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European Organisation for Technical Approvals  
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# **ETAG 019**

**Edition November 2004**

**GUIDELINE FOR EUROPEAN TECHNICAL APPROVAL**

**FOR**

**PREFABRICATED WOOD-BASED  
LOADBEARING STRESSED SKIN PANELS**

**EOTA**

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# FOREWORD

## **Background of the ETA Guideline**

Reference documents are referred to within the body of the ETAG and are subject to the specific conditions mentioned therein.

## **List of reference standards**

See Annex B.

## **Updating conditions of reference standards**

The edition of a reference standard which has been adopted by EOTA for its specific uses is given in the list of reference standards. When a new edition of such a reference standard becomes available, this supersedes the edition mentioned in the list only when EOTA has verified or re-established its compatibility with the Guideline.

## **EOTA comprehension documents**

EOTA comprehension documents permanently take on board all useful information on the updating of reference standards and on the general understanding of this ETAG as developed when delivering ETAs in consensus by the EOTA members.

## **EOTA Technical Reports**

EOTA Technical Reports go into detail in some aspects and as such are not part of the ETAG but express the common understanding of existing knowledge and experience of the EOTA bodies at that moment. When knowledge and experience is developing, especially through approval work, these reports can be amended and supplemented. When this happens, the effect of the changes upon the ETAG will be determined by EOTA and laid down in the relevant comprehension documents.

Readers and users of this ETAG are advised to check the current status of the content of this document with an EOTA member.

# SECTION ONE: INTRODUCTION

## 1 PRELIMINARIES

### 1.1 LEGAL BASIS

This ETA Guideline has been established in full compliance with the provisions of the Council Directive 89/106/EEC (CPD) and has been established taking into account the following steps:

- the final mandate issued by the EC 13-07-1999
- the final mandate issued by EFTA 13-07-1999
- adoption of the guideline by the Executive Commission of EOTA 27-02-2004
- opinion of the Standing Committee for Construction 02-04-2004
- endorsement by the EC 25-01-2005

This document is published by the Member States in their official language or languages according to Art. 11/3 of the CPD.

No existing ETA Guideline is superseded.

### 1.2 STATUS OF ETAG

**1.2.1** An ETA is one of the two types of technical specifications in the sense of the EC 89/106 Construction Products Directive. This means that Member States shall presume that the approved prefabricated wood-based loadbearing stressed skin panels are fit for their intended use, ie they enable works in which they are employed to satisfy the Essential Requirements during an economically reasonable working life, provided that:

- the works are properly designed and built;
- the conformity of the products with the ETA has been properly attested.

**1.2.2** This ETAG is a basis for ETAs, i e a basis for technical assessment of the fitness for use of a prefabricated wood-based loadbearing stressed skin panel for an intended use. An ETAG is not itself a technical specification in the sense of the CPD.

This ETAG expresses the common understanding of the approval bodies, acting together within EOTA, as to the provisions of the Construction Products Directive (89/106 EEC) and of the Interpretative Documents, in relation to the prefabricated wood-based loadbearing stressed skin panels and uses concerned, and is written within the framework of a mandate given by the Commission and the EFTA secretariat, after consulting the Standing Committee for Construction.

**1.2.3** When accepted by the EC Commission after consultation with the Standing Committee for Construction and published by the Member States in their official language or languages, this ETAG is binding for the issuing of ETAs for prefabricated wood-based loadbearing stressed skin panels for the defined intended uses.

The application and satisfaction of the provisions of an ETAG (examinations, tests and evaluation methods) leads to an ETA and a presumption of fitness of a prefabricated wood-based loadbearing stressed skin panels for the defined use only through an evaluation and approval process and decision, followed by the corresponding attestation of conformity. This distinguishes an ETAG from a harmonised European standard which is the direct basis for attestation of conformity.

Where appropriate prefabricated wood-based loadbearing stressed skin panels which are outside of the precise scope of this ETAG may be considered through the approval procedure without guidelines according to Art. 9.2 of the CPD.

The requirements in this ETAG are set out in terms of objectives and of relevant actions to be taken into account. It specifies values and characteristics, the conformity with which gives the presumptions that the requirements set out are satisfied, wherever the state of the art permits and after having been confirmed as appropriate for the particular product by the ETA.

This Guideline also indicates alternative possibilities for the demonstration of the satisfaction of the requirements.

## 2 SCOPE

### 2.1 SCOPE

This Guideline covers prefabricated wood-based loadbearing stressed skin panels for use in roofs, external walls, structural partitions and floors (including the joints/ connections between the stressed skin panels where jointing is part of the product).

These stressed skin panels are composed of single or double skin(s), made of wood-based materials (at least one skin), with or without internal reinforcement (wooden ribs), with or without a rigid insulating core and with or without a vapour control layer or breather membrane.

In case the ETA-applicant claims that the stressed skin panel is intended to contribute to the mechanical resistance or to the stability of the works or it supports other structural elements of the works or it has a positive influence on the racking resistance of the works (horizontally and/or vertically), the product is covered by this ETA-guideline.

Loads are transferred to the main structure of the works in both the plane of and or at right angles with the plane of the stressed skin panels.

The stressed skin panels (see figure 1) can be either:

1. double-skin construction, such as:
  - sandwich type (without ribs);
  - closed box type (so called double T- or I-beams),
2. single-skin construction:
  - open box type (so called T-beams or stiffened stressed skin panels).

The stressed skin effect is achieved:

- for stressed skin panels, sandwich type and closed/open box type with *rigid* insulation material (see Figure 1 – type A, respectively both types B1 and B2):
  - by rigidly bonding the skins throughout the whole skin interface to both the *rigid* insulation and the ribs where present, by gluing or foam injection;
- for other types of stressed skin panels (see Figure 1 – types C1 and C2):
  - by rigidly bonding the skin to the whole length of the ribs or by gluing and mechanical fixing – only for positioning or realisation of the pressure – with nails, staples or screws.

In addition, claddings, external façade insulating systems and rain/snow protection and fixings to the substructure may be added to the stressed skin panels; they are not covered by this ETAG.

The stressed skin panels can be treated to give improved fire and biological resistance.

This ETAG corresponds to service class 2, according to Eurocode 5.

This Guideline covers part A of the mandate, see doc CONSTRUCT 99/354, Rev.1.

For part B of the mandate see ETAG No 016 of Self-supporting composite light weight panels, which covers panels that are not loadbearing in the sense of CPD's ER1.

**Figure 1**

**Principles of prefabricated wood-based loadbearing stressed skin panels**

**I. Double-skin construction**

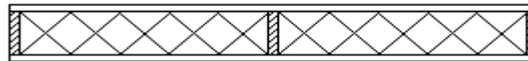
I.1 Insulation of *rigid* material which contributes to the loadbearing properties of the stressed skin panels.

- Skins: wood-based boards (at least one of the skins)  
Insulation, glued to the skins: *rigid* materials such as:
- expanded/extruded polystyrene;
  - polyurethane.

A. Sandwich type (without wooden ribs)



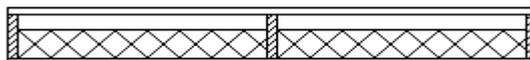
B1. Closed box type (with or without intermediate wooden ribs)



I.2 Insulation of *flexible* (soft) material which does not contribute to the loadbearing properties of the stressed skin panels.

- Skin(s): wood-based board(s)  
Insulation (if any): *flexible* (soft) materials such as mineral wool, sheepswool, polyurethane, etc.

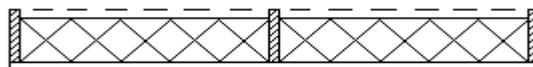
C1. Closed box type (with wooden ribs)



**II. Single-skin construction**

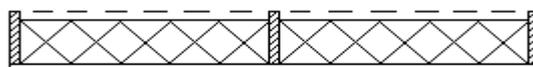
II.1 Insulation of *rigid* material which contributes to the loadbearing properties of the stressed skin panels

B2. Open box type (with or without a membrane)



II.2 Insulation of *flexible* (soft) material which does not contribute to the loadbearing properties of the stressed skin panels

C2. Open box type (with or without a membrane)



## 2.2 USE CATEGORIES, PRODUCT FAMILIES, KITS AND SYSTEMS

The performance of prefabricated wood-based loadbearing stressed skin panels in relation to the Essential Requirements will normally have to correspond with national regulatory requirements for the works relevant to the intended use of the stressed skin panels. These requirements will vary between the Member States and the performance of the stressed skin panels shall be expressed in numerical terms. For performance in case of fire, standard European fire classification is applied.

## 2.3 ASSUMPTIONS

The state of the art does not enable the development, within a reasonable time, of full and detailed verification methods and corresponding technical criteria/guidance for acceptance for some particular aspects or products. This ETAG contains assumptions taking account of the state of art and makes provisions for appropriate, additional case- by-case approaches when examining ETA applications, within the general framework of the ETAG and under the CPD consensus procedure between EOTA members.

### **3 TERMINOLOGY**

#### **3.1 COMMON TERMINOLOGY AND ABBREVIATIONS**

See Annex A.

#### **3.2 TERMINOLOGY AND ABBREVIATIONS SPECIFIC TO THIS ETAG**

##### **3.2.1 Prefabricated**

Manufactured in a factory and brought on to site for installation into the works.

##### **3.2.2 Wood-based**

Natural wood : solid timber.

Processed wood : plywood, LVL, OSB, particle board, laminated timber, etc.

##### **3.2.3 Loadbearing**

Property that:

- forces on stressed skin panels are directly transferred to the (loadbearing structure of the) works, without an intermediate structure or substructure;
- a stressed skin panel contributes to stability of the works.

##### **3.2.4 Stressed skin panel**

Stressed skin panels are structural elements comprising internal (core) and external (skin) elements, bonded together. The core elements may consist of reinforcement (wooden ribs) in the direction of the span and/or a solid form of insulation while the skins normally comprise wood-based panels on one or both sides of the core element(s). The bonding between the core and outer skin(s) are adhesives or gluing by foam blowing; mechanical fasteners can be used for (only) positioning or realisation of the pressure. Skins carry a large proportion of the stresses generated by bending, shear, compression and racking loads depending on their end use.

##### **3.2.5 T-beams**

A T-beam is a theoretical model of a beam to be used for calculation purposes only. Such a T-beam consists of a wooden rib which is (at one side) rigidly bonded to a skin with a limited effective width. The effective width has to be calculated according to Figure 9.2 of prEN 1995-1-1.

##### **3.2.6 Double T- or I-beams**

A double T- or I-beam is a theoretical model of a beam to be used for calculation purposes only. Such a beam consists of a rib which is (at both sides) rigidly bonded to skins with limited effective widths. The effective flange width of each skin has to be calculated according to Figure 9.2 of prEN 1995-1-1.

##### **3.2.7 Core**

Material positioned between two skins.

##### **3.2.8 Skin**

Sheathing or boarding covering made of flat wood-based sheet.

## SECTION TWO: GUIDANCE FOR THE ASSESSMENT OF THE FITNESS FOR USE

### GENERAL NOTES

#### a. **Applicability of the ETAG**

This ETAG provides guidance on the assessment of a family of prefabricated wood-based loadbearing stressed skin panels and their intended uses. It is the ETA applicant who defines the stressed skin panels for which he is seeking an ETA and how it is to be used in the works, and consequently the scale of the assessment

#### b. **General layout of this section**

The assessment of fitness of prefabricated wood-based loadbearing stressed skin panels with regard to their fitness for intended use in the works is a process with three main steps:

Chapter 4 clarifies **the specific requirements for the works** relevant to the prefabricated wood-based loadbearing stressed skin panels and uses concerned, beginning with the Essential Requirements for works (CPD Art. 11.2) and then listing the corresponding relevant characteristics of the stressed skin panels.

