

# FIRE TESTING CENTRE









## OUR KNOW-HOW

YOUR PROJECTS WILL BENEFIT FROM OUR  
HUMAN AND EQUIPMENT RESOURCES

## TESTING



### FIRE TESTS

The CERIB Fire Testing Centre carries out a range of tests, either in conformity with standards or customized to meet your specific needs. Tests can be performed on materials, products, construction components, or structures.

Types of tests:

- Fire-resistance tests
- Intermediate-scale orientation tests
- Vertical fire propagation tests on façades (LEPIR 2 test)
- Thermomechanical characterization tests for materials



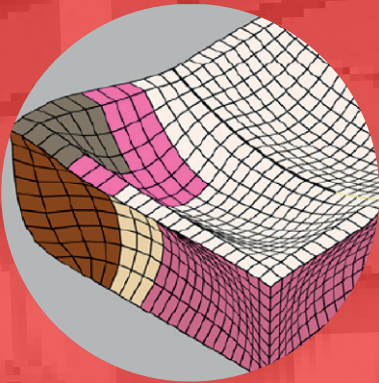
### IN SITU TESTS

Fire Testing Centre facilities can be brought to your structure or your premises to perform in situ tests such as:

- Smoke exhaust tests (rating, adjustment, commissioning)
- Safety drills
- Ventilation analysis

The laboratory can provide pyrotechnic systems: we design and build fire scenarios to meet your requirements.

# ENGINEERING



## STRUCTURAL ANALYSIS

- Ensuring the fire stability of steel-framed buildings by optimizing protection in accordance with the use of different premises
- Performing dimensional studies for structural components of 'car parks' with real vehicle fire scenarios
- Checking the failure mode for Environmentally Gazetted Installations (EGI)
- Performing special engineering studies for mezzanines of EGIs
- Performing engineering studies with respect to fire stability (concrete, steel, composite, timber, etc.)



## CALCULATION OF FIRE DEVELOPMENT

The Fire Testing Centre performs studies and conducts research in the field of fire development and the fire behaviour of structures exposed to defined fire scenarios. For example, the Fire Testing Centre can perform fire-safety engineering studies to:

- Study fire stability for nuclear facilities
- Check the fire behaviour of lifting and handling equipment (travelling cranes)
- Assess the propagation of a localized fire to nearby combustible materials



**A MULTIDISCIPLINARY TEAM AT YOUR SERVICE,  
WITH SKILLS IN:**

**COMBUSTION**

**THERMAL  
ENGINEERING**

**FLUID  
MECHANICS**

**PHYSICAL  
MEASUREMENT  
/ METROLOGY**

**MATERIALS**

**CIVIL  
ENGINEERING**



## SCOPE OF SERVICES

# LABORATORY APPROVED BY MINISTRY OF INTERIOR

- » COFRAC ESSAIS accreditation according to NF EN ISO 17025  
Authority to issue design assessments on fire stability studies
- » Accredited for IMO fire tests
- » Member of EGOLF (European Group of Organisations for Fire Testing, Inspection and Certification)

# FULL-SCALE TESTING WITH AND WITHOUT LOADING

- » All possible fire scenarios
- » Cutting-edge equipment and metrology
- » COFRAC ESSAIS accreditation No. 1-0001
- » FLEX2 flexible scope of accreditation (details: [www.cofrac.fr](http://www.cofrac.fr))

# FIRE-SAFETY ENGINEERING

- » Studies with ISO fires / real fires
- » Thermomechanical analysis
- » Smoke exhaust - Evacuation

# TESTING ALL KINDS OF MATERIALS

The Fire Testing Centre performs different kinds of tests, in conformity with standards or customized in accordance with customers' needs, for research purposes, for instance. Tests can be performed on materials, products, structural components, or structures.









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DP 81\_v4 - October 2019 - Photo Credits: ©CERIB



# LEPIR 2 TEST

## FAÇADES

Vertical fire spread  
IT 249

The Fire Testing Centre's test bed and erection resources are at your disposal for experimental appraisal and validation of your ranges of façade solutions.

In conjunction with fire-reaction experts\*, our specialists will help you develop the optimum configurations (worst-case scenarios) to meet your needs

### FULLY-TAILORED SERVICES

Definition of tests, provision of products, construction of walls by approved erectors, etc., we organize everything in complete safety.

Expertise, Performance, Simplicity, a stone's throw from Paris.

