

ENVIRONMENTAL PERFORMANCE REGULATIONS IN THE NETHERLANDS

Dr. Nico P.M. Scholten, PhD

ERB Foundation Expertcentre Regulations in Building

E-mail: N.Scholten@bouwregelwerk.org

Harry A.L. van Ewijk, MSc

IVAM UvA BV Amsterdam, research and consultancy on sustainability

ABSTRACT

The Dutch Building Decree, as in force since April 2012, stipulated that by January 1st, 2013 a calculation of material environmental performance for a dwelling or office building should be delivered at submission of the environmental (building) permit.

The aim of this requirement is to encourage more conscientious decisions by a regulated uniform determination method. Environmental and life cycle properties of the materials chosen and design variants should so be enabled to be subject to consciousness. Furthermore, the development of sustainable initiatives and innovation should be stimulated.

During the preparation of the Building Decree 2012 the so called "Determination Method Environmental Performance of Buildings and Infrastructural Works in Combination with the National Environmental Database" and the "Green Deal Environmental Performance Calculation" became available for application. Precursing the publication of limit values for sustainability in the Building Decree, exercises are executed based on these methods and promoted by the Ministry and market parties.

The paper will elaborate on this development, the methods used and the results obtained.

Keywords: sustainability, regulations, environment, performance

INTRODUCTION

Sustainability of buildings is an important subject of policy for the government and the supply industry. The environmental issue (sustainability) is from October 1st, 1998, based on the clause 2 of the Housing Act, the foundation for regulation by the Dutch Building Decree. In the period 2001-2003 various R&D organizations namely TNO, W/E, Intron, IVAM environmental Research University of Amsterdam and CML, University of Leiden run an extensive R&D project (Scholten et al., 2004) to develop a determination method for the environmental performance of buildings to use in the building regulations. Standardization of the determination method and code of practice was at the end of this period almost finished by the Dutch Standardization Body. In the end the determination method was blocked by building industry because of the expected complexity of the regulations and the influence on the freedom of the choice of materials.

Earlier the production industry started a project to introduce material based environmental relevant product information (MRPI), a so-called environmental material product declarations (EPD) according to ISO 14025 (ISO 14025:2006, 2006). Later, the standardization body transformed the 'MRPI manual' to the Dutch standard NEN 8006:2004, the determination method for the MRPI of building products, amended in 2007 (NEN 8006:2004, 2004). This NEN 8006 is at the moment the base for the determination method in use in the building regulations (Method of calculation, 2011) (See www.milieudatabase.nl).

Meanwhile, also in Europe on voluntary base there was the standardization process. The Dutch NEN 8006 was brought to the table in that process. EN 15804:2012 'Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products' was published. This caused NEN 8006 to be withdrawn on July 1st, 2012, but it is still the base of the determination used in the Building Decree 2012. To determine the environmental performance of a building EN 15978:2011 'Sustainability of construction works - Assessment of environmental performance of buildings - Calculation Methods' was published. No A-deviations are questioned by the Dutch Standardization Body.

DUTCH BUILDING DECREE 2012

On January 1st, 2013, a calculation report of environmental performance shall be handed over as a part of the environmental (building) permit procedure. This is regulated in the paragraph 5.2 of the 2012 Building Decree (Building Decree, 2012). This paragraph applies to new buildings (residential and offices with a floor area larger than 100 m²). The environmental building performance shall be calculated following the determination method "Environmental performance Building and Infrastructure works" (Method of calculation, 2011). The determination method is in good consultation with the delivery industry and building industry developed, but remarkably it is not a standardized determination method by the Dutch Standardization Body.

Emission and resources related indicators have to be demonstrated. There are no performance levels or classes yet to be met. For the calculation some calculation tools are available now.

Every calculation shall meet certain requirements. For demonstrating that the used calculation tool meets these requirements the tool owner can request the Foundation for Building Quality (SBK) proof of acceptance. For this procedure SBK has developed a special website: National Environmental Database (NMD).

TOOLS

Both the Dutch assessment tool developer "GPR Bouwbesluit", 'GreenCalc' and the Dutch EPD (Environmental Product Declaration) software operator MRPI developed already tools for the required building calculations. Free downloads of the tools are available. Both tools use environmental product data taken from the National Environmental Database. Other tools will follow.

DETERMINATION METHOD ENVIRONMENTAL PERFORMANCE OF BUILDINGS AND INFRASTRUCTURE WORKS

This method can be used by construction professionals together with the pertaining database. This method and database allow assessing the environmental impact of the used materials at construction and maintenance of a dwelling or office building based on the design documentation of those works. The results of these calculations are expressed in one or more figures. So designers can see which building components cause the most important (negative) environmental effects. Subsequently optimization of the design becomes possible. Thus, professionals can choose for sustainable solutions based on sound information, as to realize a building with less negative environmental effects and thus a better performance.

