**CSI** S.p.A.
*Sede Legale - Uffici - Laboratori:*
V.le Lombardia, 20
20021 BOLLATE (MI)
Tel. 0238330.1
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R.E.A. 1466310
Registro Imprese 352168/8620/18
C.F./P.I.: 11360160151 IT
Cap. Soc. € 1.040.000


*Issued in compliance with the articles 1 and 5 of the Decree of the Ministry of the Interior dated March 26th 1985 about "Procedures and requirements for authorization and registration of corporations and laboratories in the lists of the Ministry of the Interior" referred in the Law December 7th 1984, no.818.*

| | |
|---|---|
| *Test subject:* | **PARTITION PANEL**<br>**FIRE RESISTANCE TEST** |
| *Date:* | **August 4th 2003** |
| *Trade-name:* | **"PSME 80"** |
| *Applicant's name:* | **EMMEDUE S.r.l.** |
| *Applicant's address:* | **Via Toniolo, 39/b – Z.I Bellocchi**<br>**61032, Fano (PU)** |
| *Date of the test:* | **May, 15th 2003** |

*This test report is valid only with reference to the samples undergoing the test.*

*This test report is made up of no. 11 pages and can not be reproduced and/or publicized unless integrally.*

CSI S.p.A.
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20021 BOLLATE (MI)

# 1. GENERAL

At the CSI S.p.A., IMG Group fire resistance laboratory, a test aiming at ascertaining the fire resistance requirements of a partition panel called "**PSME 80"** has been carried out according to the methods established by the Circular of the Ministry of the Interior, General Management of the Civil Protection and Anti-fire Service, no.91 dated September 14th 1961 containing "Safety regulations about the protection against fire of civil buildings with steel structure", as well as Circular no. 52 dated November 20th 1982 "Ministerial Decree February 16th 1982 and D.P.R. July 29th 1982 no. 577 – Explications"; the panel has been presented by the firm **EMMEDUE S.r.l. Via Toniolo, 39/b – Z.I. Bellocchi – 61032 Fano (PU).**

# 2. DESCRIPTION OF THE TESTED ELEMENT

The partition panel undergoing the test, named PSME80, with finished dimensions of 2000x2000x150 mm, consists of a foamed polystyrene structure and reinforced concrete plastering.

More precisely, the panel is made up of:

- No. 2 joined slabs of self-extinguishing foamed polystyrene, whose dimensions are equal to 1125x2000x80 mm and 875x2000x80 mm and density 15 kg/m$^3$, corrugated on both faces, wavelength equal to 10 mm.
- No. 2 sheets of mesh for joining the polystyrene slabs, made with galvanized steel, consisting of longitudinal wires Ø 2.5 (pitch 6.5 cm) and transversal wires Ø 2.5 (pitch 6.5 cm).
- Structural plastering named "Intofort", produced by the firm CVR, Industrial Zone, Padule, 06020, Gubbio (PG).

The plastering application has included the following phases:

1. Mix preparation: mixing water at 16% in weight of clean water on dust (4 litres every 25 Kg). The mix has been made by pouring about 1/3 of the total pre-batched water, mixing and then adding "Intofort" pre-mixed mortar and the remaining quantity of water, until the mix has turned out to be hydrated and has reached plastic consistency.
2. Laying: the application has been made manually, with a trowel, in one restart for each side up to the obtainment of a thickness of 3 cm., starting from the extrados of the electrowelded mesh. A smoothing of the surface has been made by means of metallic stadia so as to eliminate any irregularities of the surface and possible unevenness of plastering in the cavities.

The plastering characteristics are the following:

| | |
|---|---|
| Dry volumetric mass [g/cm$^3$]: | 1.295 |
| Volume weight of the fresh mortar [g/cm$^3$]: | 1.781 |
| Mixing water [%]: | 16 |
| Average compression strength after 28 days [N/mm$^2$]: | 12.7 |
| Average flexural strength after 28 days [N/mm$^2$]: | 3.5 |
| "Rta" adhesion resistance to tensile stress at 28 days [N/mm$^2$]: | 0.44 |

| | |
|---|---|
| "E" secant coefficient of elasticity at compression [N/mm$^2$]: | 4300 |
| Water absorption at atmospheric pressure at 7 days [%]: | 6.4 |
| Total saturation water after 10 days [%]: | 6.9 |
| "Cs" specific thermal conductance [W/mm$^2$ K]: | 10 |
| "λ" thermal conductivity [W/mK]: | 0.809 |
| Time for setting start [min.]: | 40 |
| "g" average value of the steam transmission velocity [mg/h m$^2$]: | 3190 |
| "μ" average value of the factor of diffusion resistance: | 11 |
| "δ" average value of the steam permeability [mg/m h Pa]: | 0.062 |
| Fire reaction class: | 0 |

The data mentioned above have been taken from the technical report supplied by the Customer and from verifications made by technical staff, with reference to the dimensions of the element examined.