*\* A list of approved laboratory partners can be found at [www.cerib-fire.com](http://www.cerib-fire.com)*



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French technical specification IT 249 states that assessment of construction solutions may require **experimental evaluation**: the **LEPIR 2** test (Local Expérimental Pour Incendie Réel à 2 niveaux - Test setup for real fire on 2 levels)

## TEST PRINCIPLE

### Conditions d'essai

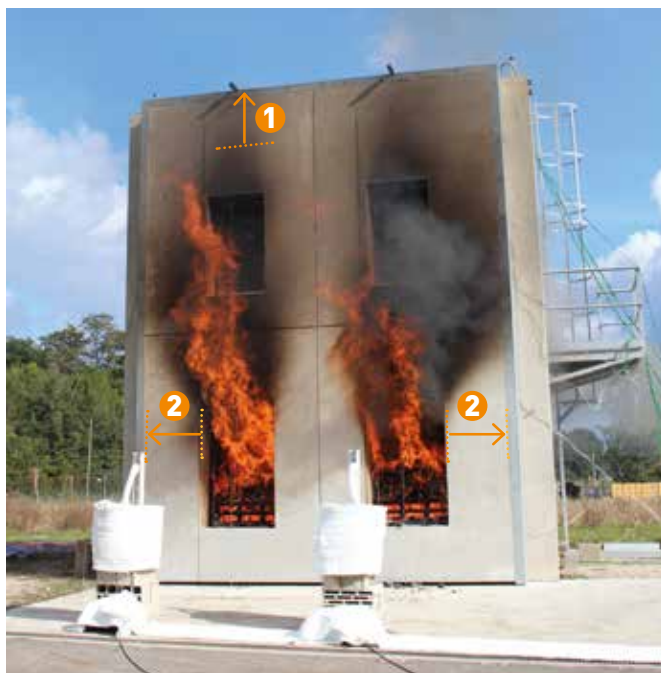
- ▶ Fire source: two piles of wood (totalling 600 kg)
- ▶ Wind speed <3 m/s, no rain or snow

### Readings and equipment

- ▶ Regulatory temperature readings (room on fire, façade/floor interface, etc.)
- ▶ Thermal flux reading
- ▶ Video recording
- ▶ Any additional readings considered helpful for extending the scope of application



## EVALUATION CRITERIA



### For the first 30 minutes of the test

- ① Ignition and vertical spread of fire
- ② Lateral spread of fire

### Systems integrated into façade/floor interface

- ▶ Flame spread to upper floor
- ▶ Transmission of hot gas (>180°C)
- ▶ Temperature rise greater than 180°C on non-exposed side of floor

### For ETICS

- ▶ Integrity of external skin above 5.2 m

## VALIDATION OF CONSTRUCTION SYSTEM

Your test report will be issued with a **Laboratory Assessment** in the form of a **Conformity Report**

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# TUNNEL FIRE SAFETY



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Your tunnel projects will benefit from our expertise in a range of fields and from our testing resources and state-of-the-art calculations. Our global approach will cover every step in your project.

We substantiate the expected performance of your products and works for any thermal load (ISO 834 standard fire curve, HCM, RWS, Eureka, real fire).

All our laboratory tests are carried out at our facility in Épernon (60 km from Paris). It is equipped with handling systems suitable for large units (25-tonne overhead travelling crane).

## FIRE PERFORMANCE OF LARGE STRUCTURES

### Computer assessment of fire performance of structures

- ▶ Computer simulation with finite-element resources
- ▶ Advanced calculation as per Eurocodes and other reference standards (*fib* Model Code, etc.)
- ▶ Assessment of stresses in structures to take account of spalling.

### Verification of tendency of concrete to spall

- ▶ Target: check there is sufficient sacrificial cover in conformity with design
- ▶ Characterization and assistance for selecting concrete mix designs
- ▶ Mix-design tests and suitability test representative of the structure (as per CETU (French Tunnel Research Centre) guideline documents)
- ▶ Measurement of spalling and temperature contours.

### Passive fire protection test

- ▶ EN 13381 series, CETU HCM reference standard
- ▶ Characterization of protection products
- ▶ Measurement of temperatures at protection/structure interface.

