The Italian National Guidelines for the fire safety of façades

Sergio Schiaroli & Piergiacomo Cancelliere

Ministry of Interior, Italian National Fire Rescue and Service – CNVVF – Rome, Italy

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Corpo Nazionale dei Vigili del Fuoco
Italian National Fire Rescue and Service
Authority Having Jurisdiction charged with:

- writing fire safety regulations
- and enforcing them

Our 600+ fire officers are engineers and architects that:

- peer review the fire safety designs and approve them
- inspect civil and industrial activities to check for compliance to the approved design
- train the designers
POSSIBLE SOURCES OF FACADE FIRE

1. SOURCES OUTSIDE THE BUILDING
   1.a Vehicles in the immediate vicinity (Vehicles can cause a severe fire that may expose the façade to direct contact with the flame)
   1.b Adjacent buildings or outdoor bins, outdoor materials or barbeques ...

2. SOURCES INSIDE THE BUILDING
   2.a intercaped spaces (eg. double skin facades)
   2.b internal construction compartment
   2.c walls

Generally the worst fire scenario concerning life safety in buildings are fires that ignite inside the apartments and that spread out along the facade.
THE TECHNICAL GUIDELINE FOR DETERMINING THE "FIRE SAFETY REQUIREMENTS OF FACADES IN CIVIL BUILDING"
(Issued by CNVVF of the Ministry of Interior with Circular Letter n. 5043 of 15 April 2013)

1) IT’S A NORMATIVE DOCUMENT OF VOLUNTARY APPLICATION
2) IT’S REFERRED TO BUILDINGS WITH A “FIRE HEIGHT” GREATER THAN 12 METERS

OBJECTIVES:

- REDUCE THE POSSIBILITY OF FIRE OF FACADE AND ITS SUBSEQUENT SPREAD, DUE TO A FIRE HAVING BOTH INTERNAL AND EXTERNAL ORIGIN

- AVOID OR LIMIT, IN THE EVENT OF FIRE, THE FALL OF PARTS OF FACADE (FRAGMENTS OF GLASS OR OTHER PARTS OTHERWISE BROKEN OR BURNED) THAT MAY AFFECT THE EXODUS OF THE OCCUPANTS IN THE BUILDING AND SECURITY OF INTERVENTION OF FIREFIGHTERS
DOCUMENT ORGANISATION

1. OBJECTIVES

2. DEFINITIONS - CLASSIFICATION

3. REQUIREMENTS OF FIRE RESISTANCE AND COMPARTMENTATION

4. REACTION TO FIRE

5. EXODUS OF OCCUPANTS AND SAFETY OF FIREFIGHTERS

VERIFICATION OF THE REQUIREMENTS OF RESISTANCE TO FIRE
No requirements for fire resistance façade elements that belong to specific compartments with fire load density, net of the contribution represented by the insulation material present on the facade, less than or equal 200 MJ / m². There are no requirements of fire resistance also for the elements of the facade that belong to compartments in which the value of the fire load density is greater than 200 MJ / m², if they are provided with an automatic extinguishing system.

N.B.: The value of the fire load density equal to 200 MJ/m² corresponds, according to the Italian D.M. 09.03.2007 to a class of fire resistance of 15 minutes (class referred to structural elements exposed to a standard fire).
Italian Technical Guideline

... Provisions for:

- SIMPLE FACADES AND CURTAIN WALLS
- NOT INSPECTABLE DOUBLE SKIN VENTILATED FACADES WITH EXTERNAL SKIN “CLOSED”
- NOT INSPECTABLE DOUBLE SKIN VENTILATED FACADES WITH EXTERNAL SKIN “OPEN”
- DOUBLE SKIN INSPECTABLE VENTILATED FACADES WITH EXTERNAL SKIN “CLOSED” AND CAVITY INTERRUPTED BY FIRE RESISTANT ELEMENTS
- DOUBLE SKIN INSPECTABLE VENTILATED FACADES WITH EXTERNAL SKIN “CLOSED” AND CAVITY NOT INTERRUPTED BY FIRE RESISTANT ELEMENTS
- DOUBLE SKIN INSPECTABLE VENTILATED FACADES WITH EXTERNAL SKIN “OPEN”

Verification of fire resistance requirements

- Method based on tests
- Method based on analytical solution or tables
THE ALTERNATIVE MEASURES

double-skin inspected facades are provided of alternative measures

**automatic fire suppression systems** (i.e. Sprinkler water Systems), positioned inside of the two walls (skins) and dimensioned so as to ensure a water discharge density of not less than 10 l/min·m² on the inner walls of the facade.

The glass elements of the facade must be “tempered” and provided with treatment “HST” (Heat Soak Test).

