

IPHA Technical Seminar 2013 in close co-operation with BIBM hosted by Cerib 30-31 October 2013

- How to plan a fire test ?
- HOLCOFIRE program = 2 series of tests
  - Series G : Fire tests to validate the shear and anchorage capacity according to EN 1168:2005 + A3:2011 Annex G
  - Series R : Fire tests on hollow core floors with restraint conditions





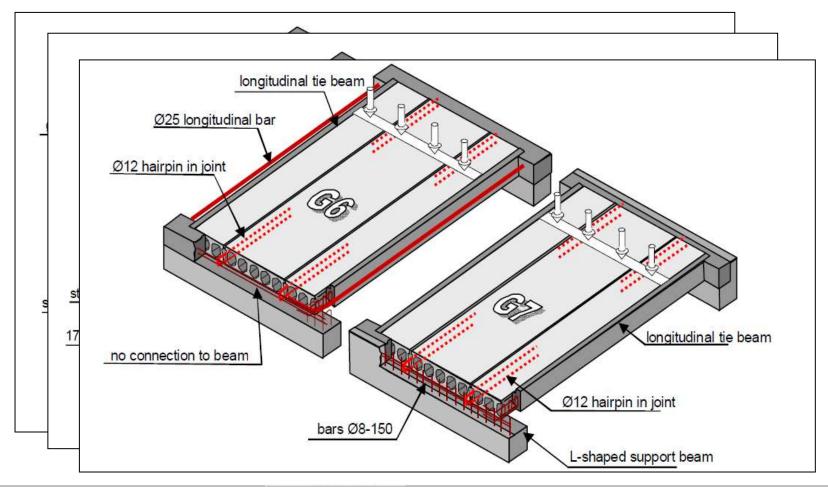
#### Series G : Validating the shear and anchorage capacity according to EN 1168:2005

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	La present document some dans la cadre de la Directiva CE 49/100/CEE - «Produits do construction».	<ul> <li>Armanice de talacer 4 Coule en pilone</li> <li>Figures G.2 — Modèle pour le calcal de la résistance su clasifiement et à l'ancrege (excerple)</li> </ul>	floor behavior :
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• Series G : Different floor configurations

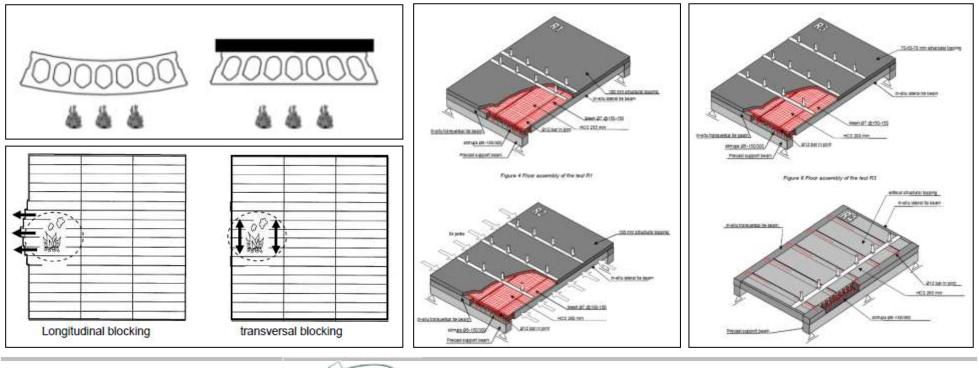






#### • Series R : Different restraint conditions

- Thick topping
- Lateral blocking (transversal, longitudinal)
- Different configurations tested







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### • A long process...

