

EUROPEAN COMMISSION
ENTERPRISE DIRECTORATE-GENERAL

Single Market : regulatory environment, standardisation and New Approach
Construction

Brussels,
1 August 2002
ENTR/G5 GK

GUIDANCE PAPER F

(concerning the Construction Products Directive - 89/106/EEC)

DURABILITY AND THE CONSTRUCTION PRODUCTS DIRECTIVE

(Revision Aug 2002)

(original issued following consultation of the Standing Committee on Construction at the 47th meeting on 01 July 1999, as document CONSTRUCT 99/367)

Preface

Article 20 of the Construction Products Directive (89/106/EEC) states that the Standing Committee may, "at the request of its Chairman or a Member State, examine any question posed by the implementation and the practical application of this Directive".

*In order to ensure as far as possible a common understanding between the Commission and the Member States as well as among the Member States themselves as to how the Directive will operate, the competent services of the Commission, assuming the chair and secretariat of the Standing Committee, may issue a series of **Guidance Papers** dealing with specific matters related to the implementation, practical implementation and application of the Directive.*

These papers are not legal interpretations of the Directive.

They are not judicially binding and they do not modify or amend the Directive in any way. Where procedures are dealt with, this does not in principle exclude other procedures that may equally satisfy the Directive.

They will be primarily of interest and use to those involved in giving effect to the Directive, from a legal, technical and administrative standpoint.

They may be further elaborated, amended or withdrawn by the same procedure leading to their issue.

DURABILITY AND THE CONSTRUCTION PRODUCTS DIRECTIVE

1. Scope

- 1.1 This paper addresses the issue of durability within the context of the implementation of Council Directive 89/106/EEC¹ (hereafter referred to as the Construction Products Directive or CPD), as amended by Council Directive 93/68/EC². Only aspects related to the immediate production of technical specifications are considered.
- 1.2 The Guidance Paper is intended for technical specification writers (CEN/CENELEC and EOTA members), for consideration together with the respective mandates and provisions given therein, and regulators and enforcement authorities within the European Economic Area (EEA). It takes account of the Communication of the Commission with regard to the interpretative documents of Directive 89/106/EEC³.

2. References relating to durability in the CPD and IDs

- 2.1 CPD 2nd whereas – *“Member States have provisions, including requirements, not only to building safety but also to health, durability, energy economy, protection of the environment, and other aspects important in the public interest.”*
- 2.2 CPD Article 31 and Annex I – *Essential Requirements (applicable to works) shall be satisfied during an economically reasonable working life.*
- 2.3 IDs, para 1.3.5 – *“**Economically reasonable working life** : (1) The working life is the period of time during which the performance of the works will be maintained at a level compatible with the fulfilment of the essential requirements. (2) An economically reasonable working life presumes that all relevant aspects are taken into account, 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 costs of insurance covering these risks; planned partial renewal; costs of inspections, maintenance, care and repair; costs of operation and administration; disposal; environmental aspects.”*
- 2.4 IDs, para 5.1(2) – *“It is up to the Member States, when and where they feel it necessary, to take measures concerning the working life which can be considered reasonable for each type of works, or for some of them, or for parts of the works, in relation to the satisfaction of the essential requirements.”*
- 2.5 IDs, para 5.1(2) - *“where provisions concerning the durability of works in relation to the essential requirement are connected with the characteristics of products, the mandates for the preparation of the European standards and guidelines for European technical approvals, related to these products, will also cover durability aspects.”*

