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SUMMARY REPORT OF THE EGOLF ROUND-ROBIN NR. TC2 16-1 IN FIRE RESISTANCE TESTING

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SCOPE

During the EGOLF meeting of October 2015, a discussion ensued on suggestion to organize a testing round robin on doors. This was considered an ambitious project due to various difficulties which could impact on conclusions to be drawn. In conclusion, TC2 supported the Chairman's proposal for a theoretical round robin on doors as a first step, prior to considering a practical testing round robin in future.

In 2016, EGOLF consequently organised such theoretical exercise. Given a realistic door (steel hinged door) and a test configuration (supporting construction, fire exposure direction etc.), the 36 laboratories who participated in the round-robin were asked to answer questions related to two phases in the process: the preparation of the test and the field of application of test results.

The whole project was managed by a steering group formed from three volunteers issued from different EGOLF lab members: Lars Boström (RISE), Fabien Dumont (ULiège) and Jacques Mertens (Peutz).

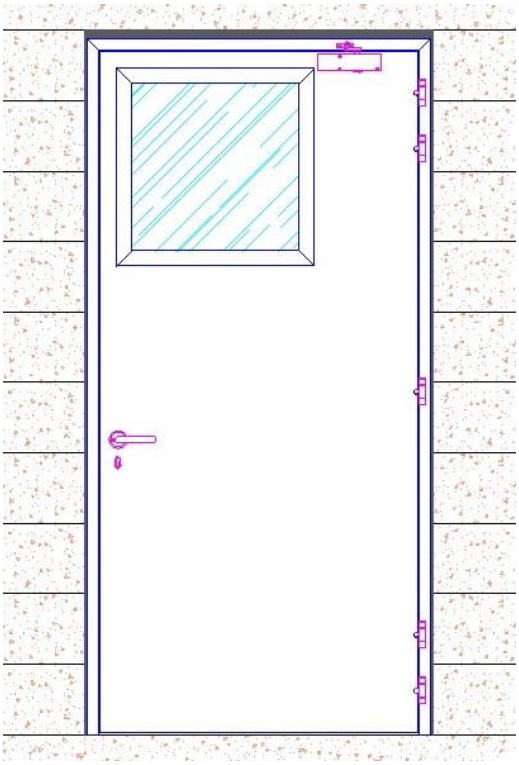
TEST SPECIMEN IN SUPPORT AND EXERCISES

The participants received a document package, consisting of the full description of the test specimen (including drawings), a list of exercises, and an instruction sheet.

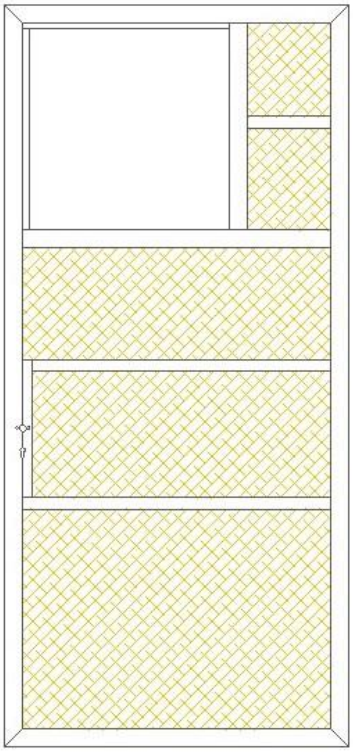
The doorset specimen was chosen to be as real as possible, slightly adapted from a real fire resistance test. The exercise specimen consisted of a steel insulated hinged door in a steel frame. The door leaf contained inside stiffeners and a glazing. The doorset was mounted in a wall (supporting construction) made of aerated concrete blocks. The fire exposure was "opening into the furnace", i.e. hinges exposed to the fire.

The exercise sheet proposed a set of 25 exercises divided into 7 families (plate thermometers, unexposed face thermocouples, deflection measurements, gap measurements, other measurements, field of direct application and field of extended application).