- Defining the test configuration
  - Function of the series
- Setting up the specimen
  - Formwork
  - Reinforcement
  - Instrumentation
  - Concrete pouring
  - Storage in a conditioning room

- Performing the fire test
  - Loading application
  - Fire start
- Analyzing the results
  - Specimen analysis

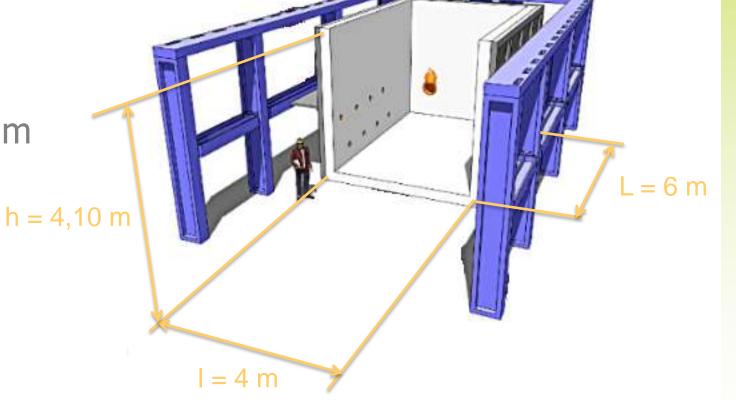
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• Test report





- PROMETHEE : A versatile device
  - Full-scale tests
    - L=6m
    - I=4m
    - h=4,1m

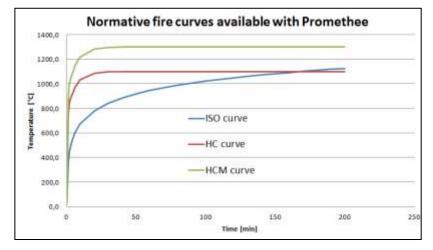


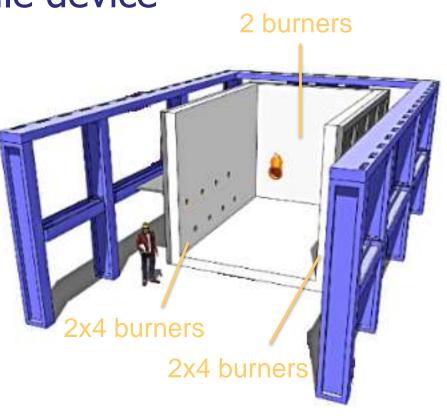




### • PROMETHEE : A versatile device

- Normalized fires
  - ISO 834 curve
  - HC curve
  - HCM curve









 PROMETHEE : A versatile device
 Multi-directional loading
 18 vertical jacks from 5 to 300T
 9 horizontal jacks from 50 to 125T



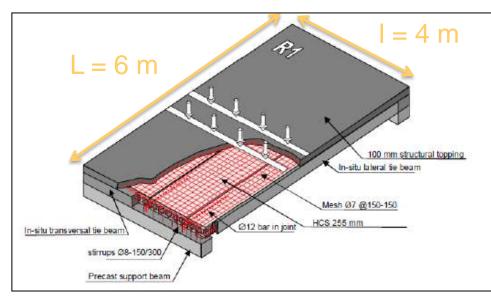


3 jacks

18 jacks

6 jacks

- PROMETHEE : A versatile device
  - Several possible configurations
    - Series R : Using the whole furnace surface
      - Use of the maximum furnace surface (4x6 m<sup>2</sup>)
      - More realistic floor behavior (stiffness ratio L/h)



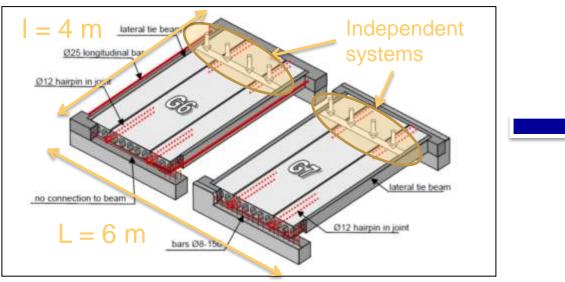






### • PROMETHEE : A versatile device

- Several possible configurations
  - Series G : Two different specimens, independently loaded
    - Take advantage of the area 4x6 m<sup>2</sup> to test 2 floors at a time
    - Need to have independent jacks



