

Report

"European assessment documents for sustainable construction products: Information for SMEs"

within the framework of the **Baltic Sea Region "SPIN"**

Project



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Legal notice

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Abbreviations

AVCP	Assessment and Verification of Constancy of Performance
BAM	'Bundesanstalt für Materialforschung und –prüfung'; Federal Institute for Materials Research and Testing
CPR	Construction Products Regulation
BMVBS	'Bundesministerium für Verkehr, Bau und Stadtentwicklung'; Federal Ministry for Transport, Building and Urban Affairs
BNB	'Bewertungssystem Nachhaltiges Bauen'; Assessment system for sustainable building
CPD	Construction Products Directive
BR	Basic Requirement
BREEAM	BRE Environmental Assessment Method
BWR	Basic Work Requirement
DGNB	'Deutsche Gesellschaft für Nachhaltiges Bauen'; German Council for Sustainable Building
EAD	European Assessment Document
ECHA	European Chemical Agency
EOTA	European Organisation for Technical Approvals
EPD	Environmental Product Declaration
ETA	European Technical Approval (under the Construction Products Directive)
ETA	European Technical Assessment (under the Construction Products Regulation)
hEN	harmonised European standard
HQE	'Haute Qualité Environnementale'
IBO	'Österreichisches Institut für Baubiologie und Bauökologie; Institute for Building Biology and Ecology
IBU	'Institut für Bauen und Umwelt'; Institute for Building and Environment
LCA	Life Cycle Assessment
LEED	Leadership in Energy and Environmental Design

npd	no performance determined
ÖGNB	'Österreichische Gesellschaft für nachhaltiges Bauen'; Austrian Association for Sustainable Construction
PCR	Product Category Rule
PBT	Persistent, Bioaccumulative, Toxic
SVHC	Substance of Very High Concern
TC	Technical Committee
TR	Technical Report
TQB	Total Quality Building
TZUS	'Technický a zkušební ústav stavební Praha, s.p.'; Technical and Test Institute for Construction)
USGBC	US Global Building Council
vPvB	very Persistent, very Bioaccumulative
WG	Working Group

1 Introduction

This report addresses small and medium-sized enterprises (SMEs) in the field of construction product manufacture. It is designed to help them to better understand and implement the new Construction Products Regulation as well as the area of approval of construction products. It focuses on the sustainability of building constructions, a requirement which has now been included in the Construction Products Regulation. To this end the report will provide an in-depth explanation of what is to be understood by the concept of sustainability.

The European Commission published the Construction Products Regulation in the Official Journal of the EU in 2011.¹ It will come into effect on 1 July 2013² and it repeals the Construction Products Directive of 1989. The Regulation contains a number of new elements that manufacturers of construction products will be facing. These also include a completely new requirement for building constructions. Basic requirement No. 7 (BR7) "Sustainable use of natural resources" serves to assist Member States in establishing minimum standards for the durability, the recyclability of buildings constructions and for the application of environmentally friendly materials and secondary construction materials. However the extended wording of basic requirement No. 3 (formerly essential requirement No. 3) also permits a reinterpretation of this requirement.

Next to the harmonised standards, in future there will be no European Technical Approvals based on agreed guidelines or assessment criteria, instead there will be the European Assessment Documents (EADs) serving as harmonised specifications. They serve as a basis for issuing a European Technical Assessment, in which information about a product's performances are established.

The report cannot deliver specific guidelines on how the new sustainability requirement can be implemented, because no side has yet provided these. To date neither the Commission nor any one or several Member States have stated any respective guidelines. However, this may actually present an opportunity, because the lack of such guidelines leaves room for ideas and procedures on how best this new requirement could be implemented. The report includes suggestions by the authors considering what requirements a construction product should meet to be able to be referred to as sustainable.

It is to be expected that the Commission and the Member States will within the foreseeable future prepare agreed criteria for assessing the sustainability of construction products. Once these have been established and published, the construction product standards will need to be revised accordingly. This process may take some time to complete. Only after a revised standard has been published will the manufacturer of a construction product, whose product falls under the requirements of the corresponding product standard, be declaring with the CE marking that his product is sustainable.

It is theoretically conceivable, that statements about the sustainability of a construction product within the field of approval can already be made. This can take place at the national or European level. The report

¹ REGULATION (EU) NO 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC. Official Journal of the European Union L88, p. 5-43. 4 April 2011

² Exempted from this are a number of articles of the Regulation that already came into force two weeks after publication of the Construction Products Regulation.

serves to show what sustainability requirements a product could be expected or asked to have, so that these could be incorporated into a European Technical Assessment.

To provide a better understanding, the report initially discusses the Construction Products Regulation in more detail. General concepts and procedures already in practice in the field of sustainable construction are then explained. The third part of the report presents suggestions for the implementation of "sustainability" as a new basic requirement. This is followed by explanations of how a European Assessment Document can be generally applied for, and in conclusion how this could be done including consideration of the aspect of sustainability.

Once more it must be emphasized that this report is breaking new ground in numerous points, because neither has the European Commission provided guidelines on the implementation of these new basic requirements for the sustainability of construction products nor has a Member State implemented similar requirements into its national set of rules. For this reason all instructions and procedures are based merely on suggestions made by the authors and are in no way binding.

The SPIN-Project

The aim of SPIN is spelt out in the full title of the project: SPIN aims at enhancing "Sustainable Production through Innovation in SMEs".

SPIN is based on the simple but normally successful business equation of matching supply and demand. SPIN taps on innovations throughout the Baltic Sea Region (BSR), which lead to sustainable production in SMEs. It supports SMEs who have developed sustainable solutions to reach out to a larger market. At the same time it gives enterprises the technical and managerial solutions they need to make their production process more sustainable and to increase their profits.

In doing so the project is creating a win-win-win situation: The supplier increases his profit by selling more products / services, the applier increases his profit by reducing production costs (e.g. through improved resource efficiency) and / or by increasing his sales (through innovative production techniques fulfilling higher environmental or social standards). In any case society benefits through reduced environmental costs or improved working conditions. The slogan of SPIN is therefore: ***Private Profits – Public Benefits.***

SPIN has created a number of instruments to fuel this matchmaking throughout the BSR: Innovation highlights like the ones presented in this brochure are collected in the SPIN Database. This is a ready-to-use instrument for SMEs wanting to push their innovative products and for enterprises seeking an innovative solution for their specific situation. All SMEs from the BSR can register and post their entries directly online. The SPIN partners perform a quality check and if the data set is meeting the criteria of sustainable production the entry is made accessible to all users. Users only searching the database for innovations can use it without registering.

Another instrument is the SPIN Toolbox. The SPIN tools can be applied rather broadly in all kinds of SMEs and are not as specific as the innovation highlights. “Umberto“ is such a tool that is promoted by SPIN. It is a powerful software tool to model, calculate and visualize material and energy flow systems in SMEs with cost intensive production that wish to optimize their processes and improve their competitiveness. Results can be assessed using economic and environmental performance indicators.

SPIN runs for 3 years (until January 2012) and is supported by the Baltic Sea Region Programme 2007-2013 of the European Union. SPIN is lead by the Federal Environment Agency from Germany and brings together some of the most important institutions for eco-innovations in the BSR.

The website www.spin-project.eu has developed into a frequently used information platform for entrepreneurs and policy makers in the BSR but also into a market place for innovations and tools supporting sustainable production.

For more information please visit the website, which provides you also with all contact details for each country.

2 Presentation of the Construction Products Regulation and its new Instruments

2.1 Background of the subject

On 4 April 2011, Regulation (EU) No. 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC was published in the Official Journal of the European Union. This initiated a changeover process from the Construction Products Directive³, which, following a transition period of a little more than two years, will be concluded in mid-2013.

According to Article 23 of the Construction Products Directive (CPD) the commission was until no later than 31 December 1993 and in close contact with the Standing Committee on Construction obliged to re-examine "the practicability of the procedures laid down by this Directive" and, where necessary, submit proposals for appropriate amendments. However, since the first European Technical Approval was granted no earlier than 1998 and the first harmonised standard was made known in the Official Journal of the EU as late as January 2001, the general consensus was that a re-examination at the scheduled early point in time would have made little sense.

From as early as 2005 onwards, discussions about a revised version of the CPD were intensified. Since 2003 there have been parallel public considerations about a revision of the new approach. The Commission Services commissioned studies on both inter-related themes and conducted Internet surveys. Associations and Member States organised forums in which the necessary amendments were discussed. It became evident that most of the participants in the field of construction wanted to maintain the Construction Products Directive with respect to its basic principles, but were interested in a number of clarifications, for example with respect to the obligations regarding CE marking.

To many observers it was thus surprising that the Commission Services changed the legal instrument and in June 2007 presented a not yet complete draft for a completely reformulated Regulation. A number of Member States expressed considerable reservations against the impending change in the legal instrument, because implementing an amendment to the Construction Products Directive into national law would have been considerably easier. The reason given by the Commission Services for choosing the Regulation as the legal instrument was on the one hand, that the directive had not been uniformly implemented in the Member States, particularly with respect to the binding nature of the CE marking. However this was less due to the legal instrument than to the not unambiguous text of the directive. On the other hand, the Commission Services placed much importance on the new regulations coming into force at the same time in all Member States, something which cannot be achieved with a directive.

In May 2008 the Commission Services then presented their official draft of the Regulation, following which numerous comments and statements were made by the Member States and by the Parliament. During the following approximately two and a half years, numerous meetings were held by the Council Working

³ Council Directive of 21 December 1988 on the approximation of laws and administrative provisions of Member States relating to construction products (89/106/EEC) (Official Journal of the EC L 40 of 11 February 1989), amended by Council Directive 93/68/EEC of 22 July 1993 (Official Journal of the EU L 220 of 30 August 1993), amended by Regulation (EC) No. 1882/2003 of the European Parliament and of the Council of 29 September 2003 (Official Journal of the EU L 284 of 31 October 2003)

Group and in the European Parliament for consultation. These consultations were reflected at the national level, in which the Deutsches Institut für Bautechnik (DIBt) participated intensively.

Following the adoption of the draft of the Construction Products Regulation (CPR) by the European Parliament on 18 January 2011 at second reading, Counsel too agreed to a compromise proposal by qualified majority on 28 February 2011, this compromise being the result of a trilogue procedure at the end of 2010. In such a trilogue procedure the Commission, the Council and Parliament jointly seek to determine whether a compromise can be reached, and this has been the case here.

Since then there have been further discussions at the national and the European level, the focus being on establishing clarity about some of the aspects of the practical implementation of the Regulation. These discussions should be concluded no later than 1 July 2013, when the Regulation is to be completely applied. Until then only those rules of the Regulation are to apply that relate to the preparation of a practical implementation, i.e.

- Naming Technical Assessment Bodies by the Member States,
- Establishing an organisation for the Technical Assessment Bodies,
- Notification of bodies by the Member States, which are to be engaged within the framework of the system for assessing and checking constancy of performance (notifying authorities, notified bodies) and
- the Standing Committee on Construction.

2.2 Conceptual changes

The Regulation contains a number of new elements, not only but also particularly with respect to the "essential requirements" for building constructions and the European Technical Approvals (terminology used hitherto according to the Construction Products Directive). The following overview will discuss in greater detail some of the changes that are of particular interest for manufacturers.

2.2.1 Declaration of Performance and CE marking, basic requirements

When a construction product is covered by a harmonised standard or when a European Technical Assessment was issued for a construction product, a Declaration of Performance shall be drawn up. The CE marking shall then be authoritatively applied to the product. Exceptions only relate to

- Products that were manufactured individually or custom-made and are being installed by the manufacturer in a certain individual building construction.
- Products that were manufactured on the construction site and
- Products that were manufactured in a traditional way or using a non-industrial method that is appropriate or special for maintaining a cultural heritage, particularly for example historic buildings.

The CE marking does not stand for the agreement of a product with the provisions of a harmonised technical specification, but it stands for the conformity of the product with the performance that is stated in the Declaration of Performance. Making a statement in some other way about product performances with reference to the "essential characteristics" of the product is only permitted when such statements are also included in the Declaration of Performance. "Essential characteristics" are those characteristics of the construction product which are necessary so that the building construction into which the product is to be installed can meet the basic requirements (or basic works requirement - BR or BWR respectively, a uniform abbreviation has not as yet been established). The term "basic requirements" replaces the term "essential requirements" used hitherto. This is to make clear that there is a difference compared to such European regulations in which the ("essential") requirements address the product directly, while the basic requirements according to the CPR address the building constructions.