### Fire resistance testing of compartmentation elements

- ▶ Large partition walls (up to 6 m x 4 m) as per EN 1364-1
- ▶ Penetration seals as per EN 1366-3
- ▶ Linear joint seals as per EN 1366-4

## SEGMENT DESIGN CHECK

**Ambient and high temperature characterization of steel-fibre-reinforced concrete (SFRC)**

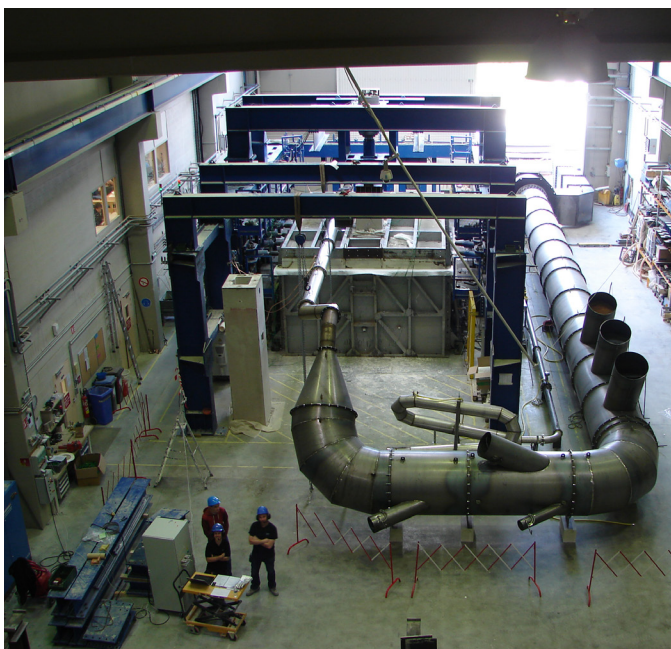
**Full-scale bending testing of segments**

**Full-scale testing of segments under thrust of TBM pads**

▶ Thrust stand: up to 1800 tonnes.

**Full-scale fire-resistance testing of segments**

- ▶ Variable vertical and horizontal loading during test
- ▶ Strain and temperature measurement
- ▶ Configurations with segment seals.



## IN SITU TESTING AND MEASUREMENT: EVALUATION OF VENTILATION AND SMOKE-EXHAUST SYSTEMS

- ▶ Special metrology for thermal and fluid dynamics
- ▶ Controlled generation of smoke and heat, adapted to the type of structure and smoke-exhaust strategy
- ▶ Measurement and recording: gas velocities, temperature, pressure, sound levels, weather conditions, HD videos, video recording with thermal imaging cameras
- ▶ Expert appraisal of results.

## FIRE RESISTANCE OF EQUIPMENT

**Fire resistance testing of ventilation and smoke-exhaust equipment**

- ▶ Ventilation and smoke-exhaust ducts (EN 1366-1/-8/-9)
- ▶ Fire and smoke-control dampers (EN 1366-2 and EN 1366-10)
- ▶ Our airflow test rig:
  - Extraction flow rate: 100,000 m³/h
  - Internal dimensions up to 4 m x 3 m.

**Fire performance testing of sound traps (mufflers) and registers**

**Fire resistance testing of fire doors**

- ▶ EN 1634-1
- ▶ Substantiation for large doors
- ▶ Testing bay up to 6 m x 4 m.



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Find us on :



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Accreditation and approvals:

- COFRAC ESSAIS Accreditation No. 1-001 (scope available at [www.cofrac.fr](http://www.cofrac.fr))
- Fire-resistance laboratory approved by the French Ministry of the Interior



# VENTILATION AND SMOKE- EXHAUST DUCTS

Ductwork platform  
EN 1366-1/-8/-9

**CERIB**  
Fire Testing Centre

  
**promethee**  
Fire resistance laboratory approved  
by the French Ministry of the Interior

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**cofrac**  
  
**ESSAIS**  
ACCREDITATION  
N° 10001  
SCOPE  
AVAILABLE ON  
WWW.COFRAC.FR

## FOR YOUR PROJECTS OF ALL SIZES

The ductwork platform is used to test the fire resistance of even very large ducting:

- ▶ extract rate of 100,000 m<sup>3</sup>/h
- ▶ up to 4 m × 3 m internal section
- ▶ loadbearing and non-loadbearing

## EVALUATING AND ASSESS ALL DUCTWORK ON THE MARKET OR UNDER DEVELOPMENT



Combined, the ductwork platform and Promethee enable us to evaluate and substantiate the fire resistance of all fire-rated ventilation and smoke-extraction ductwork, whatever it is made of:

- ▶ steel ducts
- ▶ plasterboard ducts
- ▶ calcium silicate ducts
- ▶ concrete ducts

## ADVANCED SKILLS, EQUIPMENT, AND METROLOGY

- ▶ specimen mass stabilized in conditioning room
- ▶ COFRAC ESSAIS accreditation N°. 10001 (details of scope: [www.cofrac.fr](http://www.cofrac.fr))

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# IN SITU TESTING AND MEASUREMENT



The purpose of ventilation systems is to ensure good air quality inside constructions and to remove smoke and heat in the event of fire.