Chapter 5 extends the list in Chapter 4 into more precise definitions and **the methods available to verify product characteristics** and to indicate how the requirements and the product characteristics are described. This is done by test procedures, methods of calculation and other appropriate methods.

Chapter 6 provides guidance on **assessing and judging methods** to confirm fitness for the intended use of the stressed skin panels.

Chapter 7, assumptions and recommendations are only relevant in as far as they concern the basis upon which the assessment of the stressed skin panels is made concerning their fitness for the intended use.

#### c. **Levels or classes or minimum requirements, related to the essential requirements and to the product performance (see ID, clause 1.2 and EC Guidance Paper E)**

According to the CPD, 'classes' in this ETAG refer only to mandatory levels of classes laid down in the EC mandate.

This ETAG indicates however the compulsory way of expressing relevant performance characteristics for the stressed skin panels. If, for some uses at least one Member state has no regulations, a manufacturer always has the right to opt out of one or more of them, in which case the ETA will state 'no performance determined' against that aspect, except for those properties for which, when no determination has been made, the stressed skin panels do not any longer fall under the scope of the ETAG; such cases shall be indicated in the ETAG.

**d. Working life (durability) and serviceability**

The provisions, test and assessment methods in this Guideline or referred to, have been written, based upon the assumed intended working life of the stressed skin panels for the intended use of at least 50 years, provided that the stressed skin panels are subject to appropriate use and maintenance (cfr. ch 7). These provisions are based upon the current state of art and the available knowledge and experience.

An "assumed intended working life" means that it is expected that, when an assessment following the ETAG provisions is made, and when this working life has elapsed, the real working life may be, in normal use conditions, considerably longer without major degradation affecting the Essential Requirements.

The indications given as to the working life of a stressed skin panel cannot be interpreted as a guarantee given by the producer or the approval body. They should only be regarded as a means for the specifiers to choose the appropriate criteria for stressed skin panels in relation to the expected, economically reasonable working life of the works (based upon ID, paragraph 5.2.2).

**e. Fitness for the intended use**

According to the CPD it has to be understood that within the terms of this ETAG, products shall 'have such characteristics that the works in which they are to be incorporated, assembled, applied or installed, can, if properly designed and built, satisfy the Essential Requirements' (CPD, Art. 2.1).

Hence, the stressed skin panels shall be suitable for use in construction works which (as a whole and in their separate parts) are fit for their intended use, account being taken of economy, and in order to satisfy the Essential Requirements. Such requirements must, subject to normal maintenance, be satisfied for an economically reasonable working life. The requirements generally concern actions which are foreseeable (CPD, Annex 1, preamble).

## 4 REQUIREMENTS

This chapter sets out the aspects of performance to be examined in order to satisfy the relevant Essential Requirements, by:

- expressing in more detail, within the scope of the ETAG, the relevant Essential Requirements of the CPD in the Interpretative Documents and in the mandate, for works or part of the works, taking into account the actions to be considered, as well as the expected durability and serviceability of the works.
- applying them to the scope of the ETAG of prefabricated wood-based loadbearing stressed skin panels and providing a list of relevant stressed skin panel characteristics and other applicable properties.

When a product characteristic or other applicable property is specific to one of the Essential Requirements, it is dealt with in the appropriate place. If, however, the characteristic or property is relevant to more than one Essential Requirement, it is addressed under the most important one with cross reference to the other(s). This is especially important where a manufacturer claims ‘No performance determined’ for a characteristic or property under one Essential Requirement and it is critical for the assessing and judging under another Essential Requirement. Similarly, characteristics or properties that have a bearing on durability assessments may be dealt with under ER 1 to ER 6, with reference under clause 4.7. Where there is a characteristic which only relates to durability, this is dealt with in clause 4.7.

This chapter also takes into account further requirements, if any (e.g. resulting from other EC Directives) and identifies aspects of serviceability including specifying characteristics needed to identify the stressed skin panel (cf. ETA-format par. II.2).

Table 1 shows the links between the Essential Requirements (ER) in the Construction Products Directive (CPD), the relevant paragraphs of the corresponding Interpretative Documents (ID) to the CPD, and the related requirements and product performances in this ETA Guideline.

**Table 1 Summary checklist**

ER	Corresponding ID paragraph for works	Element concerned	Corresponding ID paragraph for product performance	Performance Characteristics
1	2.1 Variable actions  Accidental actions	floors/roofs roofs walls/roofs  floors/walls floors/walls roofs/floors/walls	4.3.2 imposed loads snow load wind load  impact load seismic actions resistance to fixings	Loadbearing capacity Creep Dimensional stability Racking resistance <sup>(1)</sup> Stiffness
2	4.2.2 Loadbearing capacity 4.2.3 Limitation of generation and spread of fire and smoke without or beyond room of origin ( 4.2.3.3.2a and b and 4.2.4.2a)	roofs/walls/floors  roofs/walls/floors	4.3.1.1 Products subject to reaction to fire requirements 4.3.1.3 Products subject to resistance to fire requirements 4.3.1.3.3 Loadbearing elements 4.3.1.2 Products subject to fire requirements	1. Reaction to fire  2. Resistance to fire  3. External fire performance of roof coverings and claddings
3	3.3.1.1 Air quality  3.3.1.2 Indoor environment Dampness: (in particular 3.3.1.2.3.1)  3.3.5 Outdoor environment	Roofs/walls/floors  Roofs/walls/floors  Roofs/walls/floors	3.3.1.2.3.e.1 and e.3 Dampness control 3.3.5.3 Release of pollutants to outdoor air 3.3.1.1.3.2a (building materials) Susceptibility to the growth of harmful micro-organisms Emission of volatile organic compounds and release of other pollutants	Water permeability Water absorption <sup>(1)</sup> Water vapour permeability Hygroscopic humidity content <sup>(2)</sup> Release (and content) of dangerous substances  Susceptibility to mould growth and insect attack <sup>(2)</sup>
4	3.3.1.2 Nature of surfaces  3.3.2.2 Direct impacts – Behaviour on impact	Floors  Walls	4.2 Capability to avoid slippery floors  3.3.2.3 Capability to resist horizontal thrust	Slipperiness  Impact/shock resistance
5	2.3.1 Protection against airborne sound	Roofs/walls/floors	4.3.3 Acoustic properties: Other building products	Direct airborne sound insulation Impact sound insulation Sound absorption <sup>(3)</sup>
6	4.2 Energy consumption limitation	Roofs/walls/floors	4.2 Components Characteristics	Thermal conductivity/resistance Air permeability Thermal inertia

<sup>(1)</sup> only for walls

- (2) durability aspects
- (3) optional

## **4.1 MECHANICAL RESISTANCE AND STABILITY (ER 1)**

### **4.1.1 Resistance to static and dynamic loads**

The prefabricated wood-based loadbearing stressed skin panels shall have adequate resistance to static and dynamic loads and safety against structural collapse and inadmissible deformations.

The relevant actions to be considered comprise normally self-weight, imposed loads, wind loads and snow loads.

Requirements for the liability of both variable and accidental loads and safety requirements shall be in accordance with laws, regulations and administrative provisions, applicable to the end use of the stressed skin panel in the works.

### **4.1.2 Dimensional stability**

All wood-based panels should have a moisture content at installation close to the moisture content it will have in service.

The dimensional stability (size and thicknesses) of the stressed skin panels, even though there will be varying moisture content and (possible) differences in thicknesses in the outer skin and inner skin, shall not affect the intended performance of the stressed skin panels.

## **4.2 SAFETY IN CASE OF FIRE (ER 2)**

The following aspects of performance are relevant to this Essential requirement for the prefabricated wood-based loadbearing stressed skin panels:

### **4.2.1 Reaction to fire**

The reaction to fire performance of prefabricated wood-based loadbearing stressed skin panels shall be in accordance with laws, regulations and administrative provisions applicable to prefabricated wood-based loadbearing stressed skin panels in their intended end use application. This performance shall be expressed in the form of a classification specified in accordance with the relevant EC decision and the appropriate CEN classification standards.

### **4.2.2 Resistance to fire**

The resistance to fire performance of prefabricated wood-based loadbearing stressed skin panels shall be in accordance with laws, regulations and administrative provisions applicable to prefabricated wood-based loadbearing stressed skin panels in their intended end use application. This performance shall be expressed in the form of a classification specified in accordance with the relevant EC decision and the appropriate CEN classification standards.

### **4.2.3 External fire performance of roof coverings and claddings**

Roof coverings and claddings can be part of a stressed skin panel. If so, they shall have the necessary external fire performance applicable to the end use application.

The external fire performance of roof coverings and claddings shall be in accordance with laws, regulations and administrative provisions applicable to prefabricated wood-based loadbearing stressed skin panels in their intended end use application. This performance shall be expressed in the form of a classification specified in accordance with the relevant EC decision and the appropriate CEN classification standards.

## **4.3 HYGIENE, HEALTH AND THE ENVIRONMENT (ER 3)**

### **4.3.1 Water vapour permeability and moisture resistance**

The stressed skin panels shall be designed and installed in such a way as to minimize the risk of harmful levels of interstitial and surface condensation of moisture which may cause unacceptable growth of micro-organisms and/or affect the indoor climate.

Thermal bridges, which may cause water vapour condensation affecting hygiene, health and environment, shall be avoided.



### **4.3.2 Watertightness**

#### **4.3.2.1 External envelope**

The stressed skin panels, installed in the external envelope shall prevent leakage of water from rain and melting snow into the works.

Measures to weather resistance during installation shall be taken for both the stressed skin panels and the joints.

#### **4.3.2.2 Internal surfaces**

Internal wall and floor surfaces (of stressed skin panels) in bathrooms, toilets, etc, claimed to be watertight by the manufacturer, shall be sufficiently impervious to water absorption to avoid moisture levels in materials and components which may lead to unacceptable growth of micro-organisms .

### **4.3.3 Release of dangerous substances**

The stressed skin panels must be such that, when installed according to the appropriate provisions of the Member States, they allow for the satisfaction of the ER 3 of the CPD as expressed by the national provisions of the Member States and in particular do not cause harmful emission of toxic gases, dangerous particles or radiation to the indoor environment nor contamination of the outdoor environment (air, soil or water).

#### **Emission of formaldehyde in the case of indoor use:**

If formaldehyde-containing resins are used for the production of wood-based panels, the release or the content of formaldehyde shall be determined.

## **4.4 SAFETY IN USE (ER 4)**

### **4.4.1 Slipperiness of floors**

To limit accidental falls in buildings under normal use, finished floor surfaces shall not be unacceptably slippery.

### **4.4.2 Impact/shock resistance**

Roofs, walls and floors shall have sufficient strength to withstand dynamic loads to ensure retention of their performance and consequently to protect persons from injury by brittle material or falling through. For external walls the impact/shock resistance has to withstand 900 Joules with a soft body of 50 kg.

## **4.5 PROTECTION AGAINST NOISE (ER 5)**

### **4.5.1 Airborne sound insulation**

Walls and floors shall provide the necessary airborne sound insulation applicable to the intended use of the building.

The external walls and roofs shall provide the necessary sound insulation applicable to the intended use of the building concerning airborne noise from the outside (i e noise from industry, road and air traffic, etc).

### **4.5.2 Impact sound insulation**

Floors shall provide the necessary impact sound insulation applicable to the intended use of the building.

### **4.5.3 Sound absorption**

The internal surfaces of stressed skin panels to be used in walls, roofs or floors may need to provide the necessary sound absorption applicable to the intended use of the building.

## **4.6 ENERGY ECONOMY AND HEAT RETENTION (ER 6)**

### **4.6.1 Thermal resistance**

The roofs, walls and bottom floors shall provide the necessary thermal insulation applicable to the intended use of the building, with R-values (including thermal bridging) and/or U-values (if required) in accordance with national regulations. Thermal bridges, which may cause uncomfortably low temperatures or water vapour condensation affecting hygiene, health and environment related to ER 3, shall be avoided.

