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TEST LABORATORY IN VESELÍ NAD LUŽNICÍ
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FIRE RESISTANCE TEST REPORT

No. Pr-04-1.02.149

Issued on: 2004-11-11

For the products:
Horizontal glazing EI60
PYROBEL EI60H/28 in steel construction

Sponsor: S.A. GLAVERBEL
Parc Industriel Zone C
B-7180 Seneffe

Test methods:

EN 1365-2:1999 (E)
Fire resistance tests for loadbearing elements – Part 2: Floors and roofs

ČSN EN 1365-2:2000
Fire resistance tests for loadbearing elements – Part 2: Floors and roofs
(Zkoušení požární odolnosti – Část 2: Stropy a střechy)

The report consists of:

5 pages
4 Annexes

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PROSECKÁ 412 / 74, CZ-19000 PRAGUE 9 – PROSEK, e-mail: mail@pavus.cz, http:// www.pavus.cz
Reg. No.: 60193174, VAT No.: CZ60193174.
The Company is registered in the Commercial Register administered by the Municipal Court of Prague (section B, inset 2309).
Tel.: +420 286 019 587, Fax: +420 286 019 590

Office Branch Veselí nad Lužnicí
J. Hybeše 879, CZ-39181 Veselí nad Lužnicí, e-mail: veseli@pavus.cz
Tel.: +420 381 581 128, +420 381 581 129, GSM gate: +420 603 296 301, Fax: +420 381 581 127

1 INTRODUCTION

Fire resistance test for Horizontal glazing EI60 with PYROBEL EI60H/28 in steel construction was provided for the company S.A. GLAVERBEL by the PAVUS, a. s. accredited test laboratory in Veselí nad Lužnicí.

The test was prepared, implemented and test results were analysed on the basis of the following documents:

[1] EN 1363-1:1999 Fire resistance tests – Part 1: General requirements

[2] EN 1365-2:1999 (E) Fire resistance tests for loadbearing elements – Part 2: Floors and roofs

[3] ČSN (Czech National Standard) EN 1363-1:200 Fire resistance tests – Part 1: General requirements
(Zkoušení požární odolnosti – Část 1: Základní požadavky)

[4] ČSN (Czech National Standard) EN 1365-2:2000 Fire resistance tests for loadbearing elements – Part 2: Floors and roofs
(Zkoušení požární odolnosti – Část 2: Stropy a střechy)

[5] Technical documentation for the specimens (provided by the sponsor)

For the purposes of this Test Report the definitions stated in [1] to [5] apply, together with the following abbreviations:

TC	thermocouple
STC	sheathed thermocouple made of a cable with mineral insulation
PT	plate thermometer with STC ∅ 1 mm
ES	fire exposed side of the specimen or supporting construction
US	unexposed side of the specimen or supporting construction
IC	initial conditions according to [1]: 10.3.

2 TEST SPECIMEN

The test was performed on Horizontal glazing EI60 with PYROBEL EI60H/28 in steel construction. The test specimen was erected within the standard low density rigid wall construction with the clear horizontal opening of dimensions 3000 mm (width) x 6000 mm (length).

The used glass was Pyrobel EI60H/28 type with structure of 6:3/3/3/3/3:

6 = float glass with thickness of 6 mm oriented on top,

3 = float glass with thickness of 3 mm,

/ = fire resistant layer,

: = PVB folium with thickness of 0.76 mm.

The glass was laid on the steel construction (topped by ALSIFLEX 4 mm pad made by PROMAT). The steel construction consisted of 3 free segments of dimensions 3 m x 2 m with 9 openings for glass panes (max. glass dimensions were 1.1 m x 2.1 m). The steel construction was insulated by PROMATECT-H 25 mm boards (made by PROMAT). The glass/steel joints were sealed with fire resistant silicones made by PROMAT (PROMASEAL Mastic acrylate sealant, Promat SYSTEMGLAS silicone, Silicone DC 895, respectively within particular thirds of the specimen).

The steel construction was finally fixed to the wall using steel L – profiles and screws designed for aerated concrete. Wall/construction joints were insulated by mineral wool. The glass/glass and glass/wall gaps were filled with ceramic wool and sealed with fire resistant silicones made by PROMAT (PROMASEAL Mastic acrylate sealant, Promat SYSTEMGLAS silicone, Silicone 791, respectively within particular thirds of the specimen).

The test specimen was assembled by the employees of the sponsor in conjunction with JH CB s. r. o. České Budějovice (a steel construction) and Promat s. r. o Praha (sealants, a protection of steel construction) from 15th to 17th September 2004.

On 17th September 2004 the test specimen was handed over in accordance with the documentation, free and clear.

3 TEST PROCEDURES

3.1 General information

The fire resistance test was performed on 5th October 2004.

The preparation, test procedures and the evaluation were performed in accordance with:

- EN 1365-2:1999 (E) Annex A: "Specific requirements for testing floors and roofs incorporating glazing" and other relevant parts of standard;
- EN 1363-1:1999.

At the same time the test complied with ČSN EN 1365-2 and ČSN EN 1363-1.

The test equipment and measurement equipment used for the test are stated in Annex 1.

The representatives of the sponsor witnessed the test procedure.

3.2 Conditioning

From the handover date to the test date the specimen was kept in a closed testing hall with the following parameters: the ambient temperature (20 to 23) °C, the relative humidity (51 to 54) %.

3.3 Installation of the specimen

The test was carried out on a horizontal test furnace of the following internal dimensions: 3000 mm (width) x 8500 mm (length) x 2150 mm (height); in the longitudinal direction the furnace was adjusted to an internal length of 6000 mm.

The standard supporting construction was performed as the low density rigid wall construction according to [2]: 7.2.2.2.1 and was made from aerated concrete blocks with density of 650 kg/m^3 and the thickness of 250 mm.

The test specimen was installed as a slab fixed to the walls on four sides and loaded only by the dead weight of the construction.

3.4 Control of the test equipment

The furnaces were heated by an oil burner system. The furnace was controlled in accordance with [2]: 5.1 i. e. particular sections of [1]: 5:

The used PTs were produced in accordance with [1]: 4.5.1.1. The temperatures in the furnace were measured by PTs placed according to [1]: 9.1.1 and recorded at one-minute intervals. The temperatures in the furnace were regulated automatically so that the average temperature measured by all PTs (within a tolerance according to [1]: Article 5.1.2) corresponded to the equation stated in [1]: 5.1.1

$$T = 345.\log(8t+1) + 20 \qquad (°C),$$

where:

T (°C) is the temperature required by the standard and measured in the time *t*;

t (min) is the time, which begins to run at the commencement of the test.

Overpressure in the test furnace was measured by a differential pressure transducer and regulated automatically by an exhaust fan so that the overpressure values in the furnace corresponded to the conditions stated in [2]: 5.2.

3.5 Measurements on the specimen

Unexposed surface temperatures were measured using K-type thermocouples made in accordance with [1]: 4.5.1.2 attached and located in accordance with [2]: A.3.2 and A.3.3.

Internal temperatures were measured using K-type thermocouples made in accordance with [1]: 4.5.1.4 attached in accordance with the sponsor request.

The temperatures were recorded at one-minute intervals.

The vertical deflection was measured at the location where the maximum deflection was expected to occur as given in [2]: 9.3. Two locations were appointed at mid-span of two inner transoms oriented in the longitudinal direction of specimen and the specimen deflection was assessed as average value of these measured deflections. At sponsor's request the deflection of mid point of mid glass span was measured too. The deflections were recorded at five-minute intervals.

3.6 Ambient temperature

The ambient temperature was measured by measurement equipment in accordance with [1]: 5.6.

4 TEST PROCEDURES

The initial conditions of the tests corresponded to standard values according to [2]: 10.3. Observations made during the tests and afterwards are given in the following tables:

Time	Observation
2nd min	Glass cracking on ES
3rd min	Reaction of the first active layer – glass is getting opaque
6th min	Opaque glass in the whole area, longitudinal glass cracking on ES
13th min	Vertical shift by 15 mm in longitudinal cracks
30 min	No essential change
33rd min	Maximal vertical shift of parts of mid pane by 40 mm
	Noticeable vertical shifts in other longitudinal cracks
35th min	Smoke leaking from cracks
45th min	Vertical shift of parts of mid pane by 50 mm
50th min	Vertical shift of parts of mid pane by 70 mm
61 min 30 s	Collapse of part of mid pane, sustained flaming around opening
	Integrity failure, termination of test

Tabular and graphical depictions of the output from all measurement devices are reported in Annex 2.

The field of temperature in the furnace during the tests fulfilled to the requirements of [1]: 5.1; the pressure in the furnace fulfilled to the requirements of [2]: 5.2.

5 TEST RESULTS

5.1 Performance criteria

Performance criteria for the tested specimens in accordance with [2]: 11 and A.4 are:

Loadbearing capacity

This is the time in completed minutes for which the test specimen continues to maintain its ability to support the test load (i. e. dead weight in this instance) during the test following [1]: 11.1. Failure to support the load is deemed to have occurred when both of the following criteria have been exceeded:

limiting deflection $D = L^2/(400\ d)$, in mm, and

limiting rate of deflection $dD/dt = L^2/(9000\ d)$, in mm/min, when $D > L/30$

where

L = 5960 mm is the clear span of the test specimen;
d = 70 mm is the distance from the extreme fibre of the cold design compression zone to the extreme fibre of the cold design tension zone of the structural section.

Integrity

These are the times in completed minutes for which the test specimen continues to maintain its separating function during the test without either:

a) causing the ignition of cotton pad applied in accordance with [1]: 10.4.5.2; [2]: 8.2.3; or
b) permitting the penetration of gap gauge as specified in [1]: 10.4.5.3; or
c) resulting in sustained flaming.

Insulation

This is 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 (derived from thermocouples specified in [2]: A.3.2) above the initial average temperature by more than 140 °C;
b) increase the temperature at any location (derived from thermocouples specified in [2]: A.3.3) above the initial average temperature by more than 180 °C.

(The initial average temperature equals the average temperature on the unexposed surface at the commencement of the test.)

5.2 Expression of the test results

Expression of the test results in accordance with [1]: 12.3:

- Loadbearing capacity	**61 minutes**,	no failure (the test having been discontinued at integrity failure)
- Integrity		
- Cotton pad	**61 minutes**	no failure (the test having been discontinued at sustained flaming)
- Gap gauge	**61 minutes**	no failure (the test having been discontinued at sustained flaming) [1)]
- Sustained flaming	**61 minutes,**	collapse of part of mid pane
- Insulation	**61 minutes**	[2)]

6 CONCLUSION

The results of the test are valid only for the tested specimen.

This report details method of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in EN 1363-1, EN 1365-2 (and at present following the procedure outlined in ČSN EN 1363-1 and ČSN EN 1365-2). Any significant deviation with respect to size, construction details, loads, stresses, edge or end conditions other than those allowed under the field of direct application in the relevant method is not covered by this report.

The report shall be reproduced only as a whole; otherwise, the written consent of the Test Laboratory shall be required.

Report sheets and Annexes are valid only if stamped with an embossed stamp.

Approved by: .....
Mirko Louma
Assistant Manager
of the Fire Test Laboratory

Požární zkušebna Veselí nad Lužnicí
AKREDITOVANÁ ZKUŠEBNÍ LABORATOŘ č. 1026
PAVUS
PAVUS, a. s.

Worked out by: .....
Radek Hruska
Engineer of the Fire Test Laboratory

[1)] For practical and safety reasons it was not possible to use gap gauges to evaluate integrity and visuall assesment was used with the negative result.
[2)] According to [1]: 11.4.2 the performance criteria „insulation“ shall be assumed not to be satisfied when the „integrity“ criterion ceases to be satisfied.

TEST AND MEASURING EQUIPMENT, MEASUREMENT UNCERTAINTY

Test equipment:	Registration No.:
Horizontal furnace (+ equipment pressure and temperature control inside the furnace)	2.001
Wall furnace (+ equipment pressure and temperature control inside the furnace)	2.003
Test frame	2.007/1
Pressure probe in the furnace	2.006/1
Frame for the cotton cushion	2.013/1.2

Measuring equipment:	Measured quantity	Metrological registration No.:
Differential pressure transducer	pressure (voltage)	3 09 10
Datalogger	temperature	3 10 06
Datalogger	voltage	3 11 65
Plate thermometers in the furnace (STC K ∅ 1 mm)	temperature (emf)	3 10 08
Device for measuring ambient temperature (STC K ∅ 3 mm)	temperature (emf)	3 10 15
TC (K) – temperature on the US	temperature (emf)	3 10 09
Roving TC (K)	temperature (emf)	3 10 06
Deflectometer	deflection	3 01 01
Stopwatch	time	3 05 01
Measuring tape	dimension	3 01 05

The metrological relationships of the device are defined in the metrological registration card of the device; this card is expressly identified by the metrological registration number of the device.