Once a fire has started, it is essential that equipment operates correctly and that the procedures for safeguarding building occupants can thus be implemented appropriately.

In situ testing is a means of ensuring that resources will be effective when called upon.



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**You can benefit from the expertise of the Fire Testing Centre in fire testing and air-flow measurement for in situ appraisal of the performance of your ventilation and smoke extraction systems.**

In situ tests are a select method for validating the characteristics and the implementation of a system. They are an effective way of demonstrating the level of safety of constructions.

Dedicated heat and air flow measurements forming part of the tests provide quantified results for objective appraisal of the performance level.

#### **Physical measurements**

- ▶ Gas velocity
- ▶ Temperature
- ▶ Pressure
- ▶ Noise level
- ▶ Weather conditions

#### **Characterization of test conditions**

- ▶ Videos and photos
- ▶ Equipment activation times
- ▶ General observations



Controlled generation of heat and smoke enables observers to watch representative flows from the fire simulated.

The smoke production techniques employed have to be adapted to the type of construction and to the smoke-extraction strategy (quantity of smoke produced, heat emitted, smoke temperature, extent of soiling, etc.).

Testing is accompanied by expert appraisal of the results obtained to determine whether or not the ventilation system is fully effective.

## **A SPECIAL APPLICATION OF IN SITU TESTS: SAFETY DRILLS**

All parties involved in fire safety must be prepared to tackle any event, and regular safety training exercises are an excellent means of ensuring their ability to react effectively.

For fire training drills, a high degree of realism can be attained by generating smoke and heat. This puts participants in conditions very close to what they might have to confront.

Every fire drill requires the definition of the scenario to be played out, followed by analysis of all the results (conditions of the drill, interviews with participants, organization, setup, etc.).

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# CHARACTERIZATION OF FIRE PERFORMANCE OF BIO-BASED MATERIALS

Bio-based materials are those derived from animal or plant mass. They can be used as raw materials for construction products. Bio-based materials cover a wide range of products used in construction, e.g.:

- ❖ insulation (wool made from plant or animal fibres, etc.),
- ❖ mortar and concrete (hempcrete, woodcrete, flaxcrete),
- ❖ panels (compressed straw, plant fibres, etc.).

To comply with fire-safety regulations, the fire performance (reaction and resistance) of bio-based materials must be characterized.

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## CERIB, SUPPORT FOR THE APPLICATION OF BIO-BASED MATERIALS

CERIB plays a leading role in the 'fire safety' work group studying bio-based construction materials. We are familiar with the specific issues related to bio-based materials and can help you meet the requirements of fire-safety regulations.



## YOUR REQUIREMENTS, OUR SOLUTIONS

The CERIB Fire Testing Centre's expertise in fire can be applied to different kinds of products:

- ▶ Overlaid-insulation products: animal or plant wools as boards or rolls
- ▶ Inherently insulating products: plant-based concretes (renderings, poured concrete, concrete blocks, precast elements), straw bales, wall paints and coatings.
- ▶ Composites: wood fibres and plastic resin (terrace flooring, etc.)
- ▶ Adhesives and thin-set mortars.

The elements tested can be constructions of all kinds. If necessary, they can be set up on support structures such as concrete or gypsum plasterboard walls or, on special request, on special supports.

## STRENGTHS OF TESTING BY CERIB

Its high-tech equipment and expertise in the fire behaviour of structures have given the CERIB Fire Testing Centre a sound reputation.

Having obtained ministerial fire laboratory approval, CERIB is one of just three bodies in France entitled to issue design assessments for fire-safety-engineering fire-resistance studies.

CERIB harnesses 50 years of experience serving construction.

## FULL SERVICES

- ▶ **Product range assessment:** when validating a range of products, the Fire Testing Laboratory can carry out a global assessment to determine the classification of the range of products concerned.
- ▶ **Building site assessment:** the Fire Testing Centre can study differences between characteristics on site and the existing assessed configuration in order to validate a system adapted to customer requirements for a specific project.
- ▶ **Large elements:** engineering skills and digital modelling tools make it possible to validate elements larger than the elements actually tested.