# 3. TEST METHODS

The panel has been assembled inside a curtain frame. Afterwards, the frame containing the tested sample, has been fixed to a supporting element so as to cover entirely the opening of the test furnace having dimensions of 3000x3000 mm. The surface of the element exposed to the furnace heat turns out to be of 2000x2000 mm.

On the tested element surface which is not exposed to fire, no.5 thermo-couples have been positioned (no. 7,8,9,10,11) to take the average temperature of the element (see attachment A).

## *3.1 TEST DESCRIPTION*

After placing the measurement and control equipment, the burners have been started by heating the fire chamber according to the temperature/time curve provided for by the Circular no.91 of the Ministry of the Interior dated September 14th 1961 and in observance of the tolerances provided for.

Furthermore, the test has been carried out by pressurizing the furnace at about 2/3 of the element height and after the first 10 minutes of testing, at the pressure of 10 ± 2 Pa. The data registered by the thermo-couples regulating the temperature of the furnace and applied on the element are shown in the following diagrams:

| Description of the data shown in the diagrams | Attachment |
|---|---|
| Furnace theoric heating curve and range of variability of the furnace average temperature<br>Curve of the average temperature actually obtained in the furnace.<br>Average temperature curve of the thermo-couples applied on the panel side not exposed to fire (no.7,8,9,10,11). | B |
| Temperature curve of the thermo-couples positioned on the panel side not exposed to fire (no.7,8,9,10,11) | C |

Table 1. temperature diagrams.

## 4. TEST RESULT

The following meaningful phenomena have occurred during the test:

| Minute | Phenomenon noticed |
|---|---|
| 112' | Formation of non-passing fissures horizontally and vertically, at the perimeter of the panel |
| 151' | Temperature of the thermo-couple no.10>180°C |
| 180' | The test has been interrupted. No passage of flame or hot gas has been noticed on the panel side not exposed to fire. |

Table 2. Phenomena noticed during the test.

The temperatures taken by the thermo-couples on the not exposed side at test completion are the following:

| Thermo-couple | Temperature (°C) |
|---|---|
| Thermo-couple n° 7 | 143,8 |
| Thermo-couple n° 8 | 225,6 |
| Thermo-couple n° 9 | 191 |
| Thermo-couple n° 10 | 228,2 |
| Thermo-couple n° 11 | 149 |

Table 3. Maximum temperatures taken at test completion.

## 5. CONCLUSIONS

In compliance with the Circular no.91 and the M.D. November 30th 1983 "Terms, general definitions and graphic symbols for fire prevention", the fire resistance of the partition panel examined, named "**PSME 80**", presented by the firm **EMMEDUE S.r.l. via Toniolo, 39/b – Z.I. Bellocchi – 61032, Fano (PU)**, turns out to be:

REI 151 – RE 180

and, therefore, the non-load bearing element examined can be classified REI 120 and RE 180.
The photographs no.1, 2, 3 and 4 (Attachment D) show the element before and after testing.

Date of issue: **August 4th 2003**

IL RESPONSABILE DEL LABORATORIO
(Ing. Paolo MELE)

CSI S.p.A.
Viale Lombardia n. 20
20021 BOLLATE (MI)

IL DIRETTORE DEL LABORATORIO
(Ing. Pasqualino CAU)

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## ATTACHMENTS

### Attachment A

Partition wall table and thermo-couple arrangement diagram.

Detail of the panel horizontal section

### Attachment B

Theoric heating curve of the furnace and range of variability of the furnace temperature.

Curve of the average temperature actually obtained in the furnace.