Quantity			**Expanded uncertainties**
Term	Denotation	Unit	
Time from commencement of test	t	(min)	< 0,03 min, if $t \leq 240$ min
Time of integrity failure		(min)	< 0,5 min
Temperature (type K thermocouple, compensating cables - tolerance class 1 according to IEC 584-2 and IEC 584-3, respectively)	T	(°C)	$\sqrt{(6{,}40.10^{-6}.T^2 + 6{,}06\,°C^2)}$, if -40 °C ≤ T ≤ 375 °C) $\sqrt{(2{,}76.10^{-5}.T^2 + 3{,}03\,°C^2)}$, if +375 °C ≤ T ≤ 1000 °C,
Overpressure in the furnace	p	(Pa)	$\sqrt{(5.3.10^{-4}.p^2 + 1{,}1.10^{-5}\,Pa^2)}$
Horizontal deflection of vertical element		(mm)	< 1,8 mm

The reported expanded uncertainties of measurement are stated as the standard uncertainties of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with ALE Publication EA-4/02 (EAL R2).

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 stated a degree of accuracy of the result.

MEASUREMENTS

Furnace control

Time t	Furnace temperature (°C)														Deviation p (%)		Overpressure in the furnace[1] (Pa)		Ambient
(min)	T_N	*44*	*45*	*46*	*47*	*48*	*49*	*50*	*51*	*52*	*53*	*54*	*55*	T_s	permissible	actual	required	actual	temperature (°C)
IC		13	13	13	13	13	13	13	13	13	13	13	13	13					12
0	20	47	77	63	52	57	47	51	57	68	58	71	64	59	-	-	-	12.7	16
5	576	576	622	585	603	611	568	492	558	608	577	595	591	582	-	-8.0	-	16.8	17
6	603	584	633	614	619	635	594	546	618	676	621	607	608	613	15	-6.1	17±5	19.9	17
10	678	648	695	679	687	715	673	647	695	745	706	716	705	693	15	-3.2	17±5	12.9	17
15	739	717	756	736	733	736	714	697	735	764	742	759	755	737	12.5	-2.1	17±3	15.4	18
20	781	762	798	789	790	793	769	745	782	813	790	808	801	787	10.0	-1.4	17±3	15.5	18
25	815	795	824	801	806	806	790	773	804	828	813	826	823	807	7.5	-1.2	17±3	17.0	18
30	842	820	850	839	842	839	823	798	831	855	845	857	854	838	5.0	-1.1	17±3	19.9	20
35	865	842	868	850	861	856	843	820	850	873	864	877	873	856	4.6	-1.0	17±3	10.7	19
40	885	859	884	873	878	873	859	839	868	891	881	891	888	873	4.2	-1.0	17±3	17.8	19
45	902	890	911	889	913	918	894	866	895	916	913	921	918	904	3.8	-0.9	17±3	17.6	20
50	918	896	920	905	918	915	896	874	903	925	920	930	924	911	3.3	-0.9	17±3	18.1	21
55	932	920	940	926	942	938	919	899	930	946	943	954	947	934	2.9	-0.8	17±3	16.4	21
60	945	933	947	928	951	944	925	911	936	952	948	960	951	941	2.5	-0.8	17±3	19.5	22
61	948	934	950	935	961	958	937	913	938	957	954	967	956	947	2.5	-0.8	17±3	-1.5	21

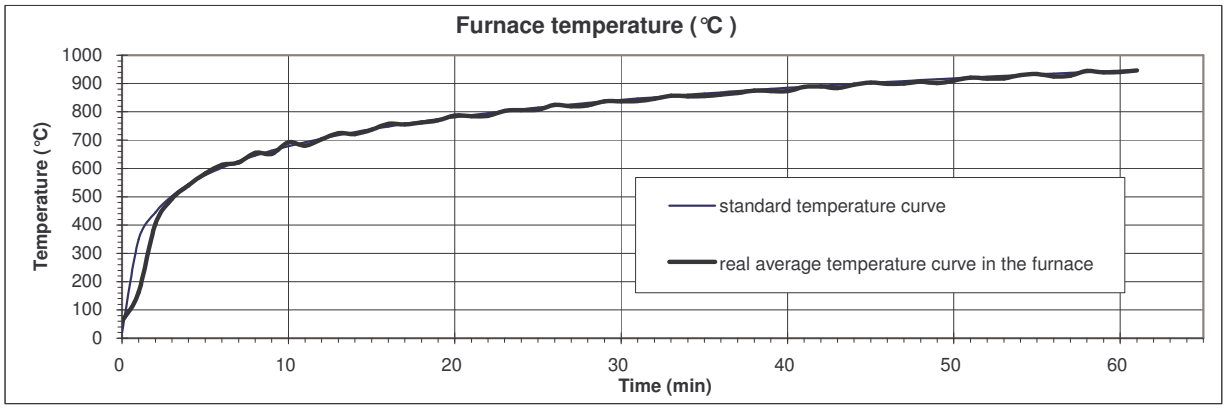
[1] 453 mm below the underside of the separating element

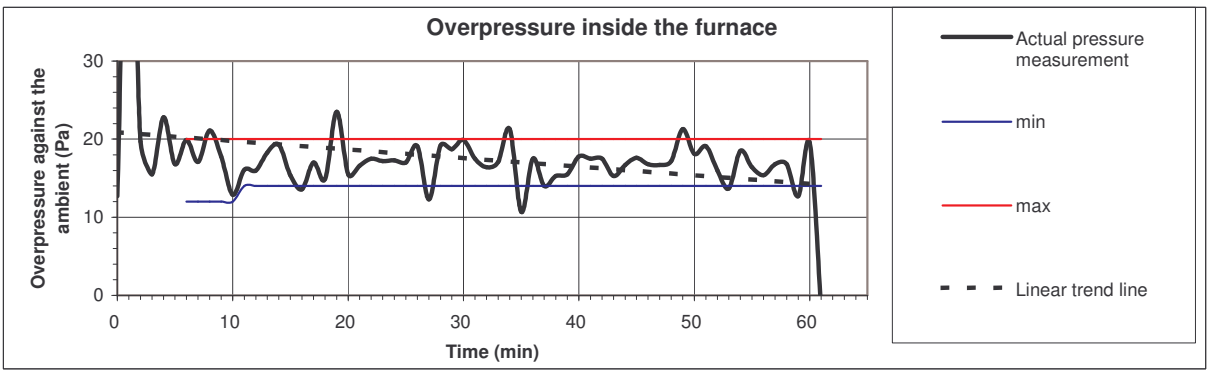
$T = 345 \cdot \log(8 \cdot t + 1) + 20$ $(°C)$ required average furnace temperatur e the according to [1] : 5.1.1

T_s $(°C)$ real average furnace temperatur e according to [1] : 5.1.1

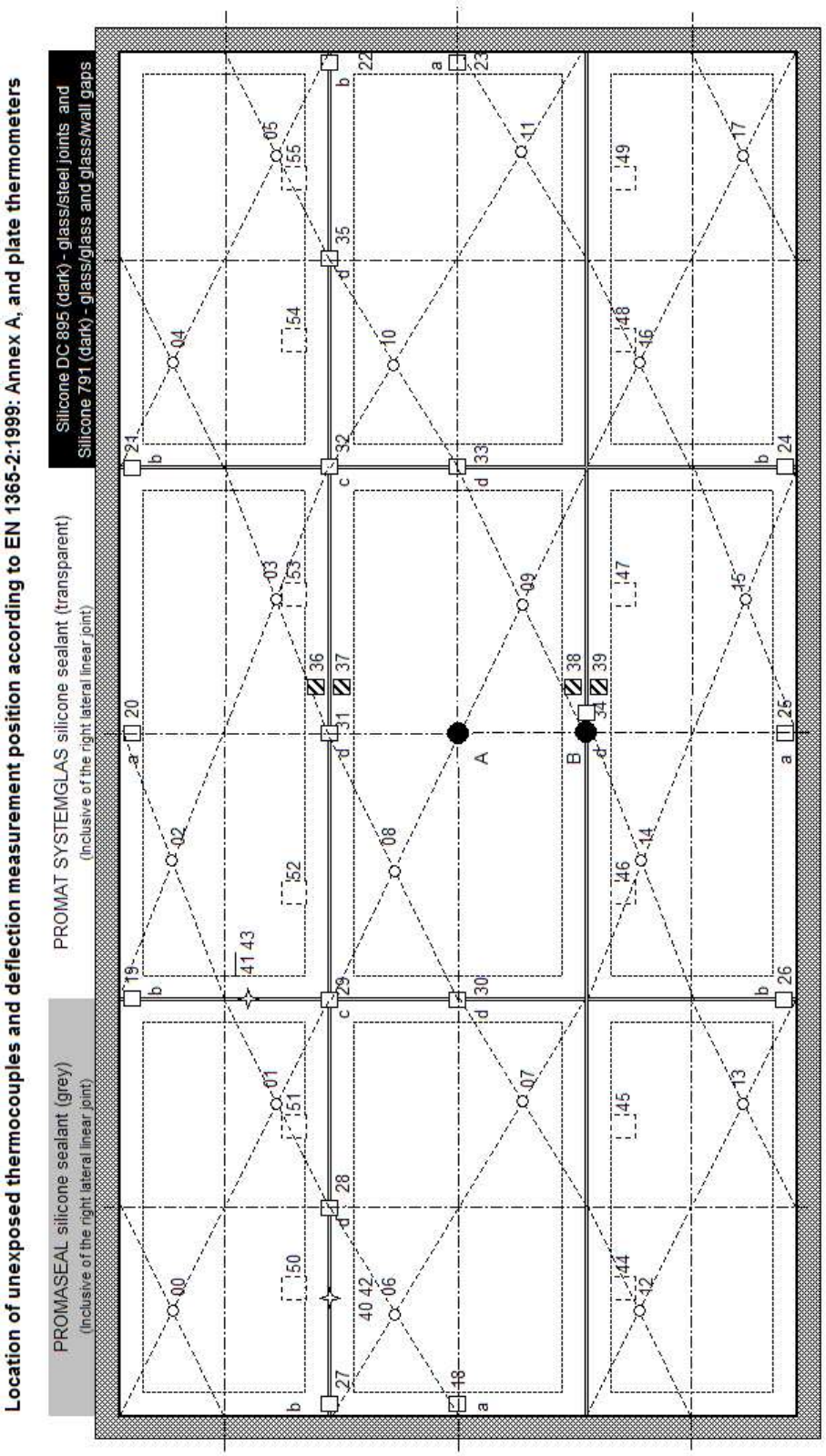
t (min) time since the commenceme nt of the test

d_e $(\%)$ percentage deviation T_s from T according to [1] : 5.1.2





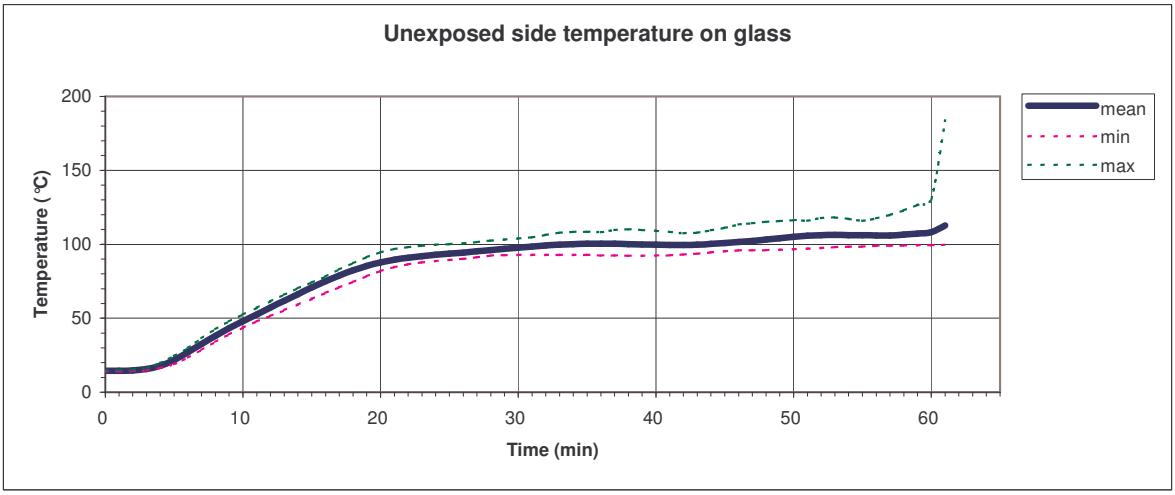
Location of unexposed thermocouples and deflection measurement position according to EN 1365-2:1999: Annex A, and plate thermometers