In addition to the already known basic requirements for building constructions, the Regulation now has a seventh requirement that was not part of the Construction Products Directive. Basic requirement No. 7 "Sustainable use of natural resources" serves to assist Member States in establishing minimum standards for the durability, the recyclability of building constructions and for the application of environmentally friendly materials and secondary construction materials.

However the extended wording of basic requirement No. 3 (formerly essential requirement No. 3) also permits a reinterpretation of this requirement. The life cycle phases of a building construction will now be explicitly itemized and effects on climate will be included.

The fourth basic requirement "safety of use" now also includes the aspect of access.

2.2.2 European Assessment Documents and European Technical Assessments

Next to the harmonised standards, in future there will be no European Technical Approvals, instead there will be the European Assessment Documents (EADs) serving as harmonised specifications. These Assessment Documents are to be prepared on the basis of an application for a specific construction product, and on the one hand they can best be compared with the current EOTA⁴-internal joint assessment principles, which are prepared on the basis of an application according to Article 9(2) CPD, while on the other hand they can also be similar to a guideline. One of the points that are currently not clear is whether a European Assessment Document is either revised or supplemented when an application is made for a further similar product - so that after several such revisions and/or supplements have been made it may contain rules with respect to a family of products, similar to previous approval guidelines - or whether in this case a further similar assessment document is to be prepared for each such further application.

The assessment documents serve as a basis for issuing European Technical Assessments, in which information about a product's performances is established. The assessment documents are to be published following the initial affixing of the CE marking on or to the respective product.

In accordance with the new instruments of the European Assessment Document and the European Technical Assessment, the future bodies shall be called European Technical Assessment Bodies. As has

⁴ European Organisation for Technical Approvals

been the case with the Approval Bodies, these Assessment Bodies will be named by the Member States. Such naming can be done for one, several or all of the product areas referred to in Appendix IV CPR. The same annex of the Regulation will contain criteria that these bodies shall meet.

Regarding the process for preparing European Assessment Documents, Appendix II of the Regulation will - against the recommendations of many Approval Bodies united in the EOTA - contain a number of bureaucratic provisions that do not take into account the contractual freedom between manufacturers and the Technical Assessment Body, and especially the possible differences in procedures particularly with respect to the complexity of the products in question.

2.2.3 Assessment and verification of constancy of performance

In accordance with the new concept of the Regulation (see 2.1), the previous term "Procedure for the attestation of conformity" will now be changed to "Assessment and verification of constancy of performance". The procedure is to serve exclusively for ensuring that the products from an ongoing production process have the performance characteristics stated in the Declaration of Performance. The systems previously known from the Construction Products Directive, abbreviated with the numerical codes, and their individual elements will generally be maintained (see annex I). Only System 2, which in practice has been hitherto applied in one case only (construction lime) and was then subsequently changed to System 2+, will be omitted. Furthermore, it is now determined that the responsibility for sampling during initial type testing within the framework of System 3 lies with the manufacturer.

2.2.4 Simplified procedures

The Regulation provides for a series of simplified procedures. The manufacturer will thus be able to replace type testing by so-called Appropriate Technical Documentation (Article 36 CPR). It will thus be possible

- to verify the achievement of certain levels or classes of performance with respect to one or more of its essential characteristics in accordance with the conditions set out in the relevant harmonised technical specification or a Commission decision without the need for (further) testing or calculation,
- to use the test results of another manufacturer (licensor) for preparing the Declaration of Performance, provided that the construction product is covered by a harmonised standard and that the other manufacturer agrees, or
- to use the test results of suppliers of systems or components as a basis for preparing the Declaration of Performance, provided that these agree.

If in these cases it is provided that the assessment and verification of constancy of performance is to be performed on the basis of Systems 1+ or 1, the Appropriate Technical Documentation shall be verified by a notified product certification body.

The following simplified procedure applies only for micro-enterprises⁵ (Article 37 CPR): Where Systems 3 or 4 have been specified as the system for assessing and verifying constancy of performance, the methods used for "determining the product type" (type testing) may differ from those contained in the applicable harmonised standard. Furthermore, the manufacturer may where applicable use System 4 instead of System 3. The manufacturer shall then demonstrate compliance of the construction product with the applicable requirements by means of a Specific Technical Documentation and shall demonstrate the equivalence of the procedures used to the procedures laid down in the harmonised standards.

And finally the Regulation contains a further rule for cases in which the product is individually manufactured or custom-made. This rule contains no statement about whether the manufacturer is required to make the installation himself as a pre-requirement for its applicability. The manufacturer can then take the System earmarked by the corresponding harmonised standard for assessing and verifying the constancy of performance and replace it with a Specific Technical Documentation with which the conformity of the product with the applicable requirements as well as the equivalence of the methods used with the methods specified in the harmonised standard are verified. If the standard earmarks method 1+ or 1, the Specific Technical Documentation is verified by a notified product certification body (Art. 38 CPR).

2.2.5 Product contact points for construction

As generally provided by horizontal Regulation (EC) No. 764/2008⁶ of the European Parliament and the Council, Product Contact Points are to be set up for construction products as well. The purpose of these Product Contact Points is that they are to provide a source from which, among other things, all national rules related to a certain product and, where applicable, also the addresses of the relevant national authorities as well as options for complaints can be inquired. This information is free of charge and shall be delivered within 15 work days.

In Germany, for construction this task will be assigned to the Federal Institute for Materials Research and Testing (BAM) in Berlin. The BAM can already be contacted through its homepage www.pcp.bam.de. In Denmark this will be the "Danish Energy Agency" in Copenhagen. The Danish body can also be contacted through its homepage: www.danishcprcontactpoint.dk No further information about other Product Contact Points was available to us at the time of completion of the report.

⁵ according to the Commission's recommendation of 6 May 2003 concerning the definition of micro-enterprises as well as small and medium-sized enterprises (2003/361/EC) (Official Journal of the EU L 124 of 20 May 2003)

⁶ Regulation (EC) No. 764/2008 of the European Parliament and of the Council of 9 July 2008 laying down procedures in conjunction with the application of certain national technical rules for products that have been properly placed on the market in another Member State, and for the repeal of Decision No. 3052/95/EC (Official Journal of the EU L 218 of 13 August 2008)

3 Instruments of sustainable construction

3.1 Introduction

Efforts to seek out the origin of the history of the impact of sustainability leads to many answers. Some see the beginning in the UN Conference in Rio de Janeiro in 1992, in which the Agenda 21 was defined, some see it in the Brundlandt Report of 1987 and others see it in the "Limits of Growth" drawn up at the instigation of the Club of Rome [1,2]. Delving more deeply into the history of the term reveals that as early as the beginning of the 18th century the concept of sustainability was considered as an alternative plan to overexploitation in forestry. The reason for this was the high demand for wood, for example for applications in the mining industry.

It is a fact that today the issue of sustainability has become an integral part of political debates, industrial and economic interests as well as administrative processes. In harmony with this, the European Commission has made "Sustainable Building" one of its current lead market initiatives⁷. A rationale for the European Commission's commitment in this field is that building constructions have the highest final energy consumption and a very high level of greenhouse emissions.

Sustainability is comprised of three dimensions: ecological or environmental sustainability, social sustainability and economical sustainability (see Figure 1). This 3-pillar model has become internationally accepted.

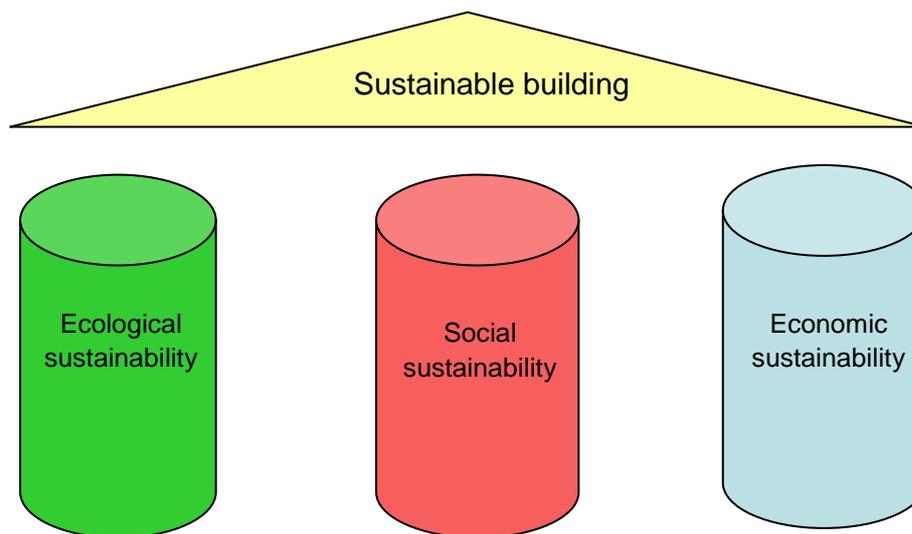


Figure 1: Dimensions of sustainability

⁷ COMMUNICATION FROM THE COMMISSION TO THE COUNCIL, THE EUROPEAN PARLIAMENT, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS - A lead market initiative for Europe. COM(2007) 860

The field of construction generally also assumes this 3-pillar model. Ecological sustainability serves to provide a framework for protecting natural resources and the ecosystem. The approach considers the environmental pollution, consumption of resources and energy consumption involved in producing the construction products, erecting a building construction, operating it and then subsequently demolishing it including its corresponding downstream disposal. This means that the building construction must be considered over its entire life cycle, and thus "from the cradle to the grave".

Within the framework of the social sustainability of building constructions it is the user of the building construction and his socio-cultural concerns that are in the foreground. Here it is particularly the immaterial values such as integration, education, demography, mobility, quality of life as well as comfort and health that are significant. Some of these indicators, for example thermal comfort, are verifiable. Health too can be at least influenced by installing health-compatible construction products.

The goal of economic sustainability for building constructions is to optimise the life cycle costs of building constructions, so that the focus is on the cost of erecting, operating and ultimately demolishing the building construction. At the same time efforts are geared towards high value retention.

3.2 Certification systems for building constructions

In many countries there have already for years been procedures, guidelines and strategies in place dealing with the sustainable erection of building constructions, what requirements such building constructions must meet and how they can be certified. Some of these construction certification systems are also oriented along the lines of the 3 pillars of sustainability. In Germany for example, the Federal Ministry for Transport, Building and Urban Affairs (BMVBS) has been cooperating with the private German Sustainable Building Council (DGNB) to establish requirements for the sustainability of building constructions. Besides ecological, social and economic quality, this system queries the technical quality, process quality as well as the site quality. For example a total of just under 50 criteria have been defined for office buildings (Table 1). These criteria are laid down in profiles. This table also includes the assessment and a weighting of the criteria (see Table 2). Some of these criteria are derived through life cycle assessment.

Table 1: Overview of profiles

Ecological quality	
Effects on global and local environment	
1.1.1	Global warming potential (GWP)
1.1.2	Ozone depletion potential (ODP)
1.1.3	Photochemical ozone creation potential (POCP)
1.1.4	Acidification potential (AP)
1.1.5	Eutrophication potential (EP)
1.1.6	Risks for the local environment
1.1.7	Sustainable material production / wood
Use of resources	
1.2.1	Primary energy requirements not renewable (PE _{ne})
1.2.2	Total requirement of primary energy (PE _{ges}) and share of renewable primary energy (PE _e)
1.2.3	Required drinking water and generation of waste water

1.2.4	Land use
Economical quality	
Life cycle costs	
2.1.1	Building related costs in the life cycle
Value performance	
2.2.1	Potential for alternate uses
Socio-cultural and functional quality	
Health, comfort and user satisfaction	
3.1.1	Thermal comfort in winter
3.1.2	Thermal comfort in summer
3.1.3	Hygiene in interior rooms
3.1.4	Acoustic comfort
3.1.5	Visual comfort
3.1.6	Influencing by the user
3.1.7	Characteristics of sojourning in outer room
3.1.8	Safety and risk of incidents
Functionality	
3.2.1	Access
3.2.2	Space efficiency
3.2.3	Convertibility for alternative use
3.2.4	Accessibility
3.2.5	Bicycle comfort
Safeguarding of design quality	
3.3.1	Architectural design and integration into the urban environment
3.3.2	Art in construction
Technical quality	
Quality of technical workmanship	
4.1.1	Protection against noise
4.1.2	Protection against heat and condensate
4.1.3	Cleaning and maintenance
4.1.4	Dismantling, separation and recycling
Process quality	
Quality of planning	
5.1.1	Project preparation
5.1.2	Integral planning
5.1.3	Complexity and optimisation of planning
5.1.4	Tendering and contracting
5.1.5	Requirements for optimum management
Quality of construction work	
5.2.1	Construction site / Construction process
5.2.2	Quality assurance for construction work
5.2.3	Systematic commissioning
Site characteristics	
Site characteristics	
6.1.1	Risks at the micro location

6.1.2	Conditions at the micro location
6.1.3	Image and condition of the site and quarters
6.1.4	Transport connections
6.1.5	Proximity to facilities relevant for usage
6.1.6	Available media / Development

Other systems such as the American LEED system and the British BREEAM certification system focus primarily on ecological sustainability. The following table briefly presents other European systems. Because of its familiarity the LEED system was also included in the table.