### **4.6.2 Air permeability**

The roofs, external walls and ground floors shall provide adequate airtightness to limit unnecessary energy loss and prevent unacceptable cold draughts which may affect persons health in relation to ER 3.

### **4.6.3 Thermal inertia**

The thermal inertia of a stressed skin panel shall be known, where applicable, to assess the effect on energy consumption and heat retention.

## **4.7 ASPECTS OF DURABILITY, SERVICEABILITY AND IDENTIFICATION**

### **4.7.1 Aspects of durability**

The design of prefabricated wood-based loadbearing stressed skin panels shall ensure that deterioration of materials and components during the intended working life does not significantly affect the performance of the stressed skin panels in relation to fulfilling all the Essential Requirements 1–6.

#### **Wood preservatives**

Wood preservatives have to fulfil the requirements of national regulations valid in the place of use of the product.

#### **Insulating core**

Ageing of insulating materials shall not affect the performance of the stressed skin panels.

#### **Adhesives**

Adhesives for loadbearing applications, e.g. phenolic, aminoplastic or polyurethane adhesives, shall be used.

#### **Moisture content of timber and wood-based materials**

The moisture content of the timber, glulam and prefabricated built-up joists of timber and/or wood-based panels shall at manufacturing of the stressed skin panels generally not exceed 15% for timber members and 12% for board members; moisture movement shall not cause shear across glued components.

### **4.7.2 Aspects of serviceability**

Stressed skin panels shall have sufficient stiffness to avoid unacceptable bowing, deflections and/or vibrations from normal use.

### **4.7.3 Aspects of identification**

The materials used in the stressed skin panels shall be identifiable in relation to those properties that have an influence to the ability of the stressed skin panels to fulfil the Essential Requirements.

## **5 METHODS OF VERIFICATION**

This chapter refers to the verification methods used to determine the various aspects of performance of the prefabricated wood-based loadbearing stressed skin panels in relation to the requirements for the works (calculations, tests, engineering knowledge, site experience, etc) as set out in Chapter 4.

The possibility exists to use existing data in accordance with the EOTA Guidance Document No 004 on The provision of data for assessment leading to ETA.

**TABLE 2 SUMMARY CHECKLIST**

ER	ETAG clause on product performance	ETAG clause on method of verification	Specific ETAG clause on method of verification
1	4.1 Mechanical resistance and stability	5.1 Mechanical resistance and stability	5.1.1 Verification of structural capacity in general 5.1.2 Verification by calculation 5.1.3 Verification by testing
2	4.2 Safety in case of fire	5.2 Safety in case of fire	5.2.1 Reaction to fire 5.2.2 Fire resistance 5.2.3 External fire performance of the roof covering
3	4.3 Hygiene, health and the environment	5.3 Hygiene, health and the environment	5.3.1 Water vapour permeability and moisture resistance 5.3.2 Watertightness of stressed skin panels 5.3.3 Release of dangerous substances 5.3.4 Dimensional stability
4	4.4 Safety in use	5.4 Safety in use	5.4.1 Slipperiness of floors 5.4.2 Impact/shock resistance
5	4.5 Protection against noise	5.5 Protection against noise	5.5.1 Airborne sound insulation 5.5.2 Impact sound insulation 5.5.3 Sound absorption
6	4.6 Energy economy and heat retention	5.6 Energy economy and heat retention	5.6.1 Thermal resistance 5.6.2 Air permeability 5.6.3 Thermal inertia

## 5.1 MECHANICAL RESISTANCE AND STABILITY

### 5.1.1 Verification of structural capacity in general

If and when Eurocodes are quoted in this ETAG as the methods for the verification of certain product characteristics, their application in this ETAG, as well as in the subsequent ETAs issued according to this ETAG, shall be in accordance with the principles laid down in the EC Guidance Paper L on the use of Eurocodes in harmonised European technical specifications, including the methods 1, 2 and 3 given in this document.

The loadbearing capacities – including resistance to fixings – for prefabricated wood-based loadbearing stressed skin panels, related to the intended use of the stressed skin panels, shall be verified by calculation or by testing. In case of verification by calculation, it shall be done in conformity with the basis of design in EN 1990, i.e. adapted to ultimate limit state design. The declared capacities are to be used in structural designs for individual works, under the condition that the structural design conforms to the principles in Eurocode 0 and associated National Application Documents.

#### 5.1.1.1 Verification by calculation

##### 5.1.1.1.1 Calculation of stressed skin panels

The loadbearing capacities of the stressed skin panels types B1, B2, C1 and C2 (see figure 1) shall be calculated according to prEN 1995-1-1 (Eurocode 5, Part 1-1). The recommended values for wood and wood-based products, which are given in this standard shall be used to calculate the declared design values in the ETA. The principles for calculating the effective flange width of the sheathing are shown in Figure 9.2 of prEN 1995-1-1.

When national building regulations require amendments of declared values due to other recommended values in National Application Documents, adjustments of capacities are presumed to be done as a part of the specific structural design for each individual works.

##### 5.1.1.1.2 Calculation of stressed skin panels for use in roofs

The loadbearing capacities of the stressed skin panels types B1, B2, C1 and C2 to be used in roofs shall be calculated according to prEN 1995-1-1 (Eurocode 5, Part 1-1).

All types (A, B1, B2, C1 and C2) can be calculated according to EOTA Technical Report No 019, which gives an accepted and recommended calculation method.

The calculation results obtained for the loadbearing capacity are design values using specific nationally determined parameters, as laid down in the EC GP L.

#### 5.1.1.2 Design assisted by testing

If a manufacturer can produce a calculation method for the performance of his product, it shall be possible to use his system, if the system has been verified through the methods described in the ETA-guideline.

In general the design assisted by testing can be used when:

- the strength or stiffness properties of the stressed skin panels are not well known or documented;
- the theoretical model to estimate the mechanical resistance and stability is not complete.

Guidance for design assisted by testing are given in clause 3.2 of Appendix D of Part 1 of Eurocode 1 (EN 1991-1).

The extension of the test programme depends on the degree of uncertainty in the used material properties as well as on the degree of uncertainty in the calculation method used. Suitable tests based on the methods given in the section "Test methods" described in manufacturers calculation method shall be considered separately for each for each product.

The products to be tested shall be a representative sample of the population.

From the test results the characteristic value ( $x_k$ ) for the population shall be given as the 5 % fractile value determined using a confidence level of 75 %.

The mean value shall be given using a confidence level of 50 %.

For a normal distribution the characteristic value  $x_k$  is given by:

$$x_k = x_{mean} - k_n x_{stdev}$$

where  $x_{mean}$  is the mean value and  $x_{stdev}$  is the standard deviation of the property  $x$  for the sample  $k_n$ . The factor depends on the number of tests and confidence level.

Values for  $k_n$  are given in Table A.

NOTE: When it is reasonable to assume that a material property is better described by a log-normal distribution function than by a normal distribution function, the logarithm of the material property may be used instead of the material property itself for determination of the characteristic values.

For a log-normal distribution the characteristic value  $x_k$  is given by:

$$x_k = e^{(\ln x)_{mean} - k_n (\ln x)_{stdev}}$$

Values for  $k_n$  are given in Table A.

Table A, values of  $k_n$

Number of tests	8	10	20	30	40	50	100	?
$k_n$	2.19	2.10	1.93	1.87	1.83	1.81	1.76	1.64

If characteristic properties are to be determined by test alone, the number of tests should be at least 30. If the tests serve to confirm certain theoretical model assumptions, a smaller number of tests than 30 will be sufficient.

NOTE: If it is impossible to test a representative sample of the product, the value of the standard deviation shall not be taken as less than 20 % of the value of the mean value. This is, for example, the situation when the product to be tested is produced on a pilot production line.

NOTE: The characteristic values determined according to Equation (5.1.1) or (5.1.2) are the highest values that may be declared as the characteristic values. It may be advisable to declare lower values to avoid an unreasonable amount of rejections during the quality control process.

When the design assisted by testing method is used to determine strength or stiffness properties of the stressed skin panels, the characteristic value based on the results given by Equation (5.1.1) or (5.1.2) shall be used in the design.

When the design assisted by testing method is used to calibrate the theoretical model to the test results, an unknown model coefficient  $D$  is introduced.

Using the test results and the results from the theoretical model, the mean value of the model coefficient  $D_{mean}$  as well as the standard deviation of the model coefficient  $D_{stdev}$  is determined. The characteristic value of the model coefficient  $D_k$  is given from an equation similar to Equation (5.1.1) or (5.1.2).

### 5.1.1.3 Testing

The characteristic resistance and stiffness can be determined directly from tests.

The sampling procedure and determination of characteristic values are given in clause 5.1.1.2. However, the number of specimens shall not be less than 30 for each type, grade and size of the product to be tested. Furthermore, the values for  $k_n$  in Equation (5.1.1) or (5.1.2) are given in Table A.

Suitable tests based on the methods given in the section "test methods" described in the EOTA Technical Report 002, shall be considered separately for each product to determine the following properties:

- bending;

- compression;
- combination of the above;
- shear.

The products to be tested shall be a representative sample of the population.

### 5.1.2 Dimensional stability

For new products or for specific uses, if permanent or non-permanent deflection is expected considering the hygroscopicity/non- hygroscopicity of the different components, this deflection can be measured as follows.

#### a. Behaviour in homogeneous humidity conditions:

- Two stressed skin panels are placed in a room regulated at  $23 \pm 2^\circ\text{C}$  and 15 or  $20 \pm 5\%$  RH (relative humidity) during three weeks, then in a room regulated at  $23 \pm 2^\circ\text{C}$  and 90 % RH (alternative stressed skin panels can be used, two at 15-20 % RH and two at 90 % RH in the same time).
- The stressed skin panels shall be stored free for/to any deformation, e.g. vertically on a long side, without effect of their own weight, the main faces exposed to the same air ambience.
- Measure every week the maximum deflection in the length and the width direction, using premarked points located in the middle of each edge.
- If a global curving is observed, measure also the diagonal deflection.

#### b. Behaviour between two different humidity conditions:

- A test specimen comprising one or several stressed skin panels free for deformation in the length direction and sealed to a frame, is placed between two climates regulated during three weeks.
- The measurements are made as in clause 5.1.2a.
- The choice of ambiances is defined according to the most severe conditions expected in the considered field of application.

In absence of specific conditions use (according to EN 1121):

- external side at  $3 \pm 2^\circ\text{C}$  and  $85 \pm 5\%$  RH;
- internal side at  $23 \pm 2^\circ\text{C}$  and  $30 \pm 5\%$  RH.

## 5.2 SAFETY IN CASE OF FIRE

The ETAG is based upon the European Commission's decisions, as well as tests and classifications according to EN standards. If these standards are not available at the time when this ETAG is to be made operational, the verification of reaction to fire and fire resistance may also be considered to be based on national classification standards on a case-by-case basis in a transition period (taking into account the intended use of the stressed skin panels and the countries where the stressed skin panels are put on the market).

### 5.2.1 Reaction to fire

Prefabricated wood-based stressed skin panels shall be tested, using the test method(s) relevant for the corresponding reaction to fire class, in order to be classified according to EN 13501-1.

Prefabricated wood-based stressed skin panels are considered to satisfy the requirements for performance Class A1 of the characteristic reaction to fire, in accordance with the provisions of EC Decision 96/603/EC (as amended) without the need for testing on the basis of its listing in that decision.

### 5.2.2 Resistance to fire

ADVANCEADVANCEPrefabricated wood-based stressed skin panels shall be tested, using the test method relevant for the corresponding fire resistance class, in order to be classified according to EN 13501-2.

