



## Fire Resistance of Building Elements

Non-loadbearing steel frame partition,  
 single layer of 5/8" Gyplac RF boards

**Fire Test Report :** TA-CO-0326-CHBL-110121-TDC-10-FIRE-0922 P

Tested element	Test performed on December 14 <sup>th</sup> , 2010	Normative references
Non-loadbearing steel frame partition, single layer of 5/8" Gyplac RF boards		ASTM E119-07a

Customer	Manufacturer
GYPLAC S.A. - Colombia	GYPLAC S.A. – Cartagena Plant

Summary
Non-loadbearing partition made with :
<ul style="list-style-type: none"> <li>• Studs M70-50/6 + Tracks R70-30/6,</li> <li>• 5/8" Gyplac RF board,</li> <li>• No insulation product inside the cavity.</li> </ul>
Dimensions of the tested element :
<ul style="list-style-type: none"> <li>• Exposed area : 3000 x 3000 mm (L x h)</li> <li>• Thickness : 102 mm</li> </ul>
Fire performances :
<ul style="list-style-type: none"> <li>• Integrity(E) : 64min:50s</li> <li>• Insulation(I) : 70min:30s</li> </ul>
<b><u>Warning:</u></b> This summary provides brief details of a test conducted in accordance with hereabove standards and the results achieved. It may not be used without the full test report to demonstrate the performance of the system. The hereabove mentioned fire performances do not cover the conformity of the commercialized building components and shall not be considered as a certificate of quality

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## 1. Scope of the test report

Fire resistance test of a non-loadbearing partition according to the American national standard ASTM E119-07a "Fire tests of Building Construction and Materials".

Some variations with this standard were made regarding the type and location of some thermocouples, without any incidence on the behaviour and fire rating of the tested system.

## 2. Sponsor

- Name : GYPLAC S.A.
- Address : Variante Mamonal-Gambote Km. 1  
Cartagena de Indias, D.T. y C., Bolívar, Colombia

## 3. Reference and origin of tested element

- Reference : Non-loadbearing steel frame partition, single layer of 5/8" Gyplac RF boards
- Origin : COLOMBIA – Cartagena Plant (Boards)

## 4. Description of the tested element

### 4.1. General

The tested element was a non-loadbearing partition made with :

- Studs M70-50/6 + Tracks R70-30/6,
- Single layer of 5/8" Gyplac RF board,
- No insulation product inside the cavity.

### 4.2. Components list

Designation	Reference	Dimensions	Characteristics	Manufacturer
Framing	Studs M70-50/6	49 x 70 x 47 mm th. = 0.6 mm	Hot-dipped steel	LAFARGE PLATRES
	Tracks R70-30/6	28 x 70 x 28 mm th. = 0.6 mm	Hot-dipped steel	
Facing	5/8" Gyplac RF boards	15,9x1220x2440 mm (th x w x L)	Type X fire board Weight <sub>measured</sub> = 11.7 Kg/m <sup>2</sup> = 2400 lbs/msf th = 15.9 mm	GYPLAC - Cartagena
Screw	PREGY TF 212x25	Ø 3.5 x 25 mm	Phosphated steel Drywall self-tapping screws	LAFARGE PLATRES
Flat-strap	FS50/R	50 mm width	Hot-dipped steel 0.5 mm thick	
Joint compound	PREGYLIS 35	/	Fast set jointing compound	
Joint tape	Paper tape	52 mm (w)	Paper tape	

#### 4.3. Detailed description

##### 4.3.1. Framework

The framework of the partition was made with :

- Studs M70-50/6, at 610 mm centers spacing,
- Top and bottom Tracks R70-30/6.

Tracks and stud on fixed edge were fixed on the supporting refractory concrete frame by means of plastic plugs and Ø6 mm screws at 500 mm centers spacing.

Studs were cut at nominal length minus 15 mm in order to provide a free expansion gap at their tops. No gap allowance was set at the bottom.

No screws were put between studs and tracks.

The partition was installed with 3 fixed edges and one vertical free edge to comply with standard requirements.

The free edge was made with a high-density stone-wool strip glued on the concrete frame.

The corresponding stud was tight to this strip, without any mechanical connection.

##### 4.3.2. Facing

The facing was made with single layer of 5/8" Gyplac RF boards, installed vertically.

Vertical joints were 24,0157 in staggered between both sides. On the exposed face, one horizontal joint was installed at 560 mm from the bottom of the partition, staggered with the one installed on the non-exposed face, installed at 560 mm from the top of the partition.

Boards were fixed on studs and tracks with drywall self-tapping screws PREGY TF 212x25, at 200 mm centers spacing along studs, at 300 mm along top and bottom tracks, and at 150 mm along horizontal joints. These latter were supported by FS50/R flat strap at their back.

Nominal length of boards was 2440 mm (8 feet), with a nominal width of 1220 mm (4 feet).

##### 4.3.3. Joints treatment

Joints between plasterboards were treated with jointing compound PREGYLIS 35 and paper tape.

##### 4.3.4. Insulation

No insulation product was installed inside the cavity of partition.

#### 5. Test conditions

##### 5.1. Thermal program

The temperature inside the furnace was monitored in accordance with the European standards EN 1363-1:1999, with few differences with the time-temperature curve described in the ASTM E119-07a, following :

$$T = 345 \log_{10} (8t+1) + 20$$

where :      t = Time [min]  
                   T=Temperature inside the furnace at time t [°C]

**Standard Time-Temperature curves – Comparison between ASTM E119 and EN 1363-1**

Time (min)	ASTM E119 (°C) *	EN 1363-1 (°C) **	(ASTM - EN) (°C)
0	20	20	0
5	538	576	-38
10	704	678	26
15	760	739	21
20	795	781	14
25	821	815	6
30	843	842	1
35	862	865	-3
40	878	885	-7
45	892	902	-10
50	905	918	-13
55	916	932	-16
60	927	945	-18
65	937	957	-20
70	946	968	-22

\* : data from the Appendix X1 of the ASTM E119-07a,

\*\* : data from the logarithmic model defined in the EN 1363-1

## 5.2. Ambient pressure

The ambient pressure inside the furnace was continuously controlled and adjusted at (-3 ± 3) Pa, at 100 mm from top of partition.