Unexposed side temperature on glass

Time	Temperatures on the unexposed side (°C)																		
(min)	*00*	*01*	*02*	*03*	*04*	*05*	*06*	*07*	*08*	*09*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	mean
IC	12	12	12	12	13	13	12	12	12	12	13	12	12	12	12	13	13	13	12
0	14	14	14	15	15	15	14	14	14	15	15	15	14	15	15	15	15	15	14
5	19	20	21	24	23	24	21	22	22	23	24	22	19	21	21	23	22	21	22
10	46	47	48	53	49	51	48	47	48	50	50	49	44	48	44	48	48	48	48
15	68	69	73	74	71	73	73	69	72	73	72	71	63	72	65	71	71	72	71
20	90	88	86	85	86	92	95	85	83	93	90	91	82	85	86	87	90	89	88
25	99	91	90	90	92	96	100	89	92	96	95	97	94	90	95	91	94	94	94
30	100	96	99	93	103	99	104	95	94	97	99	99	97	95	97	95	98	99	98
35	102	106	103	93	108	100	104	101	94	99	98	102	96	99	98	100	102	103	100
40	100	109	100	92	106	100	102	101	95	99	98	101	96	100	95	97	102	100	100
45	98	106	99	95	111	107	102	103	101	98	101	98	96	103	97	96	104	97	101
50	99	105	98	100	113	116	107	111	113	101	109	99	99	110	105	97	112	97	105
55	101	106	99	100	116	113	105	112	109	100	108	103	101	111	112	98	116	99	106
60	101	106	106	103	131	109	104	114	126	102	106	105	104	114	106	99	112	101	108
61	101	107	109	108	135	110	105	117	184	105	108	104	105	118	106	100	112	102	113

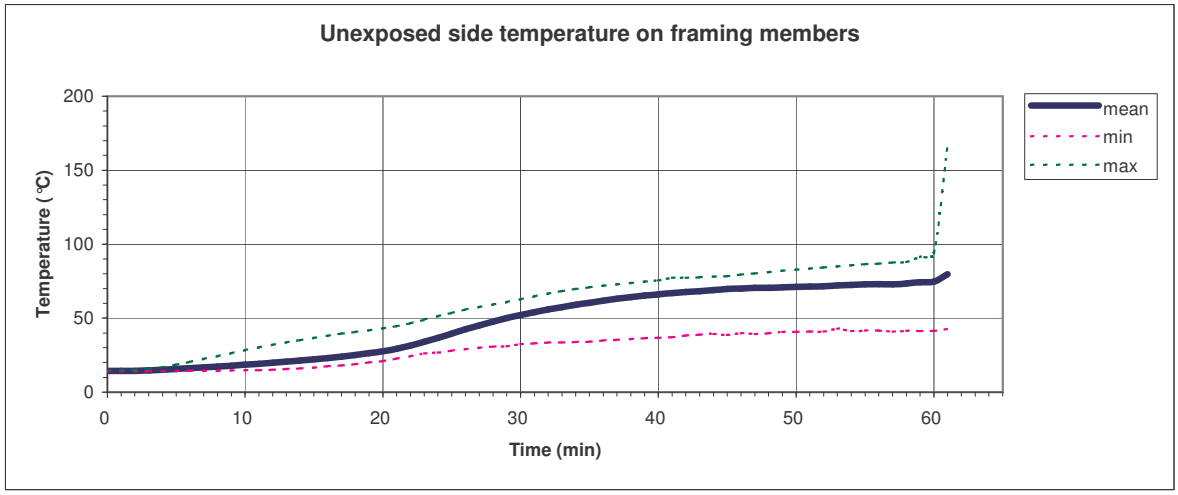
00-17 Thermocouples for average temperature rise (see A.3.2)



Unexposed side temperature on framing members

Time	Temperatures on the unexposed side (°C)																		
(min)	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	*31*	*32*	*33*	*34*	*35*	mean
IC	13	13	13	13	13	13	13	13	13	13	12	13	12	12	12	13	12	13	13
0	14	14	14	14	14	14	15	15	15	14	14	14	14	14	14	15	14	15	14
5	15	17	14	19	15	15	18	15	16	14	14	16	15	14	18	16	15	15	16
10	17	27	16	28	18	17	22	16	21	15	15	19	18	15	22	18	15	15	19
15	23	32	23	37	21	23	25	19	24	17	17	21	22	17	24	20	17	18	22
20	31	37	32	43	26	32	29	25	28	22	22	23	30	22	27	25	21	23	28
25	41	46	42	54	41	41	40	33	36	32	40	28	50	40	34	37	37	41	40
30	52	59	54	62	57	52	58	45	43	48	56	32	63	59	36	52	55	57	52
35	63	68	65	67	69	62	68	56	48	58	65	35	71	68	34	61	65	66	60
40	71	73	73	68	75	70	73	65	54	65	69	38	76	71	37	66	71	75	66
45	77	77	78	69	78	75	75	71	56	70	71	39	77	75	49	68	76	74	70
50	81	79	83	70	79	80	74	75	63	72	73	41	78	77	42	68	78	71	71
55	84	80	86	71	77	82	74	79	70	71	69	42	78	76	43	70	79	82	73
60	87	80	89	78	76	84	74	82	74	68	68	41	- - -	75	48	72	80	94	75
61	87	81	89	81	77	85	75	83	75	68	68	43	83	76	49	72	167	76	80

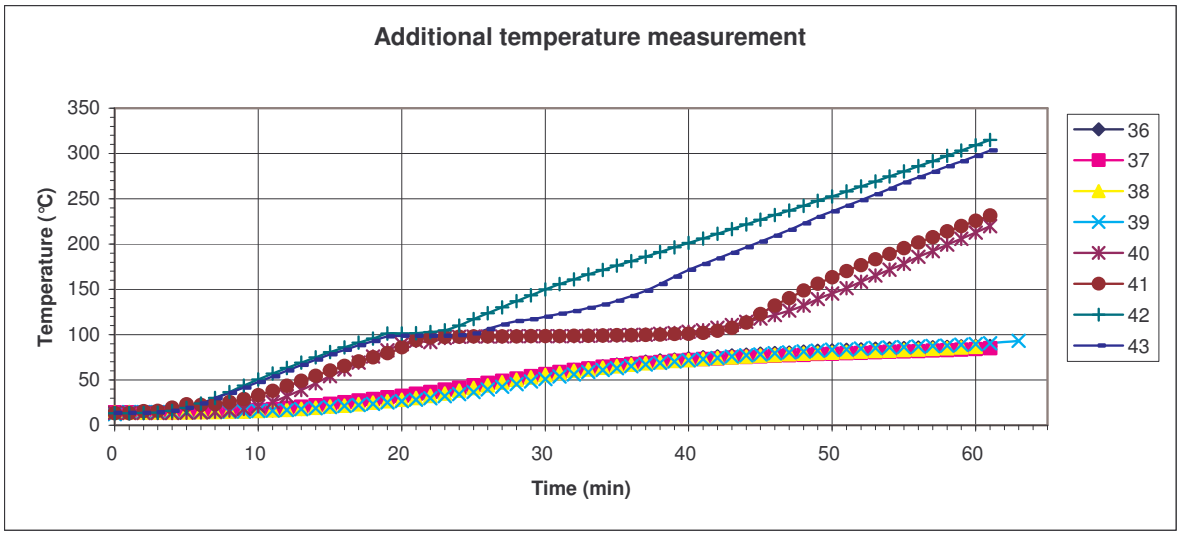
18-35 Thermocouples for maximum temperature rise (see A.3.3)



Additional temperature measurement

Time	Internal temperatures and temperatures on the unexposed side (°C)							
(min)	*36*	*37*	*38*	*39*	*40*	*41*	*42*	*43*
IC	13	12	12	12	13	13	13	13
0	15	14	14	15	14	13	13	14
5	15	15	14	15	14	23	19	19
10	16	17	16	16	21	33	51	48
15	21	24	21	21	54	60	81	78
20	29	33	28	28	90	86	101	99
25	42	44	41	40	98	98	117	101
30	56	57	56	54	98	98	150	120
35	67	66	65	65	99	99	176	137
40	74	72	72	73	103	101	201	172
45	79	76	77	80	118	123	227	203
50	83	79	80	84	145	163	253	236
55	85	82	83	87	178	195	280	268
60	87	84	87	91	213	226	309	297
61	87	85		93	220	232	315	303

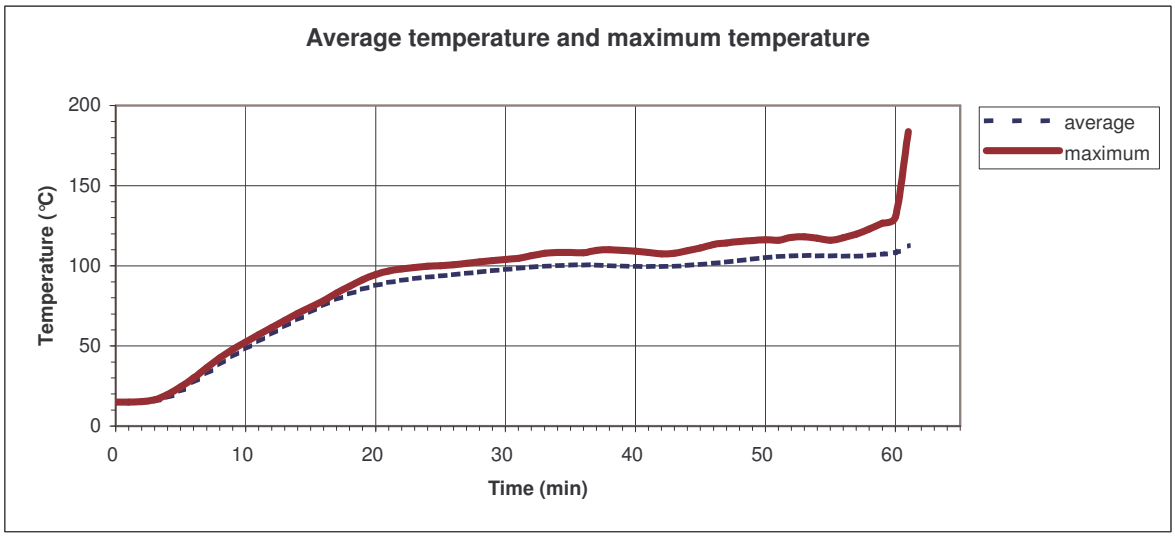
36-39	Thermocouples according to requierement of sponsor (20 mm from edge of glazing pane)
40-41	Thermocouples on linear joint between specimen and furnace wall
42-43	Thermocouples according to requierement of sponsor (under silicone sealant)



Average temperature rise and maximum temperature rise

Time (min)	Unexposed side temperature (°C)	
	average	*maximum*
IC	12	13
0	14	15
5	22	24
10	48	53
15	71	74
20	88	95
25	94	100
30	98	104
35	100	108
40	100	109
45	101	111
50	105	116
55	106	116
60	108	131
61	113	184

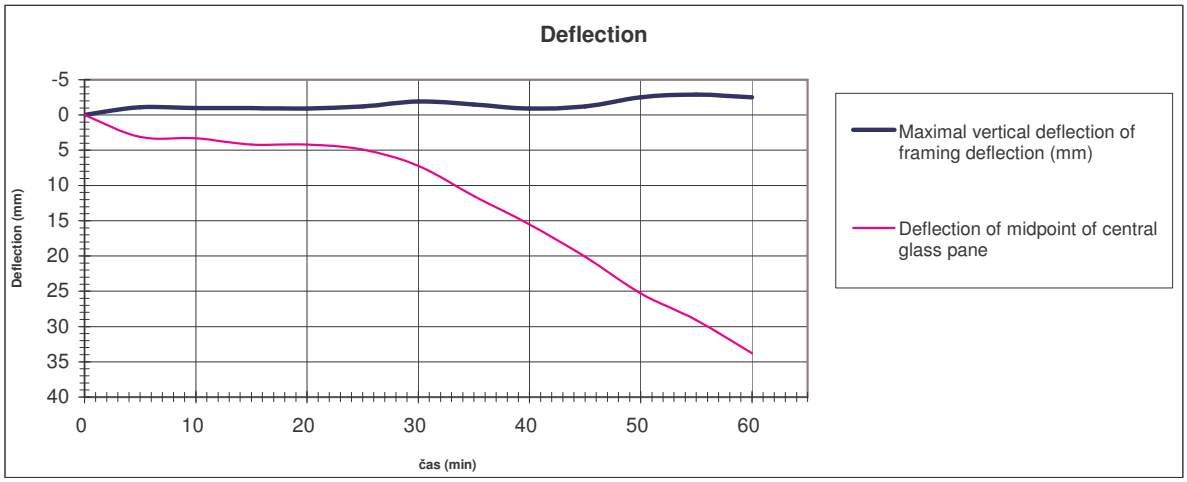
average	Maximum temperature according to [2]: A.4.2.2 derived from the TCs: 00-17
maximum	Average temperature according to [2]: A.4.2.3 derived from the TCs: 00-35, 40, 41