The determination method is used by private measuring-and calculation instruments to evaluate the environmental impact of buildings and infrastructure. The method is developed using the Life Cycle Analysis approach. This LCA is available for the calculation of environmental effects of construction materials, products, systems and complete building works. LCA takes the complete product life cycle into account, resource extraction, manufacturing, transport, use and demolition of works.

The determination method was developed to calculate the environmental performance of buildings and infrastructure transparent and verifiable over their full lifecycle. The basis for the method is NEN 8006:2004, including the May 2007 amendment. Because these methods were developed on the product level, it was necessary to develop

supplementing rules for determination on the building/works level.

These are additional rules to NEN 8006, published by SBK in their determination method, so that it can be applied on the project level. To understand the method to the full extent, knowledge about NEN 8006 and the LCA methodology is required. If and when the calculation of the environmental performance of buildings and infrastructure steps outside the border of the NEN 8006 standard, it is explicitly shown in the SBK determination method.

There are arguments to supplement the standard:

- NEN 8006 concerns construction materials, building products and building elements, while the method needs to determine the environmental performance on building or works level;
- NEN 8006 bases itself on manufacturers data provided to establish an Environmental Product Declaration (EPD). While inescapable generic, producer independent data are required to determine the environmental performance on the building or works level when specific product data are not available.

A more fundamental aim of the determination method is to harmonize and unify calculations of, for instance, the existing software like the Dutch GPR Building, GreenCalc, DuboCalc and Eco-Instal such that the calculation regardless of the used tool delivers the same environmental effect scores and environmental ratios.

Only for this purpose at SBK (Foundation Building Quality) deposited data may be used as registered in the National Environmental Database. This consists of:

1. Product cards;
2. Background processes that result in 'basic environmental profiles'.

The database is partly public accessible and partly only after signing a license agreement with SBK.

In the determination method the ten 'baseline' impact categories' of the CML2 impact categories are used. Because CML2 does not discern within abiotic depletion (in fossil energy carriers and other), and the determination method does, this results in eleven effect categories instead of ten.

DATABASE (NMD)

The national database consists of product cards, basic profiles, and the base- or background processes, in a LCA database in SimaPro format.

The product-cards contain information on functional unit, product composition, life span, auxiliary materials, maintenance frequency and general product information. (i.e., no environmental data) on building components.

The product 'External glazing' is divided in the card in various components: profile, glazing putty, double glazing and distancer. The unit is m². Per m² components are represented in kg. Additional information, like service life, is given. So, there are no

environmental data in the card-base. Basic profiles are the environmental impacts (environmental profiles) following the calculation of the basic processes in SimaPro. These are modular in principle so per unit of material for instance kg cradle-to-gate and per unit of energy for instance kWh electricity etc. To be used for implementation in LCA's, applied in calculation of buildings.

The base- or background processes, in a LCA – database in SimaPro format, are used to calculate the environmental impacts (environmental profiles) of base processes like manufacturing and demolition. The maintenance thereof in the database ensures the base profile database to be in line with the SimaPro database.

The various private calculation software use the product cards and the base profiles – together the product profile card. The information of a material or process on the product-cards is so coupled in the calculation software with the information thereof in the base profiles. More specific: the calculation of top processes in the basic process database gives these base profiles. For instance, a certain type of cement in concrete is coupled with a specific quantity per unit of concrete with the base profile of cement.

The base profile database is mainly filled according to the analyses that have been performed with SimaPro (calculation software) and the Swiss database Ecoinvent2.2, corrected for the Dutch situation where necessary and possible. To generate figures choices have been made. The choice consisted of the decision which available processes would be used. If no process is available, it has to be developed; in some cases the existing processes have been adapted to be in line with the Dutch circumstances.

Furthermore, a characterization method is required to be able to generate data. With this method the environmental impacts are determined like abiotic depletion, global warming, etc. At this moment one works with CML2 baseline 2000.

The SBK web application contains the data in MYSQL converted to SQLite. The format of the SQLite file is described in the Calculation rules project.

The National Environmental Database contains the following data categories:

Category 1: brand data, third party verified; for manufacturers and suppliers. Comparable with a declaration bases on EN 15804.

Category 2: generic (brand less) data, third party verified and notice of representativity (i.e., for the Dutch market or a specific group of products); for product groups, groups of manufacturers, groups of suppliers.

Category 3: brand less generic data, not third party verified, validated in general by the SBK Technical Committee; for product groups, groups of manufacturers, groups of suppliers, clients.