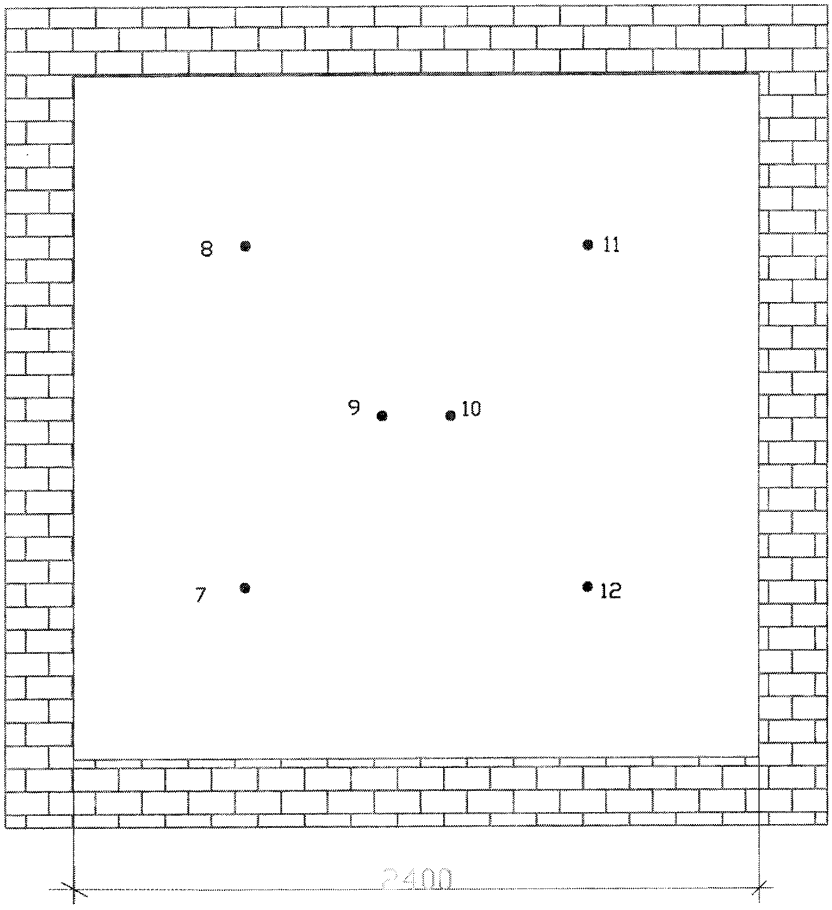
Average temperature curve of the thermo-couples placed on the element face not exposed to fire: average of the thermo-couples no. 7,8,9,10,11.

### Attachment C

Temperature curves of the thermo-couples placed on the panel face not exposed to fire: thermo-couples no. 7,8,9,10,11.

### Attachment D

Photo of the element before and after testing




**LE GEND**

- Average temperature = 150°C
- Maximum temperature = 180°C

| Progettato | Controllato | Approvato | Data | Scala |
|---|---|---|---|---|
| C.S.I. | G. GRELLA | P. MELE | 04/08/2003 | FIT TO A4 FORMAT |

Proprietario: C.S.I. S.p.A.