Table 2: Overview of selected building certification systems in Europe and the USA

Country	Name of system / Program operator	Abstract
England	BREEAM	Developed in 1990 by BRE, assessment of different building types, ten main categories, life cycle consideration of construction elements, four certification levels: Excellent, Very good, Good or Average
France	HQE	Developed by the CSTB, assessment of various building types, life cycle considerations, public buildings are certified by "Certivéa", single family homes by "CEQUAMI" and multiple dwellings by "CERQAL"
Germany	DGNB and BNB	Developed in 2007 by DGNB and BMVBS, assessment of different building types (particularly by DGNB), approx. 50 criteria, life cycle considerations, three certification levels: Bronze, Silver, Gold
Austria	TQB	Basic scheme 2001, further developed by ÖGNB in 2010 following the example of the DGNB system (see above)
U.S.A	LEED	Since 1998, developed by US GBC, assessment of different building types, six main categories, no life cycle assessment, four certification levels: Passed, Bronze, Silver, Platinum

Some of the program operators of building certification systems have joined to form the "Sustainable Building Alliance" (abbreviated as SB Alliance), in order to exchange procedures and develop shared indicators. These include CSTB (France), BRE (England), DGNB (Germany), VTT (Finland), ITC (Italy), Instituto Valenciano de la Edificación (Spain) as well as the Brazilian Fundação Vanzolini and the North American U.S. Green Building Council (USGBC). For further information please see <http://sballiance.org/>.

A globally agreed approach sees the use of six indicators that have been found to be particularly important. These six indicators are as follows (see also Figure 2).



Figure 2: Six indicators that members of the SB Alliance have agreed, status 2009

Information about other certification systems and alliances can be obtained from a report by the Austrian IBO [4]

Normative efforts aimed at unifying the procedure with respect to sustainability assessments for building constructions are currently underway at the European level in the Standardisation Committee CEN/TC 350 (see Chapter 3.5.1) and at the international level in the ISO TC59/SC 17 Committee "Sustainability in buildings and civil engineering works".

Creating sustainable buildings requires the use of sustainable products. However the assessment of products is not quite trivial, because an apparently sustainable product may lose its good properties after installation, for example when installation into a building construction requires the use of co-products that are less sustainable. Also the way in which a product is installed is very significant. For example, installing a wooden window on the weather side of a building is less sustainable than on the weather-protected side, because it requires more frequent maintenance.

In spite of this, buildings cannot be assessed without considering the products used. The following presents some of the existing instruments.

3.3 Life cycle assessment of products

The life cycle assessment (LCA) is a systematic analysis of the environmental effects of a product during the course of its life⁸. The environmental effects of the product are recorded and analysed during its

⁸ A life cycle assessment can also be used to assess services and processes.

production, its usage phase and at the disposal stage, together with the upstream and downstream processes involved. If the entire life cycle is considered we use the expression "from cradle to grave". If only the production phase is considered, we use the expression "from cradle to factory gate". The results of a life cycle assessment can be used to make environmentally oriented decisions.

The life cycle assessment follows the rules of the ISO 14040 and ISO 14044 standards, which are accepted worldwide. Several intermediate steps are required. First it is necessary to determine the goal and the research framework. In the second step a life cycle inventory analysis is prepared that shows the input and output streams and quantifies these. To this end the manufacturer is required to demonstrate his entire production process with all individual steps. This acquisition of data alone requires so much effort that generally professional assistance is required. This is then followed by an impact assessment in which the environmental influences for certain impact categories from the life cycle inventory analysis are calculated. For example the amount of energy used for operating machines with a conventional power mix is converted to the resulting greenhouse emissions. The greenhouse emissions themselves are expressed in so-called equivalents, because besides CO₂ other substances contribute to the greenhouse effect as well. For example hexafluoroethane, which is used as an etch gas, a foaming agent and a refrigerant, has a greenhouse gas potential which is 11900 times greater than that of carbon dioxide. The amounts of hexafluoroethane emitted are converted to carbon dioxide equivalents.

For the calculations various databases are available with which, e.g., the greenhouse gas emissions arising through the production (including the relevant supply chains and raw materials mining) of 1 square metre of polystyrene insulation material can be determined. These databases (e.g. GaBi 5 or ecoinvent) can usually be purchased. In France the elodie database (www.elodie-cstb.fr) is used.

In Germany the "Ökobau.dat" database holds the results of the life cycle assessments of approx. 600 construction products; these are freely accessible on www.nachhaltigesbauen.de. A similar database was created in France by the French approval authority CSTB (see www.inies.fr). At the European level the Joint Research Center of the European Commission in Ispra offers the database ELCD (<http://lca.jrc.ec.europa.eu/lcainfohub/datasetArea.vm>).

The disadvantages of a life cycle assessment are that it involves considerable effort and the result can be decisively influenced by the parameters set within the framework of defining the respective goal. Furthermore dismantling and recycling options for the construction products can hardly be estimated.

Of course the same also applies to Environmental Product Declarations whose core is a life cycle assessment, which will be presented in the next chapter.

3.4 Environmental Product Declarations

Environmental Product Declarations (EPD) were initially developed out of efforts to make environmental information about products available. Important series of standards upon which EPDs are based include ISO 14020ff and ISO 14040ff. The ISO 14020ff series of standards describes possibilities for

environmentally related product labelling and declaration⁹, while the ISO 14040ff series describes instruments for life cycle assessment (see chapter 3.3).

Standard ISO 14025 "Environmental labels and declarations - Type III environmental declarations - Principles and procedures" unites both series of standards. It explains how a product can be described with respect to its environmental performance without performing an assessment. The core here is a life cycle assessment in compliance with ISO 14040 and ISO 14044. Additionally further information about the product is offered. The objective is to support the "supply and demand of products with a smaller environmental footprint by providing verifiable, true and not misleading information about environmental aspects". [5]

The ISO 14025 standard applies for all products. There have been efforts to adapt it to construction products both at the international standardisation level as well as at the European level. At the international level these efforts have led to standard ISO 21930, at the European standardisation level under mandate M/350 to the recently completed standard EN 15804 (for further information see Chap. 3.5.2).

Meanwhile EPDs are being offered in many EU Member States. Environmental product declarations are for example being offered in France by the CSTB, in Great Britain by the BRE, in the Czech Republic by the TZUS and in Germany by the "Institut für Bauen und Umwelt" (IBU). A number of program operators have joined to form the European platform "ECO" where they are seeking to prepare European EPDs on the basis of the now available European standard EN 15804.

3.5 Normative instruments

3.5.1 Work by the CEN/TC 350

Years ago the European Commission commissioned a study to evaluate the difference between existing and practised eco labels resp. environmental product labels within the Member States. As expected, the systems were found to differ greatly. Upon the initiative of construction product manufacturers and life cycle assessors, during the follow-up a mandate was created that commissioned the KOM to the CEN in 2005. However, mandate M/350 "to develop standardised horizontal methods for assessment of the integrated environmental impact of buildings" did not pass through the information policy committee 94/38/EC. The tasks resulting from this mandate were thus not implemented in the Construction Products Directive and are thus not part of the CE marking.

In the same year (i.e. 2005) the CEN established the TC 350 "Sustainability of construction works". It is responsible for preparing standardised methods for the assessment of the sustainability aspects of buildings and construction products. The focus was thus on the pillar of sustainability "environment" resp. "ecology". During the later course of the standardisation activities the TC 350 decided to also standardise the social and economic pillars of sustainability. An overview of the work performed in this committee is given in Figure 3.

⁹ An overview of the different types of environmental labelling and declaration can be found at:
<http://www.nachhaltigesbauen.de/normung-zur-nachhaltigkeit-im-bauwesen/umweltproduktdeklaration.html> und
<http://www.umweltbundesamt.de/uba-info-medien/dateien/3700.htm>.

Within the framework of this European standardisation work the goal is to prepare harmonised sustainability requirements both at the buildings level as well as at the product level. Initially to this end corresponding framework documents were prepared within the three sustainability dimensions.

The framework document for environmental quality aspects of buildings determines that the building must be considered across its entire life cycle. Standard EN 15978: "Sustainability of construction works. Assessment of environmental performance of buildings. Calculation method" codifies the indicators which on the one hand are measurable and with which environmental quality can be described. Here again we have the indicators of the life cycle assessment. The corresponding information and data are performed at the product level, for which the standard specifies that environmental product declarations are to be carried out according to EN 15804 (see Chapter 3.5.2).

The framework document for the social quality of buildings (EN 15643-3) specifies the following indicators, which are of importance for describing the aspects and effects for social quality.

- Accessibility
- Adaptability
- Health and comfort
- Loadings on the neighbourhood
- Maintenance
- Safety / Security
- Origin of construction products
- Integration of participants

Concrete implementation documents are still in preparation. It is however conspicuously evident that the subject of "Health", which is established in the CPR as basic requirement No. 3, is within the framework of this standardisation work assigned to the social pillar of sustainability. The issues of "accessibility" as well as "safety/security", which correspond to basic requirement No. 4 according to the CPR, are also found here.

Because the framework document for economic sustainability plays only a subordinate role in the present appraisal, it is not further pursued here.

Projects of CEN TC 350

User and Regulatory Requirements					
Integrated Building Performance					
Concept level	Environmental Performance	Social Performance	Economic Performance	Technical Performance	Functional Performance
Framework level	EN 15643-1 Sustainability Assessment of Buildings - General Framework			Technical Characteristics	Functionality
	EN 15643-2 Framework for Environmental Performance	EN 15643-3 Framework for Social Performance	prEN 15643-4 Framework for Economic Performance		
Building level	EN 15978 Assessment of Environmental Performance WI 003 Use of EPDs	WI 015 Assessment of Social Performance	WI 017 Assessment of Economic Performance		
Product level	FprEN 15804 Environmental Product Declarations EN 15942 Comm. Format B-to-B CEN/TR 15941	(see Note below)	(see Note below)		
		Note: At present, technical information related to some aspects of social and economic performance are included under the provisions of prEN 15804 to form part of EPD			

Figure 3: Overview of standardisation work in CEN/TC 350 [6]

3.5.2 The standard for preparing EPDs for construction products

The CEN/TC 350 agreed to present the product level with Environmental Product Declarations. To this end the CEN/TC 350 prepared EN 15804: "Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products" as well as two companion standards.

Some corner pillars of the EN 15804, which are of significance for the further discussion, are highlighted in the following:

Product Category Rules (Section 5.1 of EN 15804)

Section 5.1 specifies that Product Category Rules (PCRs) must be prepared.

Different life cycle stages (Section 5.2 of EN 15804)

The following life cycle stages are defined and named for construction products in the EPD (see also Figure 4):

1. From cradle to gate (modules A1 through A3):

This is the production stage that encompasses the provision of raw materials, transport and manufacture including the processes involved.

2. From cradle to gate with options (modules A1 through A3 and others):

As for 1, however selected optional modules from other stages, such as disposal, are added. Module D can also be considered.

3. From cradle to grave (modules A1 through C4):

All stages are considered, i.e. production, installation into the building, use including maintenance and renewal as well as demolition, waste processing for reuse, regeneration, recycling, disposal. Module D can also be considered.

BUILDING ASSESSMENT INFORMATION																
BUILDING LIFECYCLE INFORMATION															SUPPLEMENTARY INFORMATION BEYOND THE BUILDING LIFE CYCLE	
PRODUCT stage			CONSTRUCTION PROCESS stage		USE Stage							END OF LIFE stage			Benefits and loads beyond the system boundary	
scenario																
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material supply	Transport	Manufacturing	Transport	Construction installation process	use	Maintenance	Repair	Replacement	Refurbishment	Operational. Water use	Operational Energy use	De-construction	Transport	Waste processing	Disposal	Reuse/Recovery/Recycling

Figure 4: Life cycle stages of a construction product according to EN 15804

According to EN 15804, only stages A1 through A3 are mandatory for preparing an EPD. All other modules are voluntary.