## 5.3. Fire orientation

As the partition was symmetrical, the fire orientation was indifferent.

## 6. Measurements

- Implementation of sensors: See Annex 1 & 2.
- Measured results : See Annex 3.

### 6.1. Temperature measurements

#### 6.1.1. Furnace temperatures

They were measured and controlled by plate thermometers complying with EN 1363-1 standard requirements, side A oriented towards the floor of the furnace, providing equivalent measurement as thermocouples described in the ASTM E119-07a.

Location	Markings
At 100 mm in front of the exposed side of partition	1 to 6
Deviation versus accepted tolerances according to ASTM E119 standard	

#### 6.1.2. Tested element temperatures

They were measured by K thermocouples complying with ASTM E119 standard requirements, placed under refractory fibers, located as follows :

Tested element	Page 5 /17
Non-loadbearing steel frame partition, single layer of 5/8" Gyplac RF boards	

Location	Markings
Temperatures on the non exposed face, at 1/4 and intersection of diagonals	15 to 19
Temperatures at 50 mm over the horizontal joint, front to an exposed vertical joint (25) and at joints crossing (26)	25 and 26
Temperatures at mid-height, front to an exposed vertical joint (27) and at 560 mm from the bottom of the partition, at 50 mm from a vertical joint and front to the exposed horizontal joint (28)	27 and 28

#### 6.1.3. Reference temperature rises

Location	Markings
Average reference temperature rise on the partition	15 to 19
Maximum reference temperature rise on the partition	15 to 28

#### 6.2. Ambient pressure inside the furnace

Location	Marking
Ambient pressure inside the furnace, at top of partition	

#### 6.3. Deflections

Location	Marking
Deflection at center of partition	D1
Deflection at mid-height of partition, at 50 mm from free edge	D2

### 7. Observations

#### 7.1. During fire test

Time (min :sec)	Side	Observations
15:10	EF	Slight opening of the horizontal joint.
28:00	EF	5mm to 10mm opening of horizontal joint. 10mm to 20mm opening of vertical joints. Hairline cracks observed along all the screw heads on the right edge of the full board, free edge side. No crack observed on boards.
37:00	EF	Free edge side, the vertical joint is opened from 10mm to 25mm. Stud behind is easily visible. Some local short vertical cracks observed on boards.
42:00	EF	Right edge of the full board, free edge side, is unscrewed at 50%, around mid-height. No fall of any piece of board at the moment.
47:00	NEF	First local browning of joint or some screw heads, close to the horizontal joint.
48:00	EF	Free edge side, the vertical joint is opened locally up to 40mm. Some longer thin cracks observed on boards. No fall of any piece of board.
52:00	NEF	Browning observed at screw heads.
60:00	EF	No fall of any board. Stability of joint openings, no evolution. Boards are fully cracked.
70:30	NEF	END of the test.

EF : Exposed face - NEF : Non-exposed face

**8. Criteria of fire performances**
**8.1. Integrity**

Duration : **SEVENTY MINUTES and THIRTY SECONDS – (70 min:30 s)**

Cause of limitation : **End of test**

**8.2. Insulation**

Duration, before correction : **SIXTY ONE MINUTES and FIFTY FIVE SECONDS – (61 min:55 s)**

Cause of limitation : **Average temperature rise exceeding 138 °C (250 °F), measured by thermocouples TC 15 to TC 19**

The ASTM E119 indicates that a correction shall be applied for variation of the furnace temperature and the standard curve for the first three fourths of the period. For fire exposure during the test higher than standard, which was the case for this test, the indicated resistance period shall be increased by the amount of the correction according to the following equation :

$$C = 2.I(A - As)/3(As + L)$$

Where :

- C = correction in the same units as I (min),
- I = indicated fire resistance period, equal to 61min:55s (61.91 min),
- A = area under the curve of indicated average furnace temperature for the first three fourths of the indicated period, calculated here after 45 minutes (three fourths of a hour) and equal to 34 814°C-min,
- As = area under the standard furnace curve for the same part of the indicated period of 45 minutes, with a value of 32 390 °C-min provided in appendix X1 of the ASTM E119,
- L = lag correction in the same unit as A and As, equal to 1800°C-min according to ASTM E119.

So that :

$$C = 2(61.91)(34814 - 32390)/3(32390 + 1800) = 2.92 \text{ min} = 2\text{min}:55s$$

