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## **ETAG 024**

**Edition January 2006**

**GUIDELINE FOR EUROPEAN TECHNICAL APPROVAL**

**OF**

**CONCRETE FRAME BUILDING KITS**

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## FOREWORD

### Background to the subject

This Guideline has been drawn up by EOTA Working Group 02.04/01a – Concrete Frame Building Kits.

The Working Group consisted of members from 6 EEC-countries; Belgium, Finland, Germany, Ireland, Netherlands (convenorship) and United Kingdom. There were observers from Slovakia and Slovenia.

The guideline sets out the performance requirements for concrete frame building kits used in building construction, the verification methods used to examine the performance, the assessment methods used to evaluate the performance for the intended use, and the presumed conditions for the design and installation of the kits in the works.

Concrete frame building kits according to this guideline are construction products defined in the Mandate (ref Construct 01/504 as amended after written consultation) as follows:

This mandate covers those industrially prepared kits, marketed as a building, that are made of pre-designed and prefabricated components intended for production in series. This mandate defines minimum requirements on the contents of such a kit. Partial kits falling below these minimum requirements are outside the scope of this mandate and shall not be CE marked on the basis of the resulting ETAG. These minimum requirements comprise all of the following: the structural elements of the building, the connection of the building to the substructure and the specification of the essential components of the external envelope such as thermal insulation, cladding, roof covering, internal lining, windows and external doors in so far as they are necessary for the satisfaction of the Essential Requirements applied to the building.

The design process (including the approval of detailed plans, applications for planning permission, building permits, ...) must comply with the procedures foreseen in the Member States in which the building is to be built. This Mandate does not amend this process in any way. The completed building (the works) must comply with the building regulations (regulations on works) applicable in the Member States in which the building is to be constructed. The procedures foreseen in that Member State for demonstrating compliance with the building regulations must also be followed by the entity held responsible for this act. This mandate does not amend this process in any way.

Although some components may be prepared in different factories, only the final kit for delivery, and not the different components, can be CE marked as a whole, under the responsibility of the ETA Holder.

The declared performance of the kit shall be compared with the relevant requirements in the building regulations from case to case, taking into account the intended use of the kit in relation to type of building, site, etc. An ETA is a favourable technical assessment of a construction product for an intended use, i.e. incorporated in the works. The ETA deals only with the product, and states classes or product characteristics to be used by the designer of the works.

Verification and assessment methods of loadbearing performance are based on the provisions in Eurocode 2 and Eurocode 8.

Verification and assessment methods of performance in relation to fire is based on the publication of European standards concerning classification for reaction to fire and resistance to fire.

Verification of the performance of concrete frame building kits requires an assessment of many construction details, such as the performance of joints between prefabricated elements with respect to air permeability and durability, the strength of lining materials with respect to impact loads and safety in use, watertightness of internal wet areas, etc. Relevant standardised verification methods may not always be available or judged to be necessary since the performance of many construction details has been proven to be acceptable by long-term experience from use in traditional designs. In accordance with the general advice in the Format of Guidelines for ETAs it is recognised in this guideline that some product properties can be assessed by a pass/fail approach on the basis of engineering judgement and experience from the use of well-known materials and designs.

### **Reference documents**

Reference documents are referred to within the body of the ETAG and are subject to the specific conditions mentioned therein. ENV's and prEN's are referred to within this ETAG. When ENV's or prEN's are replaced, the latest version shall be used.

The **list of reference documents** (mentioning the year of issue) for this ETAG is given in annex B. When additional parts for this ETAG are written afterwards, they may comprise modifications to the list of reference documents applicable to that part.

### **Updating conditions**

The edition of a reference document given in this list is that which has been adopted by EOTA for its specific use.

When a new edition becomes available, this supersedes the edition mentioned in the list only when EOTA has verified or re-established (possibly with appropriate linkage) its compatibility with the guideline.

**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.

**EOTA Comprehension Documents** permanently take on board all useful information on the general understanding of this ETAG as developed when delivering ETA's in consensus by the EOTA members. Readers and users of this ETAG are advised to check the current status of these documents with an EOTA member.

EOTA may need to make alterations/corrections to the ETAG during its life. These changes will be incorporated into the official version on the EOTA website [www.eota.be](http://www.eota.be) and the actions catalogued and dated in the associated **History File**.

Readers and users of this ETAG are advised to check the current status of the content of this document with that on the EOTA website. The front cover will indicate if and when amendment has taken place.

# SECTION ONE: INTRODUCTION

## 1. PRELIMINARIES

### 1.1. LEGAL BASIS (to be finally written by EOTA Secretary general)

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

- the final mandate issued by the EC :03/02/2003
- the final mandate issued by EFTA :03/02/2003
- adoption of the Guideline by the Executive Commission of EOTA :November 2005
- opinion of the Standing Committee for Construction :@@/@@/@@
- endorsement by the EC

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

a. **An ETA is one of the two types of technical specifications** in the sense of the EC 89/106 Construction Products Directive (89/106/EEC). This means that Member States shall presume that the approved concrete frame building kits are fit for their intended use, i.e. 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.

b. **This ETAG is a basis for ETA's**, i.e. a basis for technical assessment of the fitness for use of a product 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 and of the Interpretative Documents, in relation to the concrete frame building kits 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.

c. When accepted by the European Commission after consultation with the Standing Committee for Construction this **ETAG is binding** for the issuing of ETA's for concrete frame building kits 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 concrete frame building kit for the defined use only through an evaluation an 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, concrete frame building kits 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 art permits and after having been confirmed as appropriate for the particular product by the ETA.

This guideline indicates alternative possibilities for the demonstration of the satisfaction of the requirement.

## **2. SCOPE**

### **2.1. SCOPE**

This guideline covers those industrially prepared concrete frame kits, marketed as a building, that are made of pre-designed and prefabricated components intended for production in series.

The components in a kit may be manufactured as precast concrete members (such components should be in accordance with the relevant EN) or structural frames or as completely prefabricated building elements (excluding volumetric units/3-dimensional and cold storage building kits). The content of the kit is dominantly of concrete structural components but may include non-concrete structural components. A kit may comprise only the load bearing components of a structure. In such cases any restrictions in methods and locations of the connections of the external envelope, the ground floor and roof needs to be identified and be part of the ETA.

Concrete members may be manufactured of any type of concrete without any restriction on the material used for reinforcement.

The minimum content of the kit to be assessed shall include the following, as far as is necessary for the satisfaction of the Essential Requirements applied to the building: the structural components of the building (walls, columns, beams, floors, roofs), the connection of the building to the substructure and the specification of the essential components of the external envelope such as thermal insulation, cladding, roof covering, internal lining, windows and external doors (see note).

The kits are assembled according to pre-designed technical solutions for joints between the structural components and construction details.

Products like the external envelope as thermal insulation, cladding, roof covering, internal lining, internal partitions, windows and doors, stairs, surface coverings etc. may be part of the concrete frame kit. Service installations and complementary structures (including foundation or substructure) are not covered by this ETA Guideline.

Partial kits which do not meet all the conditions set out above are outside this scope, and shall not be CE-marked on the basis of an ETA based on this Guideline.

Although some components may be prepared in different factories, only the final kit for delivery, and not the different components, can be CE marked as a whole, under the responsibility of the ETA holder.

#### Note

The external envelope, the ground floor and the roof do not have to be part of the kit. This means that only the loadbearing structure of a building consisting of walls, columns, beams and/or floors can also be a kit.

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

The product performance of concrete frame building kits in relation to the Essential Requirements (ER) will normally be required to correspond with national regulatory requirements for the works relevant to the intended use of the product in, for example, dwellings, office buildings, schools, hospital and medical buildings, dormitories<sup>1</sup>. These requirements will vary between the member states, and the product performance shall be expressed in numerical terms.

<sup>1</sup> List *not* exhaustive.

### **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 and 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.

The guidance remains valid for other cases which do not deviate significantly. The general approach of the ETAG remains valid, but the provisions then need to be used case by case in an appropriate way. This use of the ETAG is the responsibility of the ETA-body which receives the special application, and subject to consensus within EOTA. Experience in this respect is collected, after endorsement in EOTA-TB, in the ETAG-Format-Comprehension document.

### **3. TERMINOLOGY**

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

See Annex A.

#### **3.2. SPECIFIC TERMINOLOGY**

In this paragraph the specific terminology used in this ETAG is given in alphabetical order. These terminology is additional to the terminology used and defined in the European standards to which is referred in this ETAG.

*Concrete frame building:*

Building of which the structure is mainly made of structural concrete components such as walls, columns, beams, floors and roofs.

*Design climatic conditions:*

Outdoor and indoor air temperature and moisture levels, snow loads, wind speed levels, etc, which may be stated in national building regulations or in other specifications to be used for design.