In the product-cards it is differentiated into the lifespan of a product in its application and the lifespan

of the material applied. For instance, a building has a lifespan of 50 years, double glazing 25 years, which means that the environmental effect of double glazing counts twice in the calculation software.

Within the determination method one has chosen for a fixed lifespan of a building to make mutual comparison on environmental performance feasible. All calculation software uses this fixed lifespan. As soon as regulations will stipulate the limit values this is not acceptable and a determination method that allows the determination of the adaptive property of a building must be made available. At the end of the functional lifespan the building represents a rest value in terms of usability of the Casco.

Flexible construction in the form of replaceable/removable/reusable interior separation walls is not yet valued in the NMD.

The following environmental effect categories are recognized:

1. Abiotic depletion, non fuel;
2. Abiotic depletion, fuel;
3. Global warming;
4. Ozone layer depletion;
5. Photochemical oxidation;
6. Acidification;
7. Eutrophication;
8. Human toxicity;
9. Ecotoxicity, fresh water;
10. Ecotoxicity, marine water;
11. Ecotoxicity, terrestrial.

The following environmental ratios are recognized:

1. Energy, primary, renewable;
2. Energy, primary, non-renewable;
3. Energy, primary;
4. Water, fresh water use;
5. Waste, hazardous;
6. Waste, non hazardous.

The determination method pays in depth attention to the transport-distance. In the base profile with the environmental effect categories the LCA must be founded on raw material extraction to the factory gate plus the transport distance from the factory exit abroad to the city of Utrecht. Concerning the transport distance in Holland one calculates them from Utrecht to the construction site, if no specific data are available. This distance is recorded in the product-card.

What is the difference between the product data category 1 & 2 and category 3?

Let us, for instance, overlook a flexible interior separation wall.

A category 1 or 2 LCA interior wall is executed over the life cycle of the complete interior wall. This analysis produces a product-card with base profiles with environmental information pertaining to this wall. These base profiles refer to the product interior wall (composed of, for instance, gypsum board, insulation and steel profiles) including the in company processes of the supplier of the interior wall, its transport profile and its waste scenario. The file

describing the end result is the third party validated according to a fixed protocol (registered under menu item base documents in the website) and that results in the status of category 1 (brand determined) or category 2 (brand less).

An interior wall category 3 (brand less, not validated) will be composed from different base profiles (gypsum board, insulation, and steel profile) also standard transport profiles and waste scenarios will be used from the database.

Important difference between category 3 and the other two categories data is that in case of a movable wall in category 3 the manufacturing process to produce the wall (energy, factory waste etc.) and to pose the wall is not included in the calculation. Therefore, it is desirable to use as much as possible validated data and that is the aim in the future.

Category 3 data will be replaced by category 1 and 2 data. To stimulate this process the environmental effects of category 3 are ameliorated by 30% on January 1st, 2013.

DATABASE ACCESSABILITY

It was decided for the time being not to make the National Environmental Database accessible via the internet. Only data suppliers and parties that contract a license like developers of calculation software have access. It is not reluctance of SBK but outside the expert-circuit and without calculation software the database has no information value. This is not in accordance with the legal provisions. Laws and elements thereof may not consist of non-accessible parts and have to be fully accessible and understandable for professional users.

Accessibility is arranged as follows:

- a. Manufacturers and associations thereof; they can read the data uploaded by them;
- b. Software/tool developers; tool developers like GPR Building, GreenCalc+ and Dubo Calc, SBK have license agreements; they can use the National Database; also new developers can buy a license;
- c. LCA agencies; third parties can obtain a part-licenses that is limited to the database of base profiles including the complete database in SimaPro format.

To be included in the NMD an Environmental Product Declaration (EPD) is required according to the Determination Method/SBK validation protocol. A MRPI certificate is not per se required, since the SBK validation protocol is in practice identical to the MRPI validation protocol.

MANAGEMENT AND ADMINISTRATION OF THE METHODS AND DATABASES

The Foundation Building Quality (SBK) manages the Determination Method, the National Environmental Database and the pertaining documents and protocols. SBK is the only organization that may expand the

database. This is at the least a strange situation, especially because the method is not fully transparent and verifiable for everyone. This is in conflict with the national Rules for Regulations and Regulatory bodies (Instructions for regulations, 2011).

RELATION TO EUROPEAN DETERMINATION METHODS

NEN and SBK do research to the differences and similarities between the European and Dutch National developments to be able to chart and monitor them as well as possible.

