A new solution for assessing the fire resistant aspect of fire doors and fire resistant items
I Current situation

The fire resistance rating is an indication of how long a room or zone can contain a fully developed blaze before it spreads to adjacent areas of the building. Each assembly enclosing and/or structurally supporting a fire containment zone, must satisfy the minimum fire resistance requirements specified in the applicable building code. This ensures that the integrity of the containment envelope will be maintained.

The test method evaluates how long the following assemblies will contain a fire and how long they will retain their structural integrity during a predetermined fire exposure.

Various aspects are tested in that sort of fire resistance experiments. This test allows the classification of three construction elements:

*Figure 1: The different construction classifications*

<table>
<thead>
<tr>
<th>R Stable with fire</th>
<th>E: Fire-guard</th>
<th>I: Fire door</th>
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<tr>
<td>The element resist mechanically under the partition.</td>
<td>Gas and flames tightness + SF</td>
<td>Thermal isolation + GF.</td>
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II The present large-scale test dedicated to fire resistance measurement

The current fire resistant tests feature individual methods for testing:
- bearing walls and partitions,
- non bearing walls and partitions,
- columns, plus an alternative test of protection for structural steel columns,
- floors and roofs,
- loaded restrained beams with an alternative classification procedure for loaded beams and an alternative test of protection for solid, structural steel beams and girders.

The real test corresponds to a full scale specimen. The specimen must be the same type of construction as the structure for which classification is being sought. In the fire endurance part of the test, the specimen faces a standard fire exposure as defined by the time-temperature curve for furnace temperatures shown in Figure 2.

*Figure 2: typical temperature evolution vs time*

This large-scale test aims to reproduce fire behavior in real fire conditions. However, this trend toward realistic fire conditions lead to other issues:
- Fire resistancy tests are known as an expensive methodology,
- Specimen dimensions lead to high cost manufacturing

This leads to limited flexibility that doesn’t fit with the reactivity requested by the development/qualification phase and quality control requirements.
Another small scale tests to fire experiments is necessary to provide firms with an orientation tool which can avoid spending high costs in tests.

III CREPIM new insight: a small scale & orientation test

Studies were carried out to develop a new approachable test in the light of the real need of an alternative solution.

The laboratory has developed a cheaper test with lower logistic costs using small models. This test only use a cone calorimeter and no longer a testing machine in large conditions. This test can represent an attractive alternative to the large scale test.

III-1 small scale test

The specimen measures approximately 10 cm x 10 cm. The sides of the models are overcastted by non combustible film material that avoid flames to spread on the sides. The irradiance used in this experiment depends of the customer’s requirements

Note: For the customers which want to develop a new fire retardant additive, the C.R.E.P.I.M can provide a small scale version of wood doors without any core. This option offers the flexibility to test various kind of fire resistant fillers.
As for standard test, a thermocouple is fixed at the back of the door model to register the temperature.
III-2 1m² scale test

This test corresponds to a 1 m² sample, positioned in horizontal and vertical position and it allow you to assess the performance on the key critical point of your installation
Please feel free to contact CREPIM for further information:

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