

# **Quality Regulations for Sandwich Panels**

**October 2008**



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## Preface

This Quality Regulations rely on EN 14509 – Self-supporting double skin metal faced insulating panels – Factory made products – Specifications.

These Quality Regulations cover all sandwich panels that are regulated by EN 14509. For these products EN 14509 is the technical basis and these Quality Regulations apply.

It is the intention of this Quality Regulations to establish a quality assurance system for sandwich panels which is mainly based on independent third party control.

Regarding EN 14509 the Attestation of Conformity (AoC) system is 4 with the exception of fire properties (AoC system 1-4) and dangerous substances (AoC system 3). Therefore no notified body exists who can be notified for mechanical properties on the basis of EN 14509. The task of EPAQ is to get experienced third parties to ensure a quality assurance system which is comparable to AoC system 1+ for mechanical properties and AoC system 3 for insulation and tightness properties.

Standards are established for third parties to guarantee work on an equal and comparable level.

## 1. Terms and Definitions

For the purposes of this document, the following terms and definitions apply.

### 1.1 Third parties

The tasks of third parties are:

- initial type testing and writing the test report
- evaluation and preparation of evaluation report of ITT (task only for independent experts)
- responsibility for and attending of initial inspection including assessment report
- responsibility for and attending of external quality control including evaluation report.

Third parties may be recognized for one or more fields of experience of the above mentioned tasks with regard to panels.

Third parties are

- independent laboratories with sufficient experience in panel testing and evaluation of panel testing, or
- a combination of an experienced independent expert acting together with an inexperienced or possibly not impartial laboratory, or
- independent laboratories or independent companies for assessment of factory production control.

### 1.2 Independent laboratories

Independent laboratories that are working on the basis of the EPAQ-regulations have to be national institutions that are member of EOTA or that are approved for testing sandwich panels by a national institution that is member of EOTA or is accredited by an EA-member. If an independent laboratory does not fulfil this requirement, a committee of the third parties who are working under the scheme of this Quality Regulations have to decide on the third party by checking their competence in testing and/or evaluating test reports on sandwich panels.

Independent laboratories are not allowed to evaluate and to prepare the evaluation report of ITT. This task can only be done by an independent expert.

### 1.3 Independent experts

An independent expert is an individual or an individual within a testing laboratory with recognized knowledge in panel technology. In case of FPC assessment, it is also possible that the responsible independent expert is a member of an auditing body.

The independent experts of the Quality Committee have to decide on the persons with enough knowledge on panels who want to become independent experts for one or more of the following tasks:

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- Responsibility for and attending of initial type testing according to 2.2.4 including test report
- Evaluation and preparation of evaluation report of initial type testing
- Responsibility for and attending of initial inspection including assessment report
- Responsibility for and attending of external quality control including evaluation report
- Checking and confirmation of test-, evaluation- and assessment reports for initial type testing, initial inspection and quality control tests

#### **1.4 Independent auditing bodies**

In case of FPC assessment, the auditing body is responsible for assessment and writing the assessment report. The independent experts of the Quality Committee decide on the auditing bodies that are working under the EPAQ-scheme.

#### **1.5 Evaluation report**

Report worked out by an independent expert determining basic values and properties as a base for awarding and maintenance of the Quality Label on the base of the relevant assessment and test reports.

#### **1.6 Assessment report**

Reviews result from external quality control and FPC in comparison to declared values on the CE-mark and in comparison to the requirements of these Quality Regulations.

#### **1.7 Test report**

Includes all basic test results without calculation of statistical evaluation and other further steps.

#### **1.8 Notified body**

Laboratories accredited under CPD; here particularly laboratories involved in fire testing.

## **2. Basis of the Quality Assurance System**

### **2.1 General**

#### **2.1.1 Technical basis**

Technical basis of the Quality Assurance System of EPAQ is the European standard EN 14509 - when there are no special regulations given by the Quality Committee. The rules of the Quality Regulations are valid for products used for applications which are for normal European outdoor and indoor conditions in normal buildings including cold stores.

#### **2.1.2 Legal basis**

The Guidance Papers of the European Commission are basis of these Quality Regulations and have to be followed for the quality assurance work of EPAQ.