*Integrated components:*

Components such as windows, non-load bearing elements for external envelope, doors, conduits, etc which are built into the main building parts.

*Internal partitions:*

Partitions according to ETAG 003.

*Joint/Connection:*

Junction between two materials, components, elements or parts of a building.

*Main building parts:*

Main construction parts of a building like walls, floors and roof.

*National Application Document:*

Supplementary document to a structural Eurocode published as European prestandard (ENV), with rules for the national application of the Eurocode. This includes boxed values and references to national standards which may be applied together with the provisions in the Eurocode.

*Nationally Determined Parameter (NDP)*

A National choice left open in a EN Eurocode about values (where symbols are given in the EN Eurocodes), classes or alternative procedures permitted within the EN Eurocodes.

*Pre-designed:*

Pre-determined technical solutions.

*Production in series:*

Production of building kits on the basis of the same materials, structural design and construction details. The buildings and components do not have to be exactly of the same size or shape.

*Production unit:*

Production line or facility where the concrete frame kit is manufactured and/or processed.

*Separating walls and floors:*

Walls and floors where national regulations can require sound insulation, fire resistance performance, etc.

*Supporting documents:*

Documents included in the formal part of the approval, but where the content is not included in the ETA-document itself. The valid version of a supporting document is the last updated version filed by the approval body.

*Suspended floors:*

Floor structures with a free span between supports.

*Structure*

Load-bearing construction, i.e. organised assembly of connected parts designed to provide mechanical resistance and stability to the works (ID 1, clause 2.1.1).

*Structural material*

Material or constituent product with properties which enter into structural calculations or otherwise relate to the mechanical resistance and stability of works and parts thereof, and/or to their fire resistance, including aspects of durability and serviceability.

*Structural component*

Load-bearing part of Works designed to provide mechanical resistance and stability to the works and/or fire resistance, including aspects of durability and serviceability, (ID 1, clause 2.1.1).

*Two-stage principle:*

Design principle for claddings, joints, etc in the exterior envelope. An outer layer serves to protect an inner layer from direct driving rain and sun radiation. The space between the layers is ventilated and drained.

*Wet area surface:*

Floors and wall areas in bathrooms and other “wet rooms” where the surface may be exposed to water spray from showers, etc, and where the manufacturer declares the surfaces to be watertight.

# 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 concrete frame building kits and their intended uses. It is the manufacturer or producer who defines the family of kits for which he is seeking an ETA and how it is to be used in the works, and consequently the scale of the assessment.

It is therefore possible that for some concrete frame building kits, which are fairly conventional, only some of the tests and corresponding criteria are necessary to establish fitness for use. In other cases, e.g. special or innovative kits or materials, or where there is a range of uses, the whole range of tests and assessment may be applicable.

### (b) General layout of this section

The assessment of fitness of concrete frame building kits with regard to their fitness for intended use in construction works is a process with three main steps:

- Chapter 4 clarifies **the specific requirements for the works** relevant to the concrete frame building kits and uses concerned, beginning with the Essential Requirements for works (CPD art. 11.2) and then listing the corresponding relevant characteristics of the concrete frame building kits.
- 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 relevant product characteristics are described. This is done by test procedures, methods of calculation and other appropriate methods.
- Chapter 6 provides guidance on **the assessing and judging methods** to confirm fitness for the intended use of the concrete frame building kits.
- Chapter 7, assumptions and recommendations are only relevant in as far as they concern the basis upon which the assessment of the concrete frame building kits 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 or classes laid down in the EC-mandate.

This ETAG indicates however the compulsory way of expressing relevant performance characteristics for concrete frame building kits. If, for some uses at least one Member state has no regulations, a manufacturer always has the right to opt out 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 concrete frame building kit does 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 concrete frame building kit for the intended use of 50 years for the loadbearing structure and for non-accessible components and materials, and 25 years for repairable or replaceable components and materials like claddings, roofing materials, exterior trims, and integrated components like windows and doors, provided that the kit is subject to appropriate use and maintenance (see chapter 7). The use of components and materials with shorter intended working life shall be clearly stated in the ETA. 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 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 concrete frame building kit can not 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 concrete frame building kits in relation to the expected, economically reasonable working life of the works (based upon ID. Par. 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 concrete frame building kits shall be suitable for use in construction works, in which (as a whole and in their separate parts) they are fit for their intended use, account being taken of economy, and in order to satisfy the essential requirements. Such requirements shall, 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 parts 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 (product and where appropriate its constituents, components and intended uses), and providing a list of relevant product 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 which have a bearing on durability assessments may be dealt with under ER 1 to ER 6, with reference under 4.7. Where there is a characteristic which only relates to durability, this is dealt with in 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 products (cfr. ETA-format par. II.2).

Table 1 on the next page shows the links between the Essential Requirements in the EC 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 – Links between the ER, relevant paragraphs of the ID and requirement and product performances in this ETAG

<b>ER</b>	<b>Corresponding ID paragraph for works</b>	<b>Corresponding ID paragraph for product performance</b>	<b>Product performance characteristics from the Mandate, and ETA-Guideline paragraphs on product performance</b>
1	2.1.3 Collapse  2.1.4 Inadmissible deformation  2.1.5 Damage by an event to an extent disproportionate to the original cause	3.2 (2) Permanent actions Variable actions Accidental actions	4.1 - Mechanical resistance and stability
2	4.2.2 Load bearing capacity of the construction  4.2.3 Limitation of generation and spread of fire and smoke within the construction works  4.2.4 Limitation of spread of fire to neighbouring construction works	4.3.1.1 Products subject to reaction to fire requirements  4.3.1.2 Products for roofs subject to fire requirements  4.3.1.3 Products subject to resistance to fire requirements, load-bearing elements with or without separating function	4.2 - Safety in case of fire  4.2.1 Reaction to fire  4.2.2 Resistance to fire  4.2.3 External fire performance (of the roof covering)  4.2.4 Fire compartmentation
3	3.3.1.1 Air quality  3.3.1.2 Dampness (indirect effect inducing mould-growth and increased deposit of house dust mites)	3.3.1.1.3.2 a Emission and release of radiation and pollutants. Susceptibility to the growth of harmful micro-organisms  3.3.1.2.3.2 e Building products	4.3 - Hygiene, health and environment  4.3.1 Vapour permeability and moisture resistance  4.3.2 Watertightness  4.3.3 Release of dangerous substances
4	3.3.1.2 Falling after slipping. Falling due to changes in level or sudden drops.  3.3.2. Behaviour on impact	3.3.1.3 Falling after slipping Falling due to changes in level or sudden drops.  3.3.2.3 Mechanical resistance and stability	4.4 - Safety in use 4.4.1 Slipperiness of floor finishes 4.4.3 Falling due to changes in level or sudden drops.  4.4.2 Resistance to eccentric loads including impact resistance.
5	2.3.1, 2.3.2, 2.3.3 Protection against air-borne and impact noise between enclosed spaces and from outside of works	4.3.2 Acoustic properties (according to 4.3.3)	4.5 - Protection against noise  4.5.1 Airborne sound insulation  4.5.2 Impact sound insulation  4.5.3 Sound absorption
6	4.2 Energy consumption limitation	Table 4.2 Component characteristics	4.6 - Energy economy and heat retention  4.6.1 Thermal resistance  4.6.2 Air permeability  4.6.3 Thermal inertia

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

The concrete frame building kit shall be capable of supporting the specified loadings with adequate safety against structural collapse, inadmissible deformations and where applicable disproportionate collapse. The relevant actions to be considered normally comprise self-weight and imposed loads, wind loads, snow loads and, where appropriate, seismic loads.

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

The Essential Requirement laid down in the Council Directive 89/106/EEC is as follows:

The construction works shall be designed and built in such a way that in the event of an outbreak of fire:

1. the load bearing capacity of the construction can be assumed for a specific period of time;
2. the generation and spread of fire and smoke within the works are limited;
3. the spread of fire to neighbouring construction works is limited;
4. occupants can leave the works or be rescued by other means;
5. the safety of rescue teams is taken into consideration.

The following aspects of performance are relevant to the Essential Requirements for concrete frame building kits:

##### **4.2.1. Reaction to fire**

The reaction to fire performance of the individual kit components shall be in accordance with laws, regulations and administrative provisions applicable to these individual kit components of the concrete frame building kit in its 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 the assembled components of the concrete frame building kit (e.g. wall, floor, or roof) shall be in accordance with laws, regulations and administrative provisions applicable to these assembled components in its intended and 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 the roof covering**

The external fire performance of the roof covering of the concrete frame building kits shall be in accordance with laws, regulations and administrative provisions applicable to the roof covering in its 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.