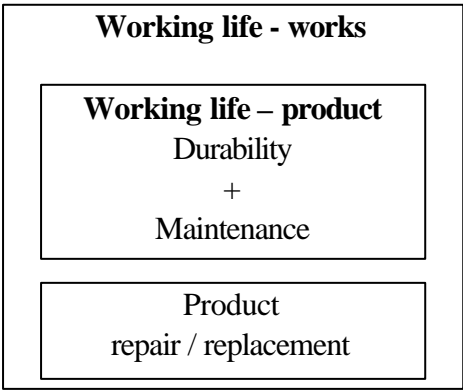
¹ OJ L 40, 11.2.1989

² OJ L 220, 30.8.1993

³ OJ C 62, 28.2.1994

- 2.6 IDs, para 5.2 (1) – “*Category B specifications and guidelines for European technical approval should include indications concerning the working life of the products in relation to the intended uses and the methods for its assessment.*”
- 2.7 IDs, para 5.2 (2) – “*The indications given on the working life of a product cannot be interpreted as a guarantee given by the producer, but are regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.*”
- 2.8 ID 1, para 4.3.1(3)(iv) - “*durability (referred to the values of characteristics) is intended to mean the extent to which the values of the characteristics are maintained during the working life under the natural process of change of the characteristics, by excluding the effect of aggressive external actions.*”
- 2.9 ID 1, Appendix – identifies durability aspects for some products : “*Durability (with respect to the values of the above characteristics and under the following actions) :”.*

3. Definitions



- 3.1 **Working life (works)** - the period of time during which the performance of the works will be maintained at a level compatible with the fulfilment of the Essential Requirements.
- 3.2 **Working life (product)** - the period of time during which the performance of a product will be maintained at a level that enables a properly designed and executed works to fulfil the Essential Requirements (i.e. the essential characteristics of a product meet or exceed minimum acceptable values, without incurring major costs for repair or replacement). The working life of a product depends upon its inherent durability and normal maintenance.

A clear distinction has to be made between the assumed economically reasonable working life for a product, which underlies the assessment of durability in technical specifications, and the actual working life of a product in a works. The latter depends on many factors beyond the control of the producer, such as design, location of use (exposure), installation, use and maintenance. **The assumed working life can thus not be interpreted as being a guarantee given by the producer.**

Technical specification writers will have to take a view about the “normal” working life of the products that they deal with. The assumed working life of a product should take account of the

assumed working life of the works, the ease and cost of repair or replacement of the product, maintenance requirements and exposure conditions.

- 3.3 ***Durability of a product*** - the ability of a product to maintain its required performance over time, under the influence of foreseeable actions. Subject to normal maintenance, a product shall enable a properly designed and executed works to fulfil the Essential Requirements for an economically reasonable period of time (the working life of the product).

Durability is thus dependent on the intended use of the product and its service conditions. The assessment of durability can relate to the product as a whole or to its performance characteristics, insofar as these play a significant part with respect to the fulfilment of the Essential Requirements. In either case, the underlying assumption is that the performance of the product will be maintained at an acceptable level, in relation to its initial performance, throughout its working life.

- 3.4 ***Foreseeable actions*** – potential degradation factors that may affect the compliance of the works with the essential requirements. They include, for example, temperature, humidity, water, UV radiation, abrasion, chemical attack, biological attack, corrosion, weathering, frost, freeze-thaw, fatigue (i.e. actions related to “normal” agents that could be expected to act on the works or parts thereof).

4. Factors affecting durability

- 4.1 ***Exposure conditions*** – as the severity of actions related (e.g.) to climate and geography vary considerably across Europe, technical specifications should aim to define an appropriate range of exposure conditions and relate the assessment of durability to these. The definition of use categories for products may be a suitable manner in which to achieve this.

Examples of the types of exposure that should be considered are temperature variations (daily, monthly, annual, freeze-thaw conditions etc), incidence of solar radiation, humidity, rainfall, wind speed etc (i.e. related to “normal” use of the product).

- 4.2 ***Other*** – the chemical and physical characteristics of a product will have an influence on its durability. For example, some types of plastics may be susceptible to UV degradation, porous materials to freeze-thaw damage, composite materials to temperature variations etc. Such material-specific factors will need to be considered by specification writers, particularly in performance-based standards that potentially cover a wide range of different materials.

5. The assessment of durability

- 5.1 The durability of construction products may be assessed using performance-based methods, descriptive solutions or a combination of the two.
- 5.2 Whilst the CPD calls for European standards to be expressed as far as practicable in product performance terms (*Article 7.2*), this does not necessarily imply that durability shall always be assessed by means of performance testing. Standards writers should adopt a pragmatic approach, striking a balance between the cost of testing, the additional information that can

result from such tests, and the apparent simplicity of descriptive solutions. The latter, however, must not be used as an arbitrary means of discrimination between products or producers.