Deflection measurement

Time (min)	Deflection of midpoint of central glass pane	Maximal vertical deflection of framing	
		deflection (mm)	rate of deflection (mm.min^{-1})
IC	0.0	0.0	
0	0.0	0.0	0.0
5	3.1	-1.1	-0.2
10	3.3	-1.0	0.0
15	4.2	-1.0	0.0
20	4.2	-0.9	0.0
25	4.9	-1.2	-0.1
30	7.2	-1.9	-0.1
35	11.5	-1.5	0.1
40	15.5	-0.9	0.1
45	20.1	-1.2	-0.1
50	25.3	-2.5	-0.3
55	29.1	-2.9	-0.1
60	33.8	-2.5	0.0

Positive value of deflection corresponds with up-deflection, negative value of deflection correspond with down-deflection



The documentation used in this Annex
was provided by the sponsor

DOCUMENTATION

LEGEND:

1 - PYROBEL EI60H/28
2 - PROMASEAL-fire resistant silicone
3 - PROMAGLAF, thcks. 2 mm
4 - PROMATECT-H, thcks. 25 mm
5 - PROMASEAL-Mastic - acrylate sealant
6 - Mineral wool
7 - Steel tube 80 x 40 x 5 mm
8 - Steel tube 80 x 80 x 6 mm
9 - Steel L-profile 70 x 70 x 9 mm, length 200 mm
10 - Screw 6 x 120 mm, 2 pcs per L profile
11 - Promat - SYSTEMGLAS - silicone
12 - Silicone sealant DC 895
13 - Silicone sealant DC 791
14 - Screw 3.9 x 45 mm, pitch ca 200 mm
15 - Steel clips 63/11.2/1.83 mm, pitch ca 100 mm
16 - Steel clips 44/11.2/1.53 mm, pitch ca 100 mm
17 - Srew 5 x 70 mm

			date	Glaverbel Czech, a.s. člen skupiny Glaverbel PYROBEL FIRE RESISTANT GLASS	Sklářská 450 41674 Teplice Czech Republic czech@glaverbel.com	phone: +420 417 501 111 fax: +420 417 502 121 www.glaverbel.com	check: date	24. 9. 2004
							name	Ing. JIŘÍ KALTOUN
			change				drawing no.:	
				date	name	Cat. No.:	test date	scale
				22. 9. 2004	JIŘÍ KALTOUN		5.10.2004	
			No.	project: PYROBEL - horizontal glazing with PYROBEL EI60H/28 glass (thickness 28 mm) in steel construction				LEGEND

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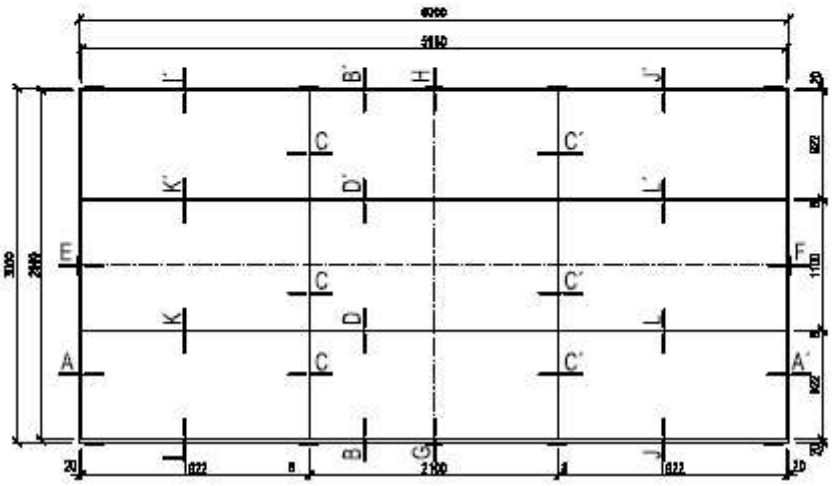
LAYOUT



			date	Glaverbel Czech, a.s. člen skupiny Glaverbel Sklářská 450 41674 Teplice Czech Republic czech@glaverbel.com phone: +420 417 501 111 fax: +420 417 502 121 www.glaverbel.com					check	date	24. 9. 2004
											name	Ing. JIŘÍ KALTOUN
			change							drawing no.:		
				date	name	Cat. No.:	test date	scale				
				22. 9. 2004	JIŘÍ KALTOUN		5.10.2004	1:50		LAYOUT		
			No.	project PYROBEL - horizontal glazing with PYROBEL E60H28 glass (thickness 28 mm) in steel construction								

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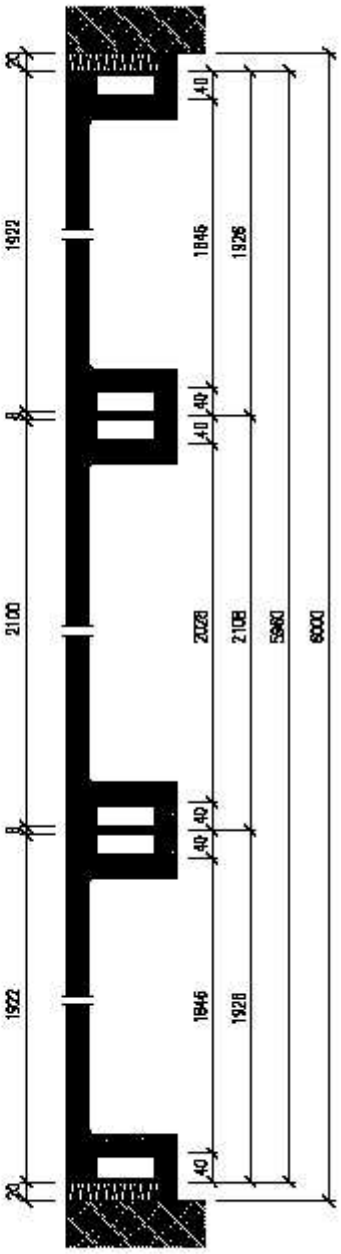
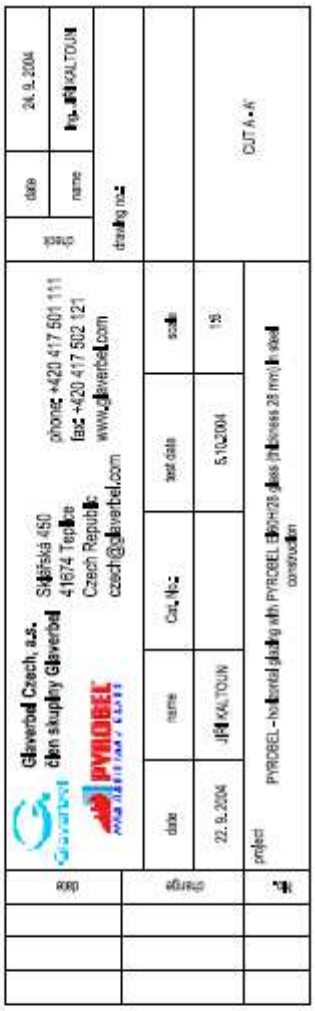
CUT A - A'





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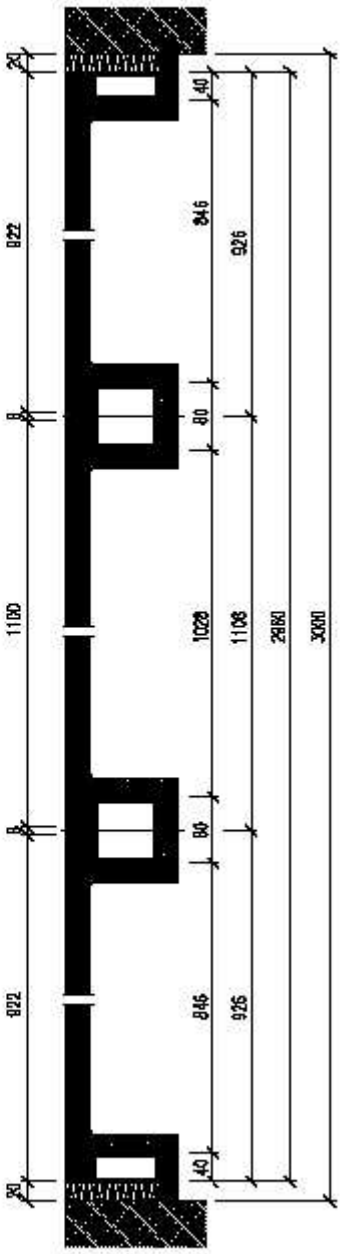
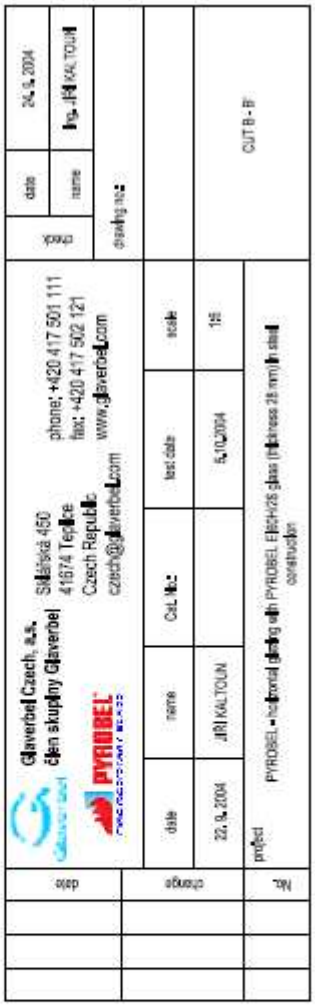
was provided by the sponsor

CUT B - B'





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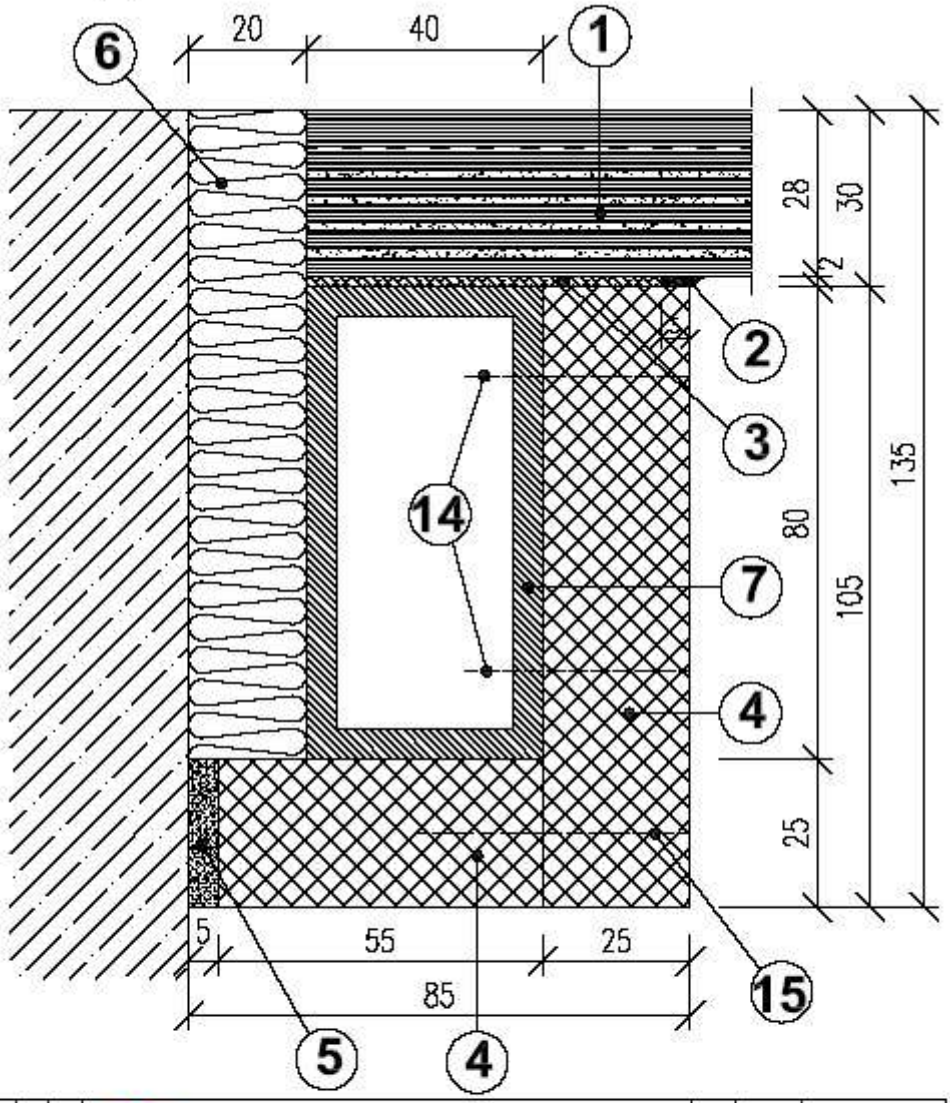
was provided by the sponsor