Titolo: THERMO-COUPLE ARRANGEMENT ON PARTITION WALL

| Nome file | Foglio |
|---|---|
| H:\MODELLI\DISEGNI\PARETE | 1/1 |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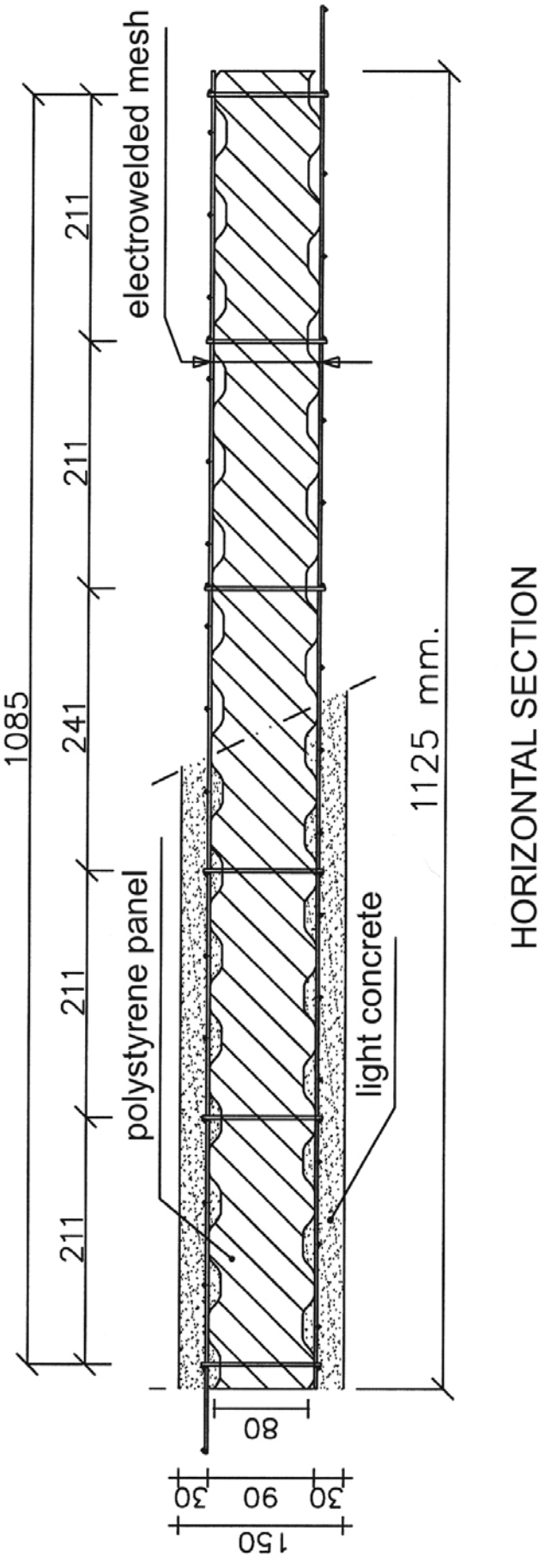
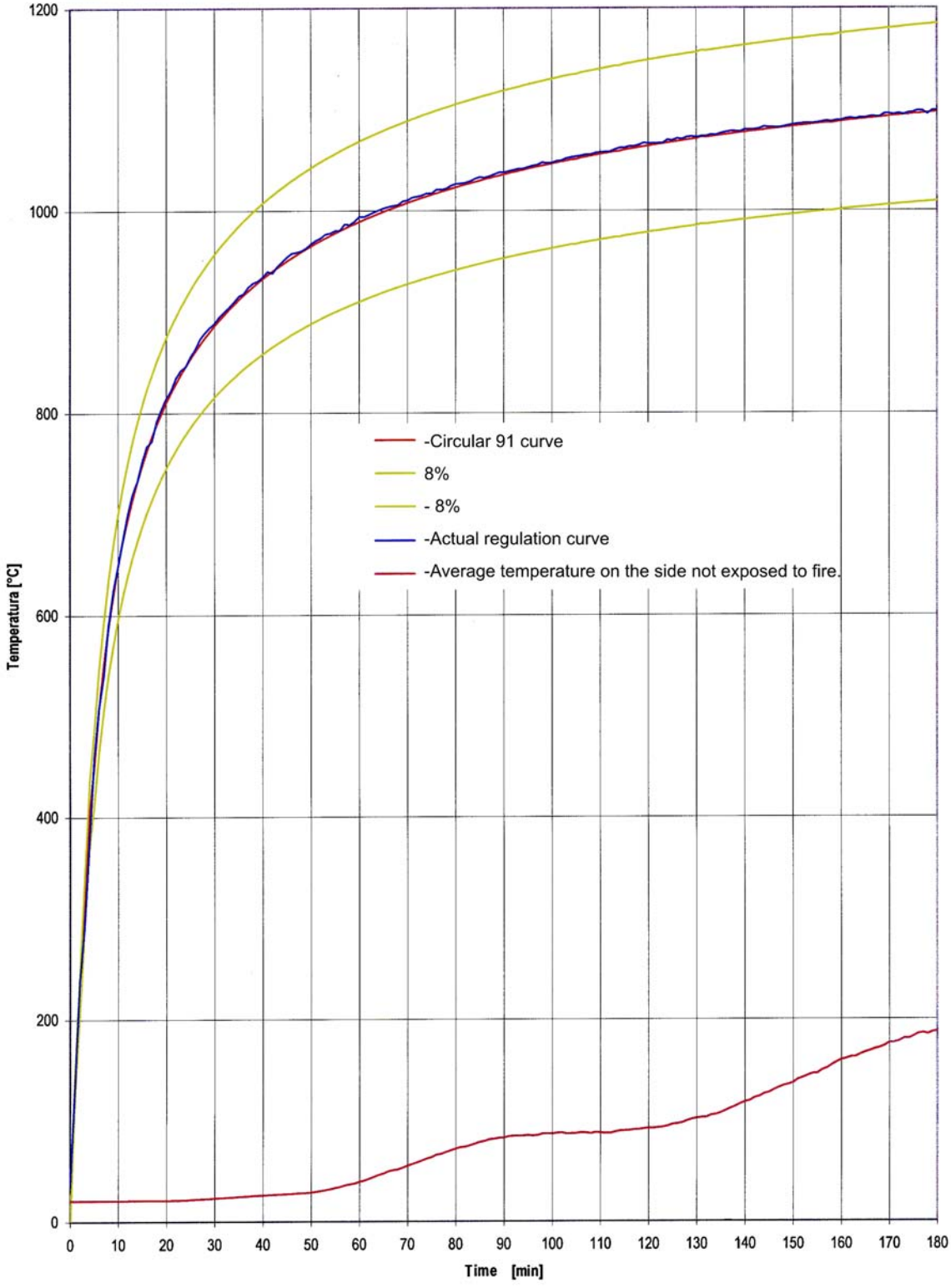