#### **2.1.3 Quality management system**

Companies which are member of EPAQ have to fulfill the requirements of a quality management system ISO 9001-2000 or higher.

### **2.2 Requirements for third parties for testing**

#### **2.2.1 General requirements**

Third parties who carry out the testing have to work in accordance to the requirements of EN ISO 17020 or EN 45011 and EN ISO 17025. The Testing Rules of EPAQ have to be applied by testing sandwich panels. It is not permitted to deviate from the testing procedures established in EN 14509 and completed by the EPAQ Testing Rules.

#### **2.2.2 Third parties for testing**

Third parties are either independent laboratories with sufficient experience in sandwich panel testing and evaluation of sandwich panel testing according to 2.2.3 or a combination of an experienced independent expert acting together with an inexperienced or possibly not impartial laboratory according to 2.2.4.

#### **2.2.3 Requirements for independent laboratories**

Independent laboratories for testing must fulfil the requirements according to 1.2.

#### **2.2.4 Requirements for independent experts working with laboratories**

Independent experts working together with laboratories can form a third party body. The independent expert can work with external laboratories, which either do not confirm with 2.2.3 and do not have the necessary experience to perform adequate testing or he can work with a manufacturer's laboratory, where the independent expert insures adequacy of testing facilities and procedures as well as independency of the laboratory.

## **2.3 Requirements for third parties for evaluation and assessment**

### **2.3.1 General requirements**

Evaluation work is undertaken by independent experts (see 1.3), assessment work is undertaken by independent laboratories (see 1.2) or in case of initial inspection and assessment only, auditing bodies (see 1.4).

### **2.3.2 Requirement for independent laboratories**

Independent laboratories must fulfil the requirements according to 1.2.

### **2.3.3 Requirements for independent experts for evaluation and assessment**

Independent experts for evaluation and assessment must fulfil the requirements according to 1.3.

### **2.3.4 Requirements for auditing bodies for assessment**

Auditing bodies for assessment must fulfil the requirements according to 1.4.

## **2.4 Requirements for independent experts in the Quality Committee**

2.4.1 Two independent experts are elected members of the Quality Committee. They have to be elected by the General Assembly (see EPAQ-Statutes, 9.).

2.4.2 The independent experts of the Quality Committee have to have good experience in testing and evaluating test results of sandwich panels.

## **2.5 Technical requirements**

2.5.1 Table A1 shows a list of properties which are under control of EPAQ in reliance on different applications. Frequency of testing and the number of samples for FPC and external control is regulated in Table A3.

2.5.2 In case of:

- dimensional tolerances,
- mechanical strength and modulus,
- durability, where required
- thermal insulation performance,

The parties involved in the voluntary quality assurance system of EPAQ have the following tasks (see Table 1 below) :

<b>Duty</b>	<b>Outcome</b>	<b>Party involved</b>
ITT tests	Test report	Third party according to 2.2
ITT test evaluation	Evaluation report	Independent expert according to 2.3
Initial inspection	Assessment report	Third party according to 2.2.
External Quality Control including assessment of FPC	Evaluation report	Third party according to 2.2 (or, for assessment of FPC only, auditing body)

Table 1: Tasks of involved parties concerning tolerances, mechanical characteristics, durability, thermal insulation performance

2.5.3 In case of:

- Reaction to fire
- Fire resistance
- External fire exposure,

According to EN 14509 in conjunction with notified bodies only specification records are to be delivered.

2.5.4 In case of:

All other properties (e. g. for insulation and tightness performance) the parties involved in the voluntary quality assurance system of EPAQ have the following tasks (see Table 2 below) :

<b>Duty</b>	<b>Outcome</b>	<b>Party involved</b>
ITT tests	Test report	Third party according to 2.2
ITT test evaluation	Evaluation report	Independent expert according to 2.3
FPC (where required)	Evaluation report	Third party according to 2.2 (or auditing body) where required (see Table A3)

Table 2: Tasks of involved parties concerning other properties



### 3. EPAQ requirements for material properties

#### 3.1 Tensile strength of the panel

The threshold value of the tensile strength of the panel is defined to:

PUR/PIR, EPS/XPS:	0.06 MPa as a characteristic value	(5 %-fractile)
For other core materials:	0.03 MPa as a characteristic value	(5 %-fractile)

Note:

The values are defined by reason of the different handling of durability testing. Known PUR/PIR, EPS/XPS shall be considered to satisfy the durability requirements without testing (for EPS/XPS only DUR 1 required), see EN 14509, chapter 5.2.3. Besides there is currently no experience for these core materials with tensile strength less than 0,06 MPa.

