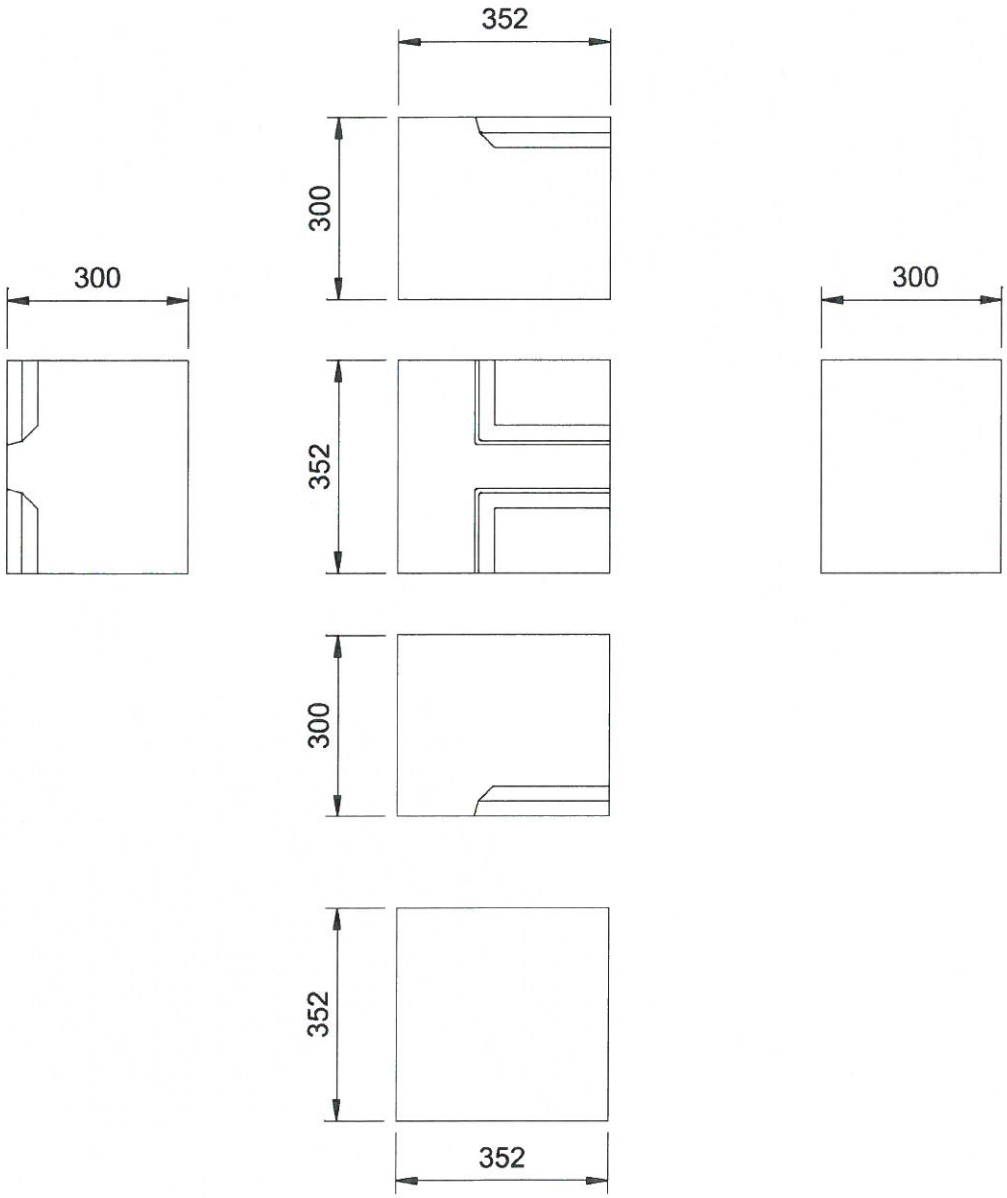
HALF OF BASIC ELEMENT TYPE - S1/2





BASIC LOWER ELEMENT TYPE - S0





HALF OF LOWER ELEMENT TYPE - S05/2

SYSTEM 3E

DECLARATION OF PERFORMANCE

DoP/I/01/21

1. *Unique identification code or the product-type:*	**Aggregate concrete masonry element in System 3E EKO+ technology, category I. Subtype according to Appendix 1.**	
2. *Intended use (s):*	**Aggregate concrete masonry element (with lightweight aggregates) for masonry walls, columns and partitions.**	
3. *Manufacturer:*	**SYSTEM 3E S.A.** Rondo ONZ 1, 00-124 Warsaw, Poland	
4. *System (s) of assessment and verification of constancy of performance:*	**System 2+**	
5. *Harmonised standard: technical assessment institute (s):*	**EN 771-3:2011+A1:2015** Instytut Materiałów Budowlanych i Technologii Betonu Sp. z o.o., notification no 2311	
6. *Declared performance:*	**Essential characteristics**	**Performance**
	Dimensions	As shown in figures
	Tolerance category	D4