electrowelded mesh
211
211
241
211
211
1085
1125 mm.
polystyrene panel
light concrete
80
30
90
30
150
HORIZONTAL SECTION

**CIRCULAR 91 REGULATION CURVE**





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**Temperature curves of the thermo-couples placed on the element face not exposed to fire.**

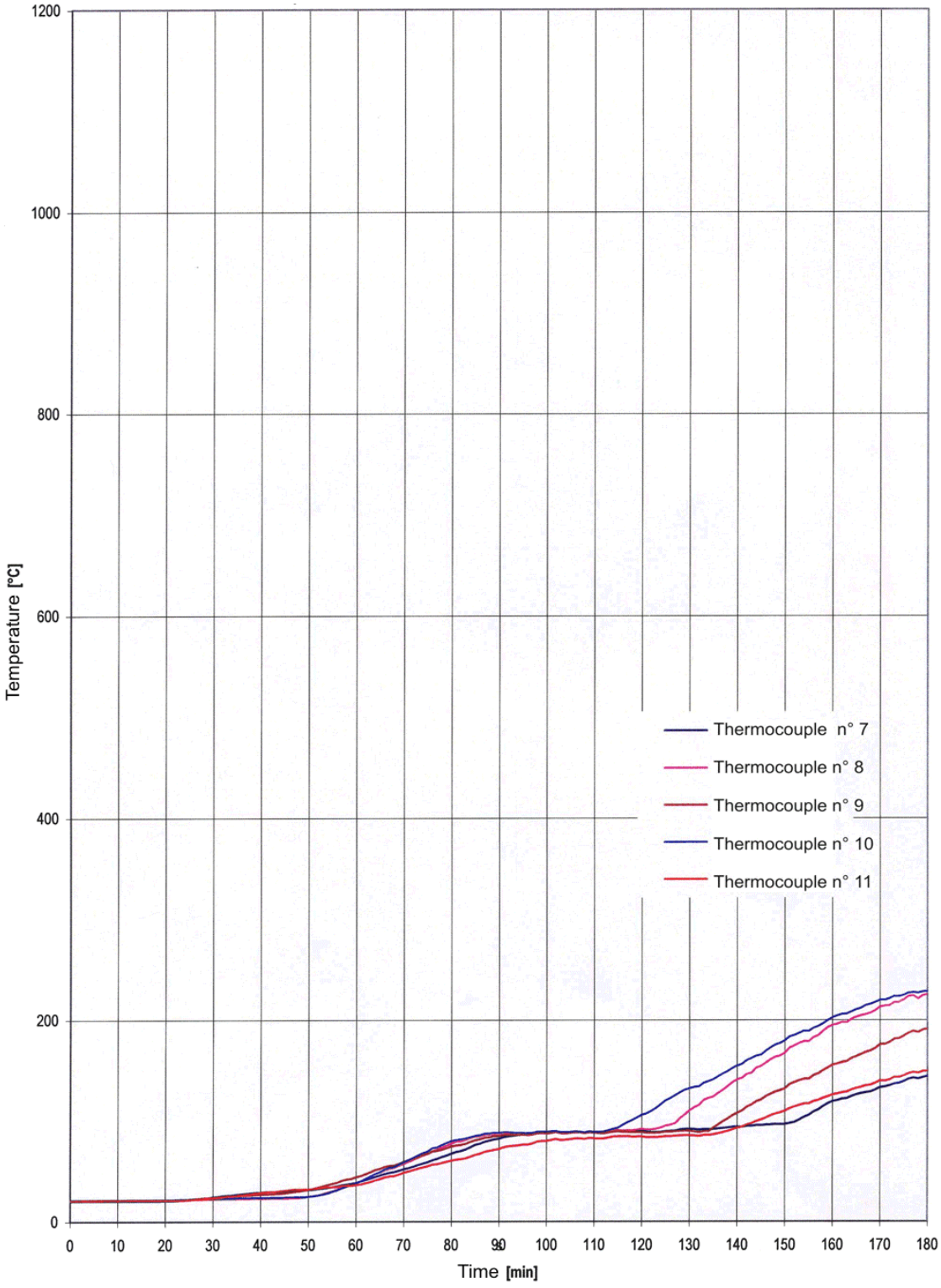


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Photo 1: Element side exposed to fire before testing