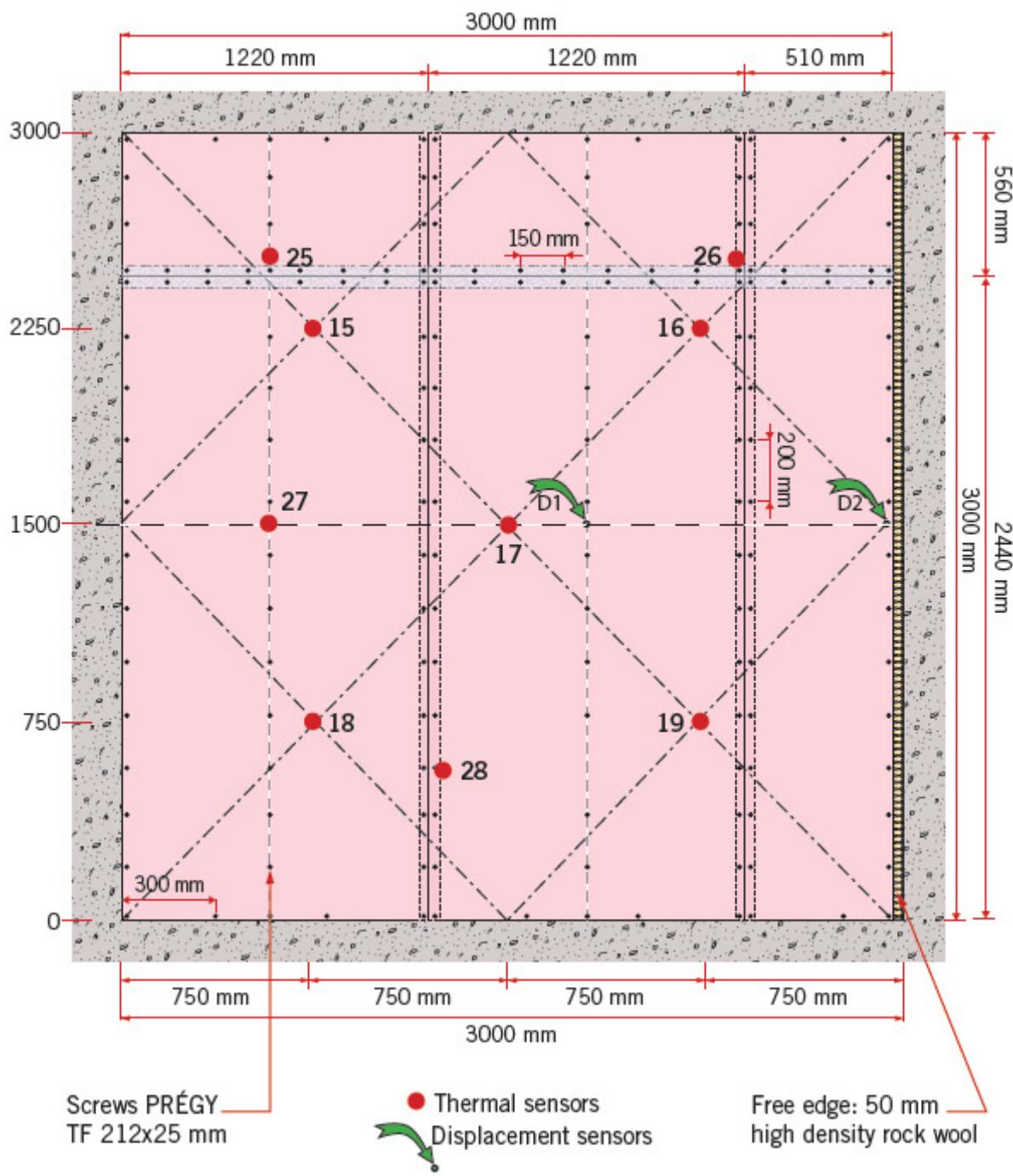
Duration, after correction : **SIXTY FOUR MINUTES and FIFTY SECONDS – (64 min:50 s)**

Written at Avignon, on January 26<sup>th</sup>, 2011

Prepared and verified by :

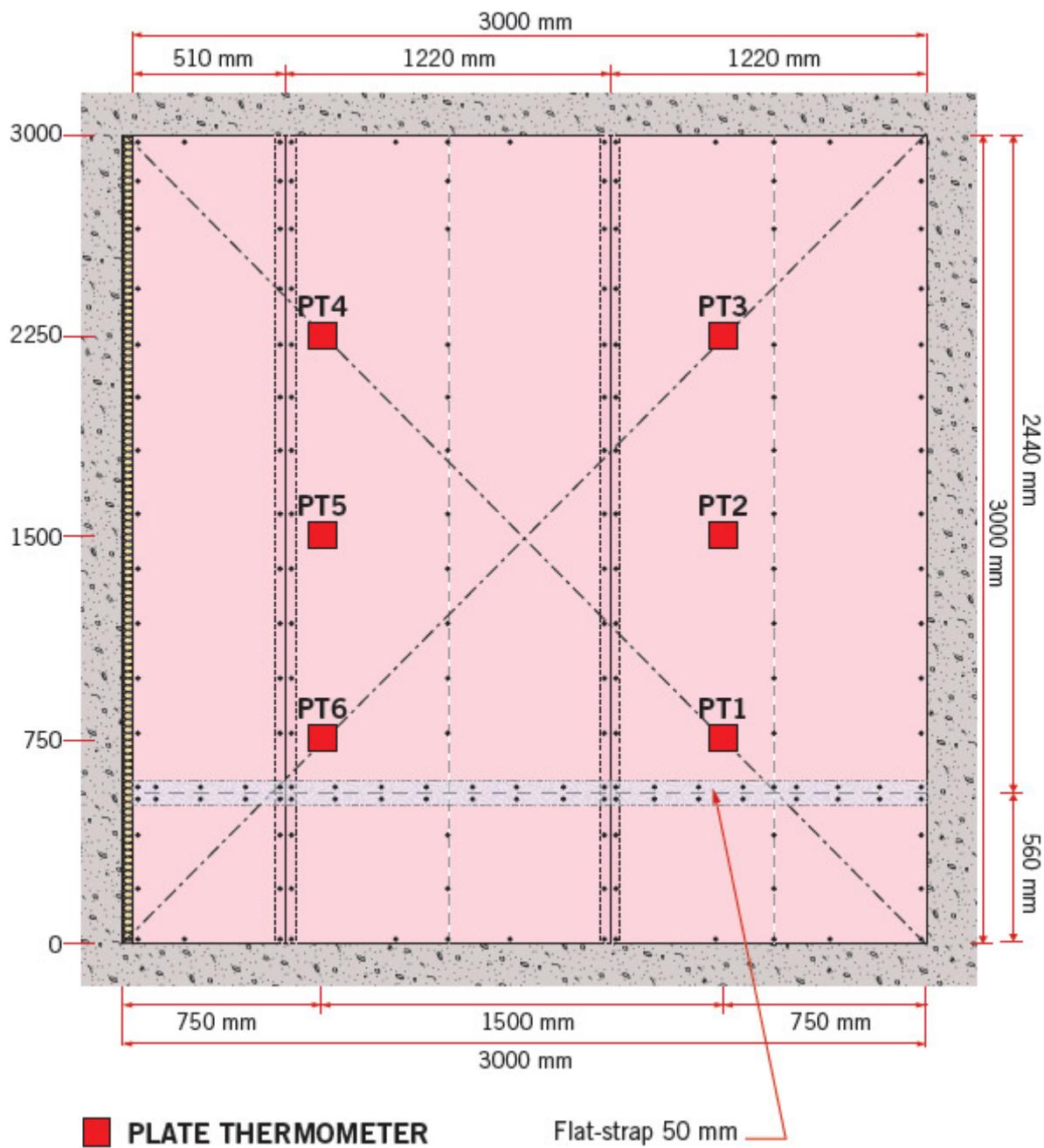


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**Annex 1**
**THERMOCOUPLES ON THE NON-EXPOSED FACE OF THE PARTITION**