##### **4.2.4. Fire compartmentation**

The fire compartmentation of an assembled building shall be in accordance with laws, regulations and administrative provisions applicable to the works where the building is to be constructed.

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

##### **4.3.1. Vapour permeability and moisture resistance**

The external envelope shall be designed to limit interstitial and surface condensation of moisture which may cause unacceptable growth of micro-organisms or affect the indoor climate.

##### **4.3.2. Watertightness**

###### **4.3.2.1 External envelope**

The external envelope shall prevent leakage of water from rain and melting snow into the works.

###### **4.3.2.2 Internal surfaces**



Internal wall and floor surfaces in bathrooms, toilets, etc claimed to be watertight by the manufacturer, shall be sufficiently tight to avoid water penetration to rooms below (short-term effects) and to avoid moisture levels in materials and components which may lead to unacceptable growth of micro-organisms (long-term effects).

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

The kit shall be such that, when installed according to the appropriate provisions of the Member States, it allows for the satisfaction of the ER3 of the CPD as expressed by national provisions of the Member States and in particular does not cause harmful emissions of toxic gases, dangerous particles or radiation to the indoor environment nor contamination of the outdoor environment (air, soil or water).

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

##### **4.4.1. Slipperiness of floor finishes**

To limit accidental falls in buildings under normal use, finished floor surfaces shall not be unacceptably slippery and any unexpected change of slipperiness of the floor surfaces shall be avoided.

##### **4.4.2. Resistance to eccentric loads including impact resistance**

The concrete frame building kits shall have sufficient mechanical resistance and stability to ensure that the safety of the occupants is not endangered (See also ER 1). This means that they shall have sufficient mechanical resistance and stability to withstand accidentally large static or dynamic loads, from the action of persons or objects, without full or partial collapse causing dangerous (sharp or cutting) fragments, giving risk of falling through, particularly at a change of level, or endangering the safety of other people.

The loads may be in the form of:

- impacts resulting from a person falling against the wall;
- differential air pressure;
- a large number of people leaning or pressing against the wall at the same time (crowd pressure);
- impacts resulting from the movement of heavy non-deformable objects such as pieces of furniture or equipment;
- slamming of doors;
- heavy objects such as furniture and sanitary or heating equipment.

##### **4.4.3. Falling due to changes in level or sudden drops**

To protect persons against falling appropriate guard-rails, balustrades, parapets should be used to cover accessible openings, appropriate stairways, fixed ladders, ramps should be used by changes in levels, appropriate safety catches and hinges should be used in windows in upper storeys.

#### **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 envelope 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 which are part of the kit shall 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 external envelope shall provide the necessary thermal insulation which is applicable to the intended use of the building. 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 external envelope shall provide adequate airtightness to limit unnecessary energy loss, and to prevent cold draughts which may affect persons health in relation to ER 3.

#### **4.6.3. Thermal inertia**

Thermal inertia of the main building parts shall be known, where applicable, to assess the effect on energy and heat retention.

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

#### **4.7.1. Aspects of durability**

The design of the concrete frame building kit shall ensure that deterioration of materials and components during the assumed intended working life does not significantly affect the performance of the kit in relation to fulfilling all the Essential Requirements 1 – 6. Deterioration may be caused by physical, biological and chemical agents.

#### **4.7.2. Aspects of serviceability**

Load bearing elements shall have sufficient stiffness to avoid unacceptable deflections and dynamic effects from normal use.

#### **4.7.3. Identification**

The materials used in the concrete frame building kit shall be identifiable in relation to those properties which have an influence on the ability of the kit 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 concrete frame kit in relation to the requirements for the works (calculations, tests, engineering knowledge, site experience etc.) as set out in chapter 4. For the acceptance criteria of data (e.g. test reports) see EOTA GUIDANCE DOCUMENT 004 “The Provisions of Data for Assessments Leading to ETA”.

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 ETA's 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 harmonized European technical specifications (Methods 1, 2 or 3).

When the performance is assessed by reference to traditional methods, general experience, etc., the Technical Dossier of the ETA shall as far as possible refer to documents where such methods or experience are described.

Assessment of individual materials and components which are part of the kit and their compatibility in the works shall be carried out on the basis of the relevant product standards or approvals for these products, or as far as possible on the basis of technical specifications for products with the same intended use.

The relationship between the product performance characteristics and the corresponding paragraphs on verification methods are summarized in Table 2.

Table 2 - The relationship between the product performance characteristics and the corresponding paragraphs on verification methods

ER	ETAG paragraph on product performance	ETAG paragraph on verification method
1	4.1 Mechanical resistance and stability	5.1 Mechanical resistance and stability
		5.1.1 Verification of structural capacities in general 5.1.2 Verification by calculation 5.1.3 Verification by assisted testing
2	4.2 Safety in case of fire	5.2 Safety in case of fire
	4.2.1 Reaction to fire	5.2.1 Reaction to fire
	4.2.2 Resistance to fire	5.2.2 Resistance to fire
	4.2.3 External fire performance of the roof covering	5.2.3 External fire performance of the roof covering
	4.2.4 Fire compartmentation	5.2.4 Fire compartmentation

<b>ER</b>	<b>ETAG paragraph on product performance</b>	<b>ETAG paragraph on verification method</b>
<b>3</b>	4.3 Hygiene, health and environment	5.3 Hygiene, health and environment
	4.3.1 Vapour permeability and moisture resistance	5.3.1 Vapour permeability and moisture resistance
	4.3.2 Watertightness	5.3.2.1 External envelope 5.3.2.2 Internal surfaces
	4.3.3 Release of dangerous substances	5.3.3 Release of dangerous substances
<b>4</b>     <b>5</b>	4.4 Safety in use	5.4 Safety in use
	4.4.1 Slipperiness of floors	5.4.1 Slipperiness of floors
	4.4.2 Impact resistance	5.4.2 Impact resistance
	4.4.3 Falling due to changes in level or sudden drops	5.4.3 Falling due to changes in level or sudden drops
	4.5 Protection against noise	5.5 Protection against noise
	4.5.1 Airborne sound insulation	5.5.1 Airborne sound insulation
	4.5.2 Impact sound insulation	5.5.2 Impact sound insulation
	4.5.3 Sound absorption	5.5.3 Sound absorption
<b>6</b>	4.6 Energy economy and heat retention	5.6 Energy economy and heat retention
	4.6.1 Thermal resistance	5.6.1 Thermal resistance
	4.6.2 Air permeability	5.6.2 Air permeability
	4.6.3 Thermal inertia	5.6.3 Thermal inertia

## **5.1. MECHANICAL RESISTANCE AND STABILITY**

### **5.1.1. Verification of structural capacities in general**

The structural components, the structure and the connections shall be verified in conformity with the basis of design as given in EN 1990, e.g. according to the limit state design method. Consideration should be given to the relevant actions on structures as defined EN 1991. The verification can normally be undertaken by structural calculations, supplemented if necessary by testing in special cases, and shall when relevant include resistance against disproportionate collapse.

### **5.1.2. Verification by calculation**

Calculations should be made according to the relevant parts of EN 1992 to verify that the concrete structural components and the concrete structure do not exceed the relevant ultimate state.

If other structural materials are used for the elements, the relevant parts of the following Eurocodes should be used:

- EN 1993 for steel;
- EN 1994 for composite steel-concrete;
- EN 1995 for timber elements;
- ENV 1999 for aluminium.

Supplementary calculations which are relevant for the resistance against seismic actions should be done according to the provisions in ENV 1998, for various materials and elements. Other information on capacities against seismic actions based on the various boxed values given in National Application Documents or other national regulations may be undertaken as a basis for the specific structural design for each individual work.

### **5.1.3. Verification by calculation assisted by testing**

Where calculation rules or material properties given in the EN's according to 5.1.2 are not sufficient or where economy may result from tests on prototypes, part of the design procedure may be performed on the basis of tests. In general this design assisted by testing shall be done according to EN 1990. The test methods for the determination of mechanical properties shall be specified. Furthermore the requirements for the factory production control and for the conformity attestation shall be specified. This shall be done in such a way that each declared value or declared class corresponds to a defined statistical confidence (defined fractile and confidence level) and can, for structural design of works, be taken as the "characteristic value" or "design value".

Test methods which are described in (h-)EN's, ETAG's or ISO-standards for materials and components which are used/part of the kit may be used (e.g. EN 1168).

Because the current state of the art is that very few test methods exist, the following procedure enables the use of new test methods (see also § 2.3):

- The approval body which needs to use a test method for issuing an ETA, makes a proposal for this test method and sends it to the convenor of the WG of this ETAG;
- The test method is worked out/agreed by the WG;
- Reference to this test method shall be made in the (history file) of ETAG according to the EOTA GUIDANCE DOCUMENT 005;
- The test method is part of the ETAG and the Approval Body may use the test method.