### 5.2.3 External fire performance roof covering and claddings

If roof covering and claddings are part of the stressed skin panels, they shall be tested, using the test method relevant for the corresponding external fire performance roof (or cladding) class, in order to be classified according to prEN 13501-5.

## **5.3 HYGIENE, HEALTH AND THE ENVIRONMENT**

### **5.3.1 Water vapour permeability and moisture resistance**

Water vapour resistance of the relevant layers may be determined by reference to product standards, as in EN 12524 or to test reports. Testing of water vapour resistance for existing thermal insulating products shall be according to EN 12086 and for (new) building materials according to EN ISO 12572 or similar test methods.

### **5.3.2 Watertightness**

#### **5.3.2.1 External envelope**

If the roof covering and/or claddings are part of the stressed skin panels, the leakage of water and melting snow through these elements may be determined by reference to the relevant product standards.

#### **5.3.2.2 Internal surfaces**

If claimed by the manufacturer, the performances of surfaces, related to water absorption or watertightness, of stressed skin panels to be used in wet areas (bathrooms, toilets, etc) may be assessed on the basis of national requirements, respectively experience/technical knowledge and verified by references to conformity with relevant performance standards for the products which are applied.

### **5.3.3 Release of dangerous substances**

#### **5.3.3.1 Presence of dangerous substances in the stressed skin panels**

The applicant shall submit a written declaration stating whether or not the stressed skin panels contain dangerous substances according to European and national regulations, when and where relevant in the Member States, and shall list these substances.

#### **Emission of formaldehyde:**

Determination of the release of formaldehyde shall be performed according to EN 717-2 or EN 120.

#### **Use of biocides:**

If biocides are used as preservatives for wood, they must be declared.

#### **5.3.3.2 Compliance with the applicable regulations**

If the stressed skin panels contain dangerous substances as declared above, the ETA will provide the method(s) which has (have) been used for demonstrating compliance with the applicable regulations in the Member States, according to the dated EU database [method(s) of content or release, as appropriate].

#### **5.3.3.3 Application of the precautionary principle**

An EOTA member has the possibility to provide to the other members, through the Secretary General, warning about substances which, according to Health authorities of its country, are considered to be dangerous under sound scientific evidence, but are not yet regulated. Complete references about this evidence will be provided.

This information, once agreed upon, will be kept in an EOTA database, and will be transferred to the Commission services.

The information contained in this EOTA database will also be communicated to any ETA applicant. On the basis of this information, a protocol of assessment of the stressed skin panels, regarding this substance, could be established on request of a manufacturer with the participation of the Approval Body which raised the issue.

## **5.4 SAFETY IN USE**

### **5.4.1 Slipperiness of floors**

Verification of slip resistance of flooring materials shall be undertaken in accordance with the relevant EN standards for the specified finished flooring products.

### **5.4.2 Impact/shock resistance**

Mechanical resistance of walls, floors and roofs against dynamic loads shall primarily be assessed by the approval body on the basis of existing knowledge related to the intended use.

Stressed skin panels (to be used in walls, floors and roofs) with well-known lining materials, such as gypsum boards, wood-based board products and solid timber boards with suitable rib spacing (e.g. at maximum 60 cm), should generally be accepted to have a satisfactory impact/ shock resistance for normal use in residential housing, office buildings, etc. This should be based on evidence accepted by all Approval bodies.

When the performance of a stressed skin panel is not known to be acceptable, or a quantified performance is to be declared due to national building regulations in some member states, the impact/shock resistance shall be tested. Testing of stressed skin panels to be used in walls has to be undertaken according to EOTA TR 001 (Determination of Impact Resistance).

For stressed skin panels used in loadbearing subfloors on joists and in roofing, the impact/shock resistance should be accepted as adequate when the stressed skin panels conform to the requirements in EN 12871.

## **5.5 PROTECTION AGAINST NOISE**

### **5.5.1 Airborne sound insulation**

The airborne sound insulation performance of the assembled stressed skin panels shall be verified by laboratory tests according to the relevant parts of EN-ISO 140-3. The rating of airborne sound insulation shall be undertaken according to ENV ISO 717-1.

### **5.5.2 Impact sound insulation**

The impact sound insulation performance of the assembled stressed skin panels to be used in floors shall be verified by laboratory tests according to the relevant parts of EN ISO 140-6 and the rating of impact sound insulation shall be undertaken according to EN ISO 717-2.

### **5.5.3 Sound absorption**

If required, sound absorption is measured according to EN 20354/A1.

## **5.6 ENERGY ECONOMY AND HEAT RETENTION**

### **5.6.1 Thermal resistance**

Thermal resistance, R-value and/or U-value (if required), of the stressed skin panels shall be calculated according to EN ISO 6946, using the design thermal conductivity values for materials according to EN 12524 or (concerning insulating materials) conductivities determined according to EN 13162/13163/13164/13165/13166/13167/13168/13169/13170/13171. Alternatively the thermal resistance may be verified by testing according to EN ISO 8990.

If the design has technical solutions with special thermal bridges not covered by the ordinary verification of the thermal resistance as mentioned above, the effect on the overall thermal resistance and the surface temperatures in relation to clause 4.3.1 shall be verified when the approval body finds this necessary. Such verification may be undertaken by calculations according to EN ISO 10211-1 or by testing according to EN ISO 8990 or relevant test standards for specific products.

### **5.6.2 Air permeability**

Assessment of the air permeability of the roofs, external walls and ground floors is normally undertaken by judgement of the construction details, on the basis of the knowledge and experience.

Where joints are part of the stressed skin panels and when the approval body finds it necessary, e.g. when non-traditional joints are applied, the air permeability shall be verified by testing. Tests may be carried out by laboratory testing according to EN 1026, EN 12114 or other relevant test standards. The tests must include long-term performance when relevant.

The assessment of air permeability should be undertaken with regard to energy economy (unintended ventilation), cold draughts (see clause 4.6.2) and risks of water vapour condensation inside the construction (see clause 4.3.1). The assessment must be undertaken on the basis of the intended use of the stressed skin panels taking into account the internal and external design climates (e.g. geographical areas).

### **5.6.3 Thermal inertia**

To calculate the thermal inertia, information on the following properties of the stressed skin panel must be taken into account:

- total mass per unit area (in  $\text{kg}/\text{m}^2$ );
- density of materials used (in  $\text{kg}/\text{m}^3$ );
- heat capacity of materials used (in  $\text{J}/\text{kg K}$ );
- thermal transmittance of materials used (in  $\text{W}/\text{m}^2 \text{K}$ ).

## **5.7 ASPECTS OF DURABILITY, SERVICEABILITY AND IDENTIFICATION**

### **5.7.1 Aspects of durability**

The estimated working life of stressed skin panels will normally have to be determined by the approval body, on the basis of experience and general knowledge. In so doing, the approval body must take into account the influence of climatic conditions when verifying the estimated working life of stressed skin panels. The EC Guidance Paper F on Durability and the Construction Product Directive may be consulted with regard to relevant degradation factors and climatic sub-divisions of Europe.

The most important aspects related to the durability of stressed skin panels are:

Insect attack of the wood material;

Fungal attack of the wood material;

Corrosion of metal fasteners in wet climates.

The durability of materials and components shall be verified for resistance to the major degradation agents such as moisture etc, making reference to the relevant standards for each product.

When verifying the durability of materials and components it should be borne in mind that durability is best ensured by good design measures. Excessive moisture content should primarily be prevented by adequate construction details. Wood preservative treatments are the final line of protection against wood-destroying fungi.

Wood preservatives must be approved under national regulations or European Regulations (Biocidal Products Directive 98/8/EC). The selection of wood preservative and its specification in terms of penetration and retention of preservative, shall be in accordance with the appropriate suite of European Standards (see EN 351-1 Annex A).

The durability of wood and wood-based products should be verified and specified to the following EN standards (taking into account the various hazard classes, given in EN 12944-2).

### **Durability of solid wood, laminated timber and wood-based materials**

The natural durability of solid wood and laminated timber should be verified according to EN 350-1 and EN 386 respectively.

The natural durability of wood-based materials should be identified according to EN 350-1 and -2 and

selected according to EN 460 for use in the appropriate hazard class described in EN 335-1, -2 and -3:

- hazard class 1: Structural members and other components situated on the inside of the panel sheathing,
- hazard class 2: Roof sheathing and battens behind ventilated claddings,
- hazard class 3: External wall claddings, trims, etc continually exposed to the weather.

As stated in EN 335-2 and -3, the risk of insect attack of susceptible wood used in construction depends on geographical regions in Europe. Chemical treatment of wood and wood-based products may be required in some Member States. Such treatment shall be declared in the ETA when the manufacturer opts for it.

If preservative treatment is proposed, the preservative should be specified according to EN 599-1 and -2. The treated timber should comply with a specification, written according to EN 351-1, or a national classification and labelling corresponding to these standards (see flow chart diagram in EN 351-1, Annex A).

#### **Durability of plywood**

Plywood which complies with EN 636-3 should be installed in service class 3.  
 Plywood which complies with EN 636-2 should be installed in service class 2.  
 Plywood which complies with EN 636-1 should be installed in service class 1.  
 Plywood for structural purposes should be balanced.

#### **Durability of Laminated Veneer Lumber (LVL)**

LVL and LVL/1 which complies with prEN 14374 may be installed in service class 1.  
 LVL/2 which complies with prEN 14374 should be installed in service class 2.  
 LVL/4 which complies with prEN 14374 should be installed in service classes 1 and 2.

#### **Durability of particle boards and OSB**

Particle board which complies with EN 312-5 or -7 should only be installed in service classes 1 or 2. Particle board which complies with EN 312-4 or -6 should only be installed in service class 1.

Oriented strand board which complies with EN 300 grades OSB 3 or 4 should only be installed in service classes 1 or 2.

#### **Durability of fibreboard and hardboard**

Fibreboard which complies with EN 622-5 should only be installed in service classes 1 or 2.  
 Fibreboard which complies with EN 622-3 should only be installed in service class 1.  
 Hardboard which complies with EN 622-2 should only be installed in service classes 1 or 2.

#### **Durability of insulating core**

Insulating materials have to be in accordance with EN 13162/13163/13164/13165/13166/13167/13168/ 13169/13170/13171.

Insulation materials, not covered by these standards, shall be assessed according to ETAG 016, part 2, clause 5.7 as "other insulating materials".

#### **Durability of adhesives**

Phenolic and aminoplastic adhesives which comply with EN 301, Adhesive type I, should be used in service classes 2.

Polyurethane adhesives which comply with EN 301, Adhesive type II shall be additionally tested as follows:

- testing according to EN 302-1 with gluelines < 0.1 mm and 0.5 mm;
- testing according to EN 302-3 in addition with oak, pine and beech;
- investigation into the foaming behaviour after different open time periods;
- investigation into the application properties as viscosity, pot life, open time, wetting, applicability by brushing, PH value and the influence of indoor climate on the setting rate;
- influence of both the open and closed assembly time on the tensile shear strength of the so-called long-cut beech specimen (according to EN 302-1, with a 1 mm glueline);

- investigation into the influence of cold and hot storage (- 60°C/ + 50°C and 70°C) in the tensile shear strength of long-cut beech specimen with glueline thicknesses  $\leq$  0.1 mm, 0.5 mm and 1.0 mm;
- investigation into the influence of (maximum) three years' storage under climatic conditions and the permanent load on the bond integrity of beech transverse tensile test specimen with glueline thicknesses  $\leq$  0.1 mm, 0.5 mm and 1.0 mm.

The performance and minimum production conditions of finger joints shall be assessed according to EN 385.

#### **Moisture content of timber and wood-based materials**

The moisture content has to be checked according to:

- EN 322 for wood-based materials;
- ISO 3130 for solid timber.