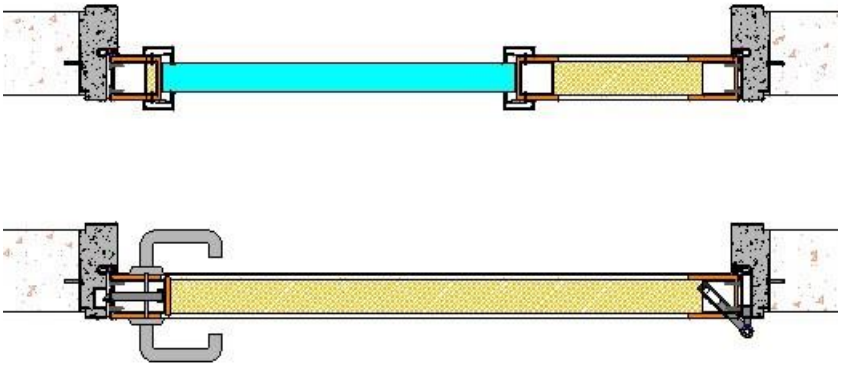
The main instruction was to fill the proposed exercises based on the provided test specimen, in strict accordance with the requirements of the standards EN 1363-1:2012, EN 1634-1:2014 and – if relevant – EN 15269-2:2012.



Exposed side
(hinges and door closer exposed to fire)



Inside view
(frame stiffeners and insulation)



Horizontal sections
(at the glazing height and below the glazing)

ANALYSES OF THE DATA

The received answers contained a substantial amount of information.

The first task was to identify what items should be submitted to evaluation. Each of the 25 proposed exercises was considered as an item to evaluate, the more complex out of them being split into several interest items when useful or necessary. This process led to 48 items selected for evaluation.

The second task was to determine the correct expected answer for each evaluated item. The steering group worked out the “accepted reference values” to which the received answers shall be compared.
As a result of this step, 13 items out of 48 turned out to be not suitable for evaluation, meaning that no correct answer could be defined. Those are designated as “ungradable items”. The reason is related to the presence of the glazing and its consideration as a discrete area of different thermal insulation. The fact is that the related rules, which are laid down in the test standard EN 1634-1, prove to be confusing, and even may conflict with each other.

The third task was to assign numerical scores to the answer of each lab for each evaluated item, in order to allow the forthcoming graphical and numerical processing. For that purpose, the following predefined 3-level grading was set up and used by the steering group:

Score = 1	Correct answer	complete and totally correct answer
Score = 0,5	Partly correct answer	incomplete answer or more conservative(*) answer, but not containing any incorrect information in any case
Score = 0	Incorrect answer	all other cases, i.e. ○ incomplete or more conservative(*) answer, and containing at least one incorrect information (even if it also contains other correct information), ○ less conservative answer(*), ○ no answer (nothing is mentioned)

(*) more severe with regard to fire safety, or grant a range more restrictive than allowed by the standard