## 5.2. SAFETY IN CASE OF FIRE

The fire performance of any product in terms of either reaction to fire, fire resistance and/or external fire performance, as considered in the following sections, does not only depend upon its intrinsic properties and the nature of the thermal attack, but also on its situation when incorporated into works. The testing of products (or the assembled system of which the product forms part) shall be such as to simulate the product in its intended end use application(s).

### 5.2.1. Reaction to fire

Generally, one or more of the following options shall apply.

**Option 1: Products not covered by options 2 or 3.**

The individual kit components 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.

**Option 2: Products satisfying the requirements for the fire reaction class A1, without the need for testing**

The individual kit components 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.

**Option 3: Products classified without the need for further testing (CWFT)**

The individual kit components are considered to satisfy the requirements for performance Class of the characteristic reaction to fire in accordance with the relevant EC Decision without the need for testing on the basis of its conformity with the specification of the product detailed in that Decision and its intended end use application being covered by that Decision.

### 5.2.2. Resistance to fire

The assembled components of the concrete frame building kit (e.g. wall, floor or roof) shall be tested, using the test method relevant for the corresponding fire resistance class, in order to be classified according to the appropriate part of EN 13501. Structural resistance may be determined from the relevant Eurocode part 1-2.

Fire resistance performance cannot be claimed for individual products alone, since it is a characteristic of a complete component.

### 5.2.3. External fire performance of the roof covering

Generally, one or more of the following shall apply.

**Option 1: Products not covered by options 2 or 3.**

The roof covering shall be tested using the test method relevant for the corresponding external fire performance roof class, in order to be classified according to EN 13501-5.

**Option 2: Products satisfying the requirements for the external fire performance, due to the deemed to satisfy list.**

The roof covering is considered "deemed to satisfy" all the provisions for external fire performance of all national regulations of the Member States without the need for testing on the basis that it is included within the definitions given in Commission Decision 2000/553/EC and provided that any national provisions on the design and execution of works are fulfilled.

**Option 3: Products classified without the need for further testing (CWFT)**

The roof covering is considered to satisfy the requirements for performance Class of the characteristic external fire performance in accordance with the relevant EC Decision without the need for testing on the basis of its conformity with the specification of the product detailed in that Decision and its intended end use application being covered by that Decision.

### 5.2.4. Fire compartmentation

Fire compartmentation of a building is a function of its application and the regulations for Works in force in the Member State where the building is to be built (see boxed wording in the Foreword to this ETAG). The ETA will give details of the reaction to fire and resistance to fire of elements of the kit, such as internal walls. It is for the designer of the Works to determine their suitability and their position for particular buildings.

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

#### **5.3.1. Vapour permeability and moisture resistance**

Assessment shall be undertaken on the basis of calculations according to EN ISO 13788, taking into account the relevant design climatic conditions.

The risk of condensation can normally be verified on the basis of hygrothermal characteristics of the products used in each component and the construction details.

Water vapour resistance of the relevant layers should be based upon:

- Design values given in EN 12524 or European technical specifications
- or
- Tests according to EN ISO 12572 or European technical specifications.

In addition, the design of joints and any fixings/services penetrating any vapour control element or membrane shall be assessed in relation to the risk of airborne moisture coming into contact with cold surfaces within the construction.

For verification of condensation risks due to low surface temperatures or air leaks see 5.6.1 and 5.6.2. Moisture resistance of materials in terms of durability is covered under 5.7.1.



### **5.3.2. Watertightness**

#### **5.3.2.1 External envelope**

Water leakage resistance of the building envelope, including driving rain on facades and possibly snow penetration, shall primarily be assessed by the approval body on the basis of the standard construction details for the kit, and by using the available technical knowledge and experience from similar well-known technical solutions.

The assessment of resistance against the penetration of driving snow into the external envelope may normally be based upon design or engineering knowledge. The assessment shall include the full external envelope, including joints between prefabricated components in the kit and principal solutions for joints between the kit and the substructure.

If the resistance against weather influence cannot be assessed by the use of existing guidelines (e.g. an ETAG), because of unfamiliar solutions to the relevant construction details, the approval body may find it necessary to require testing of the external envelope performance. Laboratory tests may be carried out according to EN 1027, EN 12155, EN 12865.

#### **5.3.2.2 Internal surfaces**

The performance of watertight membranes or surface layers in wet areas such as bathrooms, may be assessed on the basis of experience/technical knowledge. Alternatively, it may be verified by reference to conformity with relevant performance standards or ETAG's for the products involved, e.g. product standards for roofing membrane systems. For products with unknown performance, verification can be according to the Nordtest methods NT BUILD 058, 230 and 448.

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

#### **5.3.3.1 Presence of dangerous substances in the kit**

The applicant shall submit a written declaration stating whether or not the product/kit contains dangerous substances according to European and national regulations, when and where relevant in the Member States of destination, and shall list these substances.

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

If the product/kit contains dangerous substances as declared above, the ETA will provide the method(s) which has been used for demonstrating compliance with the applicable regulations in the Member States of destination, according to the dated EU data-base (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 data base, and will be transferred to the Commission services.

The information contained in this EOTA data base will also be communicated to any ETA applicant.

On the basis of this information, a protocol of assessment of the product, 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 floor finishes**

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. Resistance to eccentric loads including impact resistance**

Mechanical resistance against dynamic loads shall primarily be assessed by the approval body on the basis of existing knowledge related to the intended use. Walls with well-known internal lining materials, such as standard gypsum boards, wood-based panel products and solid timber boards with studs, should generally be accepted to have a satisfactory impact resistance for normal use in, for example, dwellings and office buildings.

When the performance of the building 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 resistance should be tested. Testing of walls is to be carried out in accordance with EOTA Technical Report No 001: *Determination of impact resistance of panels and panels assemblies*.

Floors and roofs are tested according to EN 1195.

For wood-based panels used as loadbearing sub-floor panels on joists and as roof sheathing the impact resistance should be accepted as adequate when the panels conform to the requirements in EN 12871.

Where an approach is described in a relevant Eurocode, it will be acceptable to calculate impact resistance.

### **5.4.3. Falling due to changes in level or sudden drops**

In the ETA the use category in relation to the mechanical resistance against dynamic loads of guard-rails, balustrades and parapets shall be given as meant in ETAG 003: 5.4.1.1 "Resistance of structural damage from soft body impact load – 50 kg bag".

## **5.5. PROTECTION AGAINST NOISE**

### **5.5.1. Airborne sound insulation**

The airborne sound insulation performance of the main building parts of an assembled kit shall be verified by either laboratory or field tests according to the relevant parts of EN ISO 140. The rating of airborne sound insulation shall be undertaken according to EN ISO 717. Values for airborne sound insulation in completed buildings, based on laboratory tests, can be determined according to EN 12354-1, -3, -4.

Indicative field testing of an assembly within a manufacturer's range may be possible, as part of the Approval process. However, National Regulations in some Member States may require field testing of the completed building in each case.

### **5.5.2. Impact sound insulation**

The impact sound insulation performance of the floors of an assembled kit shall be verified by either laboratory or field tests according to the relevant parts of EN ISO 140, and the rating of impact sound insulation shall be done according to EN ISO 717.

Values for impact noise level in completed buildings, based on laboratory tests, shall be determined according to EN 12354-2.

Indicative field testing of an assembly within a manufacturer's range may be possible, as part of the Approval process. However, National Regulations in some Member States may require field testing of the completed building in each case.

### **5.5.3. Sound absorption**

Sound absorption is measured according to EN ISO 354.

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

### **5.6.1. Thermal resistance**

Thermal resistance (R-value) and the corresponding thermal transmittance (U-value) of the main building parts in a kit shall be calculated according to EN ISO 6946, using the design thermal conductivity values for materials according to EN 12524, relevant European product standards, or conductivity determined according to EN ISO 10456. Alternatively the thermal resistance may be verified by testing according to EN ISO 8990.

Verification of thermal transmittance for windows, doors and shutters may be undertaken by calculation according to EN ISO 10077-1, EN ISO 10077-2 or by testing according to relevant EN ISO-standards for these products.

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 4.3.1 shall be verified when the approval body finds this necessary. E.g. the effect of moisture due to thermal bridges. Such verification may be undertaken by calculations according to EN ISO 10211-1 and EN ISO 10211-2, or by testing according to EN ISO 8990 or relevant test standards for specific products.

### **5.6.2. Air permeability**

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

Assessment of the air permeability of the external envelope is normally undertaken by judgement of the construction details, on the basis of the knowledge and experience from traditional technical solutions. The assessment shall include joints between components.