DETAIL A, I, I'



			date	Glaverbel Czech, a.s. člen skupiny Glaverbel PYROBEL	Sklářská 450 41674 Teplice Czech Republic czech@glaverbel.com	phone: +420 417 501 111 fax: +420 417 502 121 www.glaverbel.com	check	date: 24. 9. 2004 name: Ing. JIŘÍ KALTOUN
			change	date: 22. 9. 2004	name: JIŘÍ KALTOUN	Cat. No.:	test date: 5.10.2004	scale: 1:1
			No.	project: PYROBEL – horizontal glazing with PYROBEL EI60/I120 glass (thickness 28 mm) in steel construction				drawing no.: DETAIL A, I, I'

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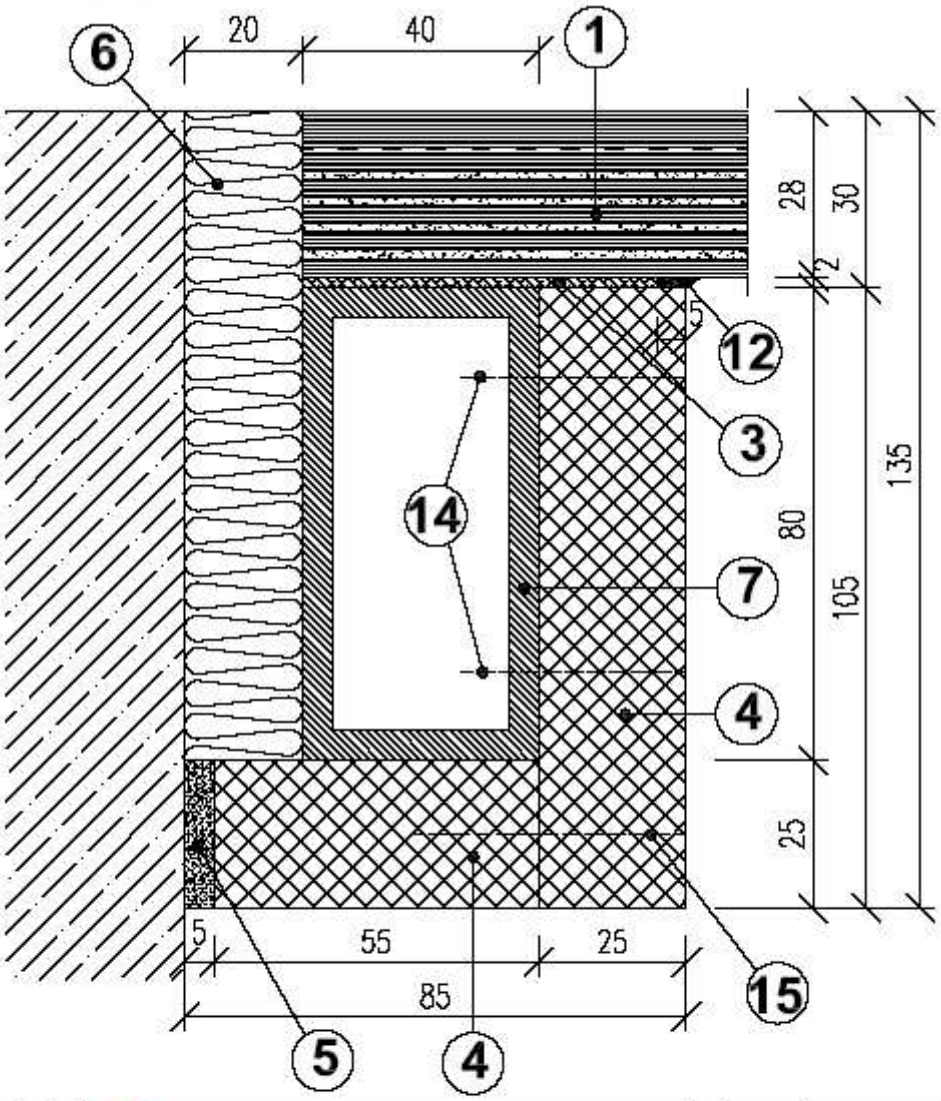
DETAIL A´, J, J'



			date	Glaverbel Czech, a.s. člen skupiny Glaverbel PYROBEL	Sklářská 450 41674 Teplice Czech Republic czech@glaverbel.com	phone: +420 417 501 111 fax: +420 417 502 121 www.glaverbel.com	check	date	24. 9. 2004
								name	Ing. JIŘÍ KALTOUN
			change				drawing no.:		
				date	name	Cat. No.:	test date	scale	
				22. 9. 2004	JIŘÍ KALTOUN		5.10.2004	1:1	DETAIL A´,J,J'
			No.	project: PYROBEL - horizontal glazing with PYROBEL EI60H28 glass (thickness 28 mm) in steel construction					

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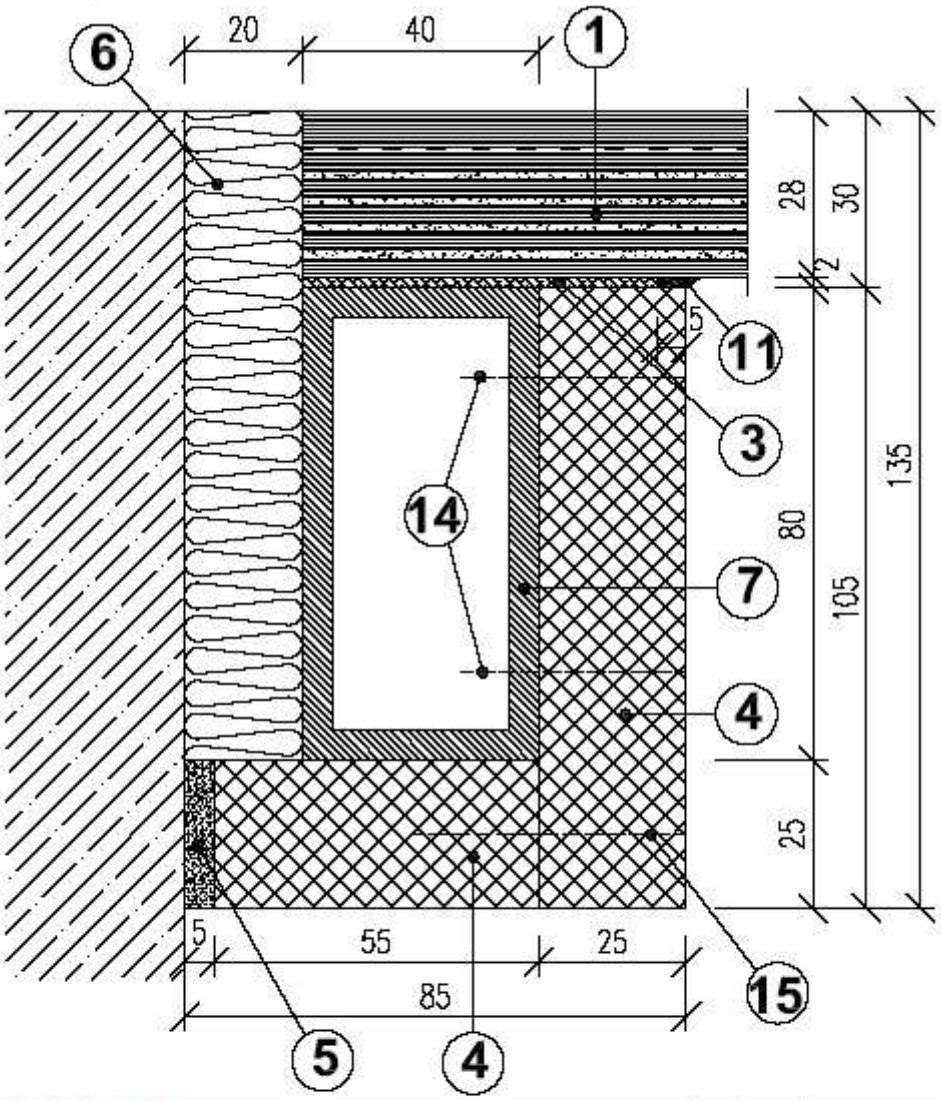
DETAIL B, B'



			date	Glaverbel Czech, a.s. člen skupiny Glaverbel PYROBEL	Sklářská 450 41674 Teplice Czech Republic czech@glaverbel.com	phone: +420 417 501 111 fax: +420 417 502 121 www.glaverbel.com	check	date	24. 9. 2004
								name	Ing. JIŘÍ KALTOUN
			change				drawing no.:		
				date	name	Cat. No.:	test date	scale	
				22. 9. 2004	JIŘÍ KALTOUN		5.10.2004	1:1	DETAIL B,B'
			No.	project PYROBEL – horizontal glazing with PYROBEL EI60 H28 glass (thickness 28 mm) in steel construction					

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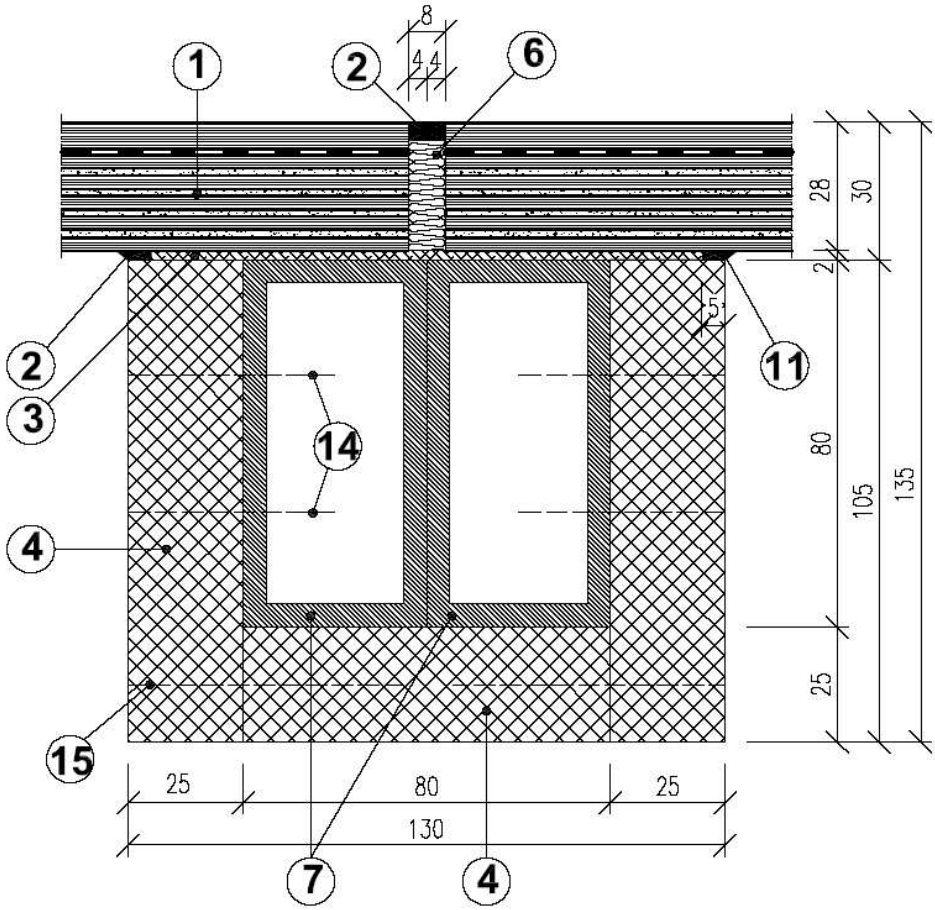
was provided by the sponsor