	Flatness of faces	≤ 1,0 mm
	Parallelism of supporting surfaces	≤ 1,0 mm
	Configuration	As shown in figures
	Density	310±10% kg/m³
	Compressive strength: mean: (⊥ bed face)	≥ 1,5 N/mm² Kat I
	Water absorption	po 10': ≤ 40 g/m² * s^{0,5}
	Dimensional stability	≤ 0,30 mm/m
	Reaction to fire	A1
	Thermal resistance, thermal conductivity (λ)	0,072±0,003 W/mK
	Water vapour permeability	≤ 15
	Durability against freeze/thaw (20 cycles):	No damage
	Direct airborne sound insulation: Gross dry density	310±10% kg/m³
	Direct airborne sound insulation: Configuration	As shown in figures
	Shear bond strength	NPD
	Flexural bond strength	NPD
	Dangerous substances	NPD
	NPD = No performance determined	

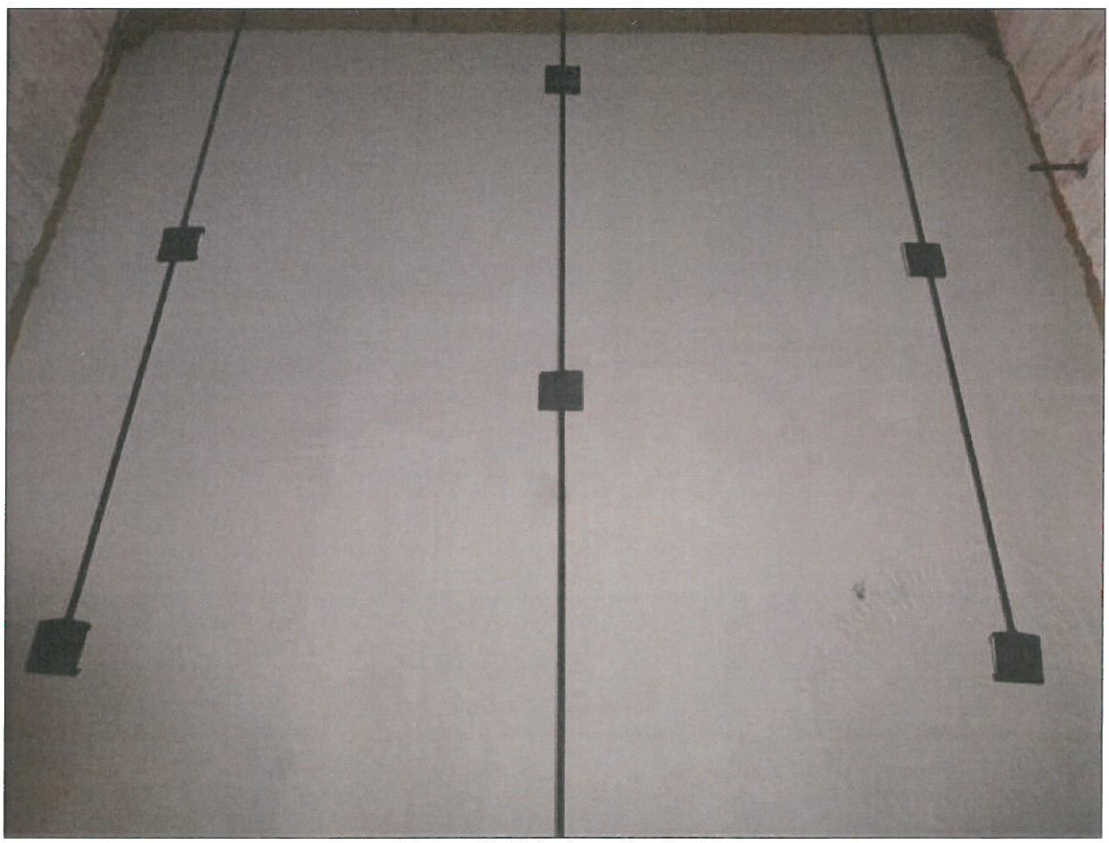
The performance of the product identified above is in conformity with the declared performance.
This Declaration of performance is issued in accordance with Regulation (UE) No 305/2011, under the sole responsibility of the manufacturer identified above.