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 pressurisation of completed buildings according to EN 13829, or by laboratory testing according to pr EN 1026, EN 12114 or other relevant test standards. The tests shall include long-term performance when relevant.

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

### **5.6.3. Thermal inertia**

Verification of thermal inertia is undertaken on the basis of the following properties of the main building parts: the total mass per unit area, density and specific heat capacity of relevant materials and thermal resistance. Specific heat capacities are tabulated in EN 12524, and material densities are shown in EN 1991-2-1.

Alternatively, values measured in accordance with ISO 11357-4 or equivalent may be used.

## **5.7. DURABILITY, SERVICEABILITY AND IDENTIFICATION**

### **5.7.1. Aspects of durability**

The estimated working life of the various parts of the kit will normally have to be determined by the approval body, on the basis of experience and general knowledge, and mainly by examining the building details which are part of the kit.

In so doing the approval body shall take into account the influence of climatic conditions when assessing the estimated working life of the concrete frame building kit. The EC Guidance Paper F on Durability and the EOTA Guidance document 003 (Assessment of working life of products) may be consulted with regard to the use of relevant degradation factors and climatic sub-divisions of Europe.

When assessing the durability of materials and components in the kit it should be born in mind that durability is normally best ensured by good design measures and good site practice. Excessive moisture content should primarily be prevented by adequate construction details.

The most important aspect related to the durability of concrete frame building kits is the corrosion of the reinforcement. Exposure classes are given in EN 1992.

- The durability of materials and components in the kit is sufficiently proved if these materials and components comply with the relevant EN-, ETAG- or ISO standards.
- When a standard is used for calculations, the materials and components shall comply with the requirements of the Eurocode and in particular with the material and components standards named in the Eurocode.

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

Deflections and dynamic effects related to the structural design of the loadbearing elements shall be determined (serviceability limit state) by calculations or tests as in 5.1.

### **5.7.3. Identification**

All components of the concrete frame building kit shall be identified, either by reference to:

- Harmonised product standards;
- European Technical Approvals, based on other ETA-Guidelines;
- Non-harmonised European product standards;
- Non-harmonised International product standards;
- Descriptive identification, identifying the products by their composing materials and their function.

In any case, dimensions (length, width, thickness), geometry (squareness, flatness, ...), significant properties (mechanical, physical, chemical, ...) and their tolerances shall be given. In those cases where the above listed product specifications do not specify test methods for identification, test methods used shall be based on European standards (CEN), International standards (ISO), EOTA Technical Reports, UEAtc Guidelines, Nordtest standards or RILEM test methods.

Ultimately, a formulation, a ETA applicant's specific reference or a similar unique specification can also be accepted.

## 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).

The performance characteristics are summarised in Table 3.

Where at least one Member State has no regulated requirement against a performance characteristic, or some aspect of that characteristic, then the 'No performance Determined' (NPD) option is available, except for ER1. ER1 should always be evaluated. The ETA applicant and the Approval Body can agree where this option applies, taking account of the intended market. The ability of the Approval Body to determine performance in relation to regulated characteristics will be limited where the Unit(s) under assessment are 'incomplete' (See 2.1 Scope). This should be noted in the ETA but does not necessarily allow the use of the NPD option.

Table 3 - The type and options of product performance to be declared

ER	ETAG paragraph on product performance	Type of performance declaration in ETA's
1	6.1 Mechanical Resistance and Stability	- Characteristic values for materials or - Characteristic values for components - Calculation methods
2	6.2.1 Reaction to fire	- Classification according to Euroclasses in EN 13501-1
	6.2.2 Resistance to fire	- Classification according to EN 13501-2 - Calculation methods
	6.2.3 External fire performance of roof covering	- Classification according to EN 13501-5
	6.2.4 Fire compartmentation	- Classification statement for relevant elements
3	6.3.1 Vapour permeability and moisture resistance	- Assessed to be acceptable in relation to the intended use of the building and any limitations regarding climatic zones
	6.3.2 Watertightness 6.3.2.1 External envelope 6.3.2.2 Internal surfaces	- Assessed to be acceptable in relation to any limitations regarding climatic zones - Assessed to be acceptable
	6.3.3 Release of dangerous substances	- Declaration of dangerous substances defined in Council Directive 76/769/EEC, and possible measures to be taken
4	6.4.1 Slipperiness of floors	- Assessed to be acceptable or - Slip resistance of flooring
	6.4.2 Resistance to horizontal and eccentric load	- Assessed to be acceptable by judgement or - measured horizontal soft and hard body impact resistance - measured eccentric vertical load resistance
	6.4.3 Falling due to changes in level or sudden drops	- Assessed to be acceptable by judgement or - measured horizontal hard body impact resistance of guard rails, balustrades and parapets

ER	ETAG paragraph on product performance	Type of performance declaration in ETAs
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
	6.5.2 Impact sound insulation	- Weighted normalised impact sound pressure level for separating floors - Weighted normalised impact sound pressure level for all other floors
	6.5.3 Sound absorption	- Sound absorption coefficient of internal surfaces
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
	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 (ER3), interstitial or surface condensation (ER3), and intended use
	6.6.3 Thermal inertia	- Information on relevant data
No performance determined is <b>not</b> an option for the following		
	6.7.1 Aspects of durability	- Assessed to be acceptable in relation to intended use and the effect on performance related to ER1 – ER6 - Possible conditions regarding maintenance
	6.7.2 Aspects of serviceability	- Calculation methods
	6.7.3 Identification	- Values of appropriate identification parameters

## **6.1. MECHANICAL RESISTANCE AND STABILITY**

The properties of structural materials and components related to "mechanical resistance and stability" should be specified in the ETA as simply as possible with regard to the needs of fulfilling the National Provisions.

This may be done by expressing the properties in terms of:

- characteristic strength and other properties such as dimensions from which the load-bearing capacities of the assembled system installed in the works, taking into account the National Provisions, can be calculated, or
- design values provided that the NDPs applicable to works have been taken into account by appropriate levels and classes, which correspond to sets of NDPs.

For further information: see the Guidance Paper L "Application and use of Eurocodes".

The ETA will state the calculation methods to be used for each individual building project in relation to the stability of the structure, taking into account the National Provisions.

## **6.2. SAFETY IN CASE OF FIRE**

### **6.2.1. Reaction to fire**

The individual kit components shall be classified according to EN 13501-1.

### **6.2.2. Resistance to fire**

The concrete frame building kit shall be classified according to the appropriate Part of EN 13501.

### **6.2.3. External fire performance of the roof covering**

The roof covering shall be classified according to EN 13501-5.

### **6.2.4. Fire compartmentation**

The ETA shall give details of the classification of elements, such as internal walls, so that the designer of the works can make use of this data when seeking to meet the regulatory requirements in force in the Member State in which the building is to be constructed.

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

### **6.3.1. Vapour permeability and moisture resistance**

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. It shall be established that condensation in the structure 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 that the structure will dry out again during the evaporation period.

The assessment is to be undertaken with respect to both interstitial and internal surface condensation.

The performance of the kit is stated in the form of acceptable intended uses relevant to the design climatic conditions, e.g. types of buildings and geographical zones.

### **6.3.2. Watertightness**

#### **6.3.2.1 External envelope**

The performance of the kit 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 Products Directive), as well as to the requirements mentioned in 4.3.2. When a kit 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 shall be clearly stated in the ETA.

In cases where tests have been performed, the test results shall be declared.

#### **6.3.2.2 Internal surfaces**



It shall be clearly indicated in the ETA which parts of the kit are classified as watertight surface areas.

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

The product/kit shall comply with all relevant European and national provisions applicable for the uses for which it is brought to the market. The attention of the applicant should be drawn to 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 product but not covered by the ETA, the NPD option (no performance determined) is applicable.

## **6.4. SAFETY IN USE**

### **6.4.1. Slipperiness of floor finishes**

When this performance is determined the slip resistance of finished floorings shall be declared according to the relevant standard for the specified flooring product.

### **6.4.2. Resistance to eccentric loads including impact resistance**

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

When wall structures have been tested according to EOTA TR: "Determination of impact resistance", and/or floors and roof according to EN 1195, the determined impact resistance shall be declared in the ETA.

The minimum accepted impact resistance should normally be 100 Nm for soft body impact with the 50 kg bag and 10 Nm for hard body impact with the 1 kg steel ball, when the intended use is for residential housing, office buildings, etc. However, national building regulations in some member states require a minimum soft body impact resistance of 900 Nm for external walls.

Reference shall be made to Annex A of the EOTA Technical Report No 001 in order to determine the suitability of internal and external walls, for particular applications, in relation to their impact resistance.