The system should be commanded by appropriate fire detection system present at each floor of the building and the dispensing devices, located above each floor, must be directed towards the internal wall of the facade.
REACTION TO FIRE

THE PRINCIPLE:
Focusing on all products or materials that are part of the façade and that can potentially come into contact with the flame depending on their allocation and their expected chemical and physical composition, facilitating the spread of fire.

The insulation products present in a facade must be at least class 1 fire reaction (Italian classification) or Class B-s3-d0, according to European Classification.

The aforementioned class of reaction to fire, in the case where the insulating function of the facade is guaranteed by a set of components placed on the market together as a KIT, must be referred to it in its final conditions of exercise.

For the glass elements it is not required to provide reaction to fire performances.
EXODUS OF OCCUPANTS AND SAFETY OF FIREFIGHTERS

The fall of the fragile parts of the facade may compromise the exodus of occupants and also the safety of fire brigade teams.

If the facades are composed of brittle materials or materials that, in case of fire, may lead to breakage and chipping minute parts, it must be ensured that the landings of escape routes and safe places outside are protected from the fall of the parts of façade.

The design of the system of exodus must necessarily take into account the difficulty of access to the building from the outside, in case of fire, by the rescue teams.

However, it’s possible to insert windows that must be easily opened by the rescue teams from the outside, in compliance with the accessibility requirements of the means VV.F.

The use of the cavity (in the double skin facades) by the occupants for the purpose of evacuation it is prohibited.
TEST PROTOCOL FOR THE EVALUATION OF FIRE BEHAVIOUR OF EXTERNAL THERMAL INSULATION COMPOSITE SYSTEM FOR FAÇADE CONSTRUCTION WORK FIRE SCENARIO, A SAMPLE CONSISTING ONLY OF THE INSULATING COMPONENTS OF STANDARDIZED DIMENSIONS 2950MM X 2950M

- Ignition source: ribbon-type propane gas-burner, with Venturi mixer (according to EN 50399 standard).
- Burner heat release rate profile (600s in total):
  - 30kW for 600s
- Air flow to the Venturi mixer: 170 Nl / min.
- Burner positioning (flame production area) = 80 mm from the surface of the specimen and 80 mm from the lower edge of the specimen, inclined towards the base of the specimen of 10° from the floor axes. (This inclination is necessary to evaluate the behavior of the melted material)
- Exhaustion flow = 2.0 m³ / s (according to ISO 9705)
**Finished work fire scenario**, a sample of standardized dimensions 2950mm x 2950m to the actual thickness of the thermal insulation system with external plaster.

- Ignition source: linear spreading propane burner.
- Burner diffusion area = 1250 mm x 60 mm.
- Burner heat release rate profile (600s in total):
  - 300kW for 600s
- Burner positioning (flame production area) = 100mm from the lower edge of the specimen and below the same for the 50% of the depth of the burner.
  Exhaustion flow = 2.0 m³/s (according to ISO 9705).

**Diagram:**
- Propane expansion chamber (h = 53)
  - Layer of steel spheres with Ø = 5 (h = 20)
  - Grit layer with Ø = 2.5÷4 (h = 40)
- Woven Wire Mesh Net 4 × 4
- Woven Wire Mesh Net 2 × 2
- Linear spreading burner
- 300 kW Burner system
# TEST RESULTS ASSESSMENT

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
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<tbody>
<tr>
<td>RHR peak with burner at 30 kW [kW]</td>
<td>(for construction work fire scenario)</td>
</tr>
<tr>
<td>RHR peak with burner at 300 kW [kW]</td>
<td>(for finished work fire scenario)</td>
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<tr>
<td>Time of RHR peak [s]</td>
<td></td>
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<tr>
<td>THR at 900s without burner [MJ]</td>
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<tr>
<td>Transmittance minimum [%]</td>
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<tr>
<td>Time of Transmittance minimum [s]</td>
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<tr>
<td>TSP at 900s [m²]</td>
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<tr>
<td>Flaming dripping</td>
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</tbody>
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**DAMAGED ZONE**

- Max height [cm]
- Max width [cm]

*note: it does not consider the discoloration*
1. Acceptance criteria for construction work fire scenario:

- maximum height of the damaged area <250cm (vertical propagation upwards);
- the damaged area does not reach the edges of the sample (lateral propagation).

2. Acceptance criteria for fire scenario to finished work

- maximum height of the damaged area <250cm (vertical propagation upwards)
- The damaged area does not reach the edges of the sample (lateral propagation)

ONLY IF BOTH APPLICATIONS ARE POSITIVE, THE TEST IS CONSIDERED PASSED.
Thank You for your kind attention

Sergio Schiaroli & Piergiacomo Cancelliere, Ph.D.
E-mail piergiacomo.cancelliere@vigilfuoco.it