Stage D describes the potentials for reuse, recovery and/or recycling. Module D shows "the potential benefits of avoided future use of primary materials and fuels while taking into account the loads associated with the recycling and recovery processes beyond the system boundary" [EN 15804, Section 6.4.3.3].

Additional information (Section 5.4 of EN 15804):

Additional technical information is required to provide better support for the life cycle assessments, for example the type of installation (are ancillary materials required) or similar. The development of scenarios plays an important role here. These may differ very much from product group to product group or product to product.

Where, after being installed, a construction product is in contact with the interior or is in contact with soil, ground water or surface water, the standards given by the CEN/TC 351 must be observed, which is currently working out harmonised test standards for determining the release of dangerous substances from construction products (see also Chap. 3.5.4). According to EN 15804 this requirement with respect to the EPDs is presently voluntary. However for explanatory purposes it must be added that in contrast to the requirements of EN 15804, testing construction products with respect to dangerous substances within

the framework of the currently still valid Construction Products Directive is mandatory whenever corresponding requirements have been specified in the respective mandates of the technical specifications (standards and approvals).

Calculation rules for the life cycle assessment:

The calculation rules have been taken from the appropriate life cycle assessment standards ISO 14040 and ISO 14044.

Construction products are as a rule long-lived products so that here it is particularly the service life of these products that must be considered. Standards of the ISO 15686 standards series are cited to determine the so-called reference service life (RSL).

Selection of data (Section 6.3.6 of EN15804)

EN 15804 emphasises that specific data must have priority over generic data.

However, it acknowledges that for certain areas generic data are adequate, because the manufacturer has no means of influence and thus cannot generate any specific data. This particularly concerns the provision of energy carriers (upstream processes) or waste treatment (downstream processes).

3.5.3 The international standard for preparing EPDs for construction products

Even prior to the M/350 mandate and the CEN/TC 350 constitution work on sustainable building construction had already been initiated at the international level. These works are being performed in ISO TC59/SC 17: Sustainable buildings. However, since within the framework of this appraisal European standardisation has greater significance, no further detailed explanation of the ISO level activities will be given. However the efforts being made at the international level show that there is keen interest in sustainable building.

3.5.4 Requirements for construction products with respect to the emission of dangerous substances from construction products

In 2005 the European Commission assigned to the European Committee for Standardisation (CEN) a standardisation mandate, M/366, for the harmonisation of test standards. These test standards are to be used to determine whether products release or contain dangerous substances. They are to serve in implementing essential requirement No. 3 of the Construction Products Directive and are legally binding.

To implement mandate M/366 the CEN established a new committee, the CEN/TC 351 "Construction Products - Assessment of release of dangerous substances", which does not develop new methods, but adapts existing ones.

One of the test standards of the CEN/TC 351 is to cover tests for the release of volatile organic compounds into indoor air. It is to be applicable for all emission-relevant construction products for which technical specifications (harmonised standards or European technical approvals) are available under the Construction Products Directive. Two further test standards are for determining leaching of organic and inorganic substances out of construction products with respect to ground and water. Here one of the methods covers granular construction products such as unbound mineral aggregates, while the other is for monolithic construction products such as precast concrete products as well as platelike and sheetlike

construction products. According to present estimation, these two leaching tests cover almost all construction products that can come into contact with the ground or surface waters or rain water and for which technical specifications are available under the Construction Products Directive.

The main results of the standardisation work performed during the past years are three harmonised draft test standards which are currently up for validation. Following validation, the harmonised methods are to be able to deliver reliable measurement values for CE marking [7].

The release of dangerous substances is at the focus of the harmonisation process for test methods for environmental and health requirements for implementing the EC Construction Products Directive. The performance approach established in the European standardisation process favours test methods for measuring emission. In some cases, however, legal requirements specify determining the content of dangerous substances or it is much more practical to determine the content instead of the amount of release. For this reason the object of work in CEN/TC 351 as per mandate M/366 also covers determining contents.

The CEN/TC 351 and the latest work group (WG 5 "Content and eluate analysis in construction products") are currently implementing the results of a technical report, which was in advance prepared in the field for evaluating the existing test standards. Suitable analysis methods are already available for many substances and products. However the fields of application of the standards often do not cover construction products, or the methods used do not as yet have the status of a European standard. The challenge faced by this work group is to filter out from the many available standards those standards which are best suited for construction products in their full diversity, and, if applicable, to adapt them [7,8].

Additionally the CEN/TC 351 has launched work on a test standard for determining the radioactivity of construction products [7].

Unfortunately the activities geared at implementing essential requirement No. 3 were commenced much too late. In principle the harmonised requirements for products with respect to "hygiene, health and the environment" should have already been available while preparatory work for the first technical specification was underway.

3.6 Classification of substances in products according to chemical legislation

The following two regulations are the rules that are currently most important in Europe with regard to chemical legislation:

- REACH Regulation (Registration, Evaluation, Authorisation of Chemicals)¹⁰
- CLP Regulation (Classification, Labelling and Packaging)¹¹

¹⁰ Regulation (EC) No. 1907/2006 of the European Parliament and the Council of 18 December 2006 on the Registration, Evaluation, Authorisation and Restriction of Chemical substances (REACH), for establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93, Commission Regulation (EC) No 1488/94, Council Directive 76/769/EEC as well as Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC

¹¹ Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006

The latter governs the classification and labelling of substances and mixtures of substances worldwide. It replaces the old Substance Directive (67/548/EEC¹²) and the Preparations Directive (1999/45/EC¹³) of the European Community and introduces the "Globally Harmonised System (GHS)". Incidentally, the idea of a "Globally Harmonised System" for dangerous substances and mixtures of substances arose at the world summit 1992 in Rio de Janeiro (chapter 19 of Agenda 21).

REACH has introduced a completely new European chemicals policy. It is no longer the authorities that need to prove that a substance is dangerous and subject to restrictions or prohibitions, instead it is the manufacturer of substances who must prove to the authorities that a substance is not dangerous. From a certain tonnage band onwards a manufacturer must register his substances with the European Chemicals Agency (ECHA) in Helsinki. Some of these substances are evaluated by the ECHA. Due to the danger they present, other substances require an approval. Substances forbidden and restricted within the framework of the "Limitations Directive" (76/769/EEC¹⁴) were included in Annex XVII of the REACH Regulation while other substances are being reassessed within the framework of REACH.

REACH particularly considers substances and mixtures of substances (preparations). However it also covers articles and thus products when, for example, substances of concern are used in their fabrication. REACH thus contains obligations for construction product manufacturers independent of whether their construction products are from a legal chemical point of view considered as preparations or articles.

The following section defines the terms substance, preparation and article (from REACH, Article 3):

Substance: A chemical element and its compounds in the natural state or obtained by any manufacturing process, including any additive necessary to preserve its stability and any impurity deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition;

Preparation: A mixture or solution composed of two or more substances;

Article: An object which during production is given a special shape, surface or design which determines its function to a greater degree than does its chemical composition.

3.7 The Waste Framework Directive

The European Waste Framework Directive¹⁵ was comprehensively revised in 2008. This directive establishes measures for protecting the environment and human health, with which the negative impact of the generation and management of waste is avoided or reduced, the overall effects of resource usage are reduced and the efficiency of resource usage is improved (Article 1 of the Waste Framework Directive).

¹² Council Directive of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances (67/548/EEC). Official Journal of the European Communities No. 196/1 of 18 August 1967

¹³ Directive 1999/45/EC of the European Parliament and the Council on the approximation of laws, regulations and administrative provisions of the Member States relating to the classification, packaging and labelling of dangerous preparations

¹⁴ Not in force anymore

¹⁵ DIRECTIVE 2008/98/EC OF THE EUROPEAN PARLIAMENT AND THE COUNCIL of 19 November 2008 concerning waste and repealing certain directives. European Official Journal, L312/3 of 22 November 2008

Article 4 presents a new waste hierarchy:

- a) Prevention
- b) Preparation for reuse
- c) Recycling
- d) Other recovery, e.g. energy recovery
- e) Disposal

The directive encourages a "recycling society" seeking to avoid waste generation and promoting the use of waste as a resource (Recital 28). With regard to construction and demolition waste, the Member States are obliged to take the measures necessary so that the quota for the preparation for reuse, recycling and other recovery of materials of non-dangerous construction and demolition waste is increased to 70% (Article 11(2)).

Which waste is considered dangerous continues to be governed by the European Waste Catalogue¹⁶.

The Waste Framework Directive thus places one of its focal points on the protection of resources by means of reuse and recycling.

The Waste Framework Directive defines reuse as follows:

"...any operation by which products or components that are not waste are used again for the same purpose for which they were conceived."

and recycling as:

"...any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations".

¹⁶ COMMISSION DECISION of 3 May 2000 replacing Decision 94/3/EC establishing a list of wastes pursuant to Article 1 letter a) of Council Directive 75/442/EEC on waste and Council Decision 94/904/EC establishing a list of hazardous wastes pursuant to Article 1(4) of Council Directive 91/689/EEC on hazardous waste (notified under document number K(2000) 1147) (Text with EEA relevance) (2000/532/EC). European Official Journal, L 226/3 of 6 September 2000
and
COMMISSION DECISION of 16 January 2001 amending Decision 2000/532/EC as regards a list of wastes (notified under document number K(2001) 108) (2001/ 118/EC). Official EU Journal, L47/1 of 16 February 2011

4 Analysis of sustainability properties under Regulation (EU) No. 305/2011

4.1 Presentation of new requirement No. 7 as well as the amended requirement No. 3

The new basic requirement No. 7 can be found in Annex I of the Construction Products Regulation (CPR) and is as follows:

7. Sustainable use of natural resources

The construction works must be designed, built and demolished in such a way that the use of natural resources is sustainable and in particular ensure the following:

- a) *reuse or recyclability of the construction works, their materials and parts after demolition*
- b) *durability of the construction works;*
- c) *use of environmentally compatible raw and secondary materials in the construction works.*

It is often pointed out that basic requirement No. 3 also contains sustainability properties. Requirement No. 3 was already given under the Construction Products Directive (as "essential requirement No. 3"), however it has now been expanded considerably in a number of crucial points. The original wording can be found in annex II of this report.

3. Hygiene, health and the environment

The construction works must be designed and built in such a way that they will, throughout their life cycle, not be a threat to the hygiene or health and safety of workers, occupants or neighbours, nor have an exceedingly high impact, over their entire life cycle, on the environmental quality or on the climate during their construction, use and demolition, in particular as a result of any of the following:

- a) the giving-off of toxic gas;
- b) the emissions of dangerous substances, volatile organic compounds, greenhouse gases or dangerous particles into indoor or out door air;
- c) the emission of dangerous radiation;
- d) the release of dangerous substances into ground water, marine waters, surface waters or soil;
- e) the release of dangerous substances into drinking water or substances which have an otherwise negative impact on drinking water;
- f) faulty discharge of waste water, emission of flue gases or faulty disposal of solid or liquid waste;

g) dampness in parts of the construction works or on surfaces within the construction works.

The question whether basic requirement No. 7 with or without supplements in basic requirement No. 3 maps out sustainable building cannot be answered ad hoc. It is even less clear how basic requirement No. 7 is to be implemented. The European Commission is currently providing no assistance, although sustainable building is one of the six significant points of the lead market initiative. Thus there are neither interpretative documents nor guidance papers¹⁷ available as they were available for the Construction Products Directive for implementing the six essential requirements. One reason for the lack of such documents is that currently no Member State has officially implemented sustainable building or individual aspects of sustainable building into national sets of rules. However the German Federal Ministry for Transport, Building and Urban Affairs (BMVBS) has made sustainable building compulsory for its own buildings and has notified its base for this, the "Guideline for sustainable building"¹⁸ to the European Commission (notification number 2010/554/D¹⁹). The Netherlands too has also added sustainability aspects during the revision of its "Building Decree" (notification number 2011/212/NL²⁰ and 2011/473/NL²¹). Moreover at the end of 2011 France notified two decrees concerning the declaration of environmental impacts of construction and decoration products (notification numbers 2011/585/F²² and 2011/586/F²³). However, these guidelines are still voluntary, but are to become compulsory in four years.