#### **5.7.2 Aspects of serviceability**

Deflection limits related to the structural design of the stressed skin panels shall be determined by calculations or by tests as in 5.1.

The stiffness of stressed skin panels shall be calculated in accordance with clause 4.4.3 in Eurocode 5 to check adequate serviceability under normal variable loads.

#### **5.7.3 Identification**

The identification parameters shall be chosen appropriately, so that they give a clear understanding of the properties of the product.

The specifications of materials and components, as far as possible, should provide maximum flexibility to choose alternative products for a stressed skin panel, without affecting the declared performances or the fitness for the intended use. Hence the specifications, as far as possible, should refer to one of the following:

- a product standard;
- or
- an ETA;
- or
- material properties or performance specifications given directly in the ETA for the stressed skin panel.

## **6 ASSESSING AND JUDGING THE FITNESS FOR USE**

This chapter details the performance requirements to be met (Chapter 4) in precise and measurable (as far as possible and proportional to the importance of the risk) or qualitative terms, related to the product and its intended use, using the outcome of the verification methods (Chapter 5).

**Table 3 Summary checklist**

ER	ETAG clause on product performance	Type of performance declaration in ETAs	NPD <sup>(1)</sup>
1	6.1.2.1.1 External walls	- Vertical load capacity - Horizontal load capacity - Combined vertical/horizontal load capacity - Racking load capacity - Fixing capacity	No No No No Yes
	6.1.2.1.2 Internal loadbearing walls	- Vertical load capacity - Racking load capacity	No No
	6.1.2.1.3 Floors	- Imposed load capacity - Horizontal bending on edge load capacity	No Yes
	6.1.2.2 Roof structures	- Snow and/or wind load capacity - Concentrated imposed load capacity - Horizontal bending on edge load capacity - Fixing capacity	No Yes Yes Yes
2	6.2.1 Reaction to fire	- Classification according to Euroclasses in EN 13501-1	No
	6.2.2 Resistance to fire	- Classification according to EN 13501-2	Yes
	6.2.3 External fire performance of roof covering	- Classification according to prEN 13501-5	Yes
3	6.3.1 Water vapour permeability and moisture resistance	- Assessed to be acceptable in relation to the intended use of the building and any limitations regarding climatic zones	Yes
	6.3.2 Watertightness		
	6.3.2.1 External envelope	- Assessed to be acceptable in relation to any limitations regarding climatic zones	Yes
	6.3.2.2 Internal surfaces	- Assessed to be acceptable	Yes
6.3.3 Release of dangerous substances	- Declaration of dangerous substances	Yes	
4	6.4.1 Slipperiness of floors	- Assessed to be acceptable or - Slip resistance of flooring	Yes
	6.4.2 Impact resistance	- Assessed to be acceptable by judgement or - measured horizontal soft and hard body impact resistance of walls - measured vertical impact load resistance of floors and roofs	Yes  Yes Yes
5	6.5.1 Airborne sound insulation	- Weighted apparent sound reduction index for separating walls and floors - Weighted apparent sound reduction index for all other walls and floors - Weighted apparent sound reduction index for external walls and roof	No Yes Yes
	6.5.3 Sound absorption	- Sound absorption coefficient of internal surfaces	Yes

<sup>(1)</sup> No performance determined being an option

6	6.6.1 Thermal resistance	- Total thermal resistance $R_t$ and corrected thermal transmittance $U_c$ for:  Exterior walls Windows and external doors Floors Internal walls Roof	Yes Yes Yes Yes Yes
	6.6.2 Air permeability	- Measured air leakage of type tested buildings and/or components or - Assessed to be acceptable in relation to energy loss, cold draughts (ER 3), interstitial or surface condensation (ER 3), and intended use	Yes  Yes
	6.6.3 Thermal inertia	- Information on relevant data	Yes
	6.7.1 Aspects of durability	- Assessed to be acceptable in relation to intended use and the effect on performance related to ER 1–ER 6 - Possible conditions regarding maintenance	No Yes
	6.7.2 Aspects of serviceability	- Maximum deflections at serviceability limit state related to the loadbearing capacities declared under ER 1 - Stiffness against floor vibrations	No Yes
	6.7.3 Identification	- Values of appropriate identification parameters	Yes

<sup>(1)</sup> No performance determined being an option

## **6.1 MECHANICAL RESISTANCE AND STABILITY**

### **6.1.1 Declaration of mechanical resistance in general**

The loadbearing capacity of the stressed skin panels, taking into account the relevant connections, should normally be stated in the ETA as design values at ultimate limit state. Unless differently provided for in specific national regulations on works, the design value is calculated according to EN 1995-1-1. Before EN 1995-1-1 is published, the calculations should be undertaken on the basis of prEN 1995-1-1, using the modification factors specified in the standard.

The loadbearing capacities to be declared are specified in clause 6.1.1.1 and/or 6.1.1.2, and may preferably be given in the form of a table in the ETA.

The loadbearing capacity of stressed skin panels to be used in walls shall be given for specified wall heights as vertical resistance and racking strength per unit of the stressed skin panel, and as horizontal resistance perpendicular to the stressed skin panel per unit area.

#### **6.1.1.1 Structural capacities to be declared (on basis of calculation results)**

##### **6.1.1.1.1 Stressed skin panels to be used in walls and floors**

###### **6.1.1.1.1.1 Stressed skin panels to be used in external walls**

The following design values shall normally be declared:

1. Vertical resistance in kN/m for medium-term and short-term loads, without combination with loads perpendicular to the wall.
2. Vertical resistance in kN/m for the short-term load duration class, in combination with a specified instantaneous load perpendicular to the wall.  
The load perpendicular to the wall must be determined by the manufacturer in order to cover the wind loads which are relevant for the intended use of the stressed skin panels (geographical areas).
3. Horizontal resistance in kN/m<sup>2</sup> perpendicular to the surface of the stressed skin panel for instantaneous load, without combination with vertical loads.
4. Racking resistance for instantaneous load and stiffness, assuming that the frame is vertically anchored.
5. Resistance to fixings of the stressed skin panels to the substructure for instantaneous load, when such fixings are part of the stressed skin panels.

###### **6.1.1.1.1.2 Stressed skin panels to be used in structural partitions**

The following design values shall normally be declared:

1. Vertical resistance in kN/m for the medium-term and the long-term loads.
2. Racking resistance and stiffness for instantaneous loads, assuming that stressed skin panels are effectively anchored to the substructure.

###### **6.1.1.1.1.3 Stressed skin panels to be used in floors**

The following design values shall normally be declared:

1. Net vertical uniformly distributed medium-term and long-term imposed floor load resistance in kN/m<sup>2</sup> as defined in ENV 1991-2-1.
2. Vertical local concentrated medium-term imposed floor load resistance in kN as defined in ENV 1991-2-1.
3. Horizontal bending on edge resistance at ultimate limit state for instantaneous load.
4. Deflection in mm.

###### **6.1.1.1.2 Stressed skin panels to be used in roofs**

The following design values shall normally be declared:

1. Maximum uniformly distributed vertical medium-term, short-term and instantaneous load resistance in kN/m<sup>2</sup>.
2. Vertical local concentrated short-term imposed roof load resistance in kN as defined in ENV 1991-2-1.
3. Horizontal bending on edge resistance at ultimate limit state for instantaneous load.
4. Vertical and horizontal resistances to fixings of the stressed skin panels to the substructure at ultimate limit state for instantaneous loads, when such fixings are part of the stressed skin panels.
5. Deflection in mm.

*Notes:*

- ? Loadbearing capacities at instantaneous loads mentioned above shall be replaced by short-term load capacities when the declared values are calculated on the basis of prEN 1995-1-1, because wind loads are classified as short-term loads in this standard.
- ? Vertical load-carrying resistances of the stressed skin panels to be used in wall structures may include openings for windows and doors when the stressed skin panels has standard openings with specified dimensions, and standard load-carrying components around the openings.
- ? Racking load resistances are normally declared only for stressed skin panels in walls without openings. The racking load should normally also be declared on the basis that vertical uplift of stressed skin panels in walls are prevented by separate anchors designed for each individual works.
- ? Resistances against instantaneous and short-term loads for stressed skin panels in roofs shall normally be declared separately. On request of the ETA holder, specified combinations (with a specified wind load action) may also be declared.
- ? If necessary, the manufacturer should provide guidance on how to deal with e.g. windows, doors, roof windows, etc.

**6.1.1.2 Structural capacities to be declared (on basis of test results)**

See clause 6.1.1.1

**6.1.1.3 Structural analysis**

The detailed structural analysis to verify the declared capacities mentioned in clauses 6.1.1.1 or 6.1.1.2 should always be available to the approval body as a part of the technical file for the ETA.

**6.1.2 Dimensional stability**

The measurement of the dimensional stability shall have been carried out in accordance with the relevant product standards.

All the materials used, should comply with their relevant requirements for dimensional stability.

The Approval body shall assess the data and judge whether or not the stressed skin panels are sufficiently stable.

**6.2 SAFETY IN CASE OF FIRE**

**6.2.1 Reaction to fire**

Prefabricated wood-based loadbearing stressed skin panels shall be classified according to EN 13501-1.

**6.2.2 Resistance to fire**

Prefabricated wood-based loadbearing stressed skin panels shall be classified to the appropriate Part of EN 13501.

**6.2.3 External fire performance**

Prefabricated wood-based loadbearing stressed skin panels shall be classified according to EN 13501-5.

## **6.3 HYGIENE, HEALTH AND THE ENVIRONMENT**

### **6.3.1 Water vapour permeability and moisture resistance**

Assessment may be undertaken on the basis of moisture flow calculations and EN ISO 13788, taking into account the relevant design climatic conditions.

The product specifications shall be examined and performance in respect of exposure to moisture assessed on the basis of known material properties, design details and the intended use. Where properties such as water vapour permeability are not known, they shall have been determined by testing.

It shall be established that condensation in the stressed skin panel as a result of water vapour diffusion will not occur or will occur only to an extent where damage is not caused during the condensation period and the stressed skin panel will dry out again during the evaporation period.

The approval body will take account of the locations where the ETA applicant intends to market his product and assess this aspect using appropriate climate conditions.

### **6.3.2 Watertightness**

#### **6.3.2.1 External envelope**

The performance of the stressed skin panel will normally have to be declared in qualitative terms in relation to the intended use like potential climatic zones and with respect to durability aspects (see EC Guidance Paper F on Durability and the Construction Product Directive), as well as to the requirements mentioned in clause 4.3.2. When a stressed skin panel is assessed to be inadequate in certain regions (for example in areas with exceptional amounts of driving rain or potential snow penetration), the limitations on the intended use must be clearly stated in the ETA.

#### **6.3.2.2 Internal surfaces**

If so, it shall be clearly indicated in the ETA which parts of the stressed skin panels shall have adequate resistance to water absorption, respectively are classified as watertight surface.

### **6.3.3 Release of dangerous substances**

The stressed skin panels shall comply with all relevant European and national provisions applicable for the uses for which they are brought to the market. The attention of the applicant should be drawn on the fact that for other uses or other Member States of destination there may be other requirements which would have to be respected. For dangerous substances contained in the stressed skin panels, but not covered by the ETA, the NPD-option (no performance determined) is applicable.

#### **Emission of formaldehyde:**

For wood-based panel products the formaldehyde potential shall be classified in accordance with the following standards:

- EN 300 for oriented strand boards (OSB);
- EN 312-1 for particle boards;
- EN 622-1 for fibreboards;
- EN 1084 for plywood.

#### **Use of biocides:**

The use of biocide(s) has (have) to be declared stating the trade name of the biocide(s), the chemical name of the active component(s), the amount(s) and the technical procedure of application.