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test of G7

The (potential) failure of G6 should not disturb the

11

### • PROMETHEE : A versatile device

- Several possible configurations
  - Series G : Two different specimens, independently loaded







• PROMETHEE : A versatile device

– Thorough initial work needed to use it at its fullest





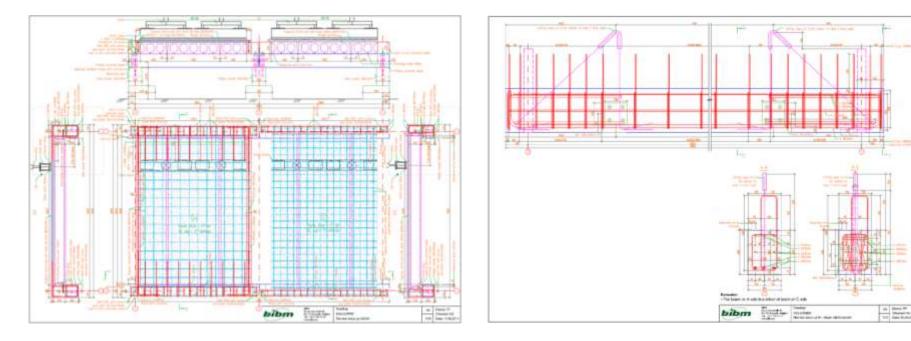


- Conception similar to a building
  - Precise schedule mandatory
  - Time-consuming activities
    - Precast elements reception : beams, slabs...
    - Assembly + formwork
    - Reinforcement (mesh, connections)
    - Instrumentation
    - Concrete pouring (joints, peripheral tie beams, topping)
    - Storage in a conditioned room





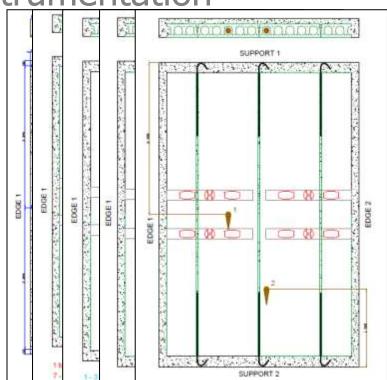
- Conception similar to a building
  - Structural definition of the specimen
    - Geometry : length of elements, section
    - Reinforcement







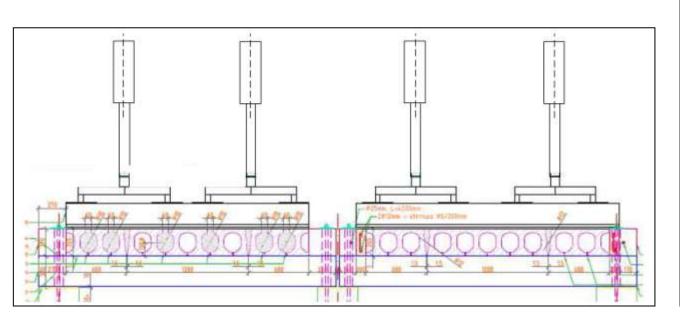
- Conception similar to a building
  - Position of the instrumentation
    - Deflection
    - Temperatures
    - Stress
    - Tendons slippage
    - Endoscopic videos

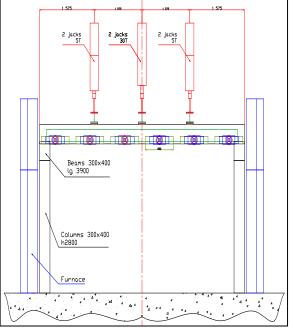






- Conception similar to a building
  - Loading system definition
    - Intensity
    - Position of jacks