For other core materials durability testing is always required and therewith core materials with lower tensile strength are always included.

#### 3.2 Reaction to fire

Panels must have a minimum class of reaction to fire behaviour of Cs3d0.

## 4. Control of material properties

### 4.1 General

The control of the production of panels is carried out by means of the plant's own production control and external control in accordance with the following stipulations of these regulations.

The manufacturer must conclude a control agreement with EPAQ in order to bear the EPAQ quality label, who for his part must commission the appropriate third parties with the control task, in order to be able to observe the requirements in accordance with the Quality Regulations.

After ensuring that the third party fulfils the requirements according to 1.2 EPAQ has to make a contract with the third parties chosen by the manufacturer to ensure that the quality assurance will be on the basis of the EPAQ-regulations.

The implementation of the inspections and the type of documentation is regulated by the Quality Committee in agreement with the third parties which carry out the external control.

The reports of assessment and external quality control shall be retained for at least five years.

The third parties have to have meetings to coordinate their work if required by EPAQ. These meetings ought to be held in combination with the meetings of the Quality Committee.

The third party has to check the components and their ratios of the foam in case of foamed panels. Third parties can compare the FPC records with the results of ITT. For the expertise and the regular checking the third party and the independent expert needs the code name of the foam and the names of all components.

### 4.2 Initial Type Testing

#### 4.2.1 General

All characteristics in Table 4 of EN 14509, where relevant, shall be subjected to ITT tests with the exception of fire performance when using the CWFT option, where measurement in accordance with C.3.1 of EN 14509 is required to ensure that the product meets the definition required for CWFT.

#### 4.2.2 Additional requirements of EPAQ

Dimensional tolerances are subjected to ITT-tests with additional EPAQ requirements, see Table A2.

#### 4.2.3 Responsibility

The ITT tests must be done by third parties for testing according to 2.2. The evaluation and preparation of the evaluation report must be done by third parties for evaluation and assessment according to 2.3.

#### 4.2.4 ITT-tests

The ITT-tests can be made in a laboratory or in a factory of the manufacturer. The presence of an independent representative of a third party is absolute necessary for calibration and supervision of the tests.

### 4.3 Initial Inspection and External Quality Control

#### 4.3.1 General

Prior to the first external quality control an initial inspection shall be conducted.

The standard inspection including audit-testing of samples is carried out at least twice a year in the factory of the quality label user based on the control agreement.

#### 4.3.2 Responsibility

The Initial Inspection and External Quality Control tests must be done by third parties for testing according to 2.2.

#### 4.3.3 Procedures

The external quality control needs to be conducted in accordance with the testing regime described in Table A3. The necessary samples are to be taken from the production process. Sampling and testing has to be done by a third party or can be done by the manufacturer in the presence and under the responsibility of a third party.

In each sandwich panel production plant the internal factory production control must be confirmed by external quality control at least twice a year. The responsible third party shall be physically present in the plant twice a year.

The record of the results of the factory production control must be submitted to the third party by the manufacturer.

In the case of External Quality Control samples from the current production process or in the warehouse must be selected in such a way that all relevant product families (see EN 14509, 6.1) are selected in the course of one year.

The results of the external control are recorded in the evaluation report of the third party. The manufacturer and the Secretary of EPAQ simultaneously receive one copy of the evaluation report.

The acceptance of evaluation of the results is incumbent upon the Quality Committee.

In the case of inadequate test results within the framework of the external control the responsible third party must inform the independent expert in the Quality Committee and the manufacturer must immediately initiate the necessary measures in order to remedy the defects.

#### 4.3.4 Evaluation of test results for mechanical properties

No individual test result in external quality control must be poorer than the value declared. Otherwise additional samples need to be taken, tested and the 5 %-fractile value needs to be determined anew. The resulting characteristic value must not be poorer than the declared value. Else the panel loses conformity with the quality label. For the anew determination of the 5%-fractile it may be assumed that  $k = 1,65$ .