 Screws PRÉGY  
 TF 212x25 mm

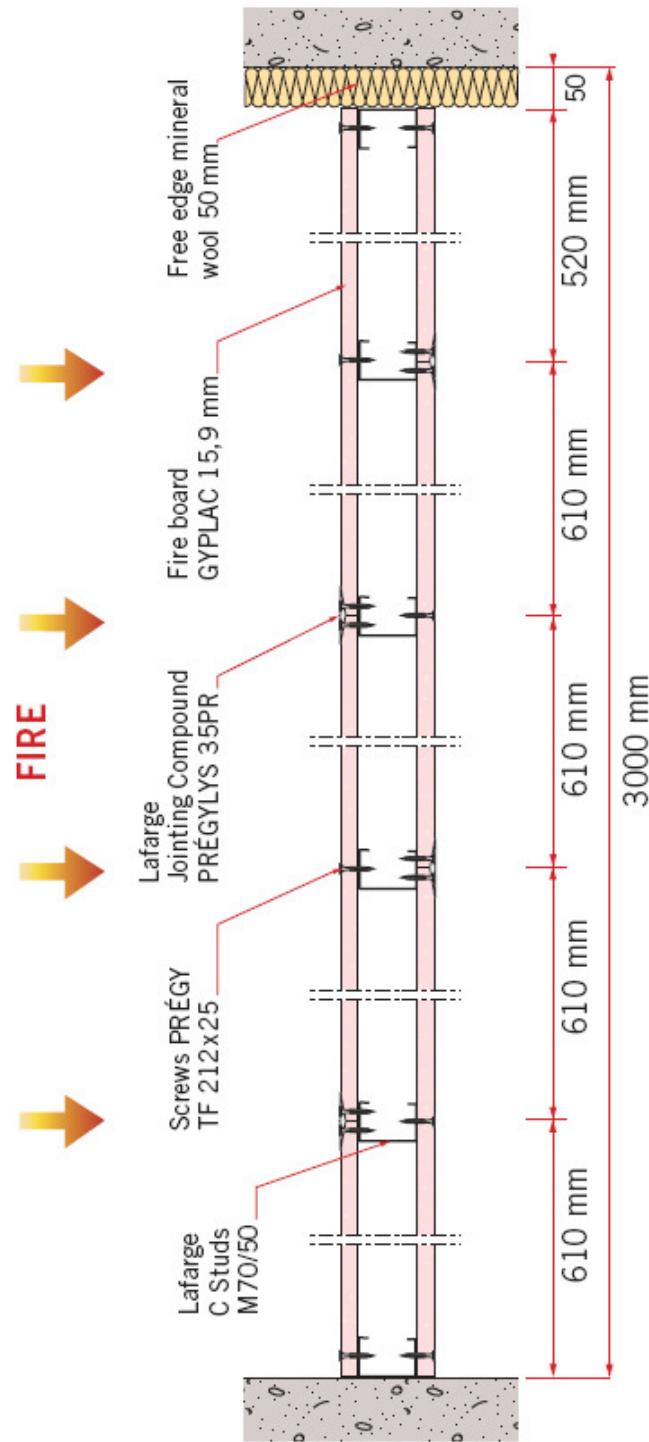
 ● Thermal sensors  
 Displacement sensors