Signed for and on behalf of the manufacturer:	*R&D and Quality Control Manager*
21.04.2021, Warsaw (Poland)	
Date and place of issue	*Patryk Adam Bolimowski PhD* *Name and surname (signature)*

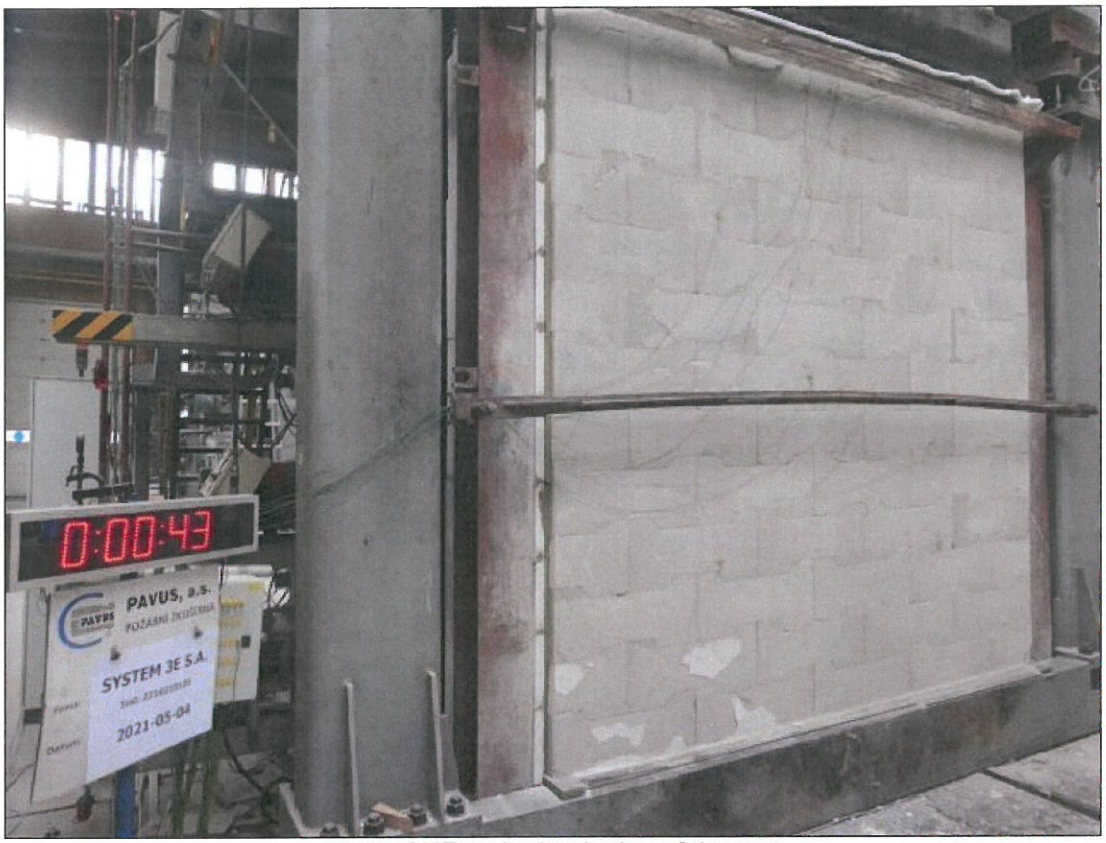
Declaration of performance also available on: www.system3e.com