These examples make it clear that during the coming years individual Member States will be deciding in favour of the implementation of their voluntary systems into their national sets of rules. For this reason a uniform procedure for implementing new basic requirements and where applicable the expanded basic requirement No. 3 should be prepared without delay. For this purpose an analysis and an evaluation of both basic requirements is necessary and explained in the following.

4.2 Origination of basic requirement No. 7

After revision work on the Construction Products Directive had already commenced in 2007, the European environmental agencies (EPA Network) convening at a symposium in Zagreb discussed which environmental aspects were missing under the Construction Products Directive and should be supplemented in a revision. The report by the EPA Network on the revision of the Construction Products Directive strongly emphasises the conservation of resources [9]. To this aim the EPA Network proposes the following:

It must be ensured that

¹⁷ Guidance papers are the most important basis for the practical implementation of the CPD. Although guidance papers have no legally binding character, they did represent a fixed written consensus between the Member States and the European Commission about the practical implementation of the directive.

¹⁸ Can be viewed under www.nachhaltigesbauen.de

¹⁹ <http://ec.europa.eu/enterprise/tris/pisa/app/search/index.cfm?iYear=2010&iNumber=554&>

²⁰ <http://ec.europa.eu/enterprise/tris/pisa/app/search/index.cfm?iYear=2011&iNumber=212&>

²¹ <http://ec.europa.eu/enterprise/tris/pisa/app/search/index.cfm?iYear=2011&iNumber=473&>

²² <http://ec.europa.eu/enterprise/tris/pisa/app/search/index.cfm?iYear=2011&iNumber=585&>

²³ <http://ec.europa.eu/enterprise/tris/pisa/app/search/index.cfm?iYear=2011&iNumber=586&>

- the building construction, its materials and its components are recyclable after demolition,
- the construction products are more durable and
- environmentally compatible raw materials and secondary materials are used.

A closer examination of the requests reveals that they have been taken over almost identically into the new basic requirement No. 7.

Only the EPA Network request concerning the marking of dangerous substances could not be enforced as an own instrument over and above the requirements presented in chapter 4.3.4. The intention of the EPA Network was to ensure that when building constructions are dismantled the dismantled materials are suitable for reuse or recycling. This marking was also intended as protection for users and employees.

At another point in its report the EPA Network requests that climate should also be considered, whereby the use of fluorinated greenhouse gases in insulating materials is discussed [9]. The subject of climate was taken over in basic requirement No. 3 of the CPR.

Finally the EPA Network spearheads that environmental product declarations on a voluntary basis should be promoted in the European construction product rules. This request was also incorporated into the CPR. Recital 56 specifically points out that EPDs are to be consulted for assessing the sustainable use of resources and for assessing building constructions with respect to the environment.

In cases where the Commission has taken over requests proposed by the EPA Network, this was occasionally due to the fact that on account of the lead market initiative it found itself in need to take over the corresponding requirements.

In summary it can be said that in its Zagreb Report the EPA Network has made a considerable contribution to the acceptance of basic requirement No. 7 into the CPR.

4.3 Proposals for implementing basic requirement No. 7

4.3.1 General

Based on the originating history of the new basic requirement No. 7 as well as on the requirements for buildings and products, which are currently still voluntary, the following section proposes different models for implementing BR7.

The first proposal presents a concept that is closely tied to the wording of the regulation. The second proposal attempts to present a more far-reaching and textually more detached interpretation of basic requirement No. 7, however with due consideration of Recital 56.

4.3.2 Proposal for implementation 1a): Recyclability

The introductory wording of basic requirement No. 7 makes the following requirement:

The construction works must be designed, built and demolished in such a way that the use of natural resources is sustainable and in particular ensure the following:

- a) *reuse or recyclability of the construction works, their materials and parts after demolition*

The life cycle of a building is addressed all the way from design to construction to demolition. And in doing so the resources must be used sustainably. However the following deals particularly with the end-of-life stage.

This can be interpreted in such a way that as early as in the planning and erection stages attention must be paid that the construction materials used must be completely reusable or that they can be fully or partly recycled. This means that the introduction of basic requirement No. 7 is not directly aimed at the use of resources (provision of raw materials and energy), the use of regenerative energy sources or even water consumption during the production of construction products, instead it is limited to the protection of resources by means of reuse and recycling, and thus:

the greater the amount of construction substances and materials that can be reused or recycled after dismantling, the better this will be for protecting resources.

This interpretation of basic requirement No. 7 agrees with the arguments and goals of the EPA Network, which considers existing building structures as resources that should be used permanently, reused or recycled.

In order to meet this target the building must be capable of being selectively dismantled. Here several factors determine the quality level of dismantling:

- Applied dismantling technology (e.g. machine applications, manual applications)
- Design and construction
- Installation situation of construction products
- Type and composition of construction products

The last two points are crucial for considerations within the framework of this report. If, for example, during the erection of a building the construction products are firmly bonded together for installation (e.g. with adhesive), much effort will be required later on to separate them when the building is being dismantled, or they cannot be separated at all. Clean separation of waste fractions is difficult or not possible at all. The high technical effort involved in the application of machines for separating different fractions of construction materials must also be considered, and with these machines the use of great amounts of energy and the production of emissions.

A classic example for this is the waterproofing of building structures or barriers made of bituminous or coal-tar based coatings or sheets. During dismantling these bitumen or tar coatings²⁴ lead to contaminations that cannot be separated from the concrete or screed so that the otherwise "clean" or contamination-free inorganic materials can no longer be recycled. Masonry foamed out with organic materials also leads to problems during dismantling, when the demolition waste (here for example crushed bricks) has deposits of polyurethane or urea formaldehyde resins, unless a suitable separating process is available. But then again this will require resources in the form of energy and water. Thus firm bondings between organic materials and inorganic mass construction materials (e.g. bricks, concrete...) should be avoided.

Furthermore, the chemical composition of a construction product is important for its later reuse or for recycling. Construction products should thus not contain any dangerous substances that make reuse or

²⁴ These are not known to be used in Europe any more.

recycling difficult or even impossible. These substances also cause problems with dismantling measures, because both the effort for personal protection as well as the organisational and technical effort need to be increased. A classic example here is the massive use of asbestos as a construction material, which today makes extreme work safety provisions necessary in renovation and demolition measures.

The answer to the question whether after dismantling work a construction product must be classified as dangerous waste that can only be reused or recycled with immense effort or not at all depends on whether the waste has dangerous properties. The hazardous properties are mentioned in Annex III of the Waste Framework Directive.

When buildings are required to meet basic requirement No. 7a), the construction products used must primarily meet the following requirements.

The construction products should:

- contain no dangerous substances
- preferably consist of one or similar material matrix
- be easily demountable from the structural fabric.

The manufacturer of a construction product should thus think about the recyclability of his construction product, even if the disposal paths that will be available in 10, 20 or more years are difficult to foresee.

The German "Bewertungssystem Nachhaltiges Bauen" (Assessment system for sustainable building - BNB) incorporates the question of dismantling, separation and recovery into technical implementation and these are interrogated in Profile 4.1.4 (see also Table 1). The recycling factors must be documented in this context. A more detailed explanation unfortunately cannot be found.

The question regarding the waste fractions generated when a building is demolished, the proportion which can be recycled or the proportion for which energy can be recovered as well as the proportion which must be disposed of to landfill is also considered within the framework of a life cycle assessment or an EPD. Recyclable and thermally recoverable proportions that contribute indirectly to the protection of resources can be entered into a life cycle assessment or EPD as credits.

4.3.3 Proposal for implementation 1b): Durability

Besides reuse and the possibility to recycle construction products following dismantling, basic requirement No. 7 requires that a building must be durable.

b) durability of the construction works.

The EPA Network requires that durable buildings must be constructed in such a way that they are long-lasting and do not need to be demolished prematurely. Building constructions must also be constructed so that it is possible to change their original usage. Here the contribution towards resource protection lies in maintaining a building and its substance.

With respect to the product level this means that a long-lived product must be preferred over a short-lived product.

Statements about the durability of construction products are also required in the still valid Construction Products Directive. It is firmly established as a general requirement in the mandates for product standards and approvals. Many technical specifications require that special tests must be performed to validate it. "Guidance Paper F"²⁵ is a guideline that is provided to achieve the best possible agreement between the Commission and the Member States. This paper establishes the following relationship between durability and service life (see Figure 5).

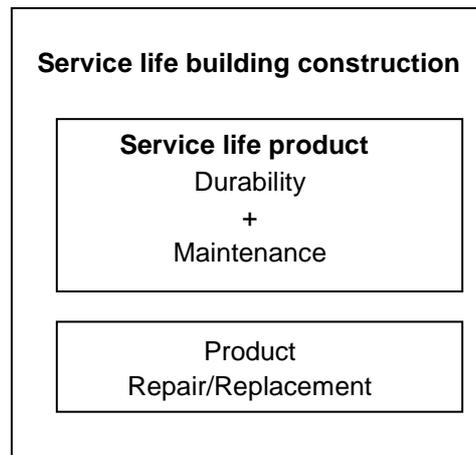


Figure 5: Terminology used in Guidance Paper F

Guidance Paper F defines durability as the "ability of a product to maintain its required performance over a given or long 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 (working life of the product). Durability is thus dependent on the intended use of the product and its service conditions..." (Guidance Paper F clause 3.3).

According to Guidance Paper F, foreseeable actions are for example (clause 3.4):

- temperature
- humidity
- water
- UV radiation
- arasion
- chemical attack
- biological attack
- corrosion
- weathering
- frost
- freeze-thaw
- fatigue

²⁵ For explanations about the Guidance Papers see also chapter 4.1 and footnote 17.

As already mentioned, many of the named parameters are interrogated by means of tests. However, a descriptive approach is also possible. For this purpose the manufacturer must present application scenarios for his product and assess actions that could lower the durability of his product. He could then decide to increase the durability of the product by, for example, applying a thicker anti-corrosion layer to the metal component. Furthermore he could give recommendations for installing the product into the building construction as well as for maintenance, care and upkeep.

These requirements, set up with regard to durability from the technical point of view of engineers, are ultimately following the same goal, as they are also being required within the framework of sustainability. Because the aspects and requirements for durability in the Construction Products Regulation are very probably being taken over from the Construction Products Directive, the authors believe that no further requirements with regard to durability of construction products need to be specified.

4.3.4 Proposal for implementation 1c): Environmental friendliness and use of secondary raw materials

The last indent mark in basic requirement No. 7 requests the following:

- c) use of environmentally compatible raw and secondary materials in the construction works.*

The question arises, what does the term "environmentally compatible" mean. Recital 25 explains the following:

"Where applicable, the Declaration of Performance should be accompanied by information on the **content of hazardous substances** in the construction product in order to improve the possibilities **for sustainable construction** and to facilitate the **development of environment-friendly products**. Such information should be provided without prejudice to the obligations, particularly with regard to labelling, laid down in other instruments of Union law applicable to hazardous substances and should be made available at the same time and in the same form as the Declaration of Performance so as to reach all potential users of construction products. Information on the **content of hazardous substances should initially be limited to substances referred to in Articles 31 and 33 of Regulation (EC) No 1907/2006** of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency (1). **However, the specific need for information on the content of hazardous substances in construction products should be further investigated with a view to completing the range of substances covered** so as to ensure a high level of protection of the health and safety of workers using construction products and of users of construction works, **including with regard to recycling and/or reuse requirements of parts or materials**. This Regulation is without prejudice to Member States' rights and obligations pursuant to other instruments of Union law that may apply to hazardous substances, in particular, Directive 98/8/EC of the European Parliament and of the Council of 16 February 1998 concerning the placing of biocidal products on the market (2), Directive 2000/60/EC of the

European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (3), Regulation (EC) No 1907/2006, Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste (4) and Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures (5)."

Within the framework of the Declaration of Performance, Article 6(5) requests:

"The information named in Article 31 resp. Article 33 of Regulation (EC) No. 1907/2006 will be provided together with the Declaration of Performance."

Thus the environmental friendliness of construction products, materials and components is to be defined on the basis of the contents of hazardous substances. This approach is consistent with the one used by the EPA Network, which justifies its request for a declaration of products with the fact that, when a building is being demolished, products that do not contain hazardous substances a) can be dismantled more easily and b) become high-quality waste that can be reused, recycled or recovered.

Regarding a definition for the danger of a substance or mixture, in Recital 25 and Article 6(5) of the CPR reference is made to Article 31 and 33 of the REACH Regulation.