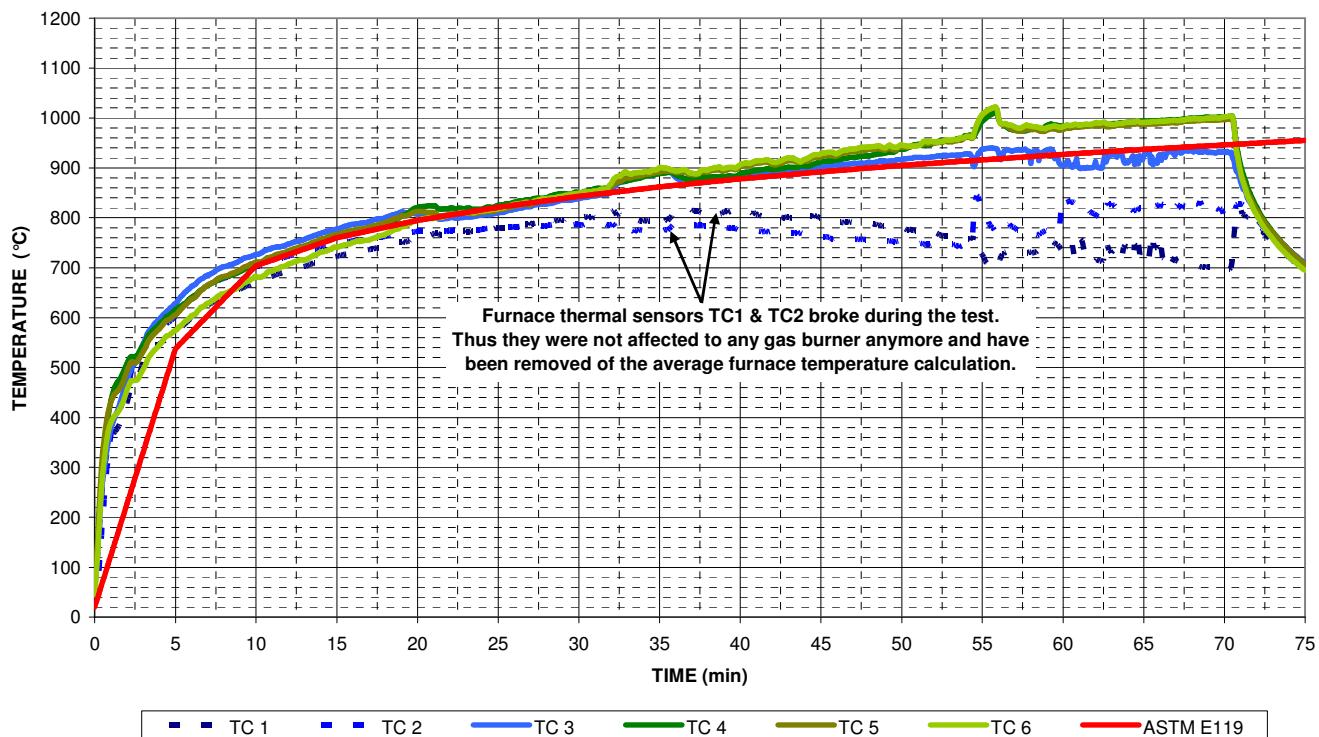
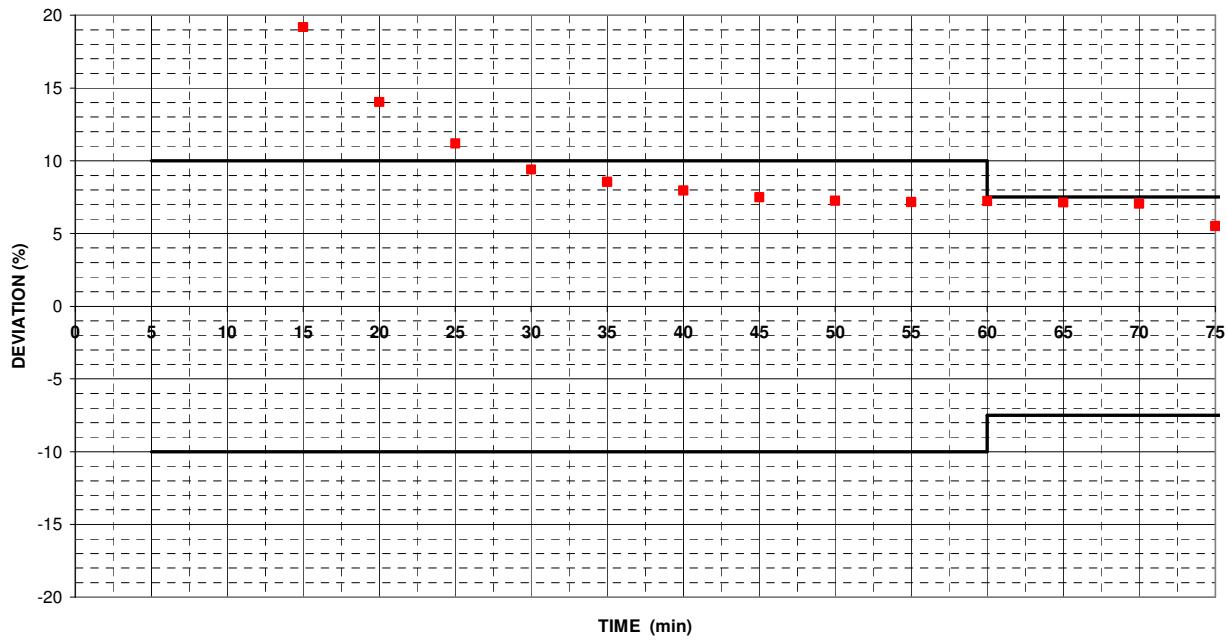
 Free edge: 50 mm  
 high density rock wool

**Annex 2**
**FURNACE THERMOCOUPLES**  
 Plate-thermometers, located at 100 mm front to the exposed side of the partition