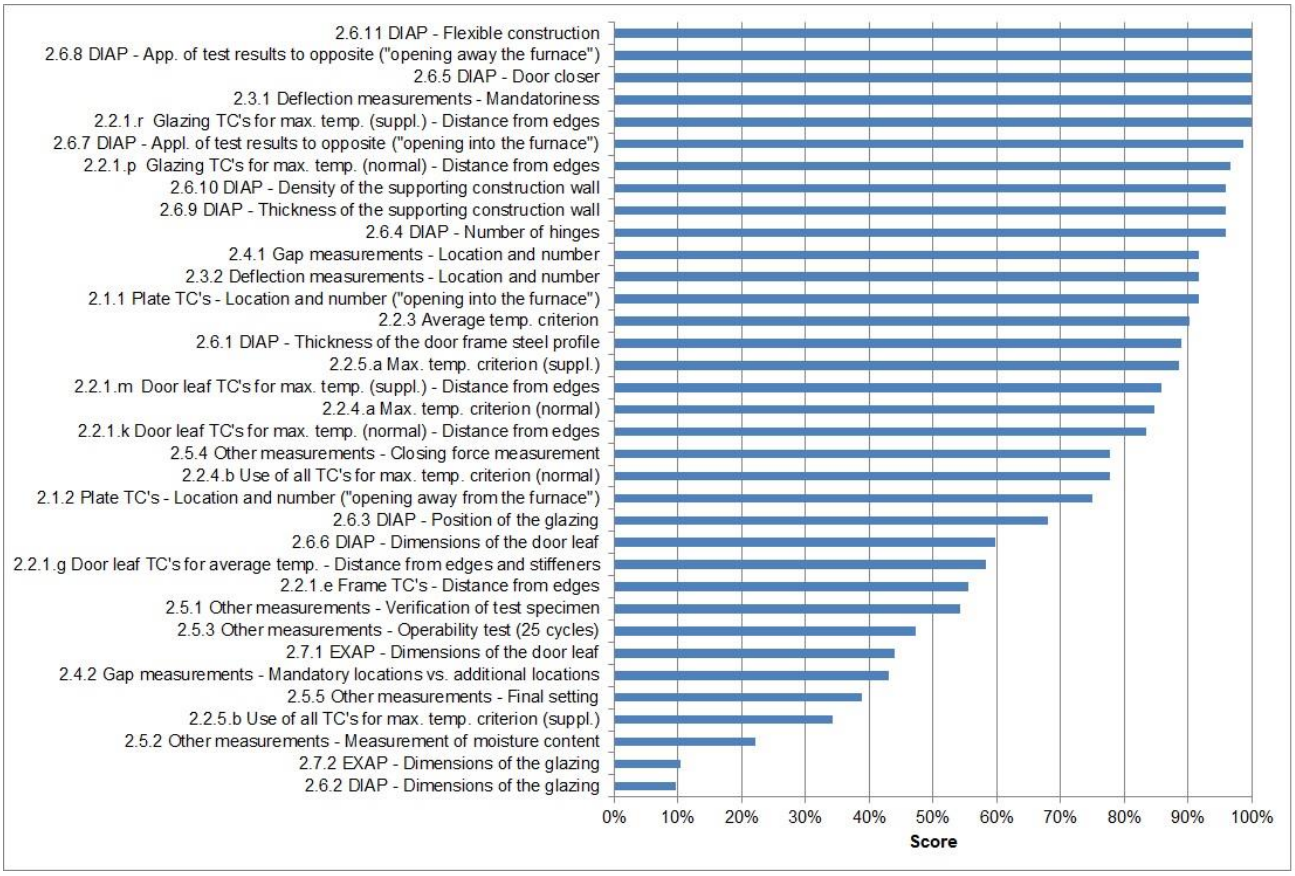
RESULTS

Several graphical and numerical basic processing were implemented to allow deducing a clear picture of the performances of the laboratories.

