Environmental criteria for sustainable public procurement of

Office Buildings (Renovation)

Version 26 January 2016

1. Scope/definition

For the purposes of this document renovation is defined as a renovation by which over 25% of the surface area of the building shell is replaced, changed or expanded, and this renovation, change or expansion pertains to the integral building shell. The criteria apply only to the office function.

This definition of renovation is intended to conform to article 5.6 of the Buildings Decree, although note that the Netherlands opted for the surface area method in implementing article 7 of the revised EPBD. It should be kept in mind that a major renovation as referred to in this article will generally involve activity for which a construction permit will be required, so the competent authority will be able to review and supervise the activity.

Activities on monuments: Given the extremely diverse nature of these buildings and the necessary activities, these criteria do not apply to monuments. Although great improvements in the field of sustainability are often possible in monuments, these must be considered case by case with respect to the monumental character.

2. Most significant environmental impacts

The government opts for a performance-based approach to the leasing and purchase of office buildings. The table in annex 1 has been developed to facilitate this. The table addresses the following themes:

- energy conservation
- materials use
- health in buildings/interior environment

Annex 1 also includes explanatory notes for each theme, and summarises the calculation methods. Annex 2 lists the premises assumed at the time of drafting this document.

A number of other themes are relevant, but no criteria for these themes have been drafted; for those themes, this is left for the contracting authority to consider doing. They include:

- materials with low emissions of volatile organic compounds (VOCs)
- view in each working area
- water management
- openable windows in each working area
- individually adjustable sun blinds
- individually adjustable temperature
- total accessibility

3. Points of attention/suggestions

Devoting attention to the opportunities and possibilities for the most sustainable procurement possible in the preparation phase will lead to specifications that are more ambitious or which differ from the standard minimum requirements and award criteria set out in this document. The following table presents points for attention and suggestions for promoting sustainability in procurement within this product group.

No.	Points of attention/suggestions (AS)
AS1	**Specifics of adaptive capacity or future value** The performance criterion adaptive capacity or future value is on the agenda, but is not yet fully worked out in detail. The goal of this criterion is to be able to say something in design and specifications about the preservation of substances in the process, such as the expected construction and waste flows during the use and conversion. Part of this involves a cohesive approach to the entire life cycle of the building. For example, the design takes into account the degree to which the building is suitable for a redesigned or different use function. VNO/NCW and MKB-Nederland have been working closely with the construction sector and governmental agencies to operationalise this criterion. Their results have been published on http://www.adaptiefvermogen.nl/ .
AS2	**Excluding certain tenderers** Construction contractors who have repeatedly violated environmental legislation/regulations or have been found guilty of severe professional misconduct as defined in article 53 and 54 of Directive

	2004/17/EC and article 45 of Directive 2004/18/EC may be excluded from the tendering procedure.
AS3	**Ask architect to provide evidence of experience with environmentally friendly construction projects** The architect can be asked to demonstrate sufficient experience with the design of environmentally friendly construction projects. The architect could refer to experts that have been partnered with on current or past projects, such as advisory engineers for heating and/or cooling systems.
AS4	**Ask tenderer to demonstrate technical capacity for implementation of environmental management measures** Tenderers may be asked to demonstrate that they are technically capable (based on expertise within their organisation or through cooperation with external experts) of implementing specific environmental management measures relevant to the execution of the construction works.
AS5	**Educate the building manager about energy efficiency** After handover of the construction/renovation work, the building manager can be educated about energy efficiency in the use of the building. The tenderer may be requested to provide a description of the content of this material.
AS6	**Consider bio-based procurement** In many cases, bio-based raw materials are preferable over fossil-based raw materials (such as plastics). Survey (with the market where possible) the possibilities, the pros (and any cons) of use of bio-based raw materials for your procurement needs, and give them an appropriate place in your procurement documents. More information on bio-based procurement can be found on PIANOo.
AS7	**Transport, recycling and waste management of construction materials** The contract party can be asked to take steps to prevent construction waste, or to separate and reuse construction waste, such as: contract party must indicate a minimum and target level for the use of reusable packaging and/or containers for the transport of the required construction materials from and to the construction site. suppliers of construction materials must indicate a minimum and target level for packaging waste (to be achieved through measures such as a system for collection, recycling and reuse of packaging material supplied). The contract party must take appropriate measures to limit the waste produced during the demolition and construction works, and to reclaim any such waste through reuse or recycling). A minimum of a certain percentage (to be defined) of the total weight must be reclaimed (through reuse or recycling).
AS8	**Avoid use of steel grit with silicon** For cleaning and removing rust or paint from steel products, a requirement to avoid the use of steel grit with silicon may be incorporated.

4. Selection criteria

Not defined for this product group.