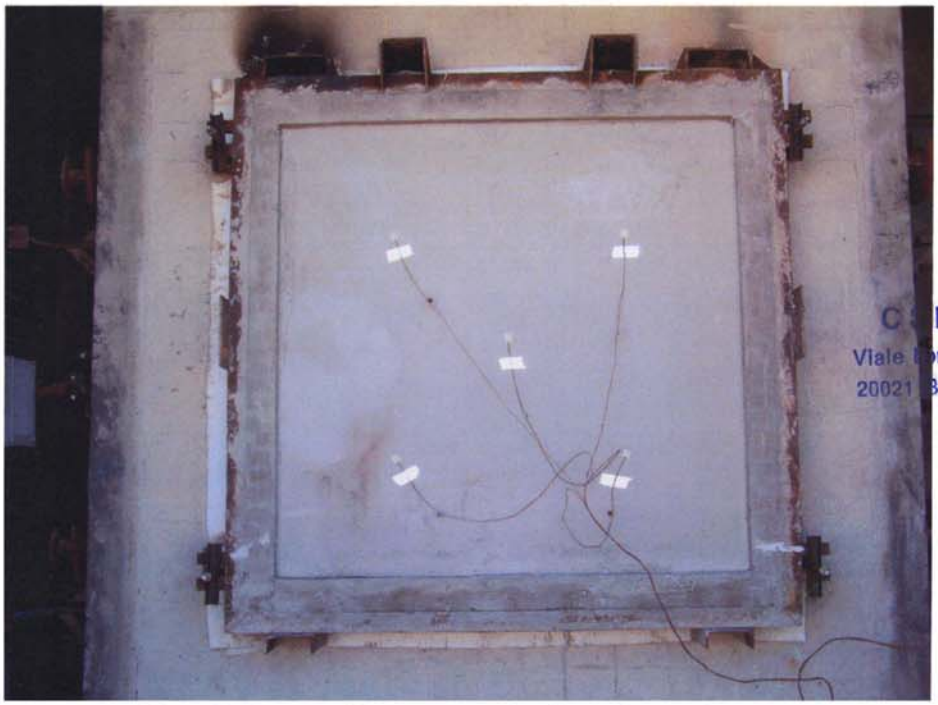

Photo 2: Element side not exposed to fire before testing

**Attachment D**

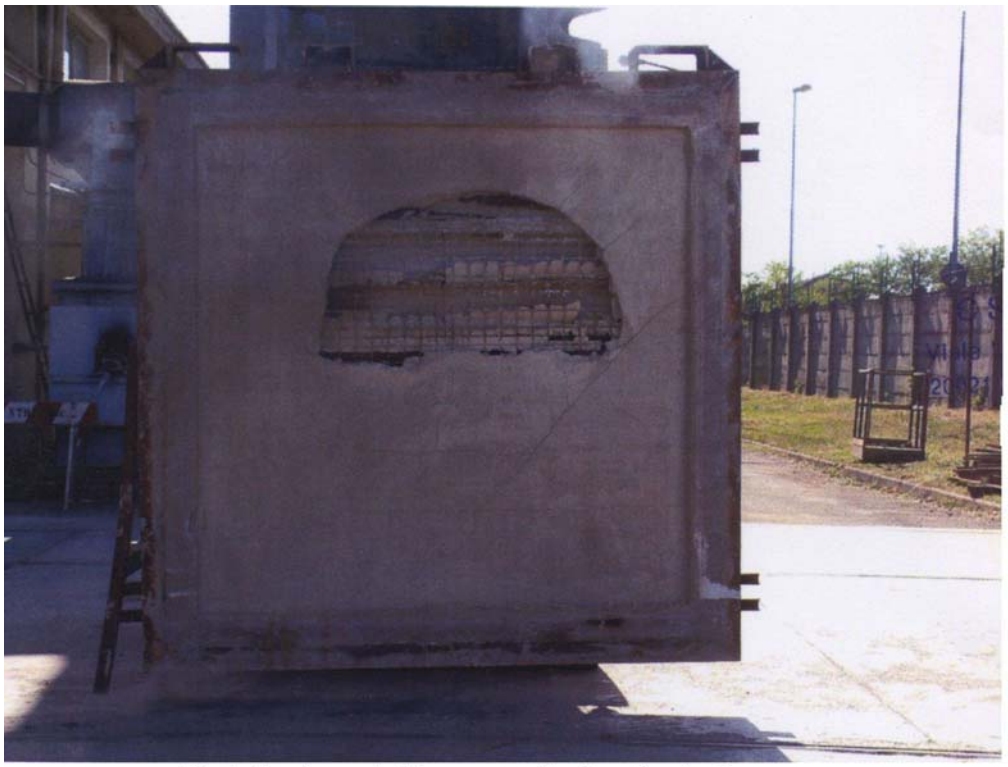

Photo 3: element side exposed to fire after testing

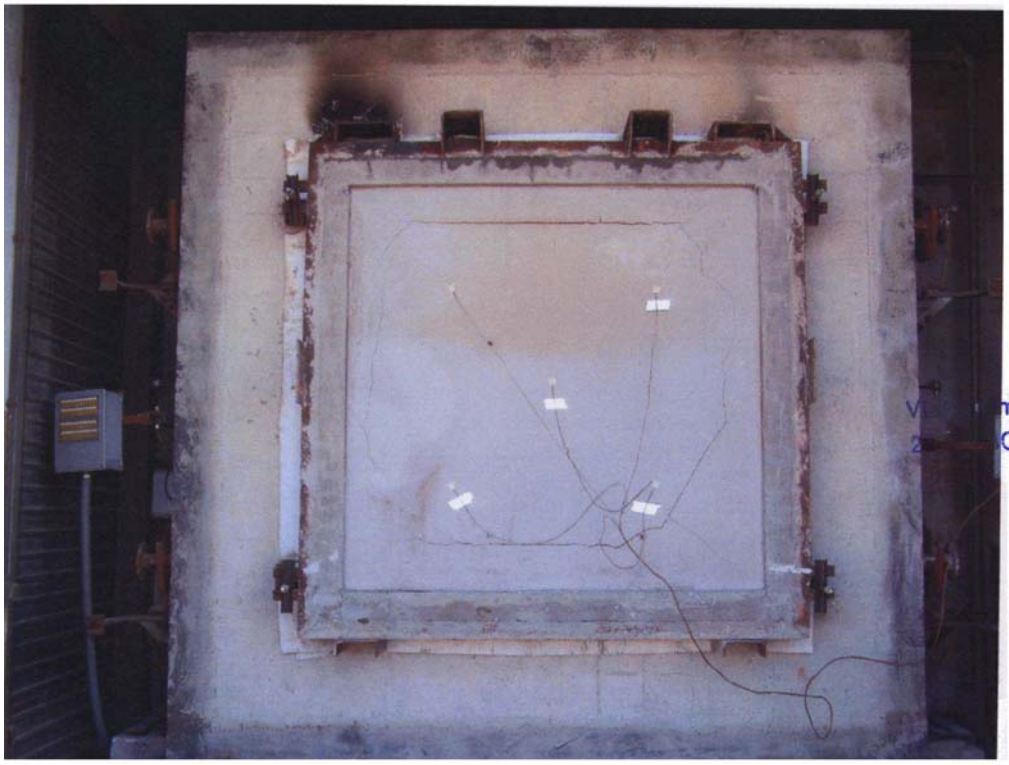

Photo 4: element side not exposed to fire

**Attachment D**

S.p.A.
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Viale Lombardia n. 20
20021 BOLLATE (MI)

MODULARIO INTERNO - 261

Ministero dell'Interno
DIREZIONE GENERALE DELLA PROTEZIONE CIVILE E DEI SERVIZI ANTINCENDI
SERVIZIO TECNICO CENTRALE
Ispettorato Attività e Normative Speciali di Prevenzione Incendi
Divisione Sez.
Prot. N. N5 2293 Allegati

Roma, 13 LUG. 1995 19

All. Laboratorio C.S.I. S.p.A.
Viale Lombardia, 20
20021 BOLLATE (MI)

Risposta al Foglio del
Div. Sez. N.

