

## Sandwich Panel Testing and Euro-Classification

*Sandwich panels can be more realistically assessed in the intermediate scale SBI test than in any other small-scale test currently used for National classification and regulatory purposes within Europe. These small-scale test methods are currently the main tests to classify sandwich panels for most Member states and for more than 80% of the European sandwich panel applications. For the remainder and in certain applications only, large and intermediate scale testing is used. Only Scandinavian countries make use of large scale testing for regulatory purposes. In other Member states, large scale testing is limited to insurance certification. The latter have also been taken up in the statistical data above.*

### Parameters influencing the safety in case of fire of sandwich panel constructions

Crucial for the fire performance of sandwich panels are the joints, the structural frame and the way of fixing, the type of cover, the coating, the insulating core and its adherence to the cover. The structural frame and the fixing to it are characteristics of the total construction and cannot be mounted in the SBI exactly as in end use. The product committee (CEN/TC128) has developed a solution in relation to the end use applications. The other parameters are product characteristics and can be taken into account in the SBI.

From past experience, the necessary provisions to prevent failure and collapse of the construction are well known and it is not necessary to repeat this assessment for every new type of panel. The use of panels, which have been evaluated in small and/or intermediate scale tests, is

acceptable from the point of view of fire safety, provided the well known principles for a stable framework and mounting are respected.

### Testing according to SBI and main National regulatory tests

Early investigations in the SBI have focussed on different factors that can affect the performance of sandwich panels. Amongst these were:

- Joint at 200 mm, yes or no
- Type of joint
- Panel classification
- Thickness
- Covering layer
- Fasteners, to simulate fixing to an internal steel frame

Test results on PU cored cold store panels showed that the SBI generally correlates, with the German DIN 4102 part 15, 16 i.e. Brandschacht. Panels, which were not B1 according to the German standard, were classified mainly as class D in the SBI test. The B1 rated panels ranged from class D to B, dependent on the presence and type of panel joint at 200 mm, indicating that the SBI test was more discriminative. A joint at 200 mm gave a worse result in general but did not necessarily result in a change of class. Differences between 150 mm and 100 mm thick panels were insignificant and there was no change in class. The results are summarised in table 1.

Different to other test methods, like the British BS 476 p6 and the French NF P 92-501, the Brandschacht test concentrates on the assessment of the real joint. In the British and French regulatory test the actual joint is not tested, which is a serious limitation of these both test methods. It is then logical that the Brandschacht has given a more realistic result for sandwich panels in the past decades. As the Brandschacht test, the SBI can assess the panel joint. An additional advantage is that greater thickness can be tested and the corner configuration in



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SBI represents better end use conditions. It has been shown that it can better take into account end use conditions than the Brandschacht and better simulate a realistic fire scenario.

Preliminary testing also focused on sandwich panels for external roof and wall cladding of buildings. Examples of such buildings are given in figures 1 and 2\* (ref). Normally, such panels are fixed to an internal frame, with sheeting rails every 2 to 3 m, which means that panel joints are kept closed at those points. It is not possible to assemble the panels with the frame in the SBI. Therefore, the end use mounting was simulated by applying two fasteners, one at the top and one at the bottom of the panel joint. Excessive fixing should be avoided when representative results are to be obtained. Approved building panels in Germany must be B1 according to DIN 4102, p15, 16 because of the higher risk area they are applied in. For this type of panels with PU core, SBI classes C or B was obtained in general, when the up-mentioned mounting conditions were respected.

### CE marking

CEN/TC128/SC11 has a mandate to develop the product standard for steel faced sandwich panels for all types of cores for classification and CE marking. The fire sections are based on the classification standards EN 13501-1 (reaction-to-fire) and prEN 13501-2 (fire resistance). A standardised mounting has been developed, which takes into account the influencing factors as joints, edges, thickness of panel, fixing to the frame etc. Agreement was obtained amongst representatives of all Member states and the CEN consultant. It is clear that the product standard is related to the product with

Table 1: Comparison of Brandschacht and SBI test results for cold store panels with PU core; tests performed in MFPA, Leipzig.

Joint detail	Thickness (mm)	Panel not B1		B1 panel	
		No joint at 200 mm	Joint	No joint	Joint
Non overlapping	100	D	D	C	D
Overlapping	100	D	C	B	B
Non overlapping	150	-	D	-	D

the aim to achieve a classification and CE mark. It is not possible with the test methods for classification according to EN 13501-1, to provide an assessment of the total system. Product testing with the purpose of CE marking should not be confused with application testing of a system. In some cases, additional application testing will be necessary. This is then a matter of the Member State or National insurance companies; it is outside the scope of the mandate to CEN.



Hall for bottling of mineral water, Brunnen-Union in Mainhardt, Germany (1995) - Architect: Wolfgang Kuhn".

### Nordic test programme for sandwich panels, NT-project no 1432-99

The Nordic test programme concludes that the SBI is not suitable for the classification of sandwich panels. Some arguments make this conclusion unacceptable to the sandwich panel industry. The commentary from experts in CEN/TC128 is as follows:

From the presentation and the answers received to specific questions, it was clear that the SBI part of the tests had not been carried out to the detailed requirements of the draft standard for sandwich panels, nor to the basic requirements of EN 13823 [SBI].

*The following points were of specific concern to the SC11 Fire Experts:*

- There was either no panel-to-panel joint in the long wing of the panel [13823], or the provisions of TC128/SC11 were not followed
- One or all of the cut panel edges were covered by flashings or foil, which is contrary to SC11 requirements

*Unless these requirements are met for the SBI test it is not indicative of the product as in end use and there is a strong possibility that different products will obtain the same classification, as was found to be the case in this research.*

*SBI tests conducted by SC11 members have shown that EN13823 does differentiate to a greater degree than that indicated by this report. Classifications of B, C, D and E have been recorded in recent tests.*

*Without further clarification, the committee of SC11, Metal Faced Sandwich Panels, cannot accept the findings and conclusions of the report and finds the conclusions therein misleading and unrepresentative of panels in use.*

Another conclusion of the project is that the Room/Corner Test ISO 9705 cannot be used as a reference scenario for sandwich panels and the final draft standard for sandwich panels developed in ISO, i.e. FDIS 13784-1 has been proposed instead. The test programme has however not been able to show by experimental evidence that this part is a better reference scenario. Finally, classification on the basis of max RHR only for

the Room/Corner Test scenarios is not acceptable for sandwich panels. Other criteria need to be taken into account, such as, structural effects, does the fire self extinguish after the burner output has ceased, etc. For the reasons stated above, the conclusions from the Nordtest project must be considered as premature.

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\* R Koschade, Die Sandwichbauweise, Ernst & Sohn a Wiley Company, 2000, p 245 and p 283

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