## **6.4 SAFETY IN USE**

### **6.4.1 Slipperiness of floors**

The slip resistance, only relevant if floor finishing is a part of the stressed skin panel, shall be declared according to the relevant EN standard for the specified finished flooring products.

### **6.4.2 Impact resistance**

Impact resistance can normally be declared as acceptable under defined conditions and not be quantified. Any limitations on intended use must be stated in the ETA.

When stressed skin panels to be used in wall structures have been tested according to EOTA TR 001 and/or use in floors and roofs according to EN 1195 and/or prEN 12871, the determined impact resistance should be declared in the ETA.

## **6.5 PROTECTION AGAINST NOISE**

Sound insulation performance of stressed skin panels shall be declared in the ETA as estimated values for airborne sound insulation and impact noise level to be expected in completed buildings. The performance shall be specified with designations according to ENV ISO 717-1 and EN ISO 717-2, and should preferably be specified as given below. Other designations for the sound insulation performance mentioned in ENV ISO 717-1 and EN ISO 717-2, may be added in the approval, to agree with the verification methods according to national building regulations based on such designations.

### **6.5.1 Airborne sound insulation**

The airborne sound insulation between rooms and of façades shall be given as:  
Weighted apparent sound reduction index  $R_w$ .

### **6.5.2 Impact sound insulation**

Impact noise level shall be given as:  
Weighted normalized impact sound pressure level  $L_{n,w}$  (Band width 1/3 octave).

### **6.5.3 Sound absorption**

The sound absorption coefficient of internal surfaces is declared (if required).

## **6.6 ENERGY ECONOMY AND HEAT RETENTION**

### **6.6.1 Thermal resistance**

The calculated or measured value of the thermal resistance, R-value and/or U-value (if required), is given.

The effect of thermal bridging shall be included in the R-value.

### **6.6.2 Air permeability**

Quantified national building regulations concerning air permeability are related to energy economy in the member states, although there may be no quantified requirements related to health and the effect on the indoor climate. Requirements on the overall air permeability are related to the completed building and not to separate building parts such as stressed skin panels.

Declaration of the degree of air permeability will normally be by stating in qualitative terms that the stressed skin panel, including the joints (if they are part of the stressed skin panel) between the panels, will provide adequate airtightness in relation to the intended use, taking into account both energy economy and heat retention, risk of cold draughts and risk of condensation within the construction.

### **6.6.3 Thermal inertia**

The information given on the total mass per unit area, the density of materials, the heat capacity of materials and the thermal conductivity per metre of materials is given as a means for the designer of a building to

calculate the contribution of the stressed skin panel to the thermal inertia of the works.

## **6.7 ASPECTS OF DURABILITY, SERVICEABILITY AND IDENTIFICATION**

### **6.7.1 Aspects of durability**

Possible geographical limitations or service classes for the intended use shall be assessed, judged and declared in the ETA if the evaluation of durability makes this relevant.

Wood preservation shall be assessed according to relevant national regulations.

Such treatment shall be declared in the ETA when the manufacturer opts for it.

Clear reference shall be made in the ETA to the European Standards used in specifying the treatment.

For timber and wood-based products, their adequacy in terms of the service classes given in EN 335-2 (see clause 5.7.1) shall be assessed and declared in the ETA.

For phenolic, aminoplastic or polyurethane adhesives the requirements of Adhesive type I or type II respectively, according to EN 301 shall be judged as being met.

For polyurethane adhesives data obtained from testing according to clause 5.7, dots 1 and 2, shall be judged and declared in the ETA; the items mentioned under dots 3-7 shall – in case they are not available – be judged and strictly taken into account in the production process of the stressed skin panels.

### **Moisture content of timber members and wood-based materials**

The ETA shall indicate that the moisture content of timber and wood-based materials in service generally will not exceed 15%.

### **6.7.2 Aspects of serviceability**

In relation to the aspect 'stiffness', maximum deflections at serviceability limit states, applied in the verification of structural capacities related to ER 1, shall be declared in the ETA, when this is relevant for the serviceability, see clauses 6.1.1.1.3 and 6.1.1.1.2. The deflections shall be given according to Eurocode 5, clause 2.3.

Floors shall be calculated to have a minimum stiffness against vibration under traffic loads as specified in Eurocode 5, clause 2.4.1, using the same recommended values for the structural stiffness design as shown in the code.

### **6.7.3 Identification**

The appropriate identification parameters shall be given in the ETA (see also clause 9.1).

## **7 ASSUMPTIONS AND RECOMMENDATIONS UNDER WHICH THE FITNESS FOR USE OF THE PRODUCTS IS ASSESSED**

This chapter sets out the assumptions and recommendations for design, installation and execution, packaging, transport and storage, use, maintenance and repair under which the assessment of the fitness for use according to the ETAG can be made.

Content:

- 7.0 General
- 7.1 Design of works
- 7.2 Packaging, transport and storage
- 7.3 Execution of the works
- 7.4 Maintenance and repair

### **7.0 GENERAL**

It is assumed in the assessment of stressed skin panels, that conditions for both manufacturing the stressed skin panels and the service in the works will be controlled to prevent an accumulation of moisture.

The moisture content at the time of manufacture should be within a few percentage points of the service conditions. In addition, the type of connection used may set the upper limit.

### **7.1 DESIGN OF WORKS**

#### **7.1.1 Local building regulations**

Normally a specification of relevant requirements concerning fire resistance and reaction to fire, sound insulation performance, thermal insulation performance and ventilation provisions shall be elaborated for each delivery as a basis for the production of a stressed skin panel.

The design process must comply with the procedures foreseen in the Member States in which the building is to be built. An ETA for a stressed skin panel does not amend this process in any way.

#### **7.1.2 Structural design**

Manufacture of a stressed skin panel for a particular application shall be made on the basis of a specific structural design for the building (the works) where the stressed skin panel is to be used as well as provisions for service openings.

#### **7.1.3 Supporting main structure**

The maximum required tolerances of the supporting main structure dimensions and levelling shall be assessed for the stressed skin panel and be specified in the ETA.

Requirements concerning damp-proof membranes or other protection against moisture from the supporting main structure shall be specified.

### **7.2 TRANSPORT AND STORAGE**

A manual for the transport and storage of the stressed skin panels shall be available from the manufacturer and assessed by the approval body. The manual must in particular cover requirements concerning handling equipment and transportation systems and means and requirements for protecting the stressed skin panels from mechanical damage during transportation. Reference to the manual shall be made in the ETA.

### **7.3 EXECUTION OF WORKS**

A general manual for the installation of the stressed skin panels in the works shall be available from the manufacturer and shall be assessed by the approval body. The manual shall cover all important aspects related to the site work, such as:

- erection techniques and necessary equipment;
- temporary bracing and weather protection;
- completion of joints between the stressed skin panels (structural fixing, weather sealing etc);
- fixing of wind and any seismic anchorage to the supporting main structure and between building parts;
- additional materials and components applied on the site and which are a precondition for the fitness in use of the stressed skin panels.

As a supplement to the general manual a specific manual containing special aspects related to each individual building project (e.g. special crane requirements, hoisting strap positions, etc) shall normally be required. Reference to the general manual for installation of the stressed skin panels shall be made in the ETA.

The completed building (the works) must comply with the building regulations (regulations on the works) applicable in the Member States in which the building is to be constructed. The procedures foreseen in the Member State for demonstrating compliance with the building regulations must also be followed by the entity held responsible for this act. An ETA for stressed skin panels does not amend this process in any way.

### **7.4 MAINTENANCE AND REPAIR**

It is normally assumed that regular maintenance will be required to retain performance and to obtain the estimated working life of the building. The type and frequency of such maintenance shall be specified, and shall be part of the assessment of the stressed skin panels.

# SECTION THREE: ATTESTATION AND EVALUATION OF CONFORMITY (AC)

## 8 ATTESTATION AND EVALUATION OF CONFORMITY

### 8.1 EC DECISION

The system of attestation of conformity, specified by the European Commission in mandate .../EC (CONSTRUCT 99/354 Rev.1), is system 1 as described in Council Directive (89/106/EEC) Annex III, and is detailed as follows:

- (a) Tasks for the manufacturer
  - factory production control;
  - further testing of samples taken at the factory by the manufacturer in accordance with a prescribed test plan.
- (b) Tasks for the approved body
  - initial type testing;
  - initial inspection of the factory and of factory production control;
  - continuous surveillance, assessment and approval of production control.

### 8.2 RESPONSIBILITIES

#### 8.2.1 Tasks for the manufacturer

##### 8.2.1.1 Factory production control (FPC)

All technical information concerning components delivered by other manufacturers, eg. specifications of components, installation procedures, etc have to be formally confirmed by the ETA holder. The ETA holder shall keep available an updated list of the manufacturers of such components that contribute to the fulfilment of Essential Requirements. Copies of this list shall be submitted to the Approved Body and the Approval Body.

The manufacturer shall exercise permanent internal control of the production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures. This factory production control system shall ensure that prefabricated wood-based loadbearing stressed skin panels are in conformity with the European Technical Approval (ETA).

The factory production control system for the prefabricated wood-based loadbearing stressed skin panels shall normally include relevant design specifications, including adequate drawings and written instructions and at least the following items:

- type and quality of all materials and components incorporated in the stressed skin panel;
- positions of structural members in prefabricated stressed skin panels;
- overall dimensions of prefabricated elements;
- installation of thermal and acoustic insulation material;
- tolerances of geometry, squareness and flatness;
- installation of sheathings, claddings, linings and air- and vapour-control layers which are part of the stressed skin panel;
- surface treatments when relevant;
- markings for correct position and installation in the works, and special handling devices like hoisting straps for prefabricated stressed skin panels when relevant;
- packaging and transport protection;

- ensure that specified moisture content levels are maintained during manufacture, storage at the factory, delivery and on site.

The production control system shall specify how the control measures are carried out, and at which frequencies.

Manufacturers having an FPC system which complies with EN ISO 9001 and which addresses the requirements of an ETA, are recognized as satisfying the FPC requirements of the Directive.

#### **8.2.1.2 Testing of samples taken at the factory – Prescribed Test Plan**

Testing of samples (components and whole stressed skin panels) by the manufacturer is normally not required for prefabricated wood-based loadbearing stressed skin panels other than visual controls and controls of dimensions, etc mentioned in clause 8.2.1.1.

#### **8.2.1.3 Declaration of conformity**

When all the criteria of the Conformity Attestation are satisfied, the manufacturer shall make a Declaration of Conformity.

### **8.2.2 Tasks for the manufacturer or the approved body**

#### **8.2.2.1 Initial Type Testing**

Approval tests have been conducted by the approval body or under its responsibility (which may include a proportion conducted by an indicated laboratory or by the manufacturer, witnessed by the approval body) in accordance with section 5 of this ETAG. The approval body will have assessed the results of these tests in accordance with section 6 of this ETAG, as part of the ETA issuing procedure.

This work shall be validated by:

- (a) the approved body for Certificate of Conformity purposes (as far as AC system 1 is concerned);
- (b) an approved laboratory for Declaration of Conformity purposes by the manufacturer (as far as AC system 3 is concerned).

The work, mentioned under (a) and (b), should be taken over by the manufacturer for Declaration of Conformity purposes.

#### **8.2.3 Tasks for the approved body (as far as AC system 1 is concerned)**

##### **8.2.3.1 Assessment of the factory production control system – initial inspection only or initial inspection and continuous surveillance**

Assessment of the factory production control system is the responsibility of the approved body.

An assessment shall be carried out of each production unit to demonstrate that the factory production control is in conformity with the ETA and any subsidiary information. This assessment shall be based on an initial inspection of the factory. The relevant production units shall be specified in the ETA.

Subsequent continuous surveillance of factory production control is necessary to ensure continuing conformity with the ETA. Surveillance inspections shall be conducted at least twice a year, and the inspection procedures shall be regulated by contracts between the manufacturer and the approved body.

