

**Consequences for German Fire Protection Barriers  
resulting from the Introduction of DIN EN 1191  
“Testing of the Continuous Performance of Windows and  
Doors - Test Method” of August, 2000**

**Abridged Version**

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**Research Project in accordance with Works Contract AZ.: P 32-5-4.144-1032/02  
between the**

**Deutsches Institut für Bautechnik**

**(German Institute for Constructional Engineering)**

**and the MPA NRW**

**(Materials Testing Office, North Rhine-Westphalia)**

**of 29.9.2002**

## **1 Introduction**

Up to the present time the continuous performance capability of fire and smoke barriers has been proven in accordance with DIN 4102-18. Here, in accordance with Para. 6.1, the door closer is set in such a way that the hinged door is closed within some 5 s and that the damping is removed some 7° before the door leaf contacts the door frame (end stop). Measurements of the speeds with which the door leaf contacts the frame have not been carried out by testing offices up to the present time.

According to DIN EN 1191 Para. 4.1.2 and 4.1.6, manually operated leaves of masses up to 400 kg must contact the frame with a speed of  $0.5 \pm 0.05$  m/s.

The objective of this project was to collect - prior to the introduction of DIN EN 1191 - findings on the consequences of the new test rules for fire protection barriers by testing fire-proof doors which have already been approved.

## **2 Selection of the samples**

DIN EN 1191 contains no statements on the selection and number of samples.

The objective was to examine as many different forms of construction within the framework of what could be justified. Greater impact and rebound effects arise when the leaf of a single-leaf door contacts its firmly mounted frame than with two-leaf doors. For this reason primarily single-leaf forms of construction were selected. To test whether the speed measurement method could be carried out in practice on two-leaf doors, a two-leaf steel door was included in the examinations by tests on its fixed leaf in the complete-panic opening test mode.

## **3 Measuring devices and testing equipment**

A test device had to be developed and built to permit the leaf speed to be measured in the laboratory.

The closing and opening modalities described in Para. 4.1.4 and image 1 B of DIN EN 1191 were able to be realized by appropriate adjustment of the pneumatic testing device to hand.

## **4 Samples**

One of each of the following doors was selected

- T30-1 door of aluminium profiled tube frame with filling
- T30-1 door of wood
- T90-1 door of steel with glass cut-out
- T30-2 door of steel, 1 leaf with glass cut-out and 1 leaf completely of steel

For all the doors listed above the continuous performance capability in accordance with DIN 4102-18 has already been proven and general approvals have been issued by the construction supervision authorities.

The manufacturers of the three single-leaf doors made their doors available for this research project. There is a test order outstanding in accordance with DIN 4102-18 for a test following a change to the two-leaf door. With the agreement of the manufacturer, the test part of the complete-panic opening was carried out via the

fixed leaf in accordance with DIN EN 1191.

## **5 Mounting of the samples**

Employees of MPA NRW installed samples 1 - 3 in a manner close to that used in practice and in an analogous manner to that used for tests on continuous performance capability already carried out in accordance with DIN 4102-18. Sample 4 was installed by the manufacturer in an expanded concrete wall.

## **6 Preparation for and execution of the tests**

After the samples had been installed and mounted and after the opening device had been set, the door closer was set in such a way that the leaf contacted the frame with a speed of 0.5 m/s. The state of the sample was recorded before and after the test. The regular routine checks with random sample testing of the closing speed were carried out during the test. DIN EN 1191 contains no statements on the number of cycles. Accordingly this was set as 200,000 in accordance with DIN 4102-18.

## **7 Result of the tests**

DIN EN 1191 contains no statements on failure criteria. The samples tested were evaluated as up to present in accordance with DIN 4102-18, Para. 6.1 (see also Para. 3):

All the tests in accordance with DIN EN 1191 proceeded without damage to the samples and securing devices in accordance with the failure criteria of DIN 4102-18. The doors remained fully functional.

The testing of the freedom from squeezing of two-leaf doors is also not regulated in DIN EN 1191. This was carried out in accordance with DIN 4102-18, Para. 4.2.2.

## **8 Consequences**

On the doors tested application of the test method in accordance with DIN EN 1191 led to the same result as with the tests already carried out in accordance with DIN 4102-18.

However DIN EN 1191 only replaces the previous DIN 4102-18 to a very limited extent and cannot be used for hinged doors without the following additional points being regulated:

- Number of samples and selection criteria therefor
- Number of test cycles
- Failure criteria
- Freedom from squeezing of two-leaf doors

According to the scope of application of DIN EN 1191, the test method holds good for all "modes of operation". Mentioned in Para. 3.1 are sliding leaves and linearly moved door leaves, which - according to Para. 4.1.2 - can have a mass of  $\geq 400$  kg. According to the second sentence of Para. 4.1.2, the reference speed can also be preset without further requirements from the system. This indicates a further point needing to be regulated, namely whether continuous performance capability tests on gates are also permissible in accordance with the EN.

New findings on testing practice will have to be obtained and evaluated for the transferring of continuous performance test results from two-leaf to single-leaf doors as practised in DIN 4102-18, Para. 5. It is to be assumed that additional tests on single-leaf doors will be necessary.

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