### **6.4.3. Falling due to changes in level or sudden drops**

In the ETA the use category in relation to the mechanical resistance against dynamic loads of guard-rails, balustrades and parapets shall be given as meant in ETAG 003: 6.4.1.1 "Resistance of structural damage from soft body impact load – 50 kg bag".

## **6.5. PROTECTION AGAINST NOISE**

Sound insulation performance of building elements 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 EN ISO 717, and should preferably be specified as given below. Other designations for the sound insulation performance mentioned in EN ISO 717 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 facades shall be declared in the ETA, as weighted apparent sound reduction index  $R'w$ , according to EN ISO 717-1. Other designations mentioned in EN ISO 717-1 may be added in the approval, to agree with the verification methods according to national building regulations based on such designations.

### **6.5.2. Impact sound insulation**

The impact sound insulation for floors shall be declared in the ETA, as weighted normalised impact sound pressure level  $L'n w$  (band width 1/3 octave), according to EN ISO 717-2. Other designations mentioned in 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.

### **6.5.3. Sound absorption**

The sound absorption coefficient of internal surfaces is declared.

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

### **6.6.1. Thermal resistance**

Thermal resistance values for the main building elements (walls, floors, roofs) in the kit shall be declared as the total thermal resistance  $R_t$  in  $m^2K/W$ , including the surface resistances. The thermal resistance shall be an average value for the main building parts, including the effect of studs, joists, plates, etc based on an average length in relation to one  $m^2$  of the building part. Thermal resistance of windows and doors in the external envelope which are included in the kit shall be declared separately, also in the term  $m^2K/W$ .

The corresponding thermal transmittance shall be specified as the corrected thermal transmittance  $U_c = 1/R_t + \Delta U$ , where the correction term  $\Delta U$  is calculated according to EN ISO 6946.

When significant thermal bridges are present, the thermal transmittance, in addition to the normal thermal transmittance  $U_c$ , shall be declared in units of  $W/m^2K$ . If relevant, the potential surface condensation risk due to these thermal bridges shall be stated in the ETA (see 4.3.1).

### **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 (works), and not to separate building parts.

Declaration of the degree of air permeability will normally have to be in qualitative terms, i.e. that a building based on the kit will result in adequate airtightness in relation to the intended use, incl. climatic zones, taking into account energy economy and heat retention, risk of cold draughts as mentioned in 4.6.2, and risk of condensation within the construction as mentioned in 4.3.1. When a kit is assessed to be inadequate in certain regions, the limitations on the intended use shall be clearly stated in the ETA.

### **6.6.3. Thermal inertia**

The information on total mass per unit area of the main building parts, and on density, specific heat capacity and thermal resistance of relevant materials, shall be declared as a means for the designer to calculate the thermal inertia of the building in accordance with EN 832 (or prEN 13790).

## **6.7. DURABILITY, SERVICEABILITY AND IDENTIFICATION**

### **6.7.1. Aspects of durability**

The ETA shall declare that the durability of the kit is acceptable in relation to intended use and performances related to Essential Requirements 1 to 6.

Acceptable in the context of this ETAG means that, according to SECTION TWO, GENERAL NOTES, (d) Working life (durability) and serviceability, the assumed intended working life of the concrete frame building kit for the intended use is 50 years for the loadbearing structure and non-accessible components and materials. For repairable or replaceable components and materials this working life is assumed 25 years

When relevant in the ETA also shall declare:

- possible geographical limitations or climatic zones;
- possible conditions regarding maintenance.

When applicable for properties related to the Essential Requirements "mechanical resistance and stability" or "resistance to fire" that have an influence on the durability of the works, the ETA shall give the possibility for national choices by means of levels or classes according to Guidance Paper E.

### **6.7.2. Aspects of serviceability**

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 or to meet possible national regulations.

When relevant, the deflections and other serviceability requirements shall be declared in accordance with the rules given in the relevant Eurocode or in other cases, for example where there is no relevant European standard, values for deflection under design loads should be restricted to the following default values:

- Floors and beams span/360 imposed load only
- Floors and beams span/250 total service load
- Lintels span/360 or 10 mm whichever is less
- Walls spanning between beam or columns span/360
- Sway deformation height/300

The deflection criteria should not be exceeded during transportation or installation.

### **6.7.3. Identification**

The appropriate identification parameters shall be given in the ETA. See also 9.1.

## **7. ASSUMPTIONS AND RECOMMENDATIONS UNDER WHICH THE FITNESS FOR USE OF THE CONCRETE FRAME BUILDING KIT IS ASSESSED**

### **7.1. GENERAL**

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 (only when necessary and in so far as they have a bearing on the assessment or on the products).

### **7.2. DESIGN OF THE WORKS**

#### **7.2.1. 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 kit.

The design process (including the approval of detailed plans, applications for planning permissions, building permits, etc.) shall comply with the procedures foreseen in the Member States in which the building is to be built. An ETA for a concrete frame building kit does not amend this process in any way.

#### **7.2.2. Structural design**

For each individual building project a structural design should be made. This structural design shall confirm that the structure of the building complies with the essential requirements 1, 2 and 6 as meant in chapter 6.

The structural design shall include specifications of any wind load anchors, welding and other supplementary structural works when these are not a part of the kit, but are essential for the fitness in use of the kit in the works.

The completed building (the works) shall 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 shall also be followed by the entity held responsible for this act. An ETA for a concrete frame building kit does not amend this process in any way.

#### **7.2.3. Substructure**

The maximum required tolerances of the substructure dimensions, levelling and permitted differential settlement of the foundation should be assessed for the concrete frame building kit, and be specified in the ETA.

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

#### **7.2.4. Ventilation and heating**

Buildings shall be assumed to be designed to have adequate ventilation rates and heating in relation to the intended use.

### **7.3. TRANSPORT, STORAGE**

A manual for the transport and storage of the building kit shall be available from the ETA holder. The manual shall in particular cover requirements concerning handling equipment and transportation systems, and means and requirements for protecting the kit from weather exposure and mechanical damage during transportation. Reference to the manual shall be made in the ETA.

#### **7.4. EXECUTION OF WORKS**

General instruction for the installation of the kit in the works shall be available from the ETA holder. The instruction 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 kit components (structural fixing, welding, weather sealing etc.);
- fixing of wind anchorage and any seismic anchorage to the substructure and between building parts;
- additional materials and components, including roofs and cladding where relevant, applied on the site, and which are a precondition for the fitness of the assembled kit.

The requirements in EN 1090 should be taken in account when applicable.

As a supplement to the general instructions, specific instructions which contain special aspects related to each individual building project (e.g. special crane requirements, hoisting strap positions, etc) should normally be required. Reference to the instructions for installation of the kit shall be made in the ETA.

The completed building (the works) shall 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 shall also be followed by the entity held responsible for this act. An ETA for a concrete frame building kit does not amend this process in any way.

#### **7.5. 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 kit.

## **SECTION THREE: ATTESTATION OF CONFORMITY (AC)**

### **8. EVALUATION AND ATTESTATION OF CONFORMITY AND CE MARKING**

#### **8.1. SYSTEM OF ATTESTATION OF CONFORMITY**

According to the decision 2003/728/EC of the European Commission the system(s) of attestation of conformity given in Table 4 applies.

Table 4 – System of attestation of conformity applicable to concrete frame building kits

Product(s)	Intended use(s)	Level(s) or class(es)	Attestation of conformity system(s)
Concrete frame building kits	In Building Works	Any	1

The system of attestation of conformity referred to above is defined as follows:

System 1: Certification of the conformity of the product by a notified certification body on the basis of:

(a) Tasks for the manufacturer:

- (1) factory production control;
- (2) further testing of samples taken at the factory by the manufacturer in accordance with a prescribed test plan;

(b) Tasks for the notified body:

- (3) initial type–testing of the product;
- (4) initial inspection of factory and of factory production control;
- (5) continuous surveillance, assessment and approval of factory production control.

Note: In addition, in the case of system 1 of attestation of conformity, the manufacturer shall make a declaration of conformity of the product.

#### **8.2. TASKS AND RESPONSIBILITIES OF THE MANUFACTURER AND NOTIFIED BODIES**

##### **8.2.1. Tasks for the manufacturer- control plan for FPC**

Concrete frame building kits may be manufactured using a wide variety of materials and design approaches. It is therefore not possible to prescribe exactly the actions to be undertaken by the manufacturer of concrete frame building kits for FPC in the procedure of attestation. Table 5 shows an example of a control plan with the corner stones for a concrete frame building kit. It is for the Approval Body and the ETA applicant to agree a control plan for the type of concrete frame building kits under consideration. The objective is to ensure, by direct or indirect methods, that the product specification remains unchanged from that covered by the ETA, allowing for normal tolerances on material properties and manufacturing processes and that the performance of the concrete frame building kits is consistent with the ETA holder's declaration, in relation to all the applicable essential requirements.