##### **8.2.3.2 Certification**

The approved body shall issue Certification of Conformity of the stressed skin panels.

### **8.3 DOCUMENTATION**

The approval body issuing the ETA shall supply the information detailed below. The information given below together with the requirements given in EC Guidance Paper B will generally form the basis on which the factory production control (FPC) is assessed.

This information shall initially be prepared or collected by the approval body and shall be agreed with the manufacturer. The following gives guidance on the type of information required:

*(1) The ETA*

See section 4 of this Guideline. The nature of any additional (confidential) information shall be declared in the ETA.

*(2) Basic manufacturing process*

The basic manufacturing process shall be described in sufficient detail to support the proposed factory production control methods.

*(3) Product and materials specifications*

- Detailed drawings (including manufacturing tolerances;
- Incoming (raw) materials specifications and declarations;
- References to European and/or international standards or appropriate specifications;
- Manufacturer's data sheets.

*(4) Test plan (as part of FPC)*

The manufacturer and the approval body issuing the ETA shall agree an FPC test plan.

An agreed FPC test plan is necessary as current standards relating to quality management systems (Guidance Paper B, EN ISO 9001), do not ensure that the product specification remains unchanged and they cannot address the technical validity of the type or frequency of checks/tests.

The validity of the type and frequency of checks/tests conducted during production and on the final product shall be considered. This will include the checks conducted during manufacture on properties that cannot be inspected at a later stage and checks on the final product. These will normally include material properties and dimensions of component parts.

Where materials/components are not manufactured and tested by the supplier in accordance with agreed methods, then where appropriate they shall be subject to suitable checks/tests by the manufacturer before acceptance.

*(5) Prescribed test plan*

The manufacturer and the approval body issuing the ETA shall agree upon a prescribed test plan.

## **8.4 CE MARKING AND INFORMATION**

The ETA shall indicate the information to accompany the CE marking. According to the EC Guidance Paper D on CE marking the required information to accompany the symbol 'CE' is:

- Identification number of the notified body;
- Name/address of the manufacturer of the stressed skin panel;
- Identification to clarify the intended use;
- Date of the marking;
- Number of the Certificate of Conformity;
- Number of ETA.

## SECTION FOUR: ETA CONTENT

### 9 THE ETA CONTENT

#### 9.1.1 THE ETA CONTENT

The ETA content shall be in accordance with the Commission Decision 97/571/EC, dated 22 July 1997.

*In section II.2 "characteristics of products and methods of verification" the ETA shall include the following note:*

In addition to the specific clauses relating to dangerous substances contained in this European Technical Approval, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply'.

#### 9.1.1 Specification of materials

The purpose is to identify the materials and components which constitute the prefabricated wood-based loadbearing stressed skin panels. The specifications of materials and components should as far as possible provide maximum flexibility to choose alternative products for a panel, without affecting the declared performances or the fitness for the intended use. Hence the specifications, as far as possible, should be made by references to:

- a product standard, or
- an ETA, or
- material properties or performance specifications given directly in the ETA for the panel.

If this is not possible, the materials shall be specified by their brand name and type, class etc, identifying the manufacturer.

The following table shows some examples of material specifications:

Material/Component	Reference to typical European or relevant product specifications:
Structural timber	Solid wood, strength classes: EN 338 Glued lam. timber, strength classes: EN 1194 Laminated veneer lumber (LVL): prEN 14279
Timber cladding and lining	Relevant product standards
Plasterboards	prEN 520 or national product standards
Wood-based materials	Particle boards: EN 312-1 to 7 Cement bonded: EN 634-1 and 2 Fibreboards: EN 622-1 to 6 Plywood: EN 636-1 to 3 OSB: EN 300 or relevant industrial product standards
Thermal insulation	Mineral wool: EN 13162 Expanded polystyrene: EN 13163 Polyurethane: EN 13165 Type and brand name, and/or relevant product standards
Water vapour and wind barriers	Type and brand name, and/or relevant product standards
Mechanical fasteners	Timber connectors: EN 912 Punched metal plates: relevant approvals Metal ties etc: EN 10147
Structural glues	Type and brand name, and/or national approvals

### **9.1.2 Drawings**

The ETA document shall include section drawings of the stressed skin panels. The purpose of the drawings is to illustrate the general build-up of the panel; i.e. structural system and loadbearing components, insulation layers, dimensions, tolerances, etc. Material specifications may also be shown directly in these drawings of the panel.

In addition, the panel shall also be described by a set of construction details as specified in clause 9.1.7. These drawings shall be a formal part of the approval, but are presented in a supporting document and not in the ETA itself.

If required by the manufacturer, some design details may be kept confidential by using neutral parts in the drawings, provided that the approval body does not find this in contradiction to necessary information related to the correct application of the panel and the evaluation of conformity performed by the approved body.

### **9.1.3 Product characteristics**

The performances of stressed skin panels related to the requirements and methods of verification and assessment mentioned in Chapters 4, 5 and 6 shall be clearly stated. When a panel includes optional designs like a set of standard dimensions (thermal insulation thicknesses, loadbearing members, etc) it may be convenient to express the characteristics in tabular form.

### **9.1.4 Installation details**

The ETA shall include particular preconditions linked to the installation details of the stressed skin panels, which the approval body finds to be of special importance. These may be requirements related to the substructure, mounting of the elements, joints on site, including fixing to the substructure, anchoring, roof bracing, etc.

Reference to the manufacturer's erection manual shall be made.

### **9.1.5 Estimated working life**

The minimum estimated working life of the stressed skin panels shall be stated.

### **9.1.6 Maintenance**

Basic maintenance of the stressed skin panels, which is necessary to obtain the minimum estimated working life of stressed skin panels, shall be specified.

### **9.1.7 Supporting documents**

A set of drawings showing the essential construction details of the stressed skin panels shall form a supporting document as a formal part of the ETA. The purpose of this document is to provide the necessary detailed description of the stressed skin panels, including the assembly details on site and the conditions for the installation of the panel in the works. An updated version of this document shall be kept at all times by the approval body and the approved inspection body.

The set of construction details shall describe the general design of the stressed skin panels, including joints between the stressed skin panels. The detail drawings shall form the necessary documentation for assessing all the performance requirements specified in Chapter 4, including airtightness.

Only the most essential construction details, directly related to the performance of the stressed skin panels, and which are the pre-designed standard details for the panel, shall be included. Annex C shows a checklist of details normally required.

Annex D shows an example of a front page for the supporting document.

## **9.2 ADDITIONAL INFORMATION**

It shall be stated in the ETA whether or not any additional (possibly confidential) information shall be supplied to the approved body for the attestation of conformity.

## ANNEX A

### COMMON TERMINOLOGY (definitions, clarifications, abbreviations)

#### 1. WORKS AND PRODUCTS

##### **1.1 Construction works (and parts of works)** (often simply referred to as ‘works’) (ID1.3.1)

Everything that is constructed or results from construction operations and is fixed to the ground.

(This covers both building and civil engineering works, and both structural and non-structural elements).

##### **1.2 Construction products** (often simply referred to as ‘products’) (ID 1.3.2)

Products which are produced for incorporation in a permanent manner in the works and placed as such on the market.

(The term includes materials, elements and components of prefabricated systems or installations).

##### **1.3 Incorporation** (of products in works) (ID 1.3.2)

Incorporation of a product in a permanent manner in the works means that:

- its removal reduces the performance capabilities of the works, and
- that the dismantling or the replacement of the product are operations which involve construction activities.

##### **1.4 Intended use** (ID 1.3.4)

Role(s) that the product is intended to play in the fulfilment of the essential requirements.

##### **1.5 Execution** (ETAG-format)

Used in this document to cover all types of incorporation techniques such as installation, assembling, incorporation, etc.

##### **1.6 System** (EOTA/TB guidance)

Part of the works realised by

- particular combination of a set of defined products, and
- particular design methods for the system, and/or
- particular execution procedures.

#### 2 PERFORMANCES

##### **2.1 Fitness for intended use** (of products) (CPD 2.1)

Means that the products have such characteristics that the works in which they are intended to be incorporated, assembled, applied or installed, can, if properly designed and built, satisfy the essential requirements.

##### **2.2 Serviceability** (of works)

Ability of the works to fulfil their intended use and in particular the essential requirements relevant for this use.

The products must be suitable for construction works which (as a whole and in their separate parts) are fit for their intended use, subject to normal maintenance, be satisfied for an economically reasonable working life. The requirements generally concern actions which are foreseeable (CPD Annex I, Preamble).

### **2.3 Essential requirements** (for works)

Requirements applicable to works, which may influence the technical characteristics of a product, and are set out in objectives in the CPD, Annex I (CPD, art. 3.1).

### **2.4 Performance** (of works, parts of works or products) (ID 1.3.7)

The quantitative expression (value, grade, class or level) of the behaviour of the works, parts of works or of the products, for an action to which it is subject or which it generates under the intended service conditions (works or parts of works) or intended use conditions (products).

### **2.5 Actions** (on works or parts of the works) (ID 1.3.6)

Service conditions of the works which may affect the compliance of the works with the essential requirements of the Directive and which are brought about by agents (mechanical, chemical, biological, thermal or electro-magnetic) acting on the works or parts of the works.

### **2.6 Classes or levels (for essential requirements and for related product performances)** (ID 1.2.1)

A classification of product performance(s) expressed as a range of requirement levels of the works, determined in the IDs or according to the procedure provided for in art. 20.2a of the CPD.

## **3 ETAG-FORMAT**

### **3.1 Requirements** (for works) (ETAG-format 4)

Expression and application, in more detail and in terms applicable to the scope of the guideline, of the relevant requirements of the CPD (given concrete form in the IDs) and further specified in the mandate for works or parts of the works, taking into account the durability and serviceability of the works.

### **3.2 Methods of verification** (for products) (ETAG-format 5)

Verification methods used to determine the performance of the products in relation to the requirements for the works (calculations, tests, engineering knowledge, evaluation of site experience, etc).

### **3.3 Specifications** (for products) (ETAG-format 6)

Transposition of the requirements into precise and measurable (as far as possible and proportional to the importance of the risk) or qualitative terms, related to the products and their intended use.

## **4 WORKING LIFE**

### **4.1 Working life** (of works or parts of the works) (ID 1.3.5(1))

The period of time during which the performance will be maintained at a level compatible with the fulfilment of the essential requirements.

### **4.2 Working life** (of products)

Period of time during which the performances of the product are maintained – under the corresponding service conditions – at a level compatible with the intended use conditions.

### **4.3 Economically reasonable working life** (ID 1.3.5(2))

Working life which takes into account all relevant aspects, such as costs of design, construction and use, costs arising from hindrance of use, risks and consequences of failure of the works during its working life and cost of insurance covering these risks, planned partial renewal, costs of inspections, maintenance, care and repair, costs of operation and administration, of disposal and environmental aspects.

#### **4.4 Maintenance** (of works) (ID 1.3.3(1))

A set of preventive and other measures which are applied to the works in order to fulfil all its functions during its working life. These measures include cleaning, servicing, repainting, repairing, replacing parts of the works where needed, etc.

#### **4.5 Normal maintenance** (of works) (ID 1.3.3(2))

Maintenance, normally including inspections, which occurs at a time when the cost of the intervention which has to be made is not disproportionate to the value of the part of the work concerned, consequential costs (e.g. exploitation) being taken into account.

#### **4.6 Durability** (of products)

Ability of the product to contribute to the working life of the work by maintaining its performances, under the corresponding service conditions, at a level compatible with the fulfilment of the essential requirements by the works.

### **5 CONFORMITY**

#### **5.1 Attestation of conformity** (of products)

Provisions and procedures as laid down in the CPD and fixed according to the directive, aiming to ensure that, with acceptable probability, the specified performance of the product is achieved by the ongoing production.