- 5.3 European technical approvals are based on examinations, tests and an assessment of the product (*Article 9.1*), giving scope for both types of solution mentioned above. Again, a balance must be struck between performance testing and descriptive solutions, bearing in mind that information may be lacking on the acceptability of the latter. For innovative products an examination of the practical experience available across Europe for similar products may provide an appropriate solution, rather than an extensive testing programme.

Descriptive solutions for durability

- 5.4 These consist of an experience-based description of a product or related measures that are known to ensure adequate durability for a given product under assumed conditions (e.g. intended use, service conditions, working life, ...). Examples are :
- specification of protective coating/ cover
 - composition/ thickness of material
 - recommendations on installation conditions in the works
 - specified maintenance requirements
 - etc
- 5.5 These types of solution are better suited to well known construction products for which experience has been accumulated over a long period of time. The proposed solutions must take account of the intended use(s) of the product and be valid for the range of exposure conditions encountered in Europe (e.g. a descriptive solution that provides acceptable durability in Southern Europe may not be appropriate for conditions further North).

Performance testing for durability

- 5.6 The second main route to durability assessment involves the performance testing of a product to determine the variation in its characteristics under a given action or cycle of actions. The most common types of performance testing are :
- Direct testing – the achievement of a certain level of performance is recognised as being sufficient to give an acceptable durability (e.g. abrasion, fatigue, closing, and impact tests)
 - Indirect testing – the measurement of “proxy” characteristics that can be correlated to actual performance and hence durability (e.g. porosity for freeze-thaw resistance and hardness for abrasion resistance)
 - Natural weathering/ ageing tests – such tests either give a direct indication of durability (e.g. corrosion tests) or enable normal performance tests to be carried out after treatment, thus allowing the degradation in performance to be determined.
 - Accelerated weathering/ ageing tests – as above, but with the normal ageing process speeded up to reduce the duration of the test.
 - “Torture” tests – the product is subjected to conditions that are much harsher than those ever encountered in use (e.g. boil testing of glass reinforced polyester or laminated timber products).

5.7 Although performance testing can provide useful data on the degradation of performance over time, often allowing greater scope for innovation, it can be expensive and is still the subject of much research around the world, particularly in relation to service life prediction. To avoid unnecessary costs, alternatives to full-scale testing should be considered wherever possible.

6. The treatment of durability in technical specifications

6.1 All technical specifications elaborated in the context of the CPD must include provisions for the assessment of durability, taking into account the needs of the Member States and using performance-based methods, descriptive solutions or a combination of the two. They should be written in such a way that a product in conformity with the technical specification can be assumed to have a “normal” working life, subject to proper maintenance.

6.2 The current, generally accepted “*state of the art*”⁴ is to be applied in dealing with durability in technical specifications for construction products. The development of performance-based methods of determination, however desirable from a technical point of view, should not delay the delivery of European standards and European technical approvals. Whilst the mandates tend to be expressed in terms of “the durability of characteristic X against action Y”, it is recognised that the current level of knowledge is not always sufficient to follow such an approach. The use of indirect methods of assessment may provide appropriate solutions in such cases.

6.3 The best judges of the “*state of the art*” are the specification writers themselves and thus durability is to be regarded as a purely technical matter to be dealt with by them⁵. Where current knowledge or appropriate methods of determination are lacking, a pragmatic approach to the assessment of durability should be taken, rather than an automatic recourse to extensive testing.

6.4 Where entirely descriptive solutions are proposed, compliance with the technical specification will normally indicate that the product meets the required criteria and no further information is required to accompany the CE marking. For performance testing, the general principles contained in the Guidance Papers on “CE marking” and “classes and levels” should be followed.

7. Attestation of conformity

7.1 The assessment of durability, as indicated in the technical specification, forms part of the attestation that products are in conformity with the requirements of that specification. The assessment is therefore carried out under the same system of attestation of conformity as for the product itself.

⁴ In this context, “state of the art” refers to the current level of knowledge that is generally accepted as being technically sound. It does not mean the most advanced technology.