DETAIL C



			date	Glaverbel Czech, a.s. člen skupiny Glaverbel PYROBEL FIRE RESISTANT GLASS	Sklářská 450 41674 Teplice Czech Republic czech@glaverbel.com	phone: +420 417 501 111 fax: +420 417 502 121 www.glaverbel.com	check: date 24. 9. 2004; name Ing. JIŘÍ KALTOUN; drawing no.:
			change	date: 22. 9. 2004	name: JIŘÍ KALTOUN	Cat. No.:	test date: 5.10.2004	scale: 1:1.5
			No.	project: PYROBEL - horizontal glazing with PYROBEL EI60H/28 glass (thickness 28 mm) in steel construction				DETAIL C

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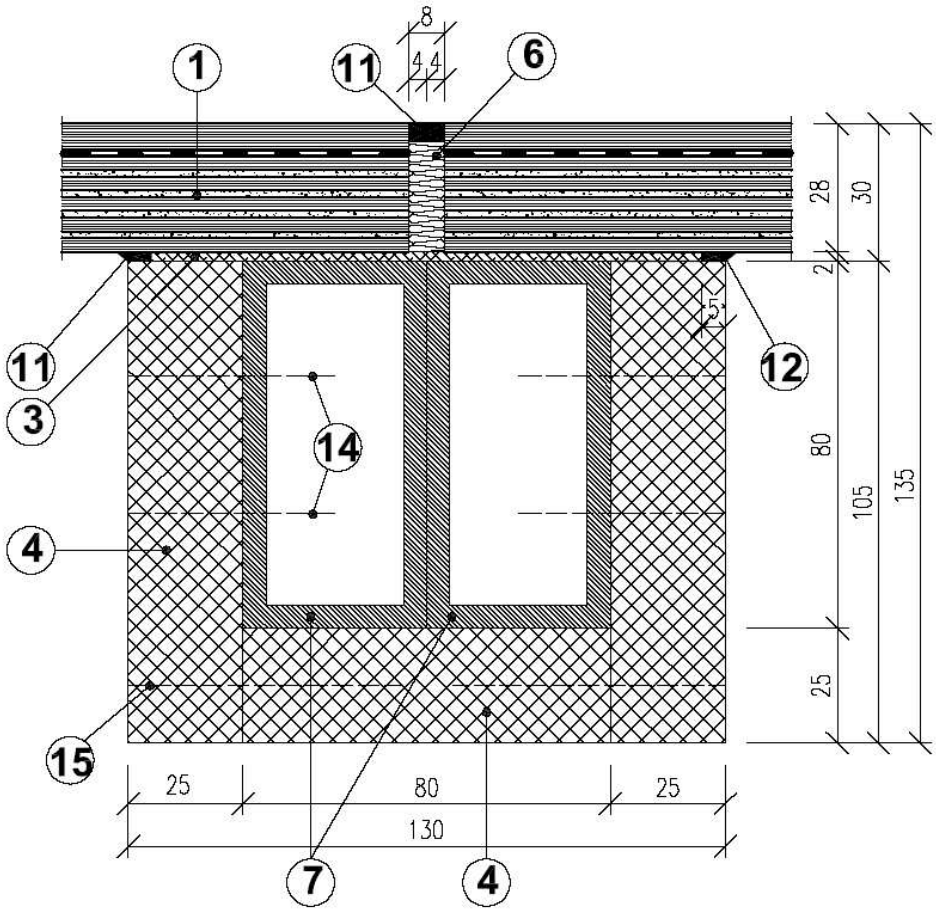
was provided by the sponsor

DETAIL C'



			date	Glaverbel Czech, a.s. člen skupiny Glaverbel PYROBEL FIRE RESISTANT GLASS	Sklářská 450 41674 Teplice Czech Republic czech@glaverbel.com	phone: +420 417 501 111 fax: +420 417 502 121 www.glaverbel.com	check: date	24. 9. 2004
							name	Ing. JIŘÍ KALTOUN
							drawing no.:	
			change	date	name	Cat. No.:	test date	scale
				22. 9. 2004	JIŘÍ KALTOUN		5.10.2004	1:1.5
			No.	project: PYROBEL - horizontal glazing with PYROBEL EI60H/28 glass (thickness 28 mm) in steel construction				DETAIL C'

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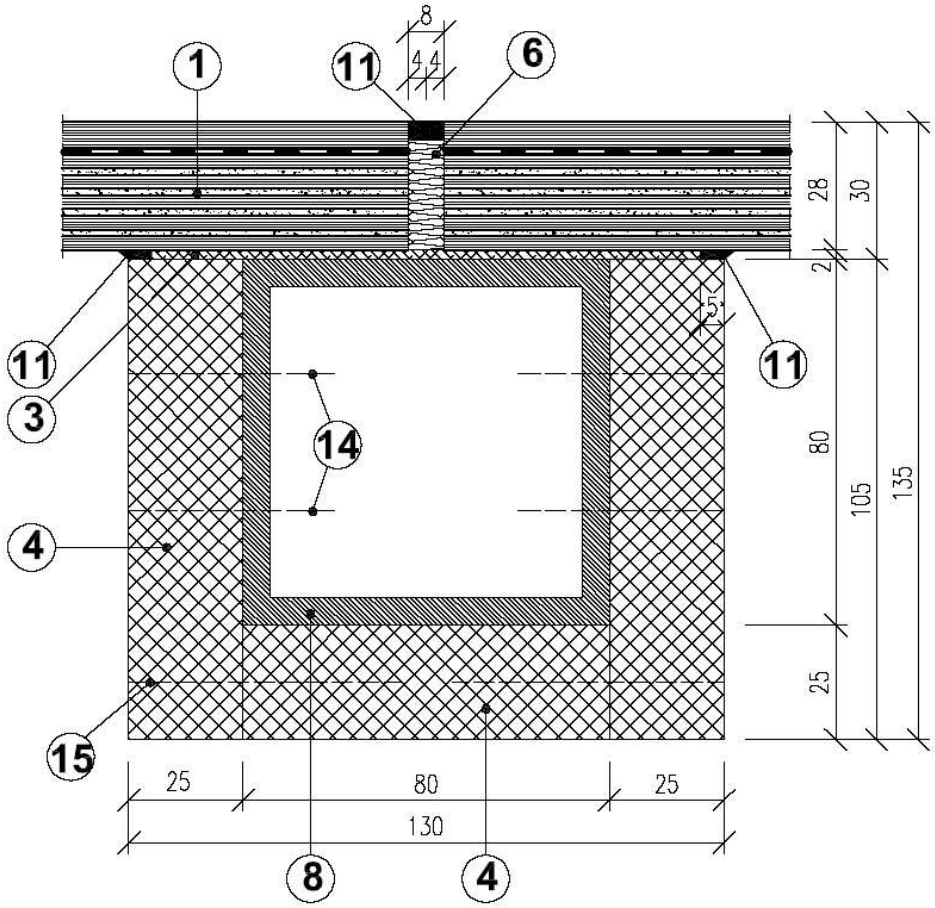
was provided by the sponsor

DETAIL D, D'



			date	**Glaverbel Czech, a.s.** **člen skupiny Glaverbel** PYROBEL	Sklářská 450 41674 Teplice Czech Republic czech@glaverbel.com	phone: +420 417 501 111 fax: +420 417 502 121 www.glaverbel.com	check	date: 24. 9. 2004 name: Ing. JIŘÍ KALTOUN
			change	date: 22. 9. 2004	name: JIŘÍ KALTOUN	Cat. No.:	test date: 5.10.2004	scale: 1:1.5
			No.	project: PYROBEL - horizontal glazing with PYROBEL EI60H/28 glass (thickness 28 mm) in steel construction				drawing no.: DETAIL D,D'

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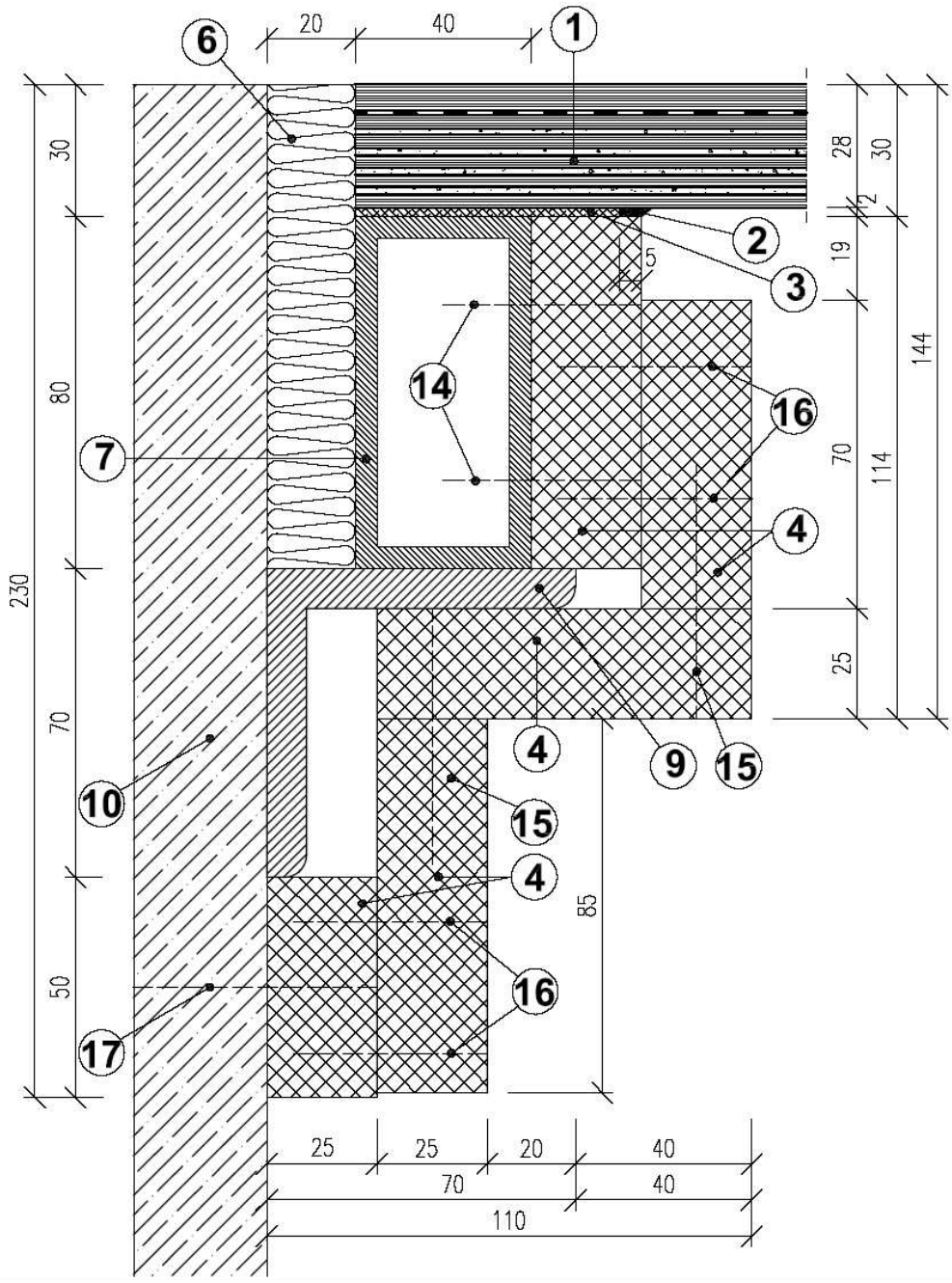
was provided by the sponsor

DETAIL E



			date	Glaverbel Czech, a.s. člen skupiny Glaverbel	Sklářská 450 41674 Teplice Czech Republic czech@glaverbel.com	phone: +420 417 501 111 fax: +420 417 502 121 www.glaverbel.com	check	date: 24. 9. 2004 name: Ing. JIŘÍ KALTOUN
			change	date: 22. 9. 2004	name: JIŘÍ KALTOUN	Cat. No.:	test date: 5.10.2004	scale: 1:1,5
			No.	project: PYROBEL - horizontal glazing with PYROBEL EI60H/28 glass (thickness 28 mm) in steel construction				drawing no.: DETAIL E