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# FIRE SAFETY ENGINEERING (FSE)

FSE studies performed with standardized fires serve to analyze the fire behaviour of structures on the basis of prescriptive requirements (R30–R60–R90, etc.).

FSE studies performed with real fire scenarios are a powerful alternative to so-called 'prescriptive' or traditional regulatory requirements. They open the way for a fire-resistance approach based on the performance of the works.

More generally, FSE studies serve to optimize structures, whether new or old, and to substantiate the continued integrity or enhanced safety of architectural structures that are complex or beyond the scope of standards. They are an authorized alternative to traditional regulatory requirements.



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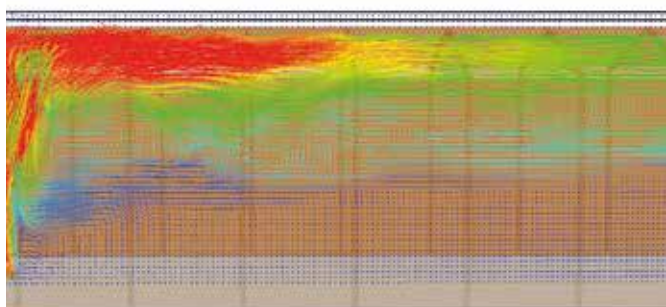
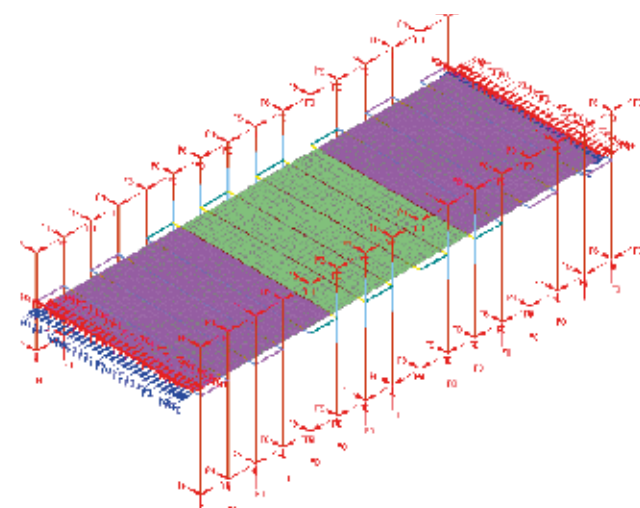
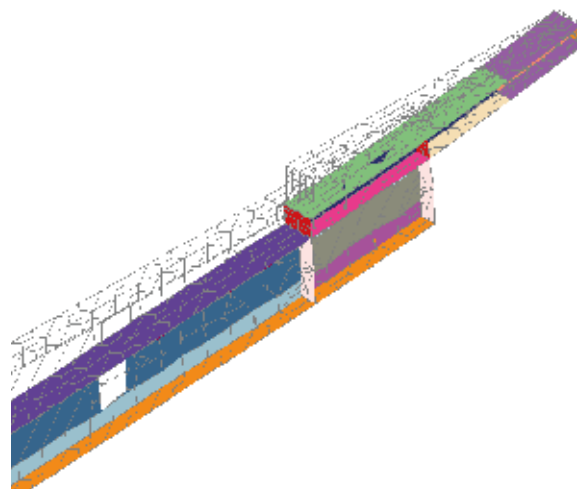


## YOUR REQUIREMENTS AND OUR SOLUTIONS

Approved for fire testing by the French Ministry of Internal Affairs since 2011, the CERIB Fire Testing Centre carries out fire-safety-engineering studies with standardized fires and with real fire scenarios.

These studies concern different construction methods such as reinforced and prestressed concrete, steel and composite methods, and timber construction.

- Studies of scenarios and fire development
- Studies of fire behaviour of structures
- Design assessments
- Site assessments
- Studies of failure modes for warehouses and mezzanines
- Evacuation studies
- Technical assistance



## SCOPE OF SERVICES

- Buildings open to the public / Housing / Commercial buildings
- Environmentally gazetted installations
- Nuclear facilities
- Tunnels

CERIB is a research operator for the French Ministry of National Education, Higher Education, and Research.

CERIB harnesses 50 years of experience serving construction.

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# FIRE TESTING OF DOORS AND OTHER CLOSURES

Fire-break doors, windows, and other closures contribute to compartmentation, and as such are essential elements in containing the spread of fire from one area to another.