ANNEX D: PHOTODOCUMENTATION

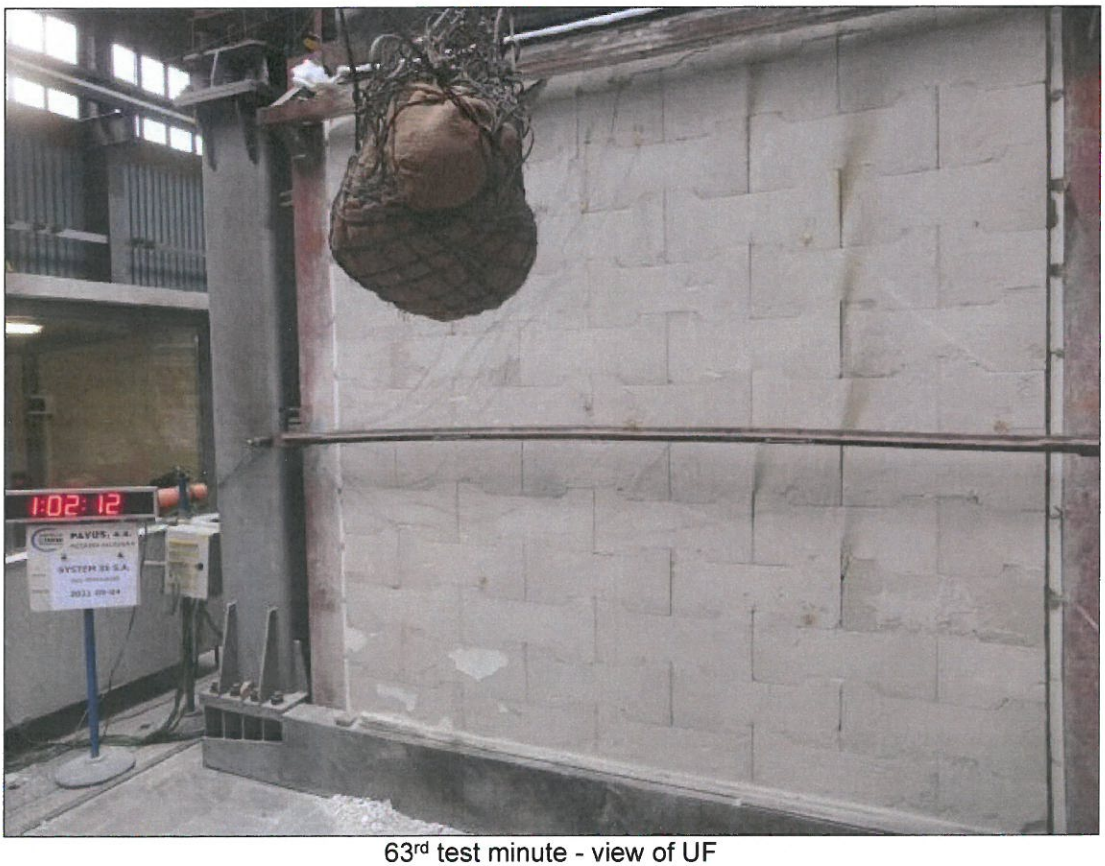
View of the specimen during the assembly