Annex 2

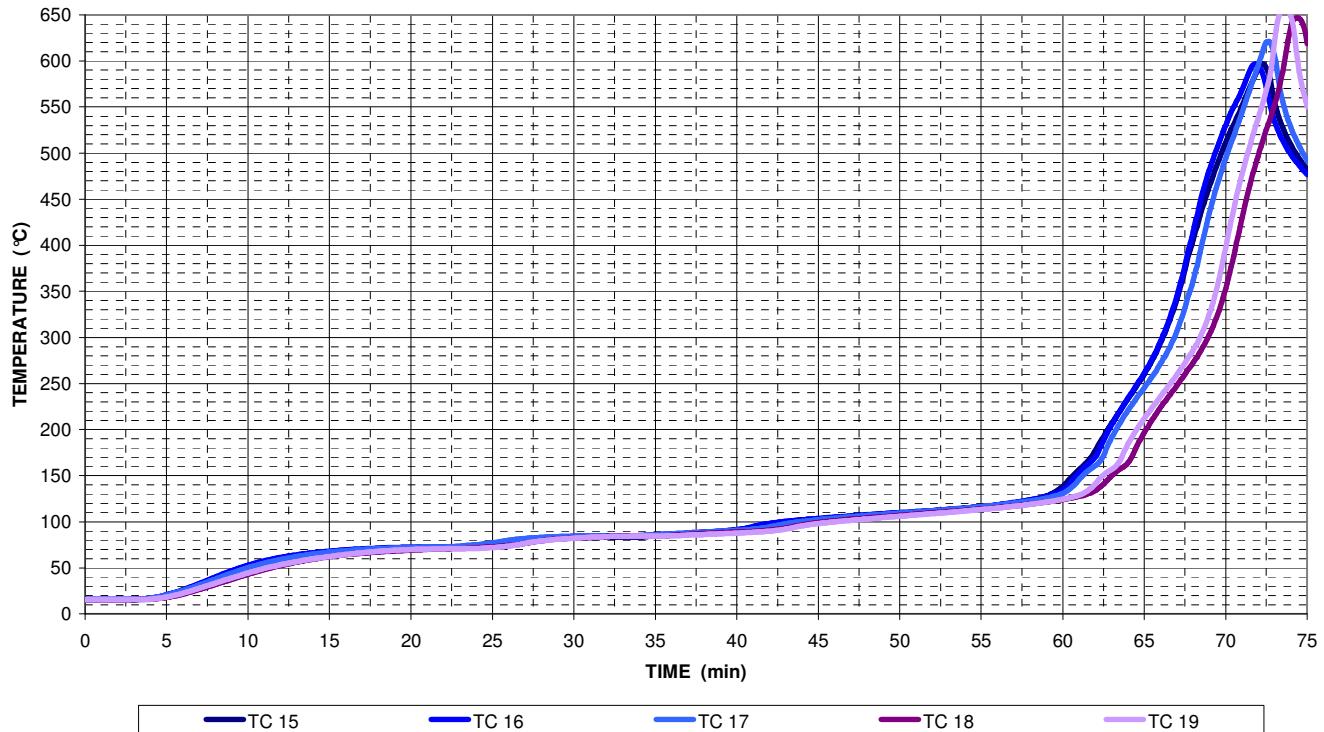
TRANSVERSAL VIEW OF THE TESTED SYSTEM



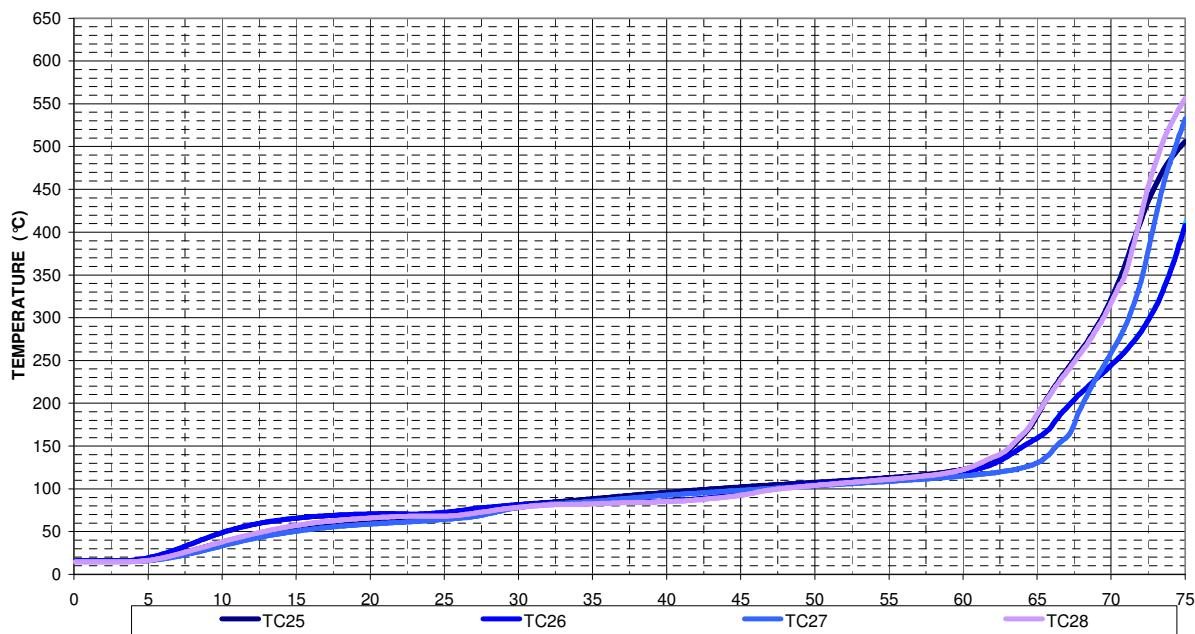
**Annex 3**
**AMBIENT TEMPERATURES INSIDE