Table 5 - Control plan with the corner stones for the manufacturer of the concrete frame building kit

Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
<b>Factory production control (FPC)</b> <b>[including testing of samples in accordance with a prescribed test plan]</b>				
<b>Laboratory and measurement equipment</b>				
Equipment	Calibrating	Manufacturer declared accuracy	-	- On (re)installation - After major repair - Once per year
<b>Production equipment</b>				
Weighing or volumetric batching equipment	Visual inspection	Correct functioning	-	Daily
	Calibrating	Manufacturer declared accuracy	-	- On (re)installation - After major repair - Weighting: once per year - Volumetric: twice a year - In case of doubt
Prestressing equipment	Visual inspection	Correct functioning	-	Daily
	Calibrating	Manufacturer declared accuracy	-	- On (re)installation - After major repair - Weighting: once per year - Volumetric: twice a year - In case of doubt
Other production equipment	Visual inspection	Correct functioning	-	Weekly
<b>Incoming material / components</b>				
All materials	Inspection prior to discharge of delivery ticket and/or label on the package showing compliance with the order	Conformiy with the order	-	Each delivery
All components	Inspection prior to discharge of delivery ticket and/or label on the package showing compliance with the order	Conformiy with the order	-	Each delivery
<b>Process inspection</b>				
Production of materials	Appropriate method	ETA holder's declaration	-	Depending on material and /or process
Production of components	- Type - Quality - Mechanical properties - Dimensions - Tolerances - Test described in the product standard (e.g. EN 13369)	Conformity with ETA specification or product standard	-	Depending on product and properties
<b>Finished product inspection</b>				
Concrete frame building	- Visual inspection - Quantities	Conformity with ETA	-	Every delivery



kit		specification		
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In all cases, the Approval Body and ETA holder may agree alternatives to the test methods given or, where none is given, these parties may agree on the method.

## 8.2.2. Tasks for notified body

### 8.2.2.1 Initial type-testing of the product (ITT)

The corner stones of the actions to be undertaken by the notified body (bodies) in the procedure of attestation of conformity for concrete frame building kits are laid down in table 6.

Table 6 - Control plan for the notified body (bodies) for concrete frame building kits - corner stones

<b>Initial type-testing of the product (ITT)</b>	
<p>*All the characteristics to be verified for concrete frame building kits will have already been the subject of assessment or test by the ETA issuing body as part of the process of issuing the ETA. It is presumed that this data will be used by the ETA holder and notified body for validation purposes. The following list shows those tests and criteria that are related to the characteristics subject to Initial type Testing.  <i>*Note that in some instances the ETA holder may have chosen the npd option and ITT on these aspects is not necessary or possible.</i></p>	
<b>Characteristic of the Prefabricated Building Unit</b>	<b>ETAG paragraphs related to tests/assessment and criteria</b>
ER1 Mechanical resistance and stability	5.1 and 6.1
ER2 Reaction to fire	5.2.1 and 6.2.1
Resistance to fire	5.2.2 and 6.2.2
Fire compartmentation	This characteristic can only be determined in relation to specific building designs. ITT should be based on confirmation of product design and specification.
ER3 Vapour permeability	5.3.1 and 6.3.1
Water tightness	5.3.2 and 6.3.2 Note that an assessment is permissible and therefore ITT should be based on confirmation of product design and specification.
Moisture resistance	5.3.1 and 6.3.1
Release of dangerous substances	5.3.3 and 6.3.3 ITT should be based on confirmation of product design and specification.
ER4 Slipperiness of floors	5.4.1 and 6.4.1, where the product specification includes a floor finish
Impact resistance	5.4.3 and 6.4.3
Falling due to changes of level or drops	5.4.2 and 6.4.2 ITT should be based on confirmation of product design and specification.
Resistance to eccentric loads	5.4.3 and 6.4.3
ER5 Airborne sound insulation	5.5.1 and 6.5.1
Sound absorption	5.5.2 and 6.5.2
Impact sound insulation	5.5.3 and 6.5.3
ER6 Thermal resistance	5.6.1 and 6.6.1
Air permeability	5.6.2 and 6.6.2
Thermal inertia	5.6.3 and 6.6.3

#### 8.2.2.2 Initial inspection of factory and factory production control (FPC)

The initial inspection of the factory provides for the identification and documentation of the kind and manner of the manufacturing process and factory production control of the products. This is to enable the notified body/inspection body to assess the compliance with the provisions of the technical specification on the one hand and to provide a baseline to identify possible changes that may occur during surveillance.

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, taking into account all the relevant provisions mentioned in 8.2.1. The relevant production units shall be specified in the ETA.

The factory production control shall include checks that the relevant design specifications for the production do exist, e.g. structural designs, construction details and manuals for installation as mentioned in chapter 7.

#### 8.2.2.3 Continuous surveillance, judgement and assessment of factory production control (FPC)

The surveillance of the manufacturing process includes checking the documentation of the factory production control to ensure continuing compliance with the provisions of the technical specification, and the identification of changes by comparing data obtained during the initial inspection or during the latest inspection.

### 8.3 CE MARKING AND ACCOMPANYING INFORMATION

According to Council Directive 93/68/EEC the CE marking consists of the letters "CE" in the form laid down in the Directive, followed by the identification number of the notified certification body, where applicable. For products subject to Council Directive 89/106/EEC the identification number of the notified certification body shall be given for concrete frame building kits as Systems 1 applies.

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 (A/C-system 1);
- Name / address of the manufacturer of the kit;
- Indication to clarify the intended use;
- Date of the marking;
- Number of the EC Certificate of Conformity (A/C-system 1);
- Number of ETA;
- Dangerous substances (see clause 5.3.3 of this ETAG).

The properties relating to the essential requirements "mechanical resistance and stability" or "resistance to fire", have to accompany the CE marking or a reference has to made, in an unambiguous way, to the respective design documents of the works (e.g. using a position number) on which the properties are mentioned.

# SECTION FOUR: ETA CONTENT

## 9. THE ETA CONTENT

### 9.1. THE ETA CONTENT

The ETA content shall be in accordance with the Commission Decision 97-571-EC, dated 22 July 1997. The following should be observed in addition:

#### 9.1.1. Specification of materials

The materials and components which constitute the concrete frame building kit shall be adequately identified, see 5.7.3.

The properties of the components used in the kit shall be in compliance with the relevant European standards.

The following table shows some examples of material specifications:

Table 7 – Examples of material specifications

Material/Component	Reference to product specifications such as:
Concrete	ENV 206
Reinforcement	prEN 10080
Prestressing steel	prEN 10138
Hollow core slabs	EN 1168
Linear structural elements	EN 13225
Cladding and lining	Relevant product standards
Thermal insulation	Mineral wool: EN 13163 Type and brand name, and/or relevant standards
Water vapour and wind barriers	Type and brand name, and/or relevant product standards
Roofing materials	Type and brand name, and/or relevant product standards

#### 9.1.2. Drawings

The ETA document shall include section drawings of the building parts. The purpose of the drawings is to illustrate the general build-up of the kit, i.e. structural system and loadbearing components, insulation layers, claddings etc. Material specifications may also be shown directly in these drawings of the kit.

In addition, the kit shall also be described by a set of construction details as specified in 9.1.8. 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 ETA-holder it should be allowed to keep some design details 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 kit and the evaluation of conformity performed by the approved body.

#### 9.1.3. Product characteristics

The performances of the concrete frame building kit related to the requirements and methods of verification and assessment mentioned in chapters 4, 5 and 6 shall be clearly stated. When a kit includes optional designs like a set of standard dimensions (thermal insulation thickness, loadbearing members etc.) it may be convenient to express the characteristics in table form.

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.”*

#### **9.1.4. Storage and transport**

Special provisions concerning storage and transport which are essential for the use of the kit shall be given in the ETA.

#### **9.1.5. Erection details**

The ETA shall include particular preconditions linked to the erection details of the concrete frame system, which the approval body finds to be of special importance. This may be requirements related to the substructure, completion of element joints on site, wind load anchors, roof bracings etc (see also 7.4).

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

#### **9.1.6. Estimated working life**

The minimum estimated working life of the concrete frame building kit shall be stated.

#### **9.1.7. Maintenance**

Basic maintenance to obtain the minimum estimated working life of the concrete frame building kit shall be specified (see also 7.5).

#### **9.1.8. Supporting documents**

A set of drawings showing the essential construction details of the kit 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 metal frame building kit, including the assembly details on site and the conditions for the installation of the kit in the works. The current version of this document shall at all times be kept by the approval body and the approved inspection body.