Article 33 of the REACH Regulation points out that every manufacturer of products (and thus also construction products) has certain obligations to provide information about his product if his product contains more than 0.1 mass percent (w/w) of a substance that is classified as being of very high concern (so called: substance of very high concern; SVHC) and is thus subject to approval.

The list of substances subject to authorisation is provided on the ECHA homepage²⁶. In order to obtain information whether a substance was classified as SVHC, the manufacturer of construction products must obtain from his sub-supplier the safety data sheets for the respective substance or mixture. The total mass of an SVHC in a construction product must not exceed 0.1% by weight.

Construction products may also be preparations and thus fall under REACH (for example, cement is a preparation), but not under Article 33 of the REACH Regulation because the latter only covers products. Apparently, this is the reason the Commission also cited Article 31, because this article also addresses the manufacturers of preparations resp. mixtures.

Article 31 states that the supplier of a substance or mixture must provide to the customer the following information in the safety data sheet.

- Classification according to Regulation (EC) No. 1272/08 (for substances) and according to 1999/45/EC (mixtures)
- The substance is persistent, bioaccumulatable and toxic, a so-called PBT substance.
- The substance is very persistent and very bioaccumulatable, a so-called vPvB substance.
- The substance is of very high concern and thus subject to approval.

²⁶ <http://echa.europa.eu/web/guest/addressing-chemicals-of-concern/authorisation/recommendation-for-inclusion-in-the-authorisation-list/authorisation-list>

In order to verify that products including preparations are environmentally friendly, the manufacturer should within the framework of this proposed implementation according to Recital 25 and Article 6(5) state as an essential characteristic in the Declaration of Performance whether his product/preparation contains any substances of very high concern, and if so, in what amounts. He should also state if his product/preparation does not contain any substances of very high concern.

However, Article 31 could also be considered to mean that the manufacturer of preparations must list all hazardous, PBT, vPvB and SVHC substances. Such an approach is being pursued in the EOTA, which is described in the following.

The current European approval procedure already requires as mandatory that a declaration of hazardous substances shall be made. Technical Report 34 (TR 34) of the EOTA on the implementation of essential requirement No. 3 under the Construction Products Directive requires that the manufacturer or the applicant for a European Technical Approval must present to the appropriate approval body the complete chemical formulation of his construction product. This approval body on the one hand examines whether there is any breach of the principles of TR 34 (e.g. active use of carcinogenic substances of category 1 or 2) and furthermore whether further tests are necessary in conjunction with the use of the product. Furthermore the chemical composition serves to identify the product.

Alternatively the manufacturer can state the dangerous substances (see box). This procedure would correspond to the requirement of Article 6(5) of the CPR, if the article is interpreted such that all dangerous, PBT, vPvB and SVHC substances must be listed.

Extract from TR 34

The applicant shall either

- submit the chemical constitution and composition of the *[product and/or constituents of the product]* to the approval body which will observe strict rules of confidentiality

or

- submit a written declaration to the approval body stating whether or not and in which concentration the *[product and/or constituents of the product]* contains substances which have to be classified as dangerous according to Directive 67/548/EEC respectively Regulation (EC) No 1272/2008 and/or listed in the "Indicative list on dangerous substances" of the EGDS²⁷ and/or substances that may be dangerous during the utilisation phase of the product - taking into account the installation conditions of the construction product and the release scenarios resulting from there.

In any case the use of recycling materials shall be indicated, because this could lead to the implementation of further assessment and verification methods.

....

²⁷ Indicative List of Dangerous Substances (ILoS): The list contains substances relevant to construction products, which are currently governed in Europe and in the individual Member States.

Expert Group Dangerous Substances (EGDS): Work group that supports the European Commission, Directorate General Enterprise and Industry, in implementing the essential requirement No. 3.

In this way the declaration of dangerous substances has already been practised within the European approval area for a long time. However there is a difference in that the declaration of dangerous substances is communicated amongst the approval bodies but not published with the ETA. However, the Declaration of Performance is a public document.

It can be assumed that the approval bodies will maintain this procedure even under the CPR resp. that they will expand it by the PBT substances, vPvB substances and SVHC substances. The active use of part of the substances of very high concern in approved construction products is already forbidden or should be avoided (see box).

Extract from TR 34

The use of substances which must be labelled with "T+" or "T" in accordance with Directive 67/548/EEC resp. Regulation (EC) No 1272/2008 should be avoided; where the use of such substances cannot be avoided for technical reasons, a special assessment must take place.

Carcinogenic (T, R 45; T, R 49) and mutagenic (T, R 46) substances of categories 1 and 2 in accordance with Directive 67/548/EEC shall not be actively used.

Furthermore the third indent of basic requirement No. 7 states that secondary raw materials are to be used. In conjunction with this requirement the same principle should apply as for new primary raw materials. Secondary raw materials should also be environmentally friendly and correspondingly contain no dangerous substances, so that they can be disposed of in an environmentally friendly way when the respective products are dismantled. However, often existing laws and regulations are not effective because the input material as a substitute for a raw material is not subject to any regulation. The object of the Construction Products Regulation should be to provide better control over the handling of secondary raw materials in construction products.

"Environmentally friendly" can also be defined such that products are not allowed to release dangerous substances and radiation. However these aspects are already being dealt with by CEN/TC 351 in conjunction with essential requirement No. 3 under the Construction Products Directive. Furthermore, in future it will be possible to check the content of some dangerous substances by means of harmonised test methods. It can be assumed that these test standards, which are currently being worked out in CEN/TC 351 (see also Chap. 3.5.4) will be taken over to implement basic requirement No. 3 when the Construction Products Regulation is introduced.

4.3.5 Proposal for implementation 2 on the basis of the life cycle approach

As explained in Chap. 4.2, when interpreted literally, basic requirement No. 7 restricts itself particularly to the life cycle phase of the building construction after it is dismantled. Resources are to be preserved by means of reuse and recycling. The provision of resources for manufacturing construction products, either

in the form of energy or raw materials, is not addressed when basic requirement No. 7 is interpreted in the presented manner. Another factor that is overlooked here is that recycling also consumes resources, because resources in the form of energy and water are required for treating waste for the purpose of gaining recycling material. Additionally this leads to waste water and new waste.

In the sense of sustainability it thus appears appropriate to consider waste streams comprehensively. The difference between the two approaches is schematically presented in the following Table 3. The waste categories used here are from EN 15804.

Table 3: Comparison between the two approaches

Construction products made of metal	Consideration of the resulting waste and its further processing using the End of Life approach	Consideration of the resulting waste and its further processing using the Life Cycle approach
Dangerous waste for disposal	No	Yes (sludge produced when processing metals)
Disposed non-dangerous waste	No	Yes (spoil when extracting metals in mining)
Disposed radioactive waste	No	Yes (when using power from nuclear power plants or from a conventional energy mix)
Components for reuse	Possible	Possible
Materials for recycling	Yes	Yes
Substances for energy recovery	No	Yes
Exported energy in MJ for each energy carrier	Does not apply	Does not apply

It can be seen that in an End-of-Life consideration essential environmental effects are not accounted for. With construction products made of metal, for example spoil from mining is generated when extracting raw materials, toxic sludge is created during treatment and processing, and radioactive waste is generated when conventional energies are used.

Life cycle assessments have proved successful for determining the consumption of resources during the entire life cycle of a product - as explained above. And these also reveal the environmental impact (such as greenhouse potential, etc.).

Thus a life cycle assessment following the above named standards can be performed to implement BR 7 as a basis for measuring environmental quality in the sense of sustainability. Because the life cycle assessment in EN 15804 is restricted to construction products, the following tables show the parameters of this standard that are important for the life cycle assessment (Table 4,

Table 5, Table 6, Table 7).

Table 4: Compilation of the environmental impacts to be tested (according to Table 3 of the EN 15804)

Impact Categorie	Parameter	Parameter unit expressed per functional/declared unit
Global warming	Global warming potential, GWP	kg CO ₂ equiv
Ozone depletion	Depletion potential of the stratospheric ozone layer, ODP	kg CFC 11 equiv
Acidification for soil and water	Acidification potential of soil and water, AP	kg SO ₂ equiv
Eutrophication	Eutrophication potential, EP	kg (PO ₄ ³⁻) equiv
Photochemical ozone creation	Formation potential of tropospheric ozone, POCP	kg Ethene equiv
Depletion of abiotic resources-elements	Abiotic depletion potential (ADP-elements) for non fossil resources *	kg Sb equiv
Depletion of abiotic resources-fossil fuels	Abiotic depletion potential (ADP-fossil fuels) for fossil resources *	
<p>* The abiotic depletion potential is calculated and declared in two different indicators:</p> <ul style="list-style-type: none"> – ADP-elements: include all non renewable, abiotic material resources (i.e. excepting fossil resources) – ADP-fossil fuels include all fossil resources 		

Table 5: Parameters for describing resource input (corresponding to Table 4 of EN 15804)

Parameter	Parameter unit expressed per functional/declared unit
Use of renewable primary energy excluding renewable primary resources used as raw material	MJ, net calorific value
Use of renewable primary energy resources used as raw materials	MJ, net calorific value
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, net calorific value
Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials	MJ, net calorific value
Use of non renewable primary energy resources used as raw materials	MJ, net calorific value
Total use of non renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, net calorific value
Use for secondary material	Kg
Use of renewable secondary fuels	MJ, net calorific value
Use of non renewable secondary fuels	MJ, net calorific value
Use of net fresh water	m ³

Table 6: Environmental information for describing different waste categories (corresponding to Table 5 EN 15804)

Parameter	Parameter unit expressed per functional/declared unit
Hazardous waste disposed	kg
Non hazardous waste disposed	kg
Radioactive waste disposed	kg

Table 7: Environmental information for describing different output material flows (corresponding to Table 6 EN 15804)

Parameter	Parameter unit expressed per functional/declared unit
Components for re-use	kg
Materials for recycling	kg
Materials for energy recovery	kg
Exported energy	MJ per energy carrier

According to EN 15804, the designations for the categories of waste flows have been taken over from the European Waste Framework Directive. However the authors believe that a revision is required here, because the terms used are not unambiguous.

According to EN 15804 a life cycle assessment across life cycle stages A1 through A3, thus "cradle to gate", is mandatory. All other considerations are voluntary (see Figure 4).

When the other life cycle phases of a construction product are incorporated, scenarios must be formed, which increases the effort required. However this effort is appropriate because otherwise a wrong impression is created. As an example, consider thermal insulation, which has a certain environmental impact during production. If the working phase is not considered it is not possible to balance the energy saved. However there are also examples where the construction product has no further impact in the working phase. For example an outer wall made of fired bricks will not have to be renewed or cleaned for 50 years. Generally the product category rules determine which life cycle phases are of relevance for a construction product and which life cycle phases must be balanced. Where construction products in the approval area are concerned, these product rules could be determined by the committees of the EOTA in the European Assessment Documents.

5 Implementation of European Technical Assessments

5.1 When must a European Technical Assessment be applied for?

According to Article 19(1) Construction Products Directive (CPR), a manufacturer may apply for a European Technical Assessment for a construction product if the product is not or not fully covered in a harmonised standard and its performance with respect to its essential characteristics cannot be completely assessed on the basis of an existing standard for one of the following reasons:

- a) the product does not fall under the application area of an existing harmonised standard
- b) the assessment procedure provided in the harmonised standard is not suitable for at least one essential characteristic of this product, or
- c) the harmonised standard does not provide an assessment procedure for at least one essential characteristic of this product.

Besides the harmonised standard, the European Technical Assessment is the only tool that places the manufacturer in a position to prepare a Declaration of Performance and apply a CE marking. On the other hand, however, the manufacturer is in no way obliged to do so, he can also market his product according to the respective valid national rules.

5.2 How is a European Technical Assessment Document created?

A European Technical Assessment does not need to be comprehensive, i.e. it must not take into account all product characteristics that are respectively relevant in at least one Member State of the European Union in conjunction with the rules for using the product. It "shall include the performance to be declared, by levels or classes, or in a description, of those essential characteristics agreed by the manufacturer and the Technical Assessment Body receiving the request for the European Technical Assessment for the declared intended use". However this also means that in making this choice the manufacturer must consider in which Member States he will be marketing his product, so that the European Technical Assessment will take into account the rules for marketing valid in these Member States and also for the use of the product itself.