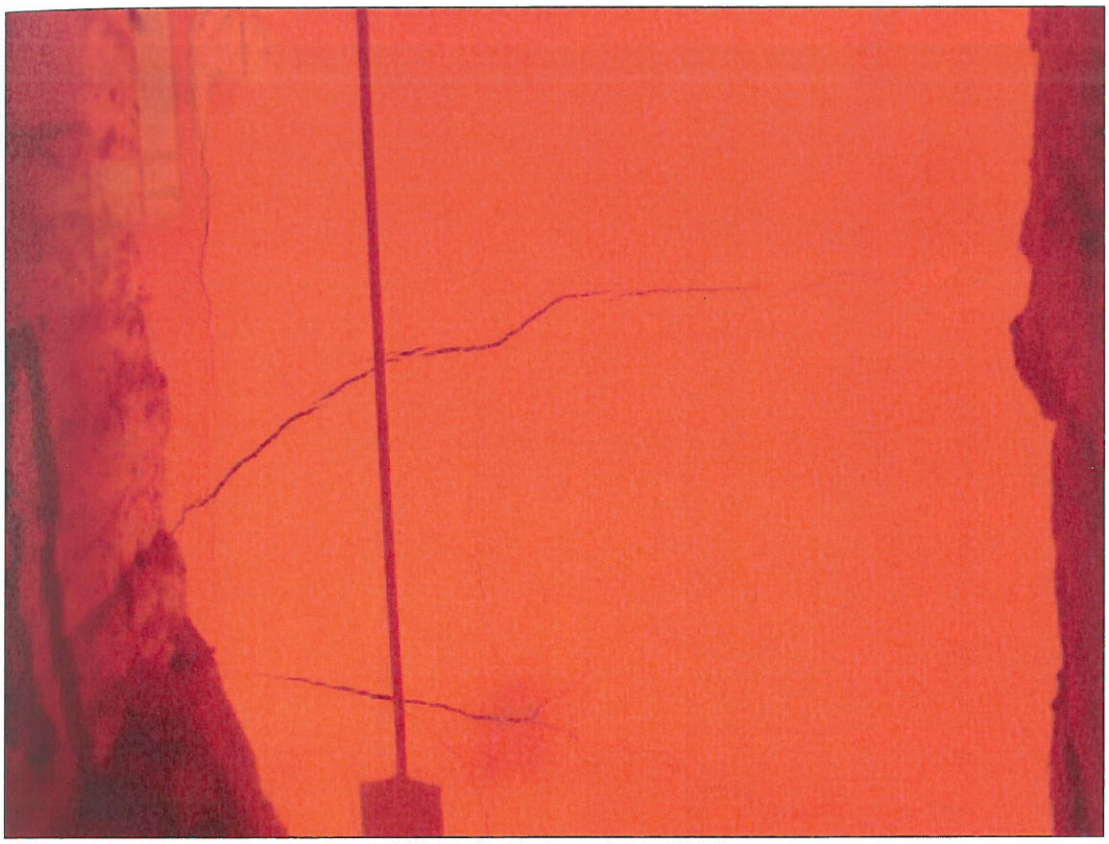
View of EF before the test



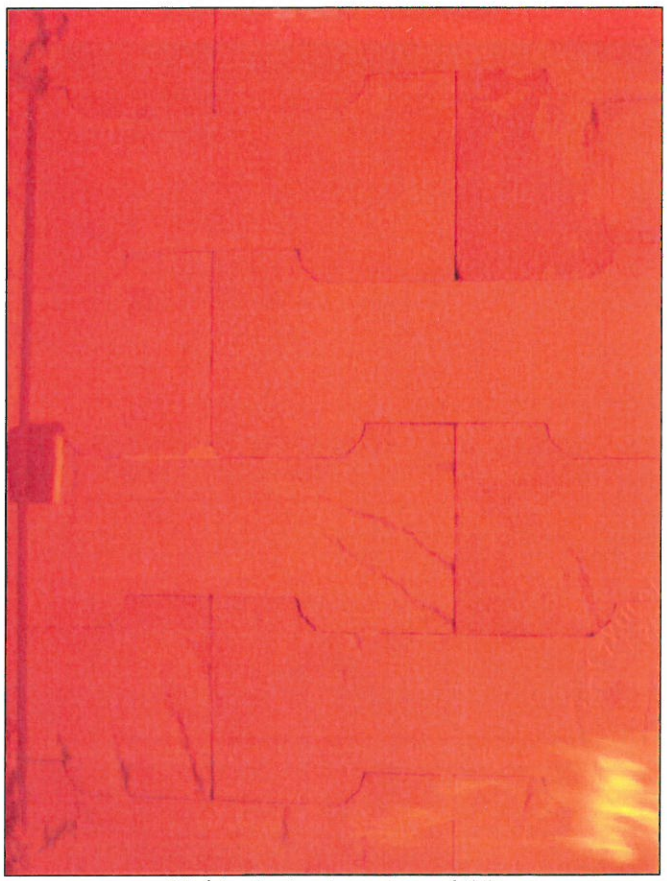
View of UF at the beginning of the test



63rd test minute - view of UF