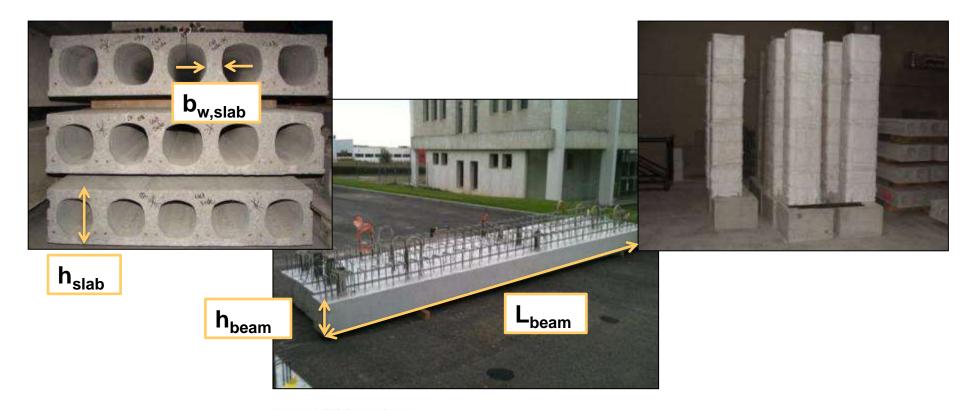






### • Product reception

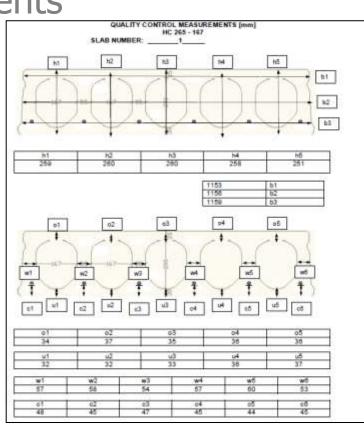
- Quality control to be performed







- Product reception
  - Geometry measurements
    - L<sub>slab</sub>
    - b<sub>w,slab</sub>
    - h<sub>slab</sub>







#### • Product reception

Concrete resistance tests

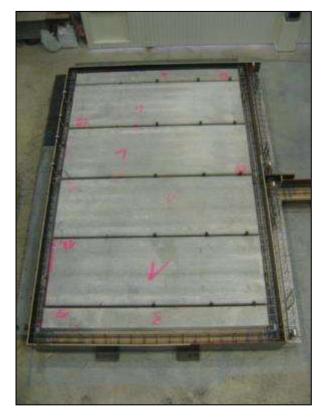
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### • Specimen fabrication

- Formwork and assembly of the floor









- Specimen fabrication
  - Joints filling









- Specimen fabrication
  - Reinforcement



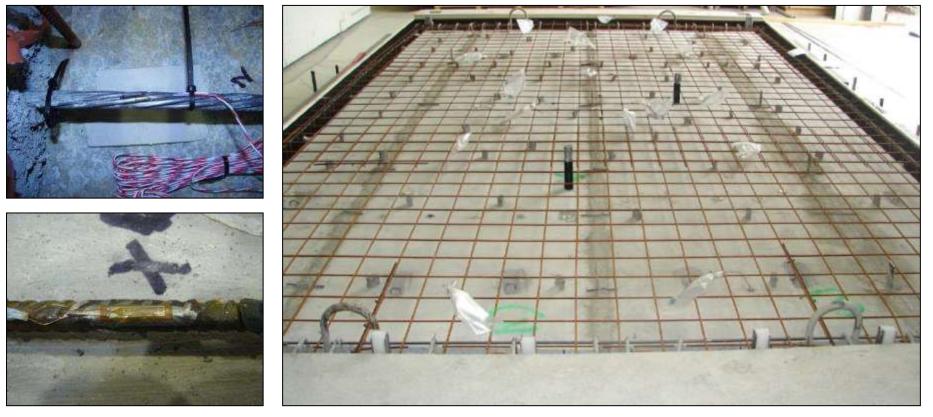






### • Specimen fabrication

– Instrumentation







### • Specimen fabrication

Topping and peripheral tie beam pouring







### Specimen fabrication

- Storage in a conditioning room
- NF EN 1363-1:2013, section 8 :
  - Hygrometry 50%
  - 23°C • Temperature
  - Duration 3 months