As has also been the case with the application of a European Technical Approval, the manufacturer should contact the Technical Assessment Body in a timely manner with respect to the application of a European Technical Assessment, so that the details of the procedure can be discussed taking into account the special technical aspects of his product. Currently there is no official application form for making the application. A new element compared with the current procedure is that the regulation provides for the conclusion of an agreement between the manufacturer and the Technical Assessment Body "in which the work program for preparing the European Assessment Document is established and includes the following:

- the work organisation within the Organisation of Technical Assessment Bodies;
- the composition of the work group that is established within the Organisation of Technical Assessment Bodies and which is responsible for the respective product area;
- the coordination of Technical Assessment Bodies." (Annex II, No. 2 CPR)

In future it must be observed that the procedure for establishing a European Assessment Document as a basis for the subsequent issuance of a European Technical Assessment is in some aspects more closely regulated than has been the case hitherto. With respect to this procedure, Annex II of the regulation contains a number of rules and information about deadlines that must be observed, these being independent of the complexity of the object of the European Technical Assessment. These deadlines also concern the manufacturer. Thus, when a draft of the European Assessment Document is forwarded to him, he must state his position within a period of 15 work days.

Concrete details for the procedure over and above the guideline given in Annex II are yet to be worked out. This is rendered difficult by the fact that no Technical Assessment Bodies have yet been named by a Member State (status end of November 2011, information by Commission Services). Although some Member States have made fundamental decisions about which body will take on this task, the process of officially naming this body takes time depending on the respective national conditions. Thus the German Federal Ministry for Transport, Building and Urban Affairs has officially announced that the Deutsches Institut für Bautechnik will be performing the task of Technical Assessment Body in Germany. However an official notification to the Commission Services will only take place after federal law has been passed that is to adapt the Construction Products Act (Bauproduktengesetz) to the changed European legal situation.

Furthermore in some aspects the views held by the current approval bodies (of which surely many will in future continue to act as assessment bodies) about the purpose and the formulation of the European Technical Assessments differ from those held by the Commission Services.

5.3 Guideline for obtaining a European Technical Assessment

Figure 6 shows a simplified representation of the process for preparing a European Technical Assessment. Compared with the current instrument of the European Technical Approval (ETA) there are certain common elements, but also principle differences. The common elements can be seen essentially in the fact that both instruments can be applied when a harmonised standard (hEN) is not or not yet available, or when such a standard is not suitable as a basis for fully characterising a product with respect to its performance characteristics, i.e. when the product does "not only insignificantly" (Article 9(2) CPD) deviate from the hEN or when it "does not come under the application area of an existing standard", when the "assessment process slated in the hEN is not suitable for at least one essential feature of the product" or when the hEN "does not provide an assessment process for at least one essential feature of the product" (Article 19(1) CPR).

Both the Construction Products Directive as well as the Construction Products Regulation designate two types of harmonised technical specifications. However, considering the second type of harmonised specification next to the harmonised standard, the CPR means a conceptual change. Instead of the European Technical Assessment being considered to be the harmonised specification, it is the assessment basis, namely the European Assessment Document that is considered as such. It is still unclear what character this Assessment Document will have. Article 66(3) of the Regulation says that "Guidelines for European technical approval published before 1 July 2013 ... may be used as European

Assessment Documents". This means that such an assessment document can relate to an entire product family. On the other hand, the rules of Annex II of the Regulation "Procedure for Adopting a European Assessment Document" suggest that the Assessment Document is being worked out with respect to a concrete product. There is still need for clarification here.

In the latter case the Assessment Document would correspond more to today's internal common assessment criteria of EOTA, which are not published due to product proximity and because the assessment methods used could possibly reveal information about the special features of the product. However the Assessment Document is published by the Commission Services as a finding place, similar to an hEN (Annex II No. 8 CPR). The Organisation of Technical Assessment Bodies will then keep available the Assessment Document in electronic form as soon as the product has received the CE marking (Annex II No. 8 CPR). The latter provision probably serves to take into account the manufacturer's innovative headstart. To obtain a CE marking for a product - depending on the procedure of assessment and verification of constancy of performance that is to be taken - it will not only be required to present a European Technical Assessment but also to have an initial inspection of the factory and the factory's in-house production control by a notified body. It has not as yet been determined how the Organisation of Technical Assessment Bodies will acquire the information that a product has received a CE marking.

Another important issue requiring clarification concerns the period of validity of the European Technical Assessment. Whereas the European Technical Approval is generally granted for a limited period of 5 years with an extension option (Article 8(4) CPD), the regulation contains no reference to a time limit - but this does not indicate that such a limited validity is prohibited either. However, from the point of view of the Commission Services it is the unset time limit that expresses the changed concept. The assessment bodies are to do no more and no less than determine the performances of a product at a certain point in time. This is done in the European Technical Assessment. Ensuring that these performances will remain constant in the running production is then the sole responsibility of the manufacturer in conjunction with the procedure for assessing and verifying constancy of performance. There is no provision for a regular examination of the assessment principles in view of newer knowledge and understanding, particularly with innovative products (similar to the harmonised standards which are generally to be subjected to a revision after 5 years). However it could of course be performed upon the initiative and at the cost of the assessment bodies.

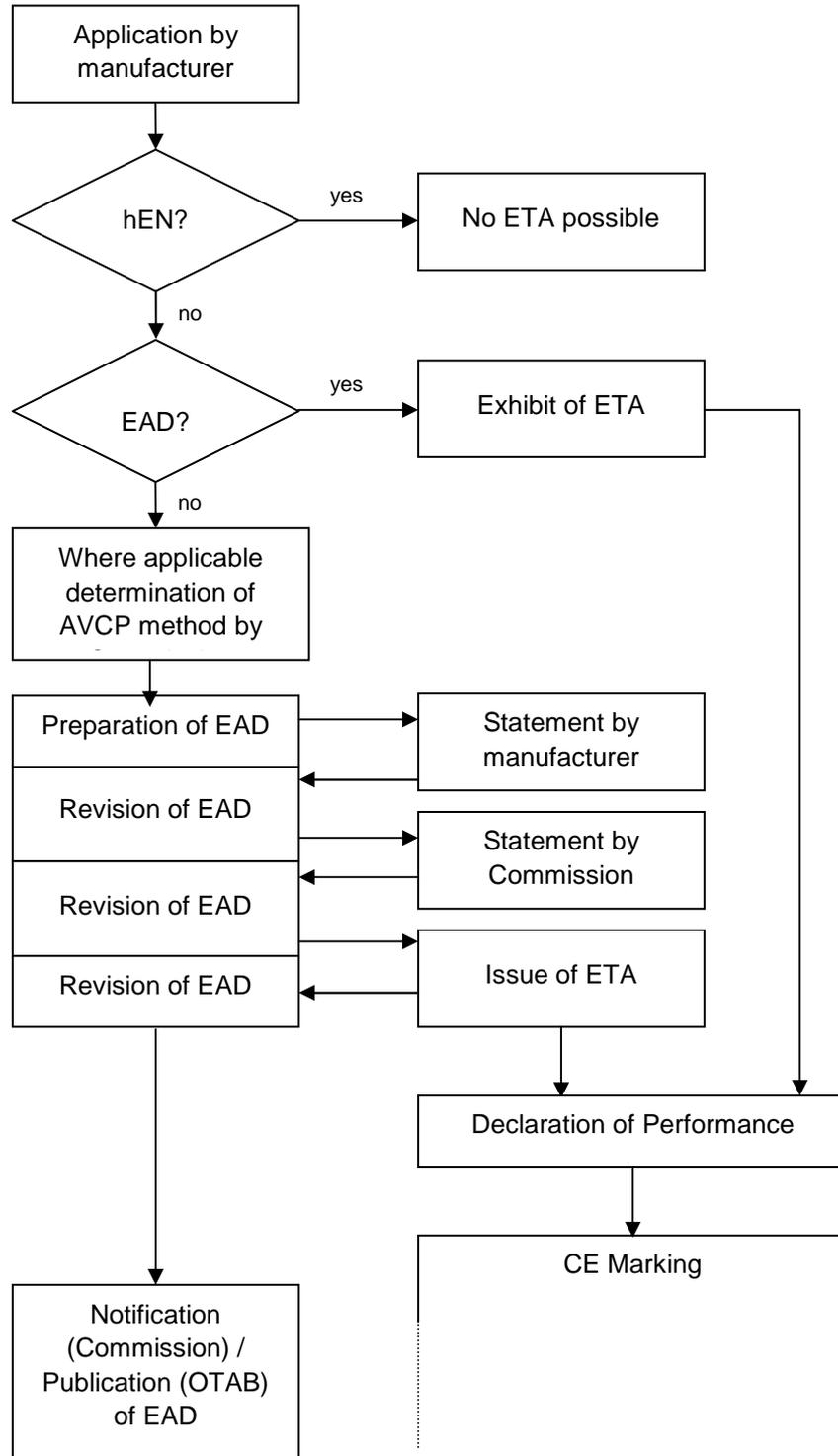


Figure 6: Simplified overview of the processes in preparation of a European Technical Assessment

AVCP: Assessment and Verification of Constancy of Performance, or in common language: attestation of conformity

EAD: European Assessment Document

ETA: European Technical Assessment

hEN: harmonised European standard

OTAB: Organisation of Technical Assessment Bodies,

5.4 Tasks of the manufacturer in preparation of sustainability aspects in an approval

As already mentioned, since the criteria with which sustainability aspects of construction products are covered according to the CPR are currently not as yet determined and agreed, the following suggested checklists can only be considered as suggestions.

The checklists are designed to help the manufacturer to implement the criteria presented in Chapter 4.3. When the checklists have been completed and a European Technical Assessment is being applied for, they are forwarded to the respective approval body which will then evaluate the information. It is conceivable that future approval bodies will not only assess but also evaluate the information given by the manufacturer, however this would require the preparation of an agreed evaluation catalogue. Since, for example, the disposal options available within the Member States can be very different, and it is also not known what disposal options will be available in 10, 20 or more years, the preparation of such an evaluation catalogue would not be easy - particularly for the following checklist.

Table 8: Checklist according to proposal for implementation 1a): Recyclability

	<i>Explanation</i>
How will the construction product be installed in the building? - Not fastened? - Mechanically fastened (screw, nails)? - Firmly connected (bonded?)	
How can the product be demounted following dismantling?	
Are technical aids required for demounting and if so, which?	
Are occupational safety measures necessary during demounting?	
Can the construction product be non-destructively demounted and reused?	
If yes, is there a market for reusing the product?	
If no, when the construction product initially becomes waste after dismantling, which code of waste must be assigned to it (see list of wastes)?	
Is the waste recyclable?	
If yes, what percentage of recyclable material does the waste contain?	
Is it down-recycling or up-recycling?	
Is there a market for it and how does it work?	
Can I take back the waste for the product myself and return it to the process?	
How great are the savings in raw material?	
How great is the technical effort for the dismantling and recycling process (information on energy consumption and consumption of fresh water)?	

What quantities of waste and waste water are generated during the dismantling and recycling process?	
--	--

With regard to determining whether recycling for protecting resources is economical, a life cycle assessment that only deals with the end-of-life stage would be helpful. This could then be followed by an assessment with respect to the Declaration of Performance.

A possible statement in the Declaration of Performance could be:

*Upon take-back by the manufacturer, 30% of the product can be recycled.
In view of the resources protected, recycling leads to an assessment value of X points.*

With regard to durability there are tests that have already been established within the framework of other essential requirements. However, by using the following checklist the manufacturer can check the requirements for durability.

Table 9: Checklist according to proposal for implementation 1b): Durability

	Explanation
How will the construction product be installed in the building?	
What is the life time of the product in its installed state and under optimum conditions?	
This estimate is based on <ul style="list-style-type: none"> - experience - empirical measurements - published information - calculation using relevant standards 	
What factors could reduce the durability of my product?	
What factors could increase the durability of my product?	
Based on information, for example in the ETA, how could I contribute to durability and avoidance of incorrect applications?	

A possible statement in the Declaration of Performance could be:

*The product has a life of 10 years under the following installation conditions:
Mean temperature: -10°C – 30°C (± 3°C)
Rel. humidity: 30% - 70% (± 5%)*

The following checklist is to be used in view of the use of environmentally friendly products and secondary raw materials.