To a large extend (>95%) the European standards and the SBK method together with NEN 8006 are in line. Since the development of the European standards and the Dutch system were parallel processes in time there are differences on details. At the moment it is clear that one of the main differences between NEN 8006 respective the SBK method and EN 15804 respective EN 15978 are the environmental indicators (EN 15978:2011, 2011). In NEN 8006 10 indicators are mentioned and in NEN-EN 15804 there are 22 + 2 indicators (in EN 15978 it is 22) (EN 15804:2012, 2012; EN 15978:2011, 2011). Besides this EN 15804 does not recognize weights allotted to the indicators, the relative importance of different indicators. The last important difference consists of the modular approach with obligatory differentiation, and a voluntary 'Module D' for the loads and benefits of recycling of materials

Is it possible to include manufacturers EPD data established according to EN 15804 in the NMD? It is quite possible that such an EPD is established without using the background data from the NMD like energy generation and transport. In such a case the EPD is not comparable with the requirements of the SBK validation protocol. Aimed at mutual recognition of EPD's international talks are ongoing. No results have come out yet and the following operational action can be taken.

If and when a product of "foreign" origin is applied in a building one can use category 3 in the NMD with a correction for the transport distance. An EPD according to EN 15804 can be the basis for category 3 data (EN 15804:2012, 2012). In such a way there are no trade impediments for the use of "foreign" data on the Dutch market. Question marks can be placed to this related to trade barriers within the EU because what has happened to this category by January 1st 2013, is mentioned before.

As such the chosen modus operandi is surprising because the European standards are leading and case history shows that the European Commission calls Member States to the European Court when products under the European standards experience unfair trade obstruction under National Regulations. Differences in impact scores because of the transport distance corrections lead not to a trade barrier.

HOW ARE INNOVATIVE PRODUCTS TREATED IN CASE OF LACKING DATA?

Innovative products mostly lack base profiles and specific product data like service life. This also may be applicable for products from abroad on which not yet LCA has been performed. Companies with such products could together with their LCA –agency propose how to provide the necessary data required for inclusion in the NMD.

Proposed could be: we take base profile X with an assumption about the differences of Y % because it is not possible to generate a base profile of material Z and base profile X is nearest to material Z.

These proposals are discussed with the SBK-product data committee and/or the Technical Committee and if agreed the product will be included as category 3.

LIMIT VALUES TO BE REQUIRED

In the Building Decree 2012 – part new Construction-provisions are given to calculate the environmental performance of dwellings and office buildings.

Upon explicit request from the construction sector limit values are not yet implemented. One wants to obtain experience to see what will be the impact on the environment and the application of materials and products.

At the moment in the running Green Deal environmental performance project the Dutch Architectural Organization and the Royal Metal Union use the determination method to gain experience and stimulate the building industry in the light of realization a level playing field and innovation.

To be able to establish appropriate limit values fitting within the system of the national technical building

REFERENCES

Building Decree 2012

EN 15804:2012 (2012) Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.

EN 15978:2011 (2011) Sustainability of construction works - Assessment of environmental performance of buildings - Calculation Methods.

Instructions for regulation, Circular of the Prime-Minister of November 18th 1992, last amendment of May 11th 2011, OJ 2011, 6602.

ISO 14025:2006 (2006) Environmental labels and declarations. Type III *Environmental declarations – Principles and procedures*

Method of calculation for the determination of the Environmental performance of buildings and infrastructure during their whole lifetime, based on the life cycle analysis method (LCA-CML2) of July 1st 2011, published by Foundation Building Quality, Rijswijk.

NEN 8006:2004 (2004) Environmental Data Of Building Materials, Building Products And Building Elements For Application In Environmental Product Declarations - Assessment According To The Life Cycle Assessment (Ica) Methodology (in Dutch).

Scholten N.P.M., de Wit S., Kortman J., Huppes G., Schuurmans A., Anink D. (2004) The development of an environmental performance standard for materials in buildings for the Dutch building decree CIB-congress 2004, Toronto, Canada.

regulations (Building Decree 2012 juncto article 2, first member, a, of the Housing Act) a series of questions requires further and deeper analysis. Ongoing research by a consortium of ERB Expertcentre Regulations in Building Delft, RIGO Research Amsterdam, IVAM Environmental Research Amsterdam and CML University of Leiden has to solve these questions.

In all situations attention has to be given to the sensitivity of the results in relation to the definition of the materialization of the functional use, determining the environmental performance and as such the determination and choice of the limit values.

There are eight specific fields of attention:

1. Allocation of function;
2. Location dependency;
3. Infill, finishing;
4. Provision/regulation free building components;
5. Extent of dwelling (sub)- and other functions;
6. Quality level;
7. Multi-functionality;
8. Governance and differentiation in standardization.

CONCLUSIONS

The regulations in the 2012 Building Decree are the first step forward with no other aim than to stimulate the building industry to invest seriously in sustainable thinking.

There is still a long way to go before reaching a situation comparable to the energy conservation requirements. Both, regarding acceptability by the consumer as well as solutions in practice.