Possibility to use propylene fibers to avoid spalling



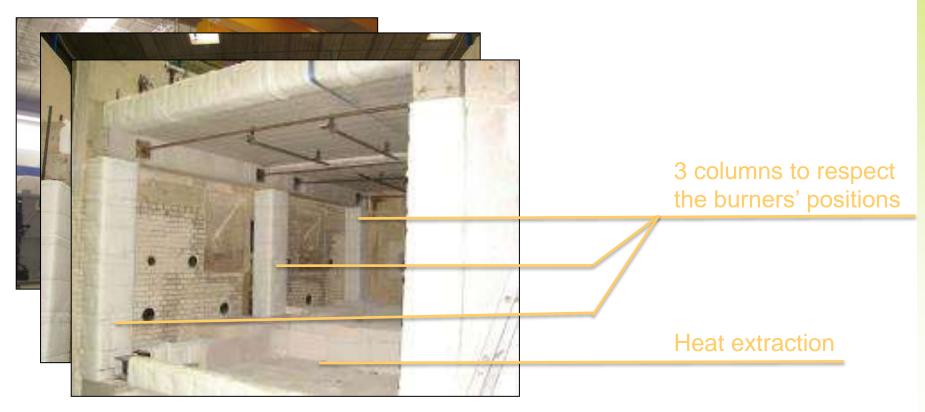






### • Specimen fabrication

– Installation of G2 and G3 specimens in the furnace







### • Specimen fabrication

- Finalizing instrumentation and applying the load







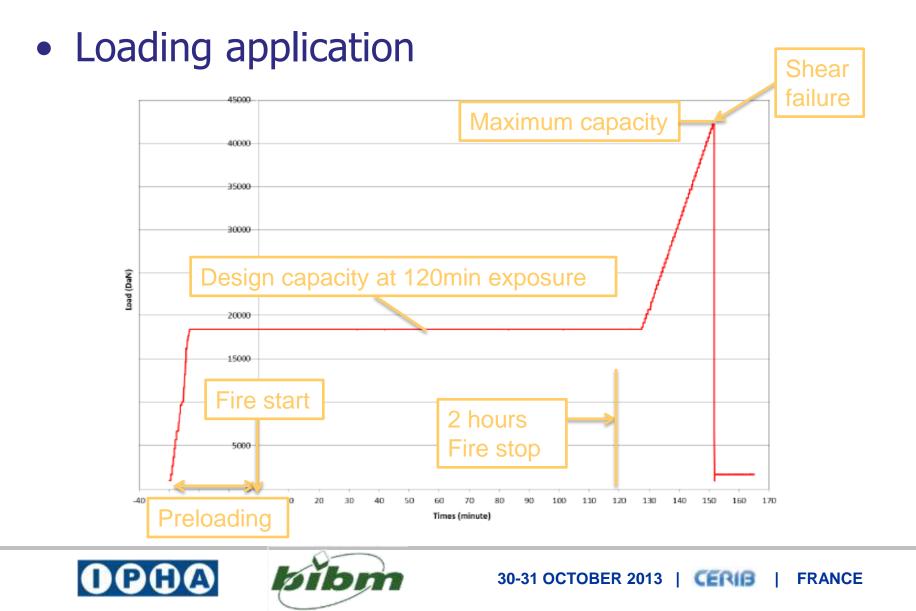
### Loading application



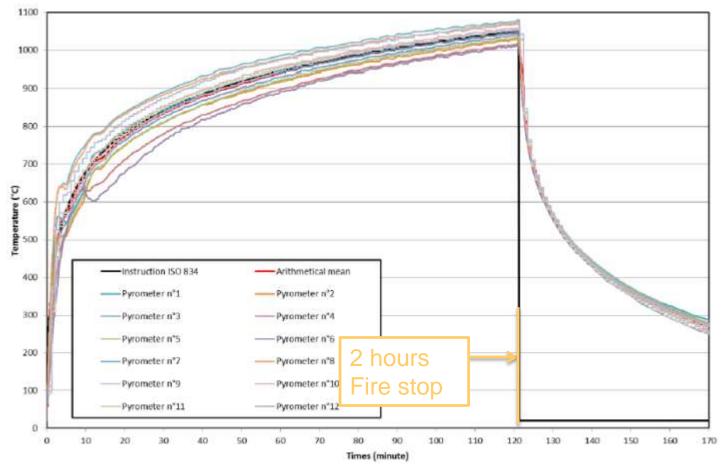