5. Technical specifications

No.	Technical specifications (ME)
ME1	**Sustainability performance** The tenderer will complete a building that is in compliance with level C for every sustainability category as set out in the table in annex 1 and described in more detail in the explanatory notes to that table. The tenderer will include with the tender a description of the performance offered and will substantiate this with corresponding calculations. These calculations must be carried out in accordance with the appropriate calculation methods as described in the explanatory notes to the table in annex 1. The text above could be incorporated into the schedule of requirements, and the annex could be added in its entirety to the schedule of requirements. *Verification* For documentation for the purposes of the handover, see contract clause 1.

6. Award criteria

No.	Award criteria (GC)
GC1	**Higher sustainability performance** The higher the individual aspects of building performance as described in the table in schedule 1, the higher the tender will be rated. *Explanation* This award criterion is a supplement to the minimum requirement. See the explanatory notes. You must assign the rating yourself. The table identifies different classes and suggests point allocations. The background to the breakdown into classes is included in annex 1. Naturally, other methods of rating are also possible. If you expect tenders to score very close together, or if you expect a tender to score higher than the highest class on the table, one option would be to use a sliding scale. In this case you would not be working with classes, but you would rate a higher score with a percentage of the maximum number of points that you wish to assign to the building performance in question. For this, you must define a maximum score or compare tenders against each other. However you do this, you must describe your procedure clearly, in advance, in the tender documents. *Verification* For documentation for the purposes of the handover, see contract clause 1.

7. Contract provisions

No.	Contract provisions (CB)
CB1	**Documentation of sustainability performance** For the purposes of the handover of the building the contractor will supply documentation of the performance level achieved, with calculations and measurement data where relevant.
CB2	**Maintenance plan and operations guide** Upon handover of the building, the contractor will supply a maintenance plan setting out the maintenance steps to be taken over the lifetime of the building. The maintenance plan will include at least the following components: • description of the components and materials used • description of the inspection and maintenance intervals for the entire building, including systems, with corresponding instructions (at a minimum, description of inspection points, methods, maintenance activities and required materials) • description of the way in which materials and components can be removed or demolished in an environmentally responsible way In addition, an operations guide will be provided. This guide explains how to use the building in the most sustainable manner. The operations guide will include at least the following components: • description of the intended use of the systems in the building (configuration, automatic settings, options for optimisation during use period, etc.), and • description of the sustainable materials and components used and the way to handle them during the operations period.

Annex 1 – Details of minimum requirement, award criterion and contract clauses

	Energy		Materials	Health in buildings				
	Energy performance	**Own generation of sustainable energy**	**Environmental performance**	**Noise in occupation areas Workspaces**	**Indoor Air Quality, ventilation capacity**	**Airflow ventilation**	**Thermal comfort,**	**Natural lighting incidence workspace for long-term occupancy > 2 hours*** **
Level A1	Label A+++ **x points**	50 % independent generation **x points**	No level specified	Class A (see explanatory notes) **x points**	No higher level specified	6 dm^3/s per m^2 of working area **x points**	No higher level specified	100% of workspaces designated for long-term occupancy min. DF > 3.0% **x points**
Level A2								
Level B1	Label A++ **x points**	25 % independent generation **x points**		Class B (see explanatory notes) **x points**				100% of workspaces designated for long-term occupancy min. DF > 2.0% **x points**
Level B2		10 % independent generation **x points**						
Level C	Label A+ **0 points**	No level specified	Calculation in accordance with explanatory notes to calculation method 100% Sustainable Procurement of wood **0 points**	Class C (see explanatory notes) **0 points**	8.3 $dm^3/s.pp$ **0 points**	3 dm^3/s per m^2 of working area Or: 6 dm^3/s per m^2 of working area **0 points**	Class A, in accordance with new ISSO 74 **0 points**	100% of workspaces designated for long-term occupancy min. DF > 1.0% **0 points**
Basic level	Legally required standard under Buildings Decree							

* Where necessary, the terms appearing in the table are defined in the explanatory notes.
** If no changes that would affect the airflow features are made, these requirements do not apply.
*** If no changes in the dimensions of the natural light openings are made, these requirements do not apply. Note that direct natural light incidence is required, and there is a supplemental criterion included for the placement of workspaces within 3 m from the outside walls.

Explanatory notes to table 1

With Socially Responsible Procurement, the government opts for a performance-based approach. The table is based on the assumption that the effects can be quantified using generally accepted calculation methods, so that the level of performance achieved can be determined simply and in a verifiable manner. Wherever possible, this has been done using calculation methods stipulated in other legislation.

As basic value, the table adopts the legal standard for new construction (wherever one is available). For the purposes of Socially Responsible Procurement, a performance requirement in excess of this statutory basic value is selected for a number of aspects. Level C in the table is the minimum requirement. Secondly, the class breakdown presents a clear picture of the performance to be delivered in order to achieve an added value. This relies on either the class breakdown as already used in practice (for example, thermal comfort) or an indication of the percentage of the basic value. Award criteria may be specified for level B2 and above.

Several levels are indicated, to give the purchaser/user a level of choice. To be able to compare the descriptions objectively, points could be assigned to the individual classes. Further explanation of each category is provided in the following. If no changes are made to a particular feature (for example, natural light openings or airflow features), compliance with the requirements need not be substantiated, but a statement that no changes were made must be specifically indicated.