THE FURNACE**

**DEVIATION WITH ALLOWED TOLERANCES ACCORDING TO ASTM E119**


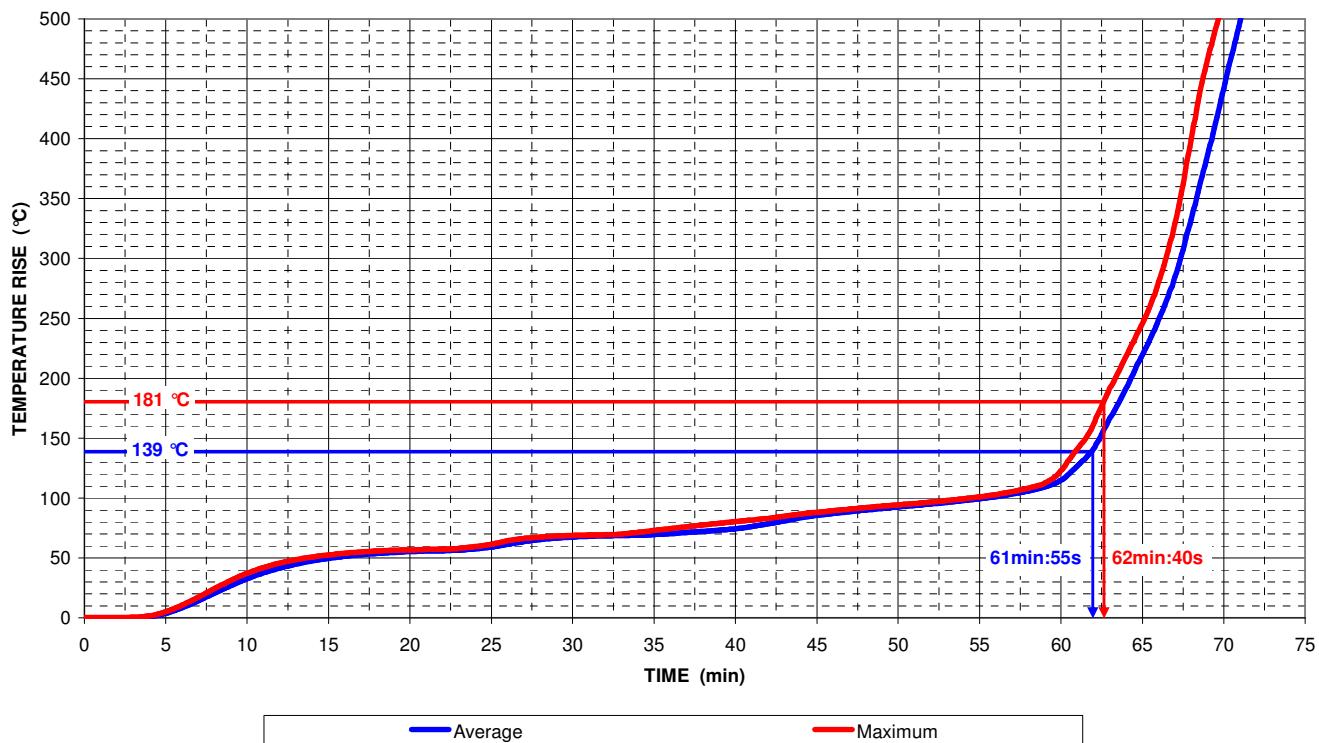
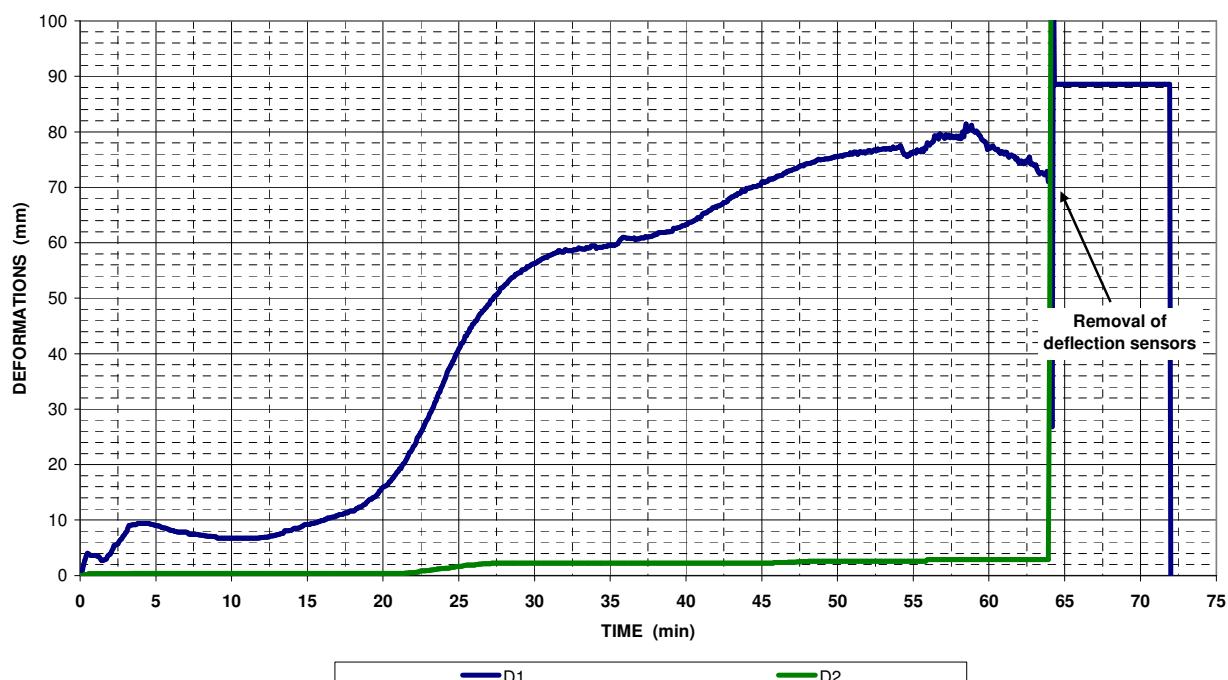
Annex 3