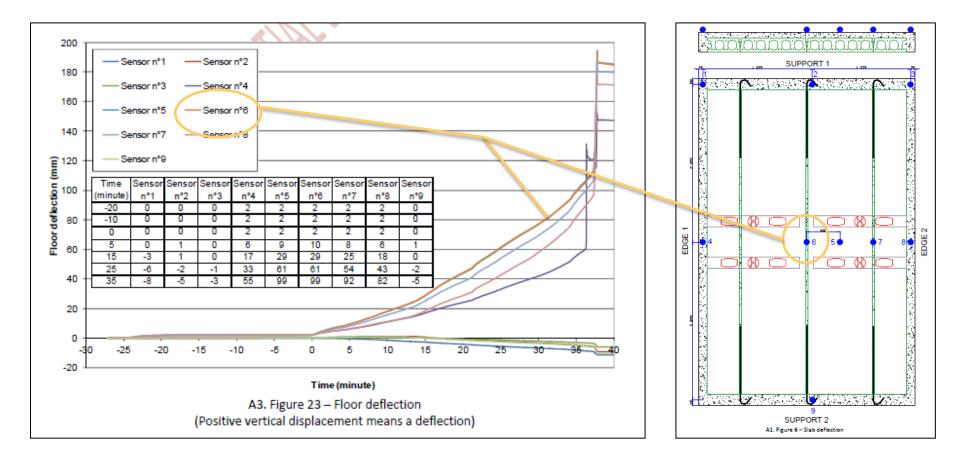
#### • Normalized fire







### • Displacement monitoring

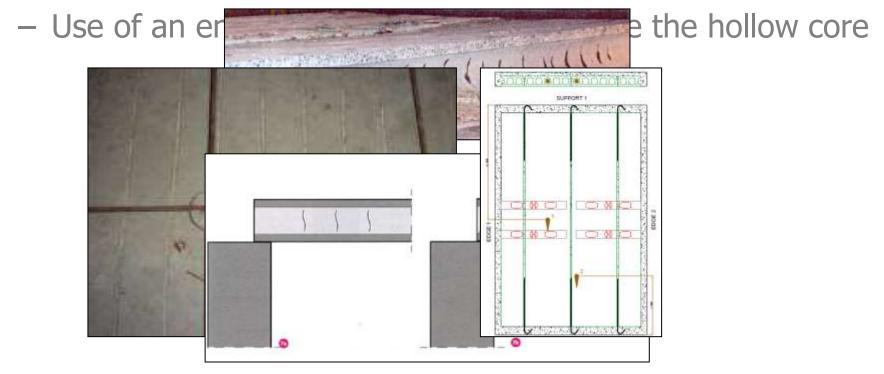






### • Endoscopic video

 Objective : observing the occurrence of horizontal cracks in the hollow core as well as vertical cracks in the web



