#### **5.2 Identification** (of a product)

Product characteristics and methods for their verification, allowing to compare a given product with the one that is described in the technical specification.

### **6 APPROVAL AND APPROVAL BODIES**

#### **6.1 Approval Body**

Body notified in accordance with article 10 of the CPD, by an EU Member State or by an EFTA State (contracting party to the EEA Agreement), to issue European Technical Approvals in (a) specific construction product area(s). All such bodies are required to be members of the European Organisation for Technical Approvals (EOTA), set up in accordance with Annex II.2 of the CPD.

#### **6.2 Approved Body<sup>\*)</sup>**

Body notified in accordance with article 18 of the CPD, by an EU Member State or by an EFTA State (contracting party to the EEA Agreement), to perform specific tasks in the framework of the Attestation of Conformity decision for specific construction products (certification, inspection or testing). All such bodies are automatically members of the Group of Notified Bodies.

<sup>\*)</sup> also known as Notified Body

## **ABBREVIATIONS**

Concerning the Construction Products Directive:

AC:	Attestation of Conformity
CEC:	Commission of the European Communities
CEN:	Comité Européen de Normalisation / European Committee for Standardization
CPD:	Construction Products Directive
EC:	European Communities
EFTA:	European Free Trade Association
EN:	European Standard
FPC:	Factory Production Control
ID:	Interpretative Documents of the CPD
ISO:	International Standardisation Organisation
SCC:	Standing Committee for Construction of the EC

Abbreviations concerning approval:

EOTA:	European Organisation for Technical Approval
ETA:	European Technical Approval
ETAG:	European Technical Approval Guideline
TB:	EOTA-Technical Board
UEAtc:	Union Européenne pour l'Agrément technique / European Union of Agrément

General :

TC:	Technical Committee
WG:	Working Group

**ADVANCE**

## ANNEX B

### LIST OF REFERENCE STANDARDS

#### EN Standards

EN 120: 1992	<u>Wood based panels – Determination of formaldehyde content – Extraction method called the perforator method</u>
EN 300: 1997	<u>Oriented strand boards (OSB). Definitions, classification and specifications</u>
EN 301: 1992	<u>Adhesives, phenolic and aminoplastic, for load-bearing timber structures: classification and performance requirements</u>
EN 302-1: 1992	<u>Adhesives for load-bearing timber structures: test methods Determination of bond strength in longitudinal shear</u>
EN 302-3: 1992	<u>Adhesives for load-bearing timber structures: test methods Determination of the effect of acid damage to wood fibres by temperature and humidity cycling on the transverse tensile strength</u>
EN 312-1: 1997	<u>Particleboards. Specifications. General requirements for all board types</u>
EN 312-4: 1997	<u>Particleboards. Specifications. Requirements for load-bearing boards for use in dry conditions</u>
EN 312-5: 1997	<u>Particleboards. Specifications. Requirements for load-bearing boards for use in humid conditions</u>
EN 312-6: 1997	<u>Particleboards. Specifications. Requirements for heavy duty load-bearing boards for use in dry conditions</u>
EN 312-7: 1997	<u>Particleboards. Specifications. Requirements for heavy-duty loadbearing boards for use in humid conditions</u>
EN 322: 1993	<u>Wood-based panels. Determination of moisture content</u>
EN 335-1: 1992	<u>Hazard classes of wood and wood-based products against biological attack. Classification of hazard classes</u>
EN 335-2: 1992	<u>Hazard classes of wood and wood-based products against biological attack. Guide to the application of hazard classes to solid wood</u>
EN 335-3: 1996	<u>Hazard classes of wood and wood-based products against biological attack. Application to wood-based panels</u>
EN 336: 2003	<u>Structural timber. Sizes, permitted deviations</u>
EN 338: 2003	<u>Structural timber – Strength classes</u>
EN 350-1: 1994	<u>Durability of wood and wood-based products – Natural durability of solid wood – Part 1: Guide to the principles of testing and classification of natural durability of wood</u>
EN 350-2: 1994	<u>Durability of wood and wood-based products – Natural durability of solid wood – Part 2: Guide to natural durability and treatability of selected wood species of importance in Europe</u>
EN 351-1: 1995	<u>Durability of wood and wood-based products – Preservative-treated solid wood – Part 1: Classification of preservative penetration and retention</u>
EN 380: 1993	<u>Timber structures. Test methods. General principles for static load testing</u>
EN 385: 2001	<u>Finger jointed structural timber. Performance requirements and minimum production requirements</u>
EN 386: 2001	<u>Glued laminated timber. Performance requirements and minimum production requirements</u>
EN 460: 1994	<u>Durability of wood and wood-based products. Natural durability of solid wood. Guide to the durability requirements for wood to be used in hazard classes</u>
EN 594: 1996	<u>Timber structures. Test methods. Racking strength and stiffness of timber frame wall panels</u>
EN 596: 1995	<u>Timber structures. Test methods. Soft body impact test of timber framed walls</u>
EN 599-1: 1997	<u>Durability of wood and wood-based products. Performance of preservatives as determined by biological tests. Specification according to hazard class</u>
EN 599-2: 1997	<u>Durability of wood and wood-based products. Performance of preservatives as determined by biological tests. Classification and labelling</u>
EN 622-1: 2003	<u>Fibreboards. Specifications. General requirements</u>
EN 622-2: 1997	<u>Fibreboards. Specifications. Requirements for hardboards</u>
EN 622-3: 1997	<u>Fibreboards. Specifications. Requirements for medium boards</u>

EN 622-5: 1997	<u>Fibreboards. Specifications. Requirements for dry process boards (MDF)</u>
EN 634-1: 1995	<u>Cement-bonded particle boards. Specification. General requirements</u>
EN 634-2: 1997	<u>Cement-bonded particle boards. Specification. Requirements for OPC bonded particle boards for use in dry, humid and exterior conditions</u>
EN 636: 2003	<u>Plywood - Specifications</u>
EN 717-2: 1995	<u>Wood-based panels – Determination of formaldehyde release Formaldehyde release by the gas analysis method</u>
EN 912: 2000	<u>Timber fasteners. Specifications for connections for timber</u>
EN 1026: 2000	<u>Windows and doors. Air permeability. Test method</u>
EN 1084: 1995	<u>Plywood. Formaldehyde release classes determined by the gas analysis method</u>
EN 1121: 2000	<u>Doors. Behaviour between two different climates. Test method</u>
EN 1194: 1999	<u>Timber structures. Glued laminated timber. Strength classes and determination of characteristic values</u>
EN 1195: 1998	<u>Timber structures. Test methods. Performance of structural floor decking</u>
EN 1990:2002	<u>Eurocode – Basis of structural design</u>
EN 1995-1-1: ?	<u>Eurocode 5: Design of timber structures. General rules and rules for buildings</u>
EN 10147: 2000	<u>Continuously hot-dip zinc coated structural steels strip and sheet. Technical delivery conditions</u>
EN 12086: 1997	<u>Thermal insulating products for building applications. Determination of water vapour transmission properties</u>
EN 12090: 1997	<u>Thermal insulating products for building applications. Determination of shear behaviour</u>
EN 12114: 2000	<u>Thermal performance of buildings. Air permeability of building components and building elements. Laboratory test methods</u>
EN 12524: 2000	<u>Building materials and products. Hygrothermal properties. Tabulated design values</u>
EN 12871: 2001	<u>Wood-based panels. Performance specifications and requirements for loadbearing boards for use in floors, walls and roofs</u>
EN 12944-2: 1998	<u>Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Classification of environments</u>
EN 13162: 2001	<u>Thermal insulation products for buildings – Factory made mineral wool (MW) products – Specifications</u>
EN 13163: 2001	<u>Thermal insulation products for buildings – Factory made products of expanded polystyrene (EPS) – Specifications</u>
EN 13164: 2001	<u>Thermal insulation products for buildings – Factory made products of extruded polystyrene (XPS) – Specifications</u>
EN 13165: 2001	<u>Thermal insulation products for buildings – Factory made rigid polyurethane foam (PUR) products – Specifications</u>
EN 13166: 2001	<u>Thermal insulation products for buildings – Factory made products of phenolic foam (PF) – Specifications</u>
EN 13167: 2001	<u>Thermal insulation products for buildings – Factory made cellular glass (CG) products – Specifications</u>
EN 13168: 2001	<u>Thermal insulation products for buildings – Factory made wood wool (WW) products – Specifications</u>
EN 13169: 2001	<u>Thermal insulation products for buildings – Factory made products of expanded perlite (EPB) – Specifications</u>
EN 13170: 2001	<u>Thermal insulation products for buildings – Factory made products of expanded cork (ICB) – Specifications</u>
EN 13171: 2001	<u>Thermal insulation products for buildings – Factory made wood fibre products – Specifications</u>
EN 13501-1: 2003	<u>Fire classification of construction products and building elements. Classification using test data from reaction to fire tests</u>
EN 13501-2: 2004	<u>Fire classification of construction products and building elements. Classification using data from fire resistance tests excluding ventilation services)</u>
EN 20354/A 1:	<u>Acoustics. Measurement of sound absorption in a reverberation room</u>

### **DD (Draft for Development) ENV Documents**

ENV 1991-1: 1994	<u>Eurocode 1 – Basis of design and actions on structures. Part 1: Basis of design</u>
ENV 1991-2-1: 1996	<u>Eurocode 1 – Basis of design and actions on structures. Part 2-1: Densities, selfweight and imposed loads</u>

### **prEN Documents**

prEN 520: 2000	<u>Gypsum boards – Definitions, requirements and test methods</u>
prEN 1995-1-1: 2000	<u>Eurocode 5: Design of timber structures. General rules and rules for buildings</u>
prEN 13501-5: 2002	<u>Fire classification of construction products and building elements: Classification using test data from external fire exposure to roof tests</u>
prEN 14279: 2001	<u>Laminated Veneer Lumber (LVL); Specifications, definitions, classification and requirements</u>
prEN 14374: 2002	<u>Timber Structures – Structural laminated veneer lumber - Requirements</u>

## ANNEX C

### CHECKLIST FOR PRINCIPAL CONSTRUCTION DETAILS

#### *Exterior walls*

1. Vertical cross-section of the walls with all layers
2. Horizontal cross-section of the walls with all layers
3. View of structural frame with positions of ribs, lintels and studs at openings
4. Horizontal racking resistance system
5. System for wall ties and uplift anchors
6. Horizontal cross-section of joints between prefabricated elements, including corner joints
7. Vertical cross-section of joint between exterior wall and foundation/ground floor
8. Vertical cross-section of joints between exterior wall and suspended floors
9. Vertical cross-section of joints between exterior wall and roof, both at gables and façades
10. Basic design of joints between wall and windows/doors

#### *Internal walls*

1. Horizontal cross-section of the walls with all layers
2. View of the structural frame with positions of studs, plates, lintels and studs at openings
3. Horizontal racking resistance system
4. Vertical cross-section of joint between wall and foundation/ground floor
5. Vertical cross-section of joints between wall and suspended floors

#### *Floors*

1. Vertical cross-section of the floors with all layers
2. Plan of structural system with positions of joists, blockings, etc.
3. Structural system for floor openings
4. Detail of possible structural joist splices
5. Vertical cross-section of element joints
6. Vertical cross-section of support details on foundations and walls

#### *Roofs*

1. Vertical cross-section of complete roof structure with all layers
2. Plan of structural system with positions of rafters and possible intermediate supports
3. Structural system for openings to attics
4. Basic design of joints around roof windows, dormer windows, ducts, pipes, chimneys, etc. penetrating the roof
5. Vertical cross-section of support details at exterior walls and possible intermediate supports
6. Vertical cross-section of element joints