TEMPERATURES ON THE NON-EXPOSED FACE, AT 1/4 AND INTERSECTION OF DIAGONALS



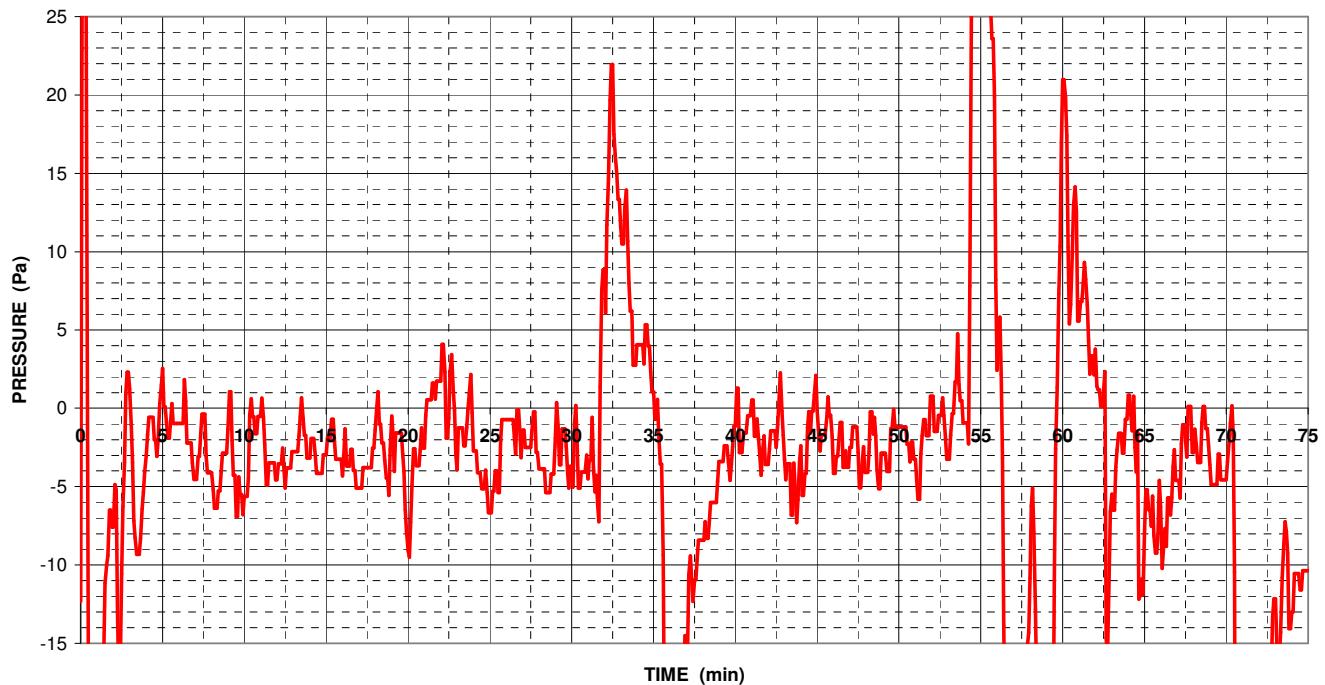
TEMPERATURES NEAR VERTICAL JOINTS and CROSSING JOINTS, ON THE NON-EXPOSED FACE



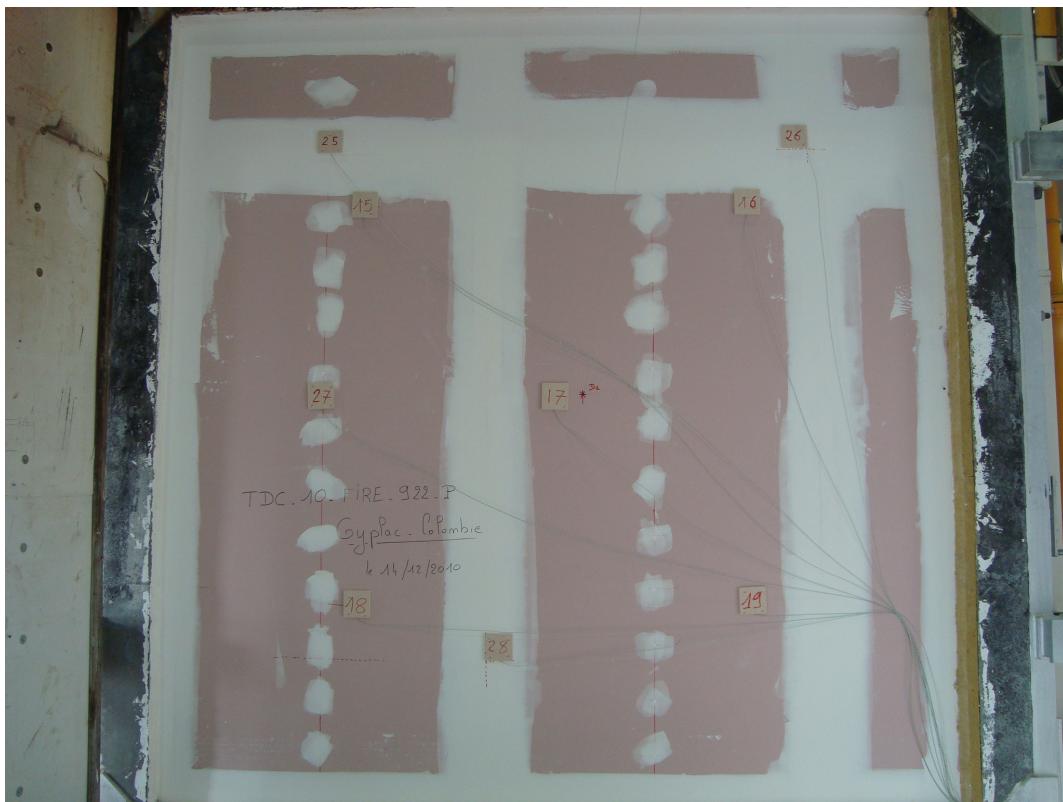
**Annex 3**
**REFERENCE TEMPERATURE RISES - ASTM E 119**

**DEFORMATIONS AT MID-HEIGHT OF PARTITION**


## Annex 3

## AMBIENT PRESSURE INSIDE THE FURNACE, 100mm BELOW TOP OF PARTITION



View of the non-exposed face, before start of test



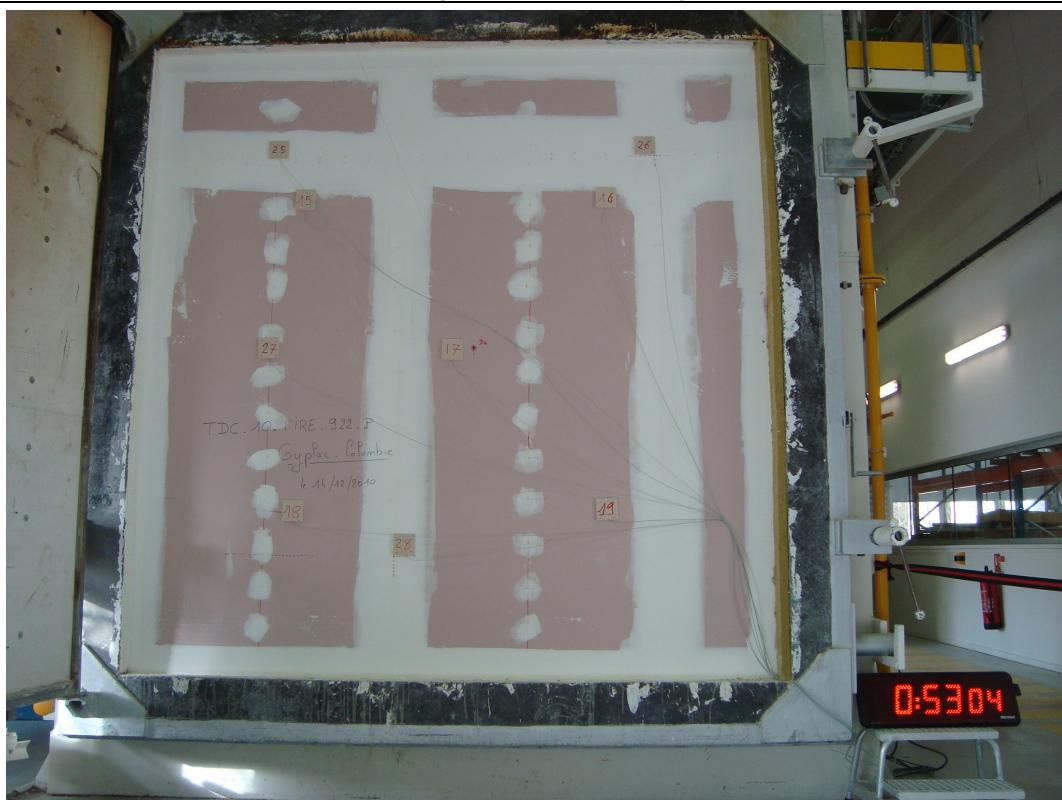
28min:00s – View of the exposed face, with opening of joints



48min:00s – View of the exposed face, with one large vertical joint opening. No fall of any piece of board.



53min:00s – View of the non-exposed face. Browning observed at screw heads.



69min:00s View of the exposed face. Boards are cracked, but no fall observed.



70min:00s – View of the non-exposed face, just before end of test