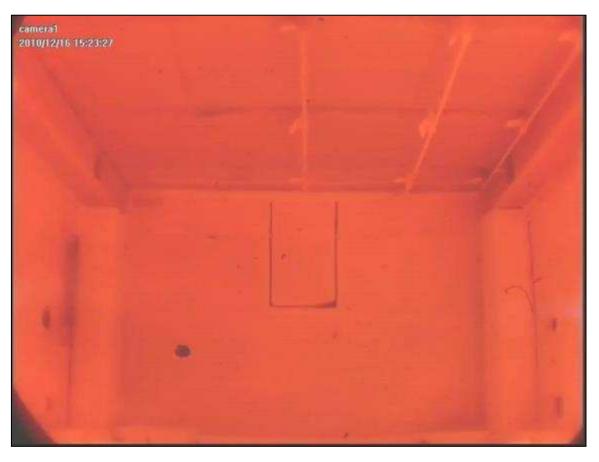








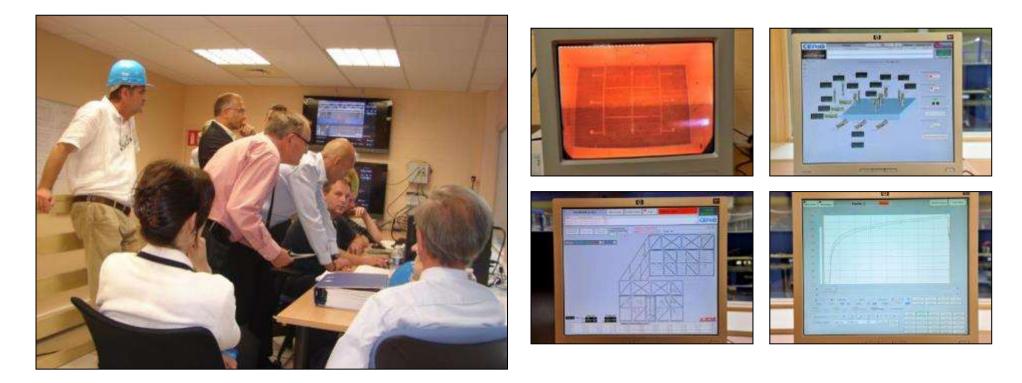
### • Video inside the furnace







### • Every data supervised from the coordination room







### Analyzing the results

### • Specimen investigation



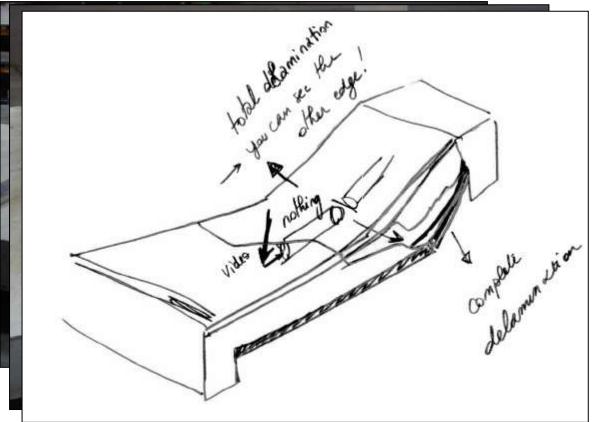
Shear failure Series G





### Analyzing the results

- Specimen analysis
  - Specimen R1







### **Other examples**

### • Tunnel segments







### **Other examples**

#### • Masonry walls

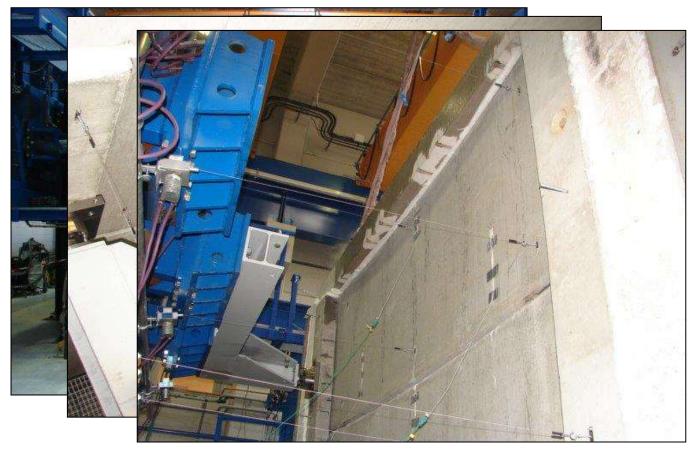






### **Other examples**

#### • Panels







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