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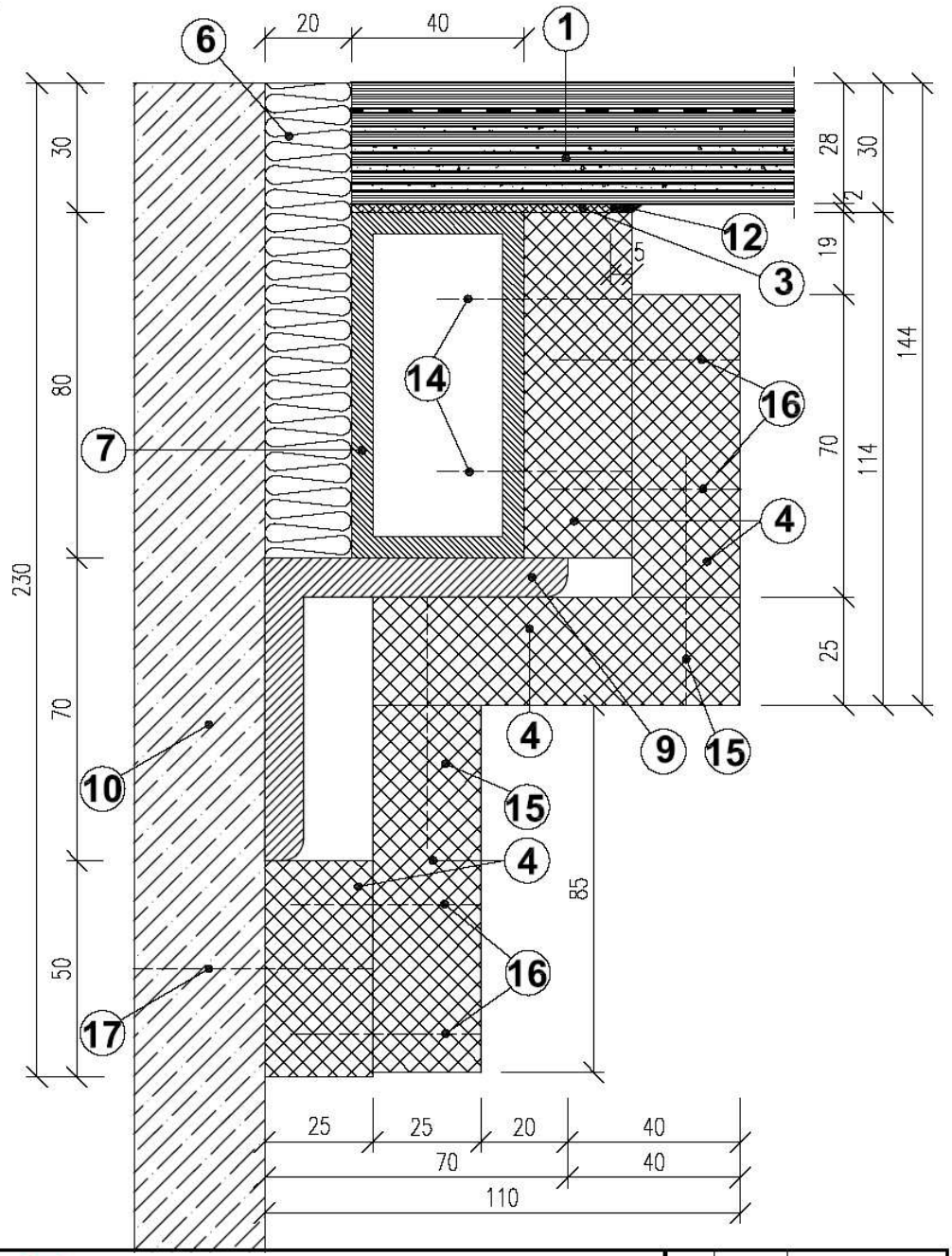
was provided by the sponsor

DETAIL F



			date	Glaverbel Czech, a.s. člen skupiny Glaverbel PYROBEL FIRE RESISTANT GLASS	Sklářská 450 41674 Teplice Czech Republic czech@glaverbel.com	phone: +420 417 501 111 fax: +420 417 502 121 www.glaverbel.com	check: date 24. 9. 2004; name Ing. JIŘÍ KALTOUN; drawing no.:
			change	date: 22. 9. 2004	name: JIŘÍ KALTOUN	Cat. No.:	test date: 5.10.2004	scale: 1:1.5
			No.	project: PYROBEL - horizontal glazing with PYROBEL EI60H/28 glass (thickness 28 mm) in steel construction				DETAIL F

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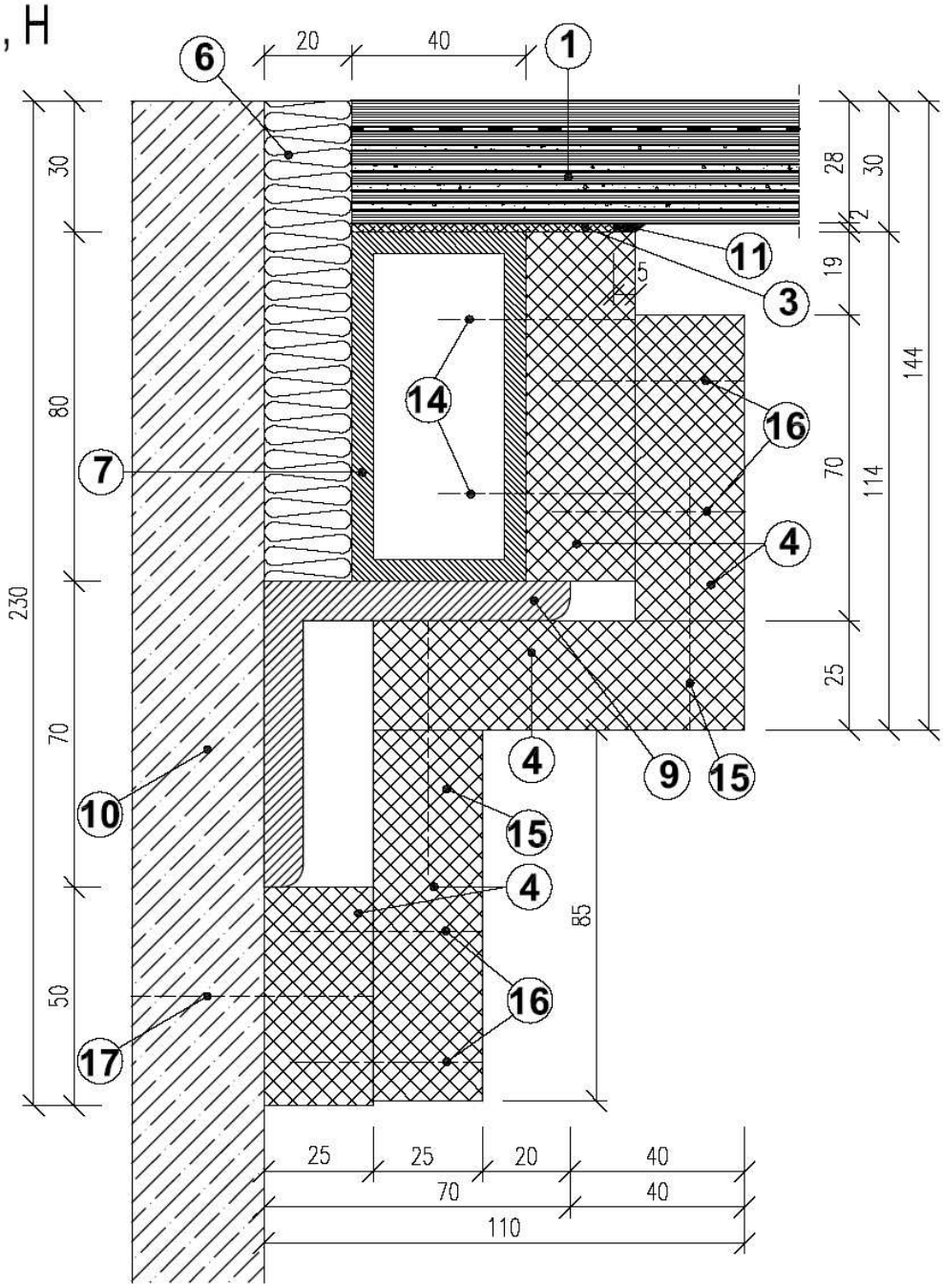
was provided by the sponsor

DETAIL G, H



			date	Glaverbel Czech, a.s. člen skupiny Glaverbel PYROBEL FIRE RESISTANT GLASS	Sklářská 450 41674 Teplice Czech Republic czech@glaverbel.com	phone: +420 417 501 111 fax: +420 417 502 121 www.glaverbel.com	check	date: 24. 9. 2004 name: Ing. JIŘÍ KALTOUN
			change	date: 22. 9. 2004	name: JIŘÍ KALTOUN	Cat. No.:	test date: 5.10.2004	scale: 1:1.5
			No.	project: PYROBEL - horizontal glazing with PYROBEL EI60H/28 glass (thickness 28 mm) in steel construction				drawing no.: DETAIL G,H

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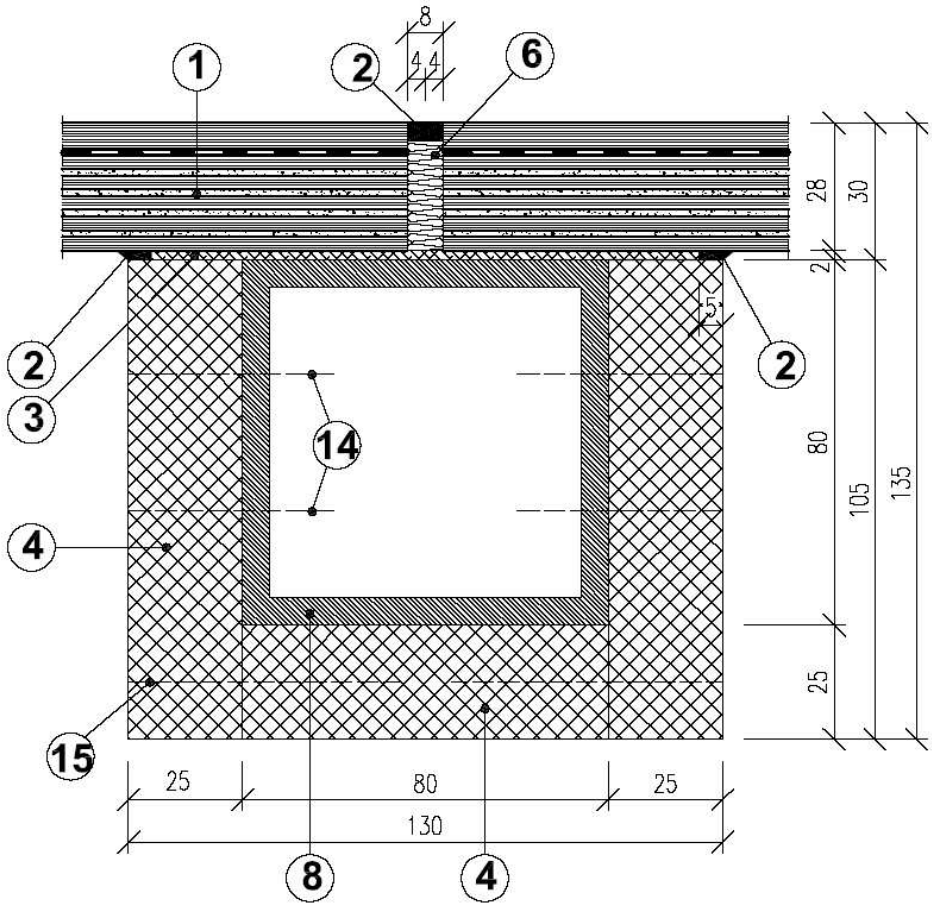
was provided by the sponsor

DETAIL K, K'



			date	Glaverbel Czech, a.s. člen skupiny Glaverbel PYROBEL FIRE RESISTANT GLASS	Sklářská 450 41674 Teplice Czech Republic czech@glaverbel.com	phone: +420 417 501 111 fax: +420 417 502 121 www.glaverbel.com	check: date 24. 9. 2004; name Ing. JIŘÍ KALTOUN; drawing no.:
			change	date: 22. 9. 2004	name: JIŘÍ KALTOUN	Cat. No.:	test date: 5.10.2004	scale: 1:1,5
			No.	project: PYROBEL - horizontal glazing with PYROBEL EI60H/28 glass (thickness 28 mm) in steel construction				DETAIL K,K'