⁵ Note, however, that Article 5.1 of the CPD constitutes a “technical” safeguard clause on the content of European technical specifications. The mandates also give the Member States the right to participate in the activities of specification writers through their national delegations/ bodies and to present their points of view at all stages of the drafting process.

7.2 Where a specific test is directly related to a particular performance characteristic of the product (i.e. the durability of characteristic X against action Y), the allocation of the test to the notified body or the producer should normally be the same as for the characteristic itself, as indicated in Annex 3 of the mandates ⁶.

8. Checklist for technical specification writers

8.1 What actions (potential degradation factors) are relevant for the family of products in question? The mandate gives an initial list, for which the Member States have indicated that they regulate, but this is not necessarily exhaustive. Consideration should be given to the intended use of the product, foreseeable service conditions and the potential variability in the severity of actions across Europe. The definition of exposure conditions and use categories should be considered where appropriate. Specific material-related aspects should also be considered, even within the context of purely performance-based specifications.

8.2 What assumptions are to be made about the “normal” working life of the product in relation to the possible intended uses? These assumptions underlie the assessment of durability and the severity of any proposed testing requirements. Current market practice should be followed wherever possible. Where different working life assumptions can be made for the same product, the technical specification should provide a means of distinguishing between the different assessments of durability (e.g. working life categories).

The technical specification need not make explicit reference to the working life assumed in the assessment of durability, but may do so if it is felt to be appropriate. In the latter case, it shall be made clear that the assumption does not constitute a guarantee from the producer as to the actual working life of his product. Table 1 below, developed by EOTA, provides an illustration of possible working life assumptions. Whilst useful as a guide, the figures provided need to be adapted to the specific product family in question.

8.3 What is the current, generally accepted “*state of the art*” for the family of products in question? This assessment will include a consideration of the current methods and provisions that are deemed to provide adequate durability and a review of available test methods, whether national, European or international ⁷. The possibility of adapting test methods developed by other technical committees or working groups should also be investigated.

8.4 The decision whether to adopt descriptive or performance-based solutions for the assessment of durability, or a combination of the two, will depend upon the above analysis. The approach adopted should be practicable and respect the principle of proportionality – the least onerous possible procedure consistent with the objective sought. The underlying basis of the assessment should be readily apparent in the specification.

8.5 The requirements for information on durability to accompany the CE marking must also appear in the technical specifications. Guidance on these aspects is given elsewhere (GPs on CE marking and classes/ levels).

⁶ Additional guidance on the role and tasks of the notified bodies is under preparation and will clarify this aspect further.

⁷ Where the state of the art consists of two or more methods of determination, the instructions given in the mandates for dealing with this type of situation must be followed.

9. Examples

Durability by performance testing

- 9.1 “The resistance to SO₂ shall be proven in a test cycle by alternating storage in a warm SO₂ atmosphere and a laboratory atmosphere. Following exposure, the test sample is submitted to the crushing test.”
- 9.2 “Durability of operational reliability against fatigue - Subject the spring to (5000 +/- 10) cycles of normal operation at a rate not exceeding 6 cycles per minute. Record any fracture or rupture. No fracture or rupture shall be permitted.”

Durability using descriptive solutions

- 9.3 “The following table shows the minimum concrete cover of reinforcement related to different ambient conditions. The cover appropriate for the intended end use shall be used, and its value stated.”
- 9.4 “The tightness of elastomeric sealing joints is presumed to be durable if the joint itself is in conformity with the requirements of the standard and if the sealing elements have been correctly selected and conform to EN 681. Note: the joint needs to be installed according to the manufacturer's instructions.”
- 9.5 “Metal components shall be protected with one of the following levels of protection/coating, whichever is relevant for the associated level of exposure.”

Table 1 : illustrative assumed working lives of works and products (from EOTA)

Assumed working life of works (years)		Assumed working life of construction products (years)		
Category	Years	Category		
		Repairable or easily replaceable	Less easily repairable or replaceable	Lifetime of works #
Short	10	10 *	10	10
Medium	25	10 *	25	25
Normal	50	10 *	25	50
Long	100	10 *	25	100

* In exceptional and justified cases, e.g. certain repair products, a working life of 3 or 6 years may be envisaged.

Products not repairable or economically replaceable.