4101 Sott. 120

OGGETTO: Laboratorio C.S.I. S.p.A. - Variazione di ragione sociale.

e, p.c. Al Centro Studi ed Esperienze
Piazza Scilla, 2
00178 CAPANNELLE (ROMA)

Con riferimento all'oggetto, si comunica che questo Ministero ha preso atto della variazione della ragione sociale di codesto Laboratorio da "Centro Sviluppo Settori Impiego S.r.l.", in forma abbreviata C.S.I. S.r.l. a "C.S.I. S.p.A.", ferma restando assegnata al Dott. Ing. Pasqualino Cau la funzione di rappresentante legale del laboratorio in questione.

Ai sensi dell'art. 17 del D.M. 26/03/85, copia della presente lettera dovrà essere allegata, unitamente alle copie delle autorizzazioni provvisorie a certificare, a tutte le certificazioni rilasciate in conformità al D.M. sopraindicato da codesto Laboratorio.

L'ISPETTORE GENERALE CAPO
(Dott. Ing. Paolo ANCILLOTTI)

ISTITUTO POLIGRAFICO E ZECCA DELLO STATO - S.

CP/is

MODULARIO
- Interno - 1370

SERVIZIO TECNICO CENTRALE
Ispettorato Attività e Norm
Speciali di Prev. Incendi

Mod. 3 PC
(ex Mod. 863)

# Ministero dell'Interno

DIREZIONE GENERALE DELLA PROTEZIONE CIVILE E S.A.

VISTA la legge 7 dicembre 1984, n.818 concernente "Nullaosta provvisorio per le attività soggette ai controlli di prevenzione incendi, modifica degli articoli 2 e 3 della legge 4 marzo 1982, n. 66, e norme integrative dell'ordinamento del Corpo Nazionale dei Vigili del Fuoco", pubblicata sulla Gazzetta Ufficiale della Repubblica Italiana n.338 del 10 dicembre 1984;

VISTO il decreto ministeriale 26 marzo 1985 concernente le procedure e requisiti per l'autorizzazione e l'iscrizione di enti e laboratori negli elenchi del Ministero dell'Interno di cui alla legge 7 dicembre 1984, n. 818;

VISTA l'istanza e la documentazione allegata, presentata dall'Ing. Pasqualino CAU, nella sua qualità di Direttore e legale rappresentante della "MONTEDIPE C.S.I." (Montedison Petrolchimica/Centro Sviluppo Settori d'impiego) sito in Viale Lombardia n. 20 Bollate (MI);

VISTO il verbale in data 9 giugno 1988 trasmesso dal Direttore del Centro Studi ed Esperienze del Corpo Nazionale dei Vigili del Fuoco con il quale vengono ritenute come positivamente verificate l'idoneità e le apparecchiature di prova di cui all'articolo 5 e la regolarità delle procedure di cui all'articolo 1 di cui al decreto ministeriale 26 marzo 1985;

S I  A U T O R I Z Z A

provvisoriamente, ai sensi dell'articolo 1, 4° comma, della legge n. 818/84 e dell'articolo 17 del decreto ministeriale 26 marzo 1985 citato in premessa, il "Laboratorio di Resistenza al fuoco" della "MONTEDIPE C.S.I." ad emettere le certificazioni di prova nel settore della resistenza al fuoco di strutture caricate e non caricate secondo le specificazioni contenute nella circolare del Ministero dell'Interno 14/9/1961 n. 91, del decreto ministeriale 26 marzo 1985 e secondo le procedure tecnico-amministrative e la modellistica comunicate dal Centro Studi ed Esperienze al predetto Laboratorio.

Copia di ogni singola certificazione emessa dal predetto Laboratorio dovrà essere inviata al Centro Studi ed Esperienze del Corpo Nazionale dei Vigili del Fuoco di Capannelle-Roma.

La funzione di direttore del predetto laboratorio è affidata al Dott.Ing. Pasqualino CAU, nato a Tempio Pausania il 21 dicembre 1934, iscritto all'Ordine degli Ingegneri della provincia di Varese con il numero 709, sotto la cui diretta responsabilità si svolgerà la intera attività del laboratorio e che provvederà a firmare tutti gli atti di certificazione prodotti dal laboratorio stesso.

L'attività del laboratorio dovrà, in particolare, essere svolta nel rispetto delle vigenti norme in materia di sicurezza e di igiene del lavoro.

Il sostituto del predetto direttore del laboratorio è il Dott. Umberto FLISI nato a Viadana (MN) il 22 aprile 1934, iscritto all'Ordine interprovinciale dei Chimici della Lombardia con il numero 2606.

Roma, 25 luglio 1988

IL DIRETTORE GENERALE
(A. GOMEZ Y PALOMA)