Table 10: Checklist according to proposal for implementation 1c): Environmental friendliness and use of secondary raw materials

	Explanation
What components do I need to manufacture the product?	
Do I have at my disposal all of the safety data sheets of the substances and preparations used?	
If yes, fill in the following table for the approval body (unless the entire formulation was already presented to the approval body according to TR 34).	
Could the substance(s) be released when the product is used or when it is being installed or during dismantling? If yes, where applicable have a test performed regarding BR 3 (in agreement with the corresponding approval body).	
Does the substance/preparation prevent the construction product from being recyclable when dismantled? (see also checklist 1 a)	
Can I substitute one of these substances or preparations with another one that has no hazard characteristics?	
Were secondary raw materials used to manufacture the construction product?	
If yes how high is the percentage in the construction product?	
Are the secondary raw materials subject to quality control with respect to <ul style="list-style-type: none"> - origin - consistent composition - analytical examination for hazardous substances 	
Does the application of secondary raw materials have effects on the technical quality of my product or on its durability? If so which?	

Table 11: Overview of the substances in the construction product that must be declared

Product consisting of	Dangerous*	PBT substance	vPvB	SVHC, or substance subject to approval
Substance A				
Substance B				
Mixture C				
Sum in product				

* Specify concrete hazard characteristic

A possible statement in the Declaration of Performance could be:

The construction product does not contain any substance of very high concern according to (EC) 1907/06.

*The product contains 30% recycling fraction.
Quality requirements regarding the recycling fraction have been met. No hazardous substances are released (examined according to harmonised standard XYZ).
The recycling fraction has no negative impact on the other basic requirements and on durability.*

If an EPD or a life cycle assessment is used in future to implement BR7, then initially it is the task of the approval body to prepare a product category rule, unless this is already available. Only when this has been prepared and approved by the other approval bodies can the manufacturer provide data. The following depicts a process scheme taking into account (see Figure 7).

The most effort consuming step for the manufacturer is data acquisition. For this purpose he must record all of the energy and material flows in his company, principally the same as within the framework of an ISO 9000 certification. He can obtain help from professional companies which generally have corresponding checklists available. In future it may also be conceivable that the approval bodies or the test bodies, which are active in the field of approvals anyway, can support the manufacturer in these efforts.

If the material and process flows and corresponding data are available (i.e. the life cycle inventory), these can be used as a basis for preparing a life cycle assessment. Here again the manufacturer must generally commission an external office. The results are forwarded to the approval body and the plausibility is checked.

An important point when forwarding this information is that all backgrounds and assumptions made in preparing the life cycle assessment must be included in the submission.

Preparing a life cycle assessment or an EPD is definitely the most effortful and costly part. Until recently the European Commission has provided funding especially to SMEs for the purposes of preparing EPDs, among other things. It is currently uncertain whether new funding will be provided.

The complete programme can be found on the following website:
<http://www.europe-innova.eu/web/guest/innovation-in-services/kis-innovation->

platform/greenconserve/about;jsessionid=DEBE5079F638520D02FC8DE155892266.

It is being coordinated through *greenovate* in Belgium (see <http://www.greenovate-europe.eu/>). Programme partners include various institutions in Norway, France and Germany.

A possible statement in the Declaration of Performance could be:

*The product has the following environmental effects:
A "cradle to grave" consideration was made based on the assumptions stated in the PCR/EAD for XYZ.*

<i>Global warming potential (GWP)</i>	<i>[kg CO₂ equivalents]</i>	
<i>Ozone depletion potential (ODP)</i>	<i>[kg R11 equivalents]</i>	
<i>Photochemical ozone creation potential (POCP)</i>	<i>[kg ethene equivalents]</i>	
<i>Acidification potential (AP)</i>	<i>[kg SO₂ equivalents]</i>	
<i>Eutrophication potential (EP)</i>	<i>[kg PO₄ equivalents]</i>	
<i>Primary energy requirements not renewable (PE_{ne})</i>	<i>[MJ/m³]</i>	
<i>Primary energy requirements, renewable (PE_e)</i>	<i>[MJ/m³]</i>	

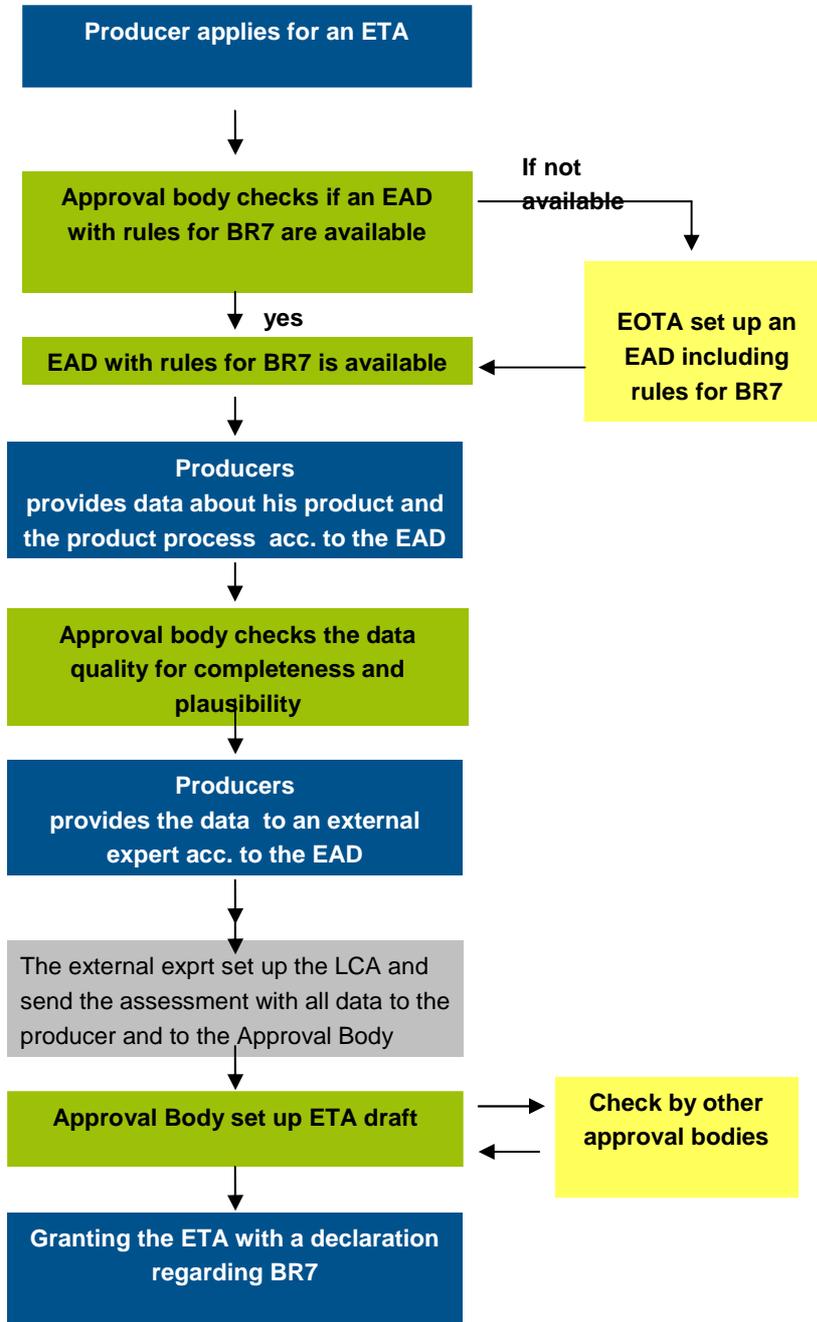


Figure 7: Progress chart for applying for a European Assessment Document including a statement on BR7 according to proposed implementation 2

6 Summary and critical consideration of results

Often the new basic requirement No. 7 is treated as the "sustainability characteristic" of the Construction Products Regulation. Upon closer consideration it appears however that basic requirement No. 7 only covers a fraction of sustainable building, namely the protection of resources. Resource protection is a component of the ecological sustainability pillar. However sustainability also means that the socio-cultural and economical impacts must be considered as well.

Limiting the impact to resource protection does not make an interpretation of basic requirement No. 7 any easier. Based on the historic development of the new requirement, an attempt has been made to disclose the corresponding backgrounds so that the goals of the initiators can be better seen and understood. This has revealed that basic requirement No. 7 is focused particularly on resource protection by maintaining buildings (durability), the recyclability of construction materials following dismantling and the use of secondary materials (and thus recycled materials). Within the framework of this report an attempt was made to work out proposals for implementation and provide assistance to manufacturers in the form of checklists. However, without balancing the processes involved it appears difficult to designate a construction product as being sustainable. This is particularly the case for the recyclability of construction products, where the question quickly arises what technical efforts will be required for waste treatment. It would however be an interesting approach to work out corresponding bases for assessment, which however was not possible within the scope of this study.

Many of those currently involved with the CPR interpret basic requirement No.7 to mean that an EPD will be required for its implementation. Although EPDs are mentioned in Recital 56, the preparation of an EPD is not explicitly requested within the framework of the Regulation. The EPD too does not fully reflect sustainability with its comprehensive approach. However, depending on the system, EPDs can map out a large subset of ecological sustainability, which can be presented as a guidance on the product level. From that aspect, preparing an EPD or the life cycle assessment it is based on would also be an instrument for implementing basic requirement No. 7. Currently it must be assumed that the EPDs or life cycle assessments will be enforced instead of the easier approaches that were shown in Proposal for Implementation 1. The French decree (draft), which is to be initially implemented on a voluntary basis, is based on the preparation of life cycle assessments and will be correspondingly pointing the way ahead.

The preparation of life cycle assessments is a very demanding proposition and cannot be done by just anybody, even when in this day and age there are helpful data bases at our disposal. It must thus be assumed that the manufacturer will need to obtain support through corresponding specialist companies and experts. The resulting costs for SMEs are not negligible. Until recently vouchers were issued to SMEs within the framework of the European "GreenConServe" program; these could be used for obtaining consultations with experts. The program was conducted in France, Germany and Norway. It will be running out at the end of 2012 whereby the funds are already depleted at this time (beginning of 2011). Results and experience gained in practice will be presented at the trade fair and congress for sustainable building ConSense 2012 in Stuttgart.

The approaches presented in this report reflect only a fraction of what could be done to implement sustainability characteristics in construction products. For example it would be helpful to gather the requirements for construction products established in European building certification systems, and then use them to develop a requirements catalogue for construction products. But, because of the many different building certification systems existing in the Member States of the EU, even this would appear to be an elaborate project. A long list of criteria will probably be necessary in order to be able to cover all of the aspects of sustainability, and to serve the building certification systems. However this needs to be done with a good measure of sound judgement, so that on the one hand the requirements can still be implemented and on the other hand the criteria that are placed on the products are transparent, assessable or at least measurable. And providing evidence of sustainability must remain financially possible for individual companies.

Basic requirement No. 7 provides the framework for a great chance to set up important forward-looking requirements for construction products. This is where the Commission and the Member States are required to work out corresponding transparent and implementable requirements so that the sustainability characteristics for construction products do not just remain lip service and marketing instruments.

Annex I: Systems of conformity assessment in accordance with the Construction Products Directive

Elements of conformity check		Systems in accordance with CPD annex III					
		2(i)		2(ii)-1		2(ii)-2	2(ii)-3
		1+	1	2+	2	3	4
Manufacturer	Initial type-testing of product						
	Testing of samples taken at the factory in accordance with a prescribed test plan						
	Factory production control						
Approved (notified) body	Initial type-testing of product						
	Audit-testing of samples taken at the factory, on the open market or on the construction site						
	Initial inspection of factory and factory production control						
	Continuous surveillance, assessment and approval of factory production control						

Annex II: Extract from the Construction Products Directive

ANNEX I (of the Construction Products Directive – 89/106/EEC)

ESSENTIAL REQUIREMENTS

The products must be suitable for construction works which (as a whole and in their separate parts) are fit for their intended use, account being taken of economy, and in this connection satisfy the following essential requirements where the works are subject to regulations containing such requirements. Such requirements shall, subject to normal maintenance, be satisfied for an economically reasonable working life. The requirements generally concern actions which are foreseeable.

.....

3. Hygiene, health and the environment

The construction work must be designed and built in such a way that it will not be a threat to the hygiene or health of the occupants or neighbours, in particular as a result of any of the following:

- the giving-off of toxic gas,
- the presence of dangerous particles or gases in the air,
- the emission of dangerous radiation,
- pollution or poisoning of the water or soil,
- faulty elimination of waste water, smoke, solid or liquid wastes,
- the presence of damp in parts of the works or on surfaces within the works.

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