#### 4.3.5 Evaluation of test results for other properties

No individual test result in external quality control must be poorer than the value declared. Otherwise additional samples need to be tested.

#### 4.3.6 Thermal insulation performance

The control of the thermal insulation performance of prefabricated core materials can also be the task of the manufacturer of the core material. The panel producer

can use CE-marked core materials without any further testing, if these core material performances are controlled under responsibility of a certification body. In case of in situ foamed panels it must be done by a third party.

#### **4.4 FPC procedures**

##### **4.4.1 General**

The manufacturer shall establish procedures to ensure that the stated values of all of the characteristics are maintained in accordance with chapter 6.3.5.2 and 6.3.5.3 of EN 14509. Table A3 shows the tests methods which must be done for FPC and external control, the number of specimens and the frequency of FPC and external control. The FPC has to follow the instructions of Guidance Paper B of the European Commission.

##### **4.4.2 FPC for safety in fire characteristics**

FPC for safety in fire characteristics shall be carried out according to EN 14509, 6.3.5.3.

## 5. Procedures

### 5.1 Award and maintenance of the Quality Label

The following procedure to get a quality label has to be followed:

#### 5.1.1 Testing by a third party according to 4.2.

The way of testing can be handled as follows:

5.1.1.1 The third party in form of an independent laboratory is responsible. The duty of the third party is to carry out the tests and to write the test-report (see 2.2.3).

5.1.1.2 The third party in form of an independent expert together with a laboratory not able to fulfil the requirements of 2.2.3 (see 2.2.4) is responsible.

The duty of the laboratory (e.g. manufacturer's laboratory) is to carry out the tests under supervision and responsibility of an independent expert. The independent expert is responsible for the test report.

#### 5.1.2 Evaluation of the test results, given in a separate evaluation report by an independent expert (see 2.3).

#### 5.1.3 Checking of the evaluation report (including test report and/or assessment report) by an independent expert of the Quality Committee (see 2.4). This independent expert must be different from the independent expert who has written the evaluation report.

#### 5.1.4 The independent experts of the Quality Committee can decide on additional independent experts for checking the evaluation reports.

#### 5.1.5 The independent experts of the Quality Committee decide on the award of the quality label.

#### 5.1.6 In case of rejection, the manufacturer has the possibility to file an objection to this decision. The manufacturer has to present arguments in favour of the award of the quality label for his products on the next meeting of the Quality Committee.

#### 5.1.7 The quality certificate has to be signed by the Secretary General and the independent expert mentioned in 5.1.3.

### 5.2 Use of the Quality Label

#### 5.2.1 Quality label users may only use the quality label for products which comply with the Quality Regulations and for which the quality label has been awarded.

#### 5.2.2 The "European Quality Assurance Association for Panels and Profiles" alone has the right to allow a means of identification of the quality label to be produced and supplied to the user of the quality label or to allow the label to be handed out and the use of it to be set out in more detail.

#### 5.2.3 The Managing Committee may issue special rules for the use of the quality label in advertising, so that the integrity of competition is preserved and misuse is prevented. Individual advertising must not be hampered by this, although the same maxim regarding the integrity of competition still applies.

- 5.2.4 If the right to use the quality label is withdrawn, the award document for the quality label has to be returned. The same applies if the right to use the label has expired for any other reason.

## 6. Annex

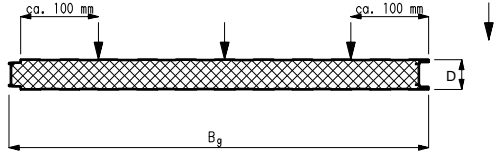
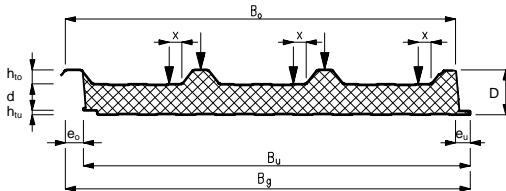
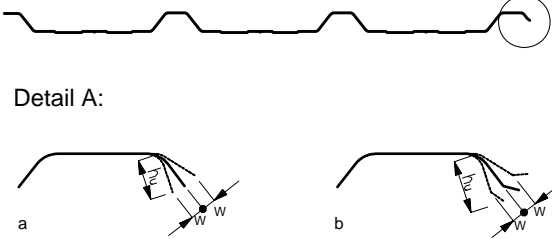
### 6.1 Table A1: Values under control of EPAQ - needed for different applications