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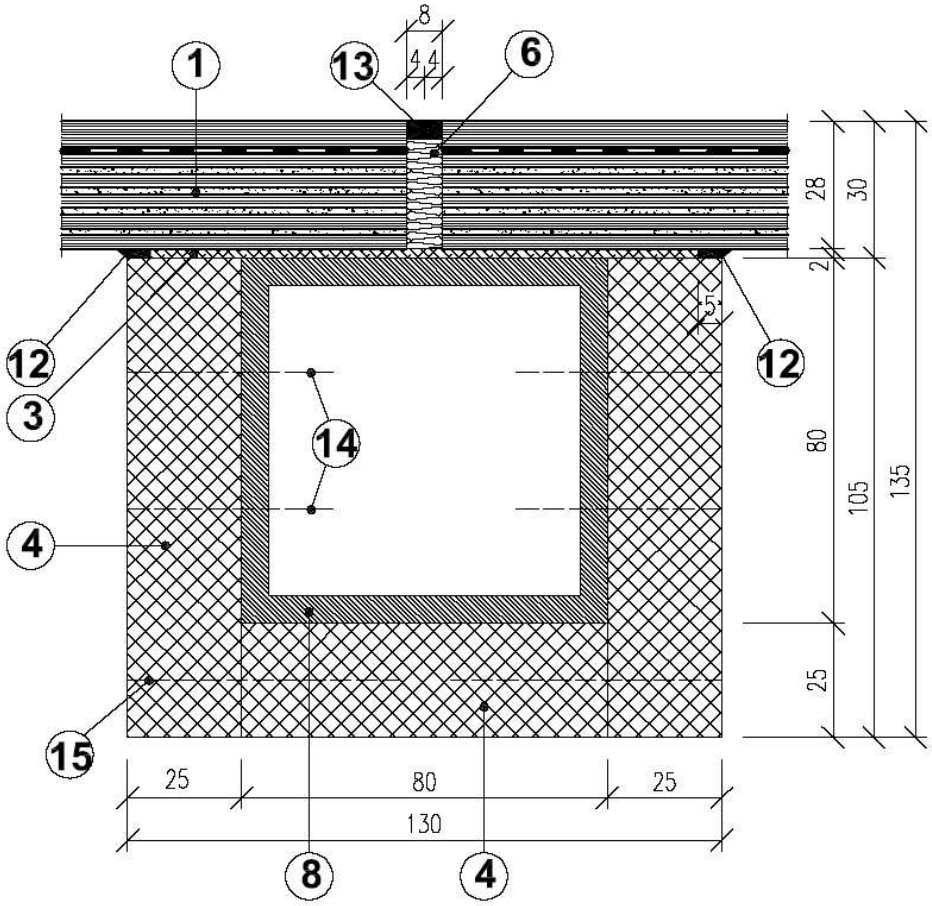
was provided by the sponsor

DETAIL L, L'



			date	Glaverbel Czech, a.s. člen skupiny Glaverbel PYROBEL PYROLYSOVANÉ SKLO	Sklářská 450 41674 Teplice Czech Republic czech@glaverbel.com	phone: +420 417 501 111 fax: +420 417 502 121 www.glaverbel.com	check	date: 24. 9. 2004 name: Ing. JIŘÍ KALTOUN
			change	date: 22. 9. 2004	name: JIŘÍ KALTOUN	Cat. No.:	test date: 5.10.2004	scale: 1:1.5	drawing no.:
			No.	project: PYROBEL - horizontal glazing with PYROBEL EI60H/28 glass (thickness 28 mm) in steel construction					DETAIL L,L'

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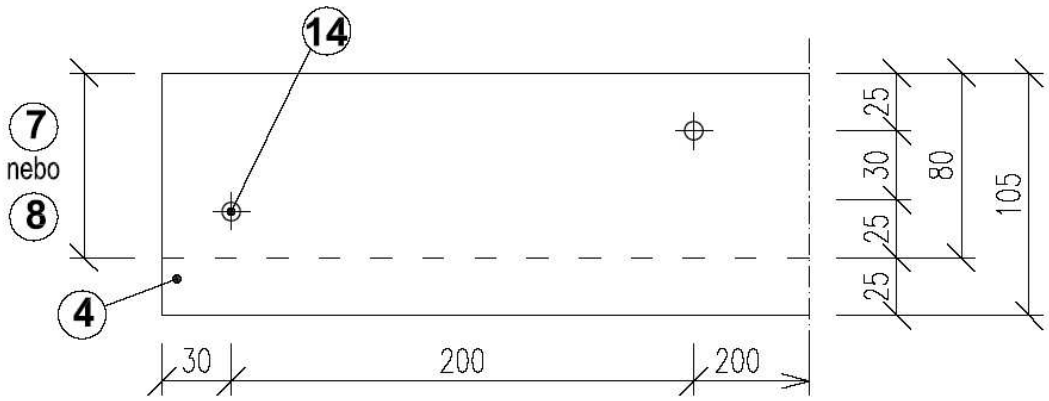
was provided by the sponsor



Note: Screws are alt. positioned

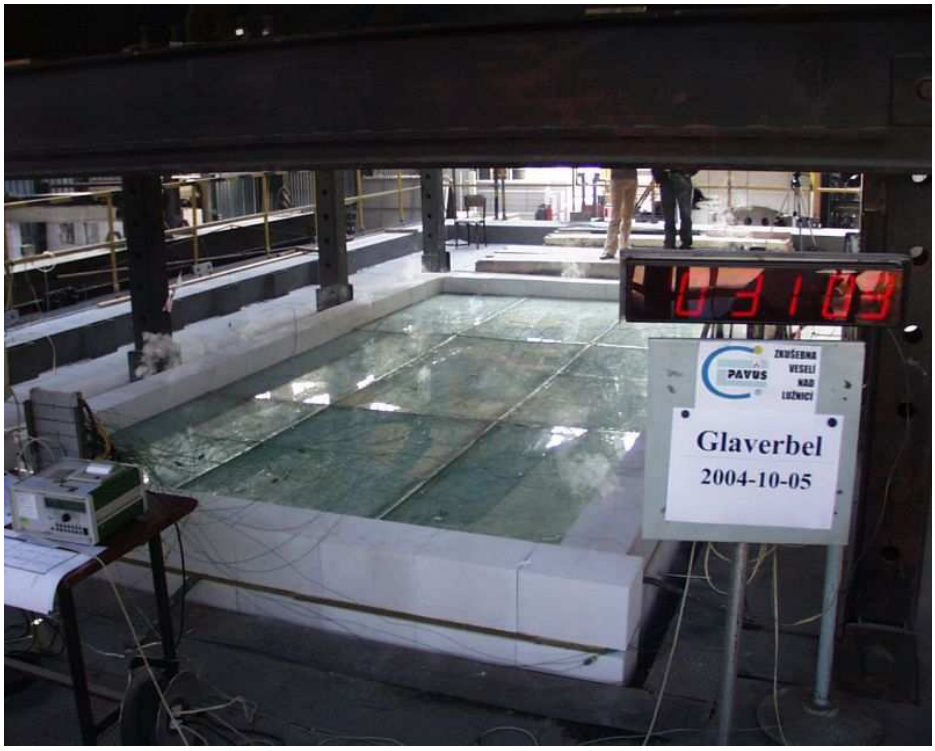
			date	Glaverbel Czech, a.s. člen skupiny Glaverbel PYROBEL FIRE RESISTANT GLASS	Sklářská 450 41674 Teplice Czech Republic czech@glaverbel.com	phone: +420 417 501 111 fax: +420 417 502 121 www.glaverbel.com	check: date	24. 9. 2004
							name	Ing. JIŘÍ KALTOUN
							drawing no.:	
			change	date	name	Cat. No.:	test date	scale
				22. 9. 2004	JIŘÍ KALTOUN		5.10.2004	1:3
			No.	project: PYROBEL - horizontal glazing with PYROBEL EI60H/28 glass (thickness 28 mm) in steel construction				SCREW POSITIONING

PHOTO DOCUMENTATION

Unexposed side before test commencement

Unexposed side before test commencement

Exposed side before test commencement

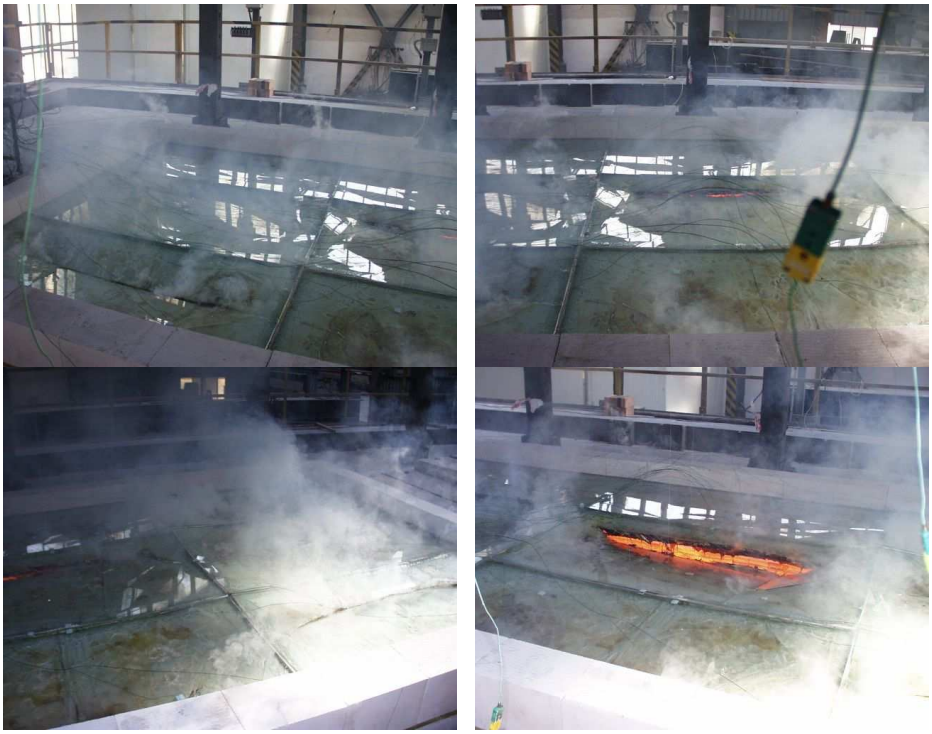


US at 32nd min

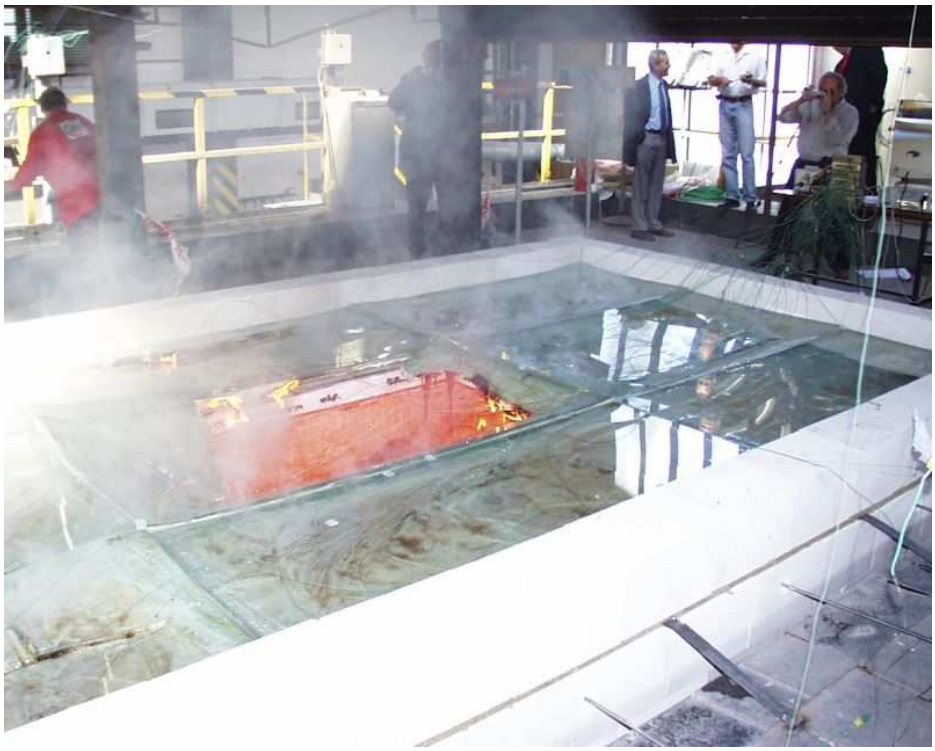
US at 33rd min

US from 50 min to 60 min

US at 61st min



US at 62nd min



US immediately after end of test