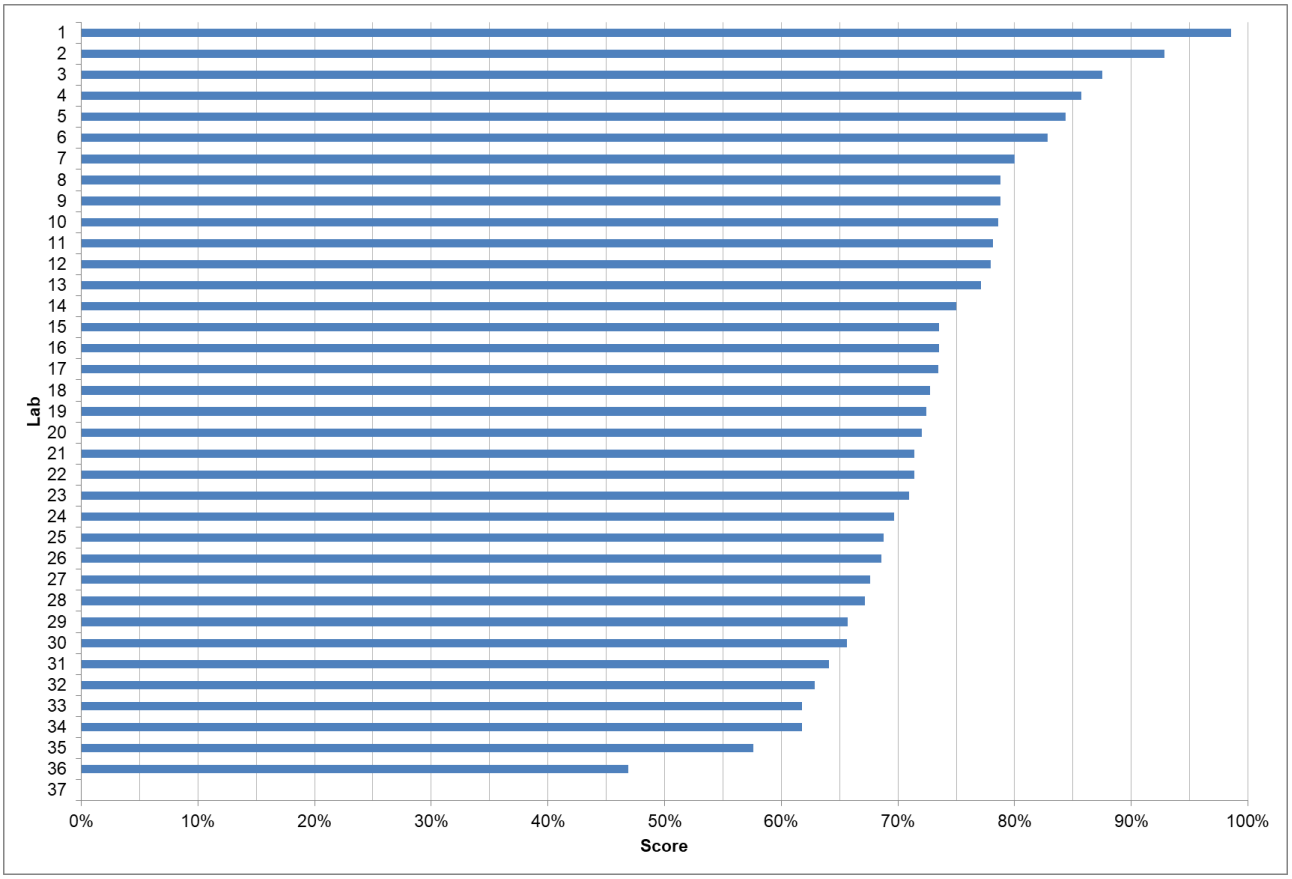
The first approach aimed at presenting the mean score and the grading distribution that characterize the evaluated items. These statistics illustrate the ***level of understanding of each evaluated item***.

Item families	Mean score
2.1 Plate thermometers	83%
2.2 Unexposed face thermocouples	76%
2.3 Deflection measurements	96%
2.4 Gap measurements	67%
2.5 Other measurements	48%
2.6 Field of direct application	83%
2.7 Field of extended application	28%

Global score	**73%**



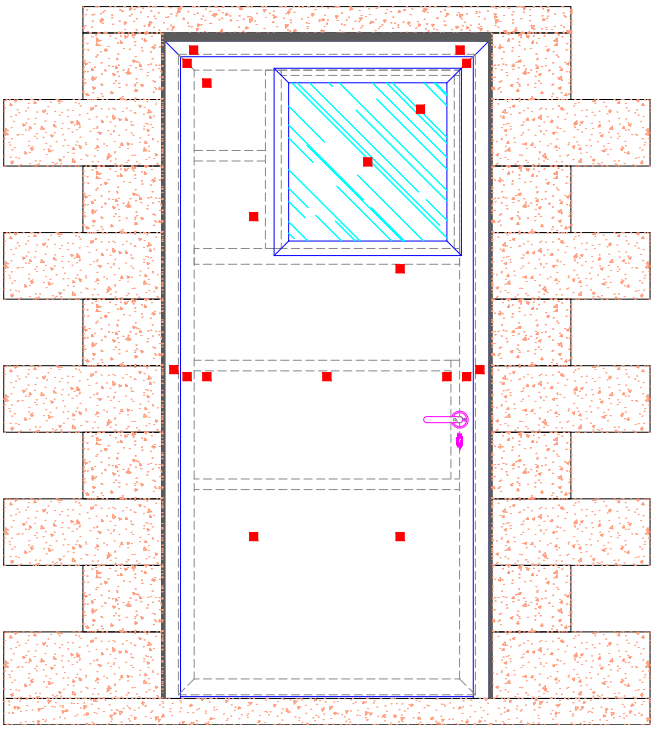
The second approach aimed at presenting the mean score and the grading distribution that characterize the participating labs. These statistics illustrate the ***individual abilities of the participating laboratories***.