No.	Type of test	External walls	Internal walls	Ceilings	Roofs
1	Density of core material	yes	yes	yes	yes
2	Cross-panel tensile strength (with faces)	yes	yes	yes	yes
3	Thickness of core	yes	yes	yes	yes
4	Mass of panel	yes	yes	yes	yes
5	Compressive strength of core material	yes	yes	yes	yes
6	Shear strength and modulus of core material	yes	yes	yes	yes
7	Long term shear strength	no	no	yes	yes
8	Creep coefficient	no	no	yes	yes
9	Tensile strength and thickness of face material (or declaration)	yes	yes	yes	yes
10	- bending resistance in span and at internal support:				
	- positive bending	yes	yes	yes	yes
	- positive bending, elevated temperature	yes	no	no	yes
	- negative bending	yes	yes	yes	yes
	- negative bending, elevated temperature	yes	no	no	yes
	- wrinkling stresses:				
	- wrinkling stress, external face:				
	- in span	yes	yes	yes	yes
	- in span, elevated temperature	yes	no	no	yes
	- at internal support	yes	yes	yes	yes
	- at internal central support, elevated temp.	yes	no	no	yes
	- wrinkling stress, internal face:				
	- in span	yes	yes	yes	yes
- at central support	yes	yes	yes	yes	
11	Dimensional Tolerances	yes	yes	yes	yes
12	Resistance to point and access loads	no	no	yes	yes
13	Reaction to fire - certification	yes	yes	yes	yes
14	Resistance to fire – certification	Where required			
15	External fire Exposure – certification	no	no	no	Yes
16	Thermal insulation performance	yes	Where required		Yes
17	Water permeability	yes	Where required		Yes
18	Air permeability	yes	Where required		Yes
19	Airborne sound insulation	Where required			
20	Sound absorptiion	Where required			
21	Durability and long term effects	yes	Where required		Yes

## 6.2 Table A2: Dimensional tolerances, test specimens, type of the test and conditions for ITT

Title		Test method	Type of test	Min. number of ITT specimens	Compliance criteria and specific conditions			
5.2.5	Dimensional tolerances:	Annex D	ITT	1				
			Values of EN 14509			New values according EPAQ		
Thickness of the panel		D.2.1	D ≤ 100 mm ± 2 mm D > 100 mm ± 2 %					
Deviation from flatness (according to the length of measurement L)		D.2.2	L [mm]      200                  400                  ≥700 Max. deviation from flatness [mm]: 0,6                  1,0                  1,5			L [mm]      ≤200                  400                  ≥700 Max. deviation from flatness [mm]: 0,4                  0,7                  1,0 Intermediate values may be interpolated		
Depth of metal profile		D.2.3	5 mm < h ≤ 50 mm      ± 1 mm 50 mm < h ≤ 100 mm      ± 2,5 mm					
Depth of stiffeners on lightly profiled faces		D.2.4	ds ≤ 1 mm                  ± 30 % of ds 1 mm < ds ≤ 3 mm                  ± 0,3 mm 3 mm < ds ≤ 5 mm                  ± 10 % of ds			Compliance has to be proofed only by a measuring rule and a precision gauge.		
Length of the panel		D.2.5	L ≤ 3000 mm                  ± 5 mm L > 3000 mm                  ± 10 mm			L ≤ 6 m ± 5 mm    L > 12 m: ± 10 mm Intermediate values may be interpolated		
Cover width of the panel		D.2.6	± 2 mm					
Deviation from squareness		D.2.7	s ≤ 0,006 x w			0,006 x w (roof)    0.004 x w (wall)		
Deviation from straightness (on length)		D.2.8	1,0 mm / m not exceeding 5 mm					