The set of construction details shall describe the general design of the building kit, including joints between main building parts and joints related to integrated components. The detail drawings shall form the necessary documentation for assessing all the performance requirements specified in chapter 4, including weather resistance and air permeability.

Only the most essential construction details, which are directly related to the main building parts, and which are the pre-designed standard details for the kit, shall be included. Any restrictions for methods and locations of the connections of the components which are not part of the kit (such as external envelope, internal partitions, roofs etc.) shall be given in the supporting documents.

### **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 AND 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 1.3.1)

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.

*(N.B. This definition covers only the intended use as far as relevant for the CPD)*

1.5 **Execution** (ETAG-format)

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

1.6 **Kit** (EC Guidance Paper C)

Construction product consisting of at least two separate components that need to be put together to be installed permanently in the works (Further clarified for the purpose of this ETAG in the Scope, chap. 2, and in the boxed wording from the Mandate reproduced in the Foreword).

## 2 Performance

### 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.

*(N.B. This definition covers only the intended fitness for intended use as far as relevant for the CPD)*

### 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 shall 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).

*As far as practicable the characteristics of products, or groups of products, should be described in measurable performance terms in the technical specifications and guidelines for ETA. Methods of calculation, measurement, testing (where possible), evaluation of site experience and verification, together with compliance criteria shall be given either in the relevant technical specifications or in references called up in such specifications.*

### 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. *Interactions between various products within a work are considered as "actions".*

### 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 ID's 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 ID's 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.)

*These verification methods are related only to the assessment of, and for judging the fitness for use. Verification methods for particular designs of works are called here "project testing", for identification*

*of products are called "identification testing", for surveillance of execution or executed works are called "surveillance testing", and for attestation of conformity are called "AC-testing".*

### 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. *The satisfaction of the specifications is deemed to satisfy the fitness for use of the products concerned.*

*Specifications may also be formulated with regard to the verification of particular designs, for identification of products, for surveillance of execution or executed works and for attestation of conformity, when relevant.*

## 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 enable the works 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 approved 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(\*)**

Body nominated 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.

(\*) 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 Standardisation)
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.

### **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 dans la construction (European Union of Agrément).

### **General:**

TC:	Technical Committee
WG:	Working Group.



## ANNEX B

### LIST OF REFERENCE DOCUMENTS

#### ***Mechanical resistance and stability***

- EN 1990: 2002 Eurocode – *Basis of structural design*
- ENV 1992 1-1 Eurocode 2: *Design of concrete structures – Part 1-1: General rules and rules for buildings*
- ENV 1993 1-1: Eurocode 3: *Design of steel structures – Part 1-1: General rules and rules for buildings*
- ENV 1994 1-1: Eurocode 4: *Design of composite steel and concrete structures – General rules and rules for building*
- ENV 1995 1-1: 1996 Eurocode 5 – *Design of timber structures part 1-1: General rules and rules for buildings*
- EN 1998-1-3:1995 Eurocode 8: *Design provisions for earthquake resistance of structures – Part 1-3 General rules – Specific rules for various materials and elements*
- ENV 1999 1-1:1998 Eurocode 9: *Design of aluminium structures – Part 1-1: General rules and rules for buildings*

#### ***Safety in case of fire***

- EN 1991-2-2:1999 Eurocode 1: *Basis of design and actions on structures – Part 2-2: Actions on structures – Actions on structures exposed to fire*
- EN 1992 1-2-2: 2002 Eurocode 2: *Design of concrete structures – Part 1-2: General rules – Structural fire design*
- EN 1993 1-2: 2001 Eurocode 3: *Design of steel structures – Part 1-2: General rules – Structural fire design*
- ENV 1999 1-2:1998 Eurocode 9: *Design of aluminium structures – Part 1-2: General rules – Structural fire design*
- EN 13501-1:2003 *Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests*
- EN 13501-2:2004 *Fire classification of construction products and building elements – Part 2: Classification using data from resistance to fire tests (excluding products for use in ventilation systems)*
- EN 13501-5:2002 *Fire classification of construction products and building elements: Classification using test data from external fire exposure to roof tests.*

#### ***Vapour permeability and moisture resistance***

- EN 12524: 2000 *Building materials and products – Hygrothermal properties – Tabulated design values*
- EN ISO 12572:2001 *Hygrothermal performance of building materials and products - Determination of Water Vapour Transmission Properties (ISO/FDIS 12572:2000)*
- EN ISO 13788: 2001 *Hygrothermal performance of building components and building elements - internal surface temperature to avoid critical surface humidity interstitial condensation – Calculation method*

#### ***Watertightness***

- EN 1027:2000 *Windows and doors - Water tightness - Test method*
- EN 12155:2000 *Curtain walling - Water tightness - Laboratory test under static pressure*
- EN 12865: 2001 *Hygrothermal performance of building components and building elements – Determination of the resistance of external wall systems to driving rain under pulsating air pressure*
- NT BUILD 058 *Walls in bathrooms: Watertightness and resistance to water and moisture. Edition 3 1998*
- NT BUILD 230 *Bathroom floors: Watertightness. Edition 2 1995*
- NT BUILD 448 *Wall coverings and bushings for water pipes and taps in bathrooms: Watertightness. Edition 1 1996*

#### ***Safety in use***

- EN 1195:1998 *Deck safety harness and safety line for use on recreational craft – Safety requirements and test methods.*
- ISO 7892:1988 *Vertical Building Components - Impact Resistance - Impact Bodies and general Test Procedures*

ISO/DIS 7893:1990 *Performance Standards in Building - Partitions made from Components - Impact Resistance Tests*

EN 12871: 2001 Wood based panels – Performance specifications and requirements for load bearing boards for use in floors, walls and roofs.

### **Protection against noise**

EN ISO 140-4:1998 *Acoustics - Measurement of sound insulation in buildings and of building elements – Part 4: Field measurements of airborne sound insulation between rooms*

EN ISO 140-5:1998 *Acoustics - Measurement of sound insulation in buildings and of building elements – Part 5: Field measurements of airborne sound insulation of facade elements and facades*

EN ISO 140-7:1998 *Acoustics - Measurement of sound insulation in buildings and of building elements – Part 7: Field measurements of impact sound insulation of floors*

EN ISO 354:2003 *Acoustics – Measurement of sound absorption in reverberation room*

EN ISO 717-1:1996 *Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation*

EN ISO 717-2:1996 *Acoustics - Rating of sound insulation in buildings and of building elements - Part 2: Impact sound insulation*

EN 12354-1:2000 *Building acoustics - Estimation of acoustic performance of buildings from the performance of elements – Part 1: Airborne sound insulation between rooms*

EN 12354-2:2000 *Building acoustics - Estimation of acoustic performance of buildings from the performance of elements – Part 2: Impact sound insulation between rooms*

EN 12354-3:2000 *Building acoustics - Estimation of acoustic performance of buildings from the performance of elements – Part 3: Airborne sound insulation against outdoor sound*

EN 12354-4 *Building acoustics- Part 4: Estimation of acoustic performance of buildings from the performance of elements: transmission of indoor sound to the outside.*

### **Thermal inertia**

EN ISO 6946:1996 *Building components and building elements - Thermal resistance and thermal transmittance- Calculation method (ISO 6946:1996)*

EN ISO 8990:1997 *Thermal insulation – Determination of steady-state thermal transmission – Calibrated and guarded hot box (ISO 8990:1994)*

EN ISO 10077-1: 2004 *Thermal performance of windows, doors and shutters – Calculation of thermal transmittance – Part 1: General*

EN ISO 10077-2: 2003 *Thermal performance of windows, doors and shutters – calculation of thermal transmittance – Part 2: numerical method for frames.*

EN ISO 10211-1:1995 *Thermal bridges in building construction - Heat flows and surface temperatures –Part 1: General calculation methods (ISO 10211-1:1995)*

EN ISO 10211-2:2001 *Thermal bridges in building construction - Heat flows and surface temperatures –Part 2: Calculation of linear thermal bridges*

EN ISO 10456:1999 *Building materials and products – procedures for determining declared and design thermal values.*

EN 12524:2000 *Building materials and products – Hygrothermal properties – Tabulated design values*

### **Air permeability**

ISO 9972:1996 *Thermal insulation - Determination of building airtightness - Fan pressurisation method*

EN 1026:2000 *Windows and doors - Air permeability - Test method*

EN 12114:2000 *Thermal performance of buildings - Air permeability of building components and building elements – Laboratory test method*

### **Execution of works**

EN 1090-1: 2004 Steel and aluminium components- General delivery conditions

### **Tasks for the manufacturer**

EN 13369: 2004 Common rules for precast concrete products