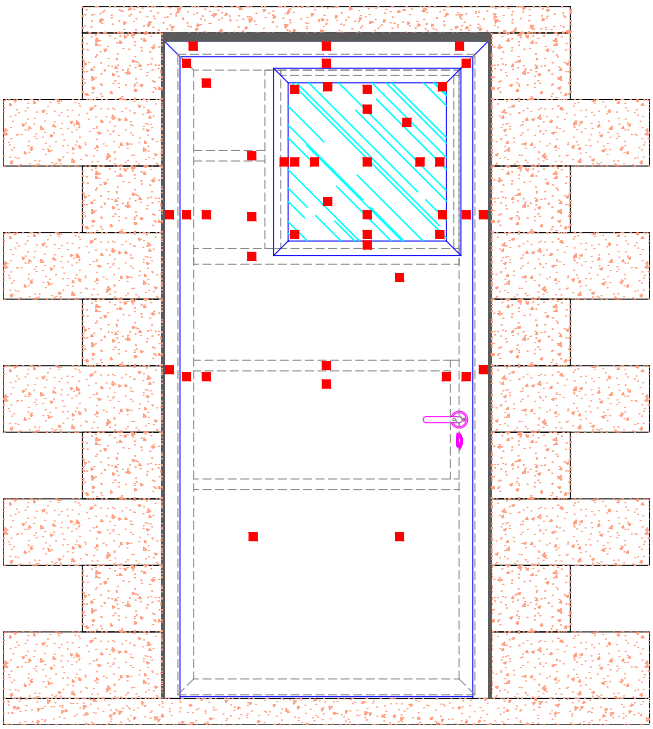
The third approach focused on the ungradable items to provide a picture of the practices across the 36 participating European laboratories.

The main observation was that all 13 ungradable items were related to the ***unexposed face thermocouples***. Some interesting variabilities were identified:

- 23 labs out of 36 considered the glazing as a discrete area for the determination of only some of the insulation criteria and not simultaneously for all of them,
- 25 labs out of 36 didn't clearly state the compliance with the insulation criteria separately for each area (door on the one hand, glazing on the other hand),
- labs systematically reported different thermocouple configurations (number and location), no two were the same, the total number of unexposed face thermocouples used by the labs ranging from 18 to 45,
- 17 labs out of 36 didn't place any thermocouple on hot spots (for instance, in the present test specimen, the temperature is very likely to be higher on stiffeners).



Min. number of unexposed face TC's
(18 TC's used by the lab E5)



Max. number of unexposed face TC's
(45 TC's used by the lab B2)

CONCLUSIONS

On the one hand, the global score (73%) of this exercise is satisfying regarding the level of complexity of the test specimen.

On the other hand, the present exercise reveals discrepancies in the understanding of the standard requirements related to the unexposed face thermocouples and/or the handling of the glazing as a discrete area. This results in variabilities between the unexposed face thermocouple configurations (number and location) which are set up across the participating labs. This is the signal that some instructions contained in the test standard are not sufficiently adequate and clear.
Anyway, it is currently not possible to deduce in what proportions these differences in thermocouples configurations affect the insulation performance.

Finally, the various answers encountered in the reports received from the participating labs have been processed in order to draw up the most useful recommendations to the attention of EGOLF labs to and to highlight the weaknesses of the test standards.

In response, EGOLF has swiftly scheduled a workshop held in June 2017. The purpose of this workshop was to investigate the difficulties in the understanding of the standard requirements revealed during this EGOLF theoretical round-robin, looking for potential deficiencies in the test standard.