Bowing (curvature on length)	D.2.9	<p>2,0 mm / (m length) <math>\leq</math> 10 mm</p> <p>8,5 mm / (m width for flat profiles, <math>h \leq 10</math> mm)</p> <p>10,0 mm / (m width for other depth, <math>h &gt; 10</math> mm)</p>	
Pitch of the profile	D.2.10	<p><math>h \leq 50</math> mm <math>\pm 2</math> mm</p> <p><math>h &gt; 50</math> mm <math>\pm 3</math> mm</p>	$\pm 1,5$ mm
Width of the ribs ( $b_1$ ) and Width of the valleys ( $b_2$ )	D.2.11	<p>Ribs: <math>\pm 1</math> mm</p> <p>Valleys: <math>\pm 2</math> mm</p>	
Alignment	EPAQ		<p><math>\Delta e = 3</math> mm</p> <p><math>\Delta e</math>: difference (overlapping) between inner and outer sheet at the joint</p>
Difference in measured thickness of joint	EPAQ		$\Delta D \leq 2$ mm
Longitudinal edge length	EPAQ		$h_u \geq 10$ mm
Edge waviness	EPAQ	 <p>Detail A:</p>	$W = \pm 2$ mm over 500 mm length

**6.3 Table A3: FPC procedures for panels and external control**

Type of test	Test Method	FPC		External control twice a year
		Number of specimen	Frequency	Number of specimen
Density of core material	A.8	3	1 per shift/ 6 or 8h <sup>a</sup>	6
Cross-panel tensile strength and modulus (with faces)	A.1	3	1 per shift/ 6 or 8h <sup>a</sup>	10
Compressive strength and modulus of core material	A.2	3	1 per week <sup>a</sup>	10
Shear strength and modulus of core material	A.3	3	1 per week <sup>a</sup>	10
Tensile strength of face material (or declaration – 6.3.4.2)	-	3	All deliveries	3
Thickness of face material (or declaration – 6.3.4.2)	-	3	All deliveries	3
Shear strength and modulus of core material with complete panel <sup>b</sup>	A.4	1	1 per 2 weeks	1
Wrinkling stress (optional see Note 3)	A.5	1	1 per week	1
Dimensional control: Panel thickness Deviation from flatness Depth of profile Depth of stiffeners Length of panel Cover width Deviation from squareness Deviation from straightness Bowing (curvature) Pitch of profile Width of valley and ribs Alignement Difference in measured thickness of joint Longitudinal Edge length Edge Waviness	D.2.1 D.2.2 D.2.3 D.2.4 D.2.5 D.2.6 D.2.7 D.2.8 D.2.9 D.2.10 D.2.11 EPAQ EPAQ EPAQ EPAQ	1	1 per shift/ 6 or 8h	1
Reaction to fire - certification (6.3.5.3) <sup>c</sup>	-	-	Specificati on record	-
Resistance to fire - certification (6.3.5.3) <sup>c</sup>				
External fire Exposure - certification (6.3.5.3) <sup>c</sup> or CWFT				
Thermal insulation performance –5.2.3	A.10.2.1.1 <sup>d</sup>	1	1 per month	1
Durability – 5.2.3.1	-	-	Specification record	-
Water permeability – 5.2.6 Air permeability – 5.2.7 Water vapour permeability – 5.2.8	Visual inspection <sup>a</sup>	-	-	-

**Table A3 (continued)**

- <sup>a</sup> Where production volumes are below 2 000 m<sup>2</sup> per shift, the manufacturer shall only test every 2 000 m<sup>2</sup> or at least every three months. Dimensional control tests and permeability inspections however shall be carried out every shift.
- <sup>b</sup> Alternative test method instead of A.3 on condition that the ITT-tests have to be made in the same way.
- <sup>c</sup> Manufacturer's specification record (see 6.3.5.3) or supplier's statement of fire performance of components.
- <sup>d</sup> Procedure tests  $\lambda_i$  (single test result of thermal conductivity) in accordance with the appropriate product standard for the core material (A.10.2.1.1).

**NOTE 1** The control of the thickness of pre-formed core material or lamellas and the positioning of the joints between individual slabs are of fundamental importance and should be frequently checked (e.g. every 2 h).

**NOTE 2** Typical allowable difference in cutting thickness between adjacent pre-manufactured pieces for fabrication with stiff platens is  $\pm 0,5$  mm.

**NOTE 3** If the wrinkling stress is controlled at least once per week it is not necessary to control the tension and compression moduli.