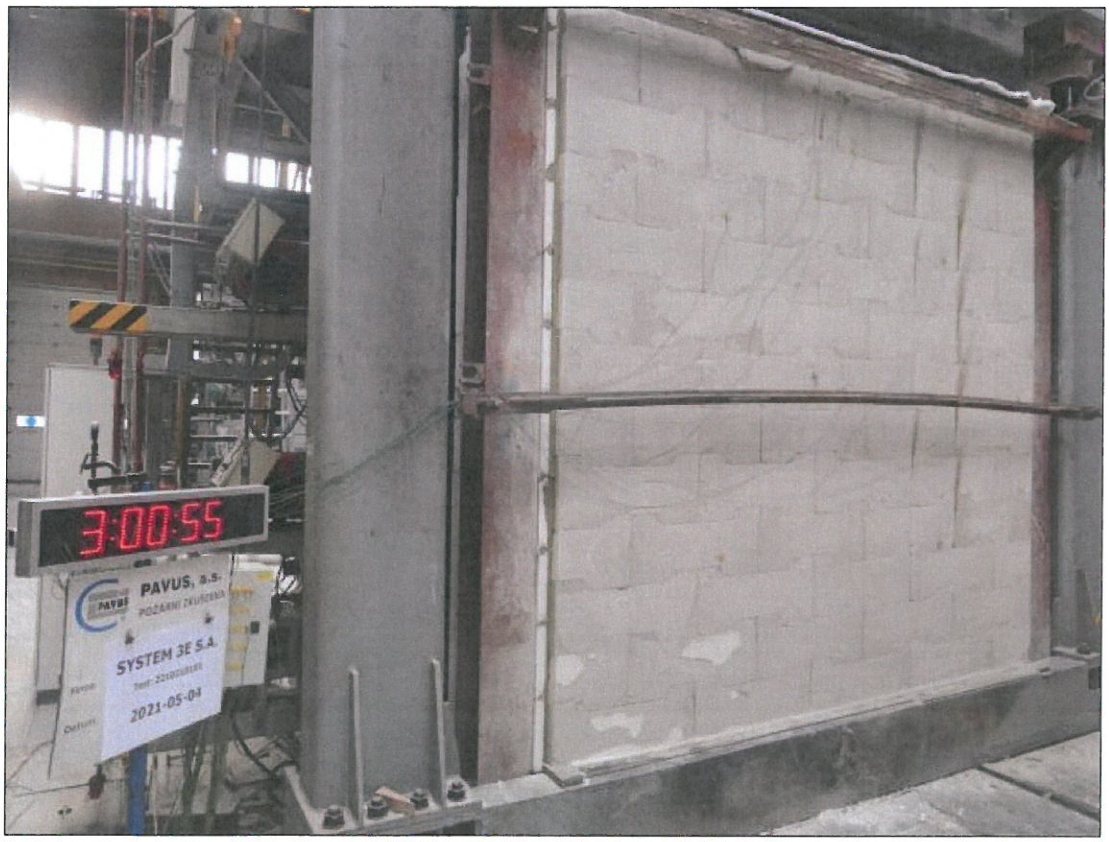


64th test minute - view of EF



83rd test minute - view of EF

121st test minute - view of UF

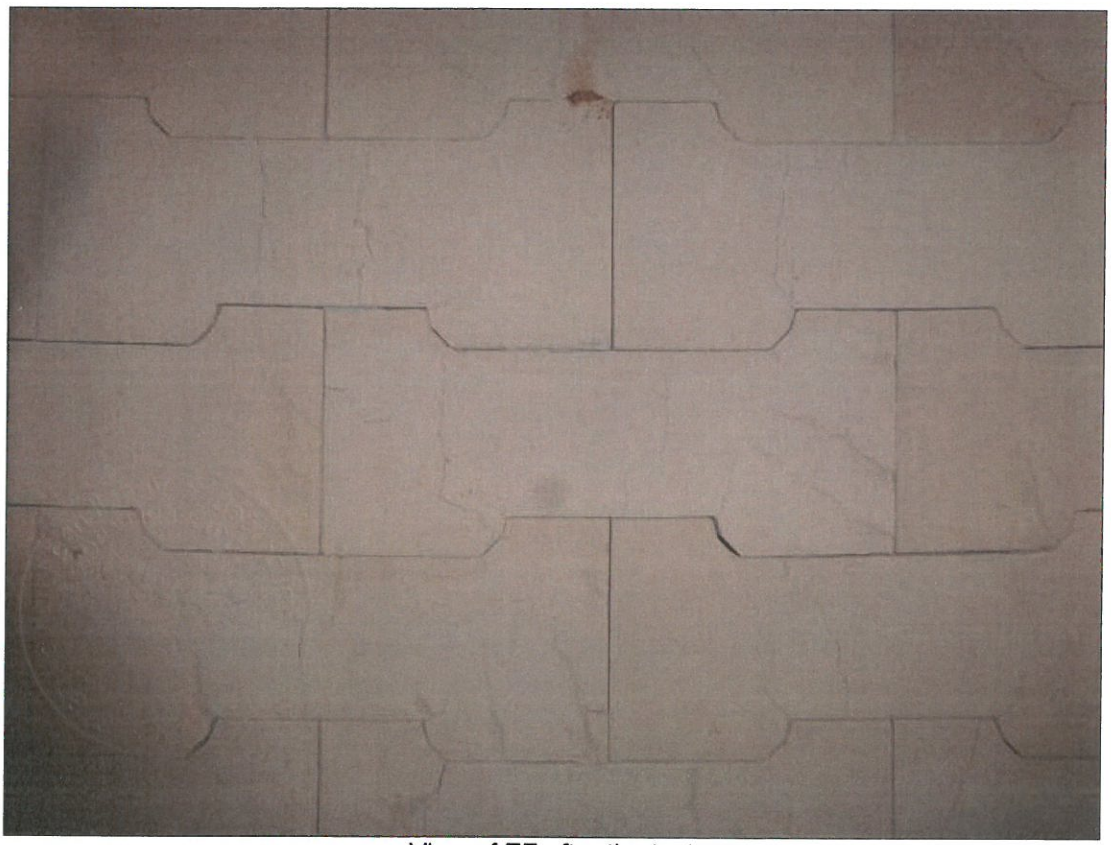


181st test minute - view of UF

235th test minute - view of EF

244th test minute - view of UF after the second impact, removal of the test load

248th test minute - view of UF after the third impact



View of EF after the test