Standard (NF) EN 1634-1 defines the tests to be carried out and gives the associated performance criteria for appraising the fire resistance of doors and other closures. The resulting classification allows for selection of elements in buildings for which regulations require there to be compartmentalized areas (buildings open to the public, tall buildings, environmentally gazetted installations, nuclear facilities, etc.).

## MORE THAN TESTING; FULL SERVICES

- ❖ **Site assessment:** the Fire Testing Centre can analyze differences between characteristics on site and the design configuration in order to validate a system adapted to the customer requirements
- ❖ **IMO appraisal:** the CERIB Fire Testing Centre is accredited by the IMO for carrying out testing and issuing technical appraisals as per the 2010 FTP Code.
- ❖ **Large elements:**
  - Elements up to 6 m high and 4 m wide can be tested
  - Engineering skills and digital modelling tools make it possible to validate elements larger than the elements actually tested.



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## YOUR REQUIREMENTS AND OUR SOLUTIONS

The CERIB Fire Testing Centre provides expertise on fires for different kinds of studies

- ▶ Pivot or side-hung doorsets and opening windows
- ▶ Horizontally and vertically sliding doorsets, including sectional doors
- ▶ Single-panel concertina closures
- ▶ Sliding / concertina doorsets
- ▶ Roller shutters
- ▶ Operable fabric curtains

The items tested can be of timber, steel, or glazed construction. The supporting structures in which they are installed can be concrete walls, gypsum plasterboard partitions, or special supports on request.



## STRENGTHS OF TESTING BY CERIB

Its high-tech equipment and expertise in the fire behaviour of structures have given the CERIB Fire Testing Centre a sound reputation.

Having obtained ministerial fire laboratory approval, CERIB is one of just three bodies in France entitled to issue design assessments for fire-safety-engineering fire-resistance studies.

CERIB harnesses 50 years of experience serving construction.

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# ENVIRONMENTALLY GAZETTED INSTALLATIONS

Environmentally Gazetted Installations (EGI) (*Installations Classées pour la Protection de l'Environnement*) are those considered likely to engender hazards or dangers. They are therefore subject to special regulations and legislation.

In particular, warehouses must provide evidence that "construction provisions are aimed at ensuring that failure of a given component (wall, roof, column, beam, mezzanine) subsequent to an accident will engender neither a chain reaction of failure of the building structure, particularly adjacent storage compartments or their compartmentation systems, nor collapse of the structure beyond the compartment on fire."

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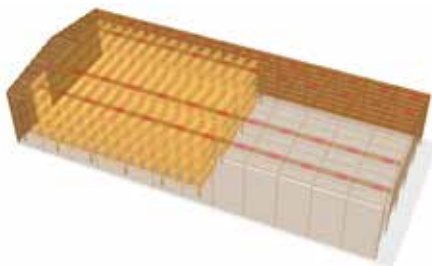
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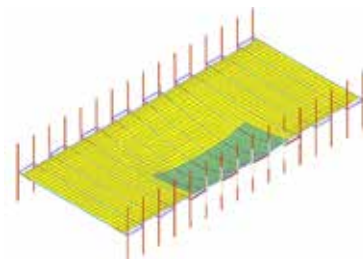
- ▶ Relevant failure-mode studies (concrete, steel, composite), whatever the administrative classification of the warehouse might be
- ▶ Fire-safety engineering studies taking account of specific features of a warehouse (mezzanine, authorization classification, e.g. area greater than 6,000 m<sup>2</sup>, etc.)
- ▶ Studies requiring determination of technical solutions meeting regulatory requirements and optimizing requirements and safety
- ▶ Fire-stability studies when a fire-stability criterion is to be met (R15, R60, etc.)



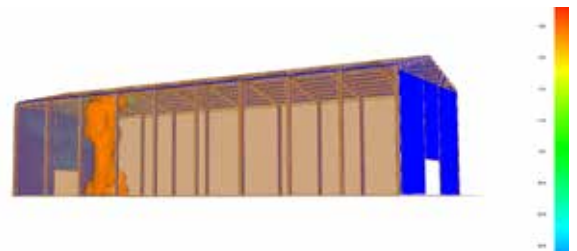
Model of warehouse with mezzanine over three storage levels



Illustration of deformation of a steel beam subject to real fire



Model of composite structure



Thermal flow attaining structural components during a localized warehouse fire

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## STAKEHOLDERS

- ▶ Local authorities responsible for EGIs
- ▶ Fire services
- ▶ EGI operators
- ▶ Owners, agents, lessors
- ▶ Mezzanine builders
- ▶ Logistics systems builders

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