The individual themes are quantified using the following calculation methods:

	Theme	Calculation method for renovation
Energy	Energy performance	Existing building energy label NEN7120*, if completed, otherwise ISSO 75
	Own generation of sustainable energy	x% = (Eownparcel/Ep,adm,tot,nb) *100% according to NEN 7120* if completed, or if not then ISSO 75
Materials	Environmental Performance	Calculation method for Environmental Performance Buildings and Groundwork, Road and Hydraulic Engineering works, with associated environmental database [SBK]
	Wood	www.inkoopduurzaamhout.nl and specifically http://www.inkoopduurzaamhout.nl/public/pdf/nieuwe-standaard-bestektekst-duurzaam-hout.pdf
Health	Acoustic comfort of workspaces	Quality levels according to the NVBV** Handbook of Building-Physical Quality of Office Space with reference to NEN 5077
	Indoor Air Quality, ventilation capacity	NEN 1087 and NVBV Handbook of Building-Physical Quality of Office Space
	Thermal comfort	In accordance with ISSO 74 and ISSO 32.
	Natural lighting incidence	Daylight factor [DF] = Eroom/Eopen field *100% -Design phase: calculation based on daylight simulation programmes with CIE-overcast sky.

* For all standards, the version applicable at the moment of the announcement of the tendering procedure applies.
** *Nederlands Vlaamse Bouwfysica Vereniging* (Netherlands-Flanders Association of Building Physics)

Further explanation of each theme is provided below.

Energy performance

Objective of requirements
The goal of this requirement is to improve the energy performance of buildings with respect to the legal minimum standard.

Explanation of calculation method
Calculation method: NEN7120, including NVN7125: EPCusi Q (100%-x%)*EPCusi if completed, otherwise ISSO 75.
The requested performance is expressed in an energy label.

Explanation of Socially Responsible Procurement threshold
The underlying goal is the reduction of the use of fossil fuels. For existing construction, the obligation to produce an energy label is adopted. The minimum performance is energy label A+. Experience in practice has shown that compliance with an energy label of C is the average standard. To promote Socially Responsible Procurement, the minimum performance is set at energy label A+.

Documentation (this must be included in the contract)
Upon handover, the contractor must demonstrate that the agreed energy performance is attained. This can be done with an energy label in accordance with the applicable standards. The contractor must also demonstrate that the building is constructed in accordance with the substantive content of the calculation (construction-technical and systems-technical).

Own generation of sustainable energy

Objective of requirements
The goal of this requirement is to promote the use of renewable energy sources that generate capacity at the location itself or in the immediate vicinity.

Explanation of calculation method
Calculation method: NEN7120, including NVN 7125: x% = (Eownparcell/Ep,adm,tot,nb) *100% The energy generated at the space (Eownparcel [MJ]) in relation to the permissible characteristic energy consumption (Ep,adm,tot,nb [MJ] in accordance with NEN7120, including NVN 7125) is evaluated. The amount of energy generated at the space consists of an item for the electricity generated at the space (Epr;el;gi) and the contribution to sustainable energy generation as described in section 5.4.4 of NEN7120:2011.

Passive solar energy, utilisation of natural light for lighting and thermal solar energy (see also section 5.4.4 of NEN7120:2011) are not included here. For the calculation of the quantity of electricity generated at the space (Epr;el;gi), see section 5.4.5 of NEN7120:2011.

Explanation of Socially Responsible Procurement threshold
Setting a requirement on the generation of renewable energy at the space promotes not only energy-efficient construction but also on-site generation of sustainable energy. "Renewable energy sources" are defined as wind, solar, ambient air/surface water/geothermal heat, energy from the oceans, hydroelectric power, biomass, landfill gas, sewage treatment gas and biogas, all as defined in section 1, paragraph 1(t) of the Electricity Act 1998. For existing buildings, there is no predefined calculation method; the requirements for new construction are adopted here. There is no standard set of requirements stipulated for on-site energy generation. If desired, higher values may be required or rated more highly in the tendering procedure.

Documentation (this must be included in the contract)
Upon handover, the contractor must submit the calculations demonstrating that the percentage of energy generated on-site is attained. The contractor must also demonstrate that the building is constructed in accordance with the substantive content of the calculation (construction-technical and systems-technical).

Environmental performance of materials

Objective of requirements
The goal of the requirement is the reduction of the environmental impact as a result of the material used of the construction and the building-specific systems.

Explanation of calculation method
Environmental Performance of Buildings and Groundwork, Road and Hydraulic Engineering Works Calculation Method published by SBK (Construction Quality Foundation), including the underlying environmental databases for determining the shadow price. This shadow price is the performance to be delivered.

Within BREEAM certifications, a certain amount of experience has now been gained in calculating the shadow prices of a building. Based on a number of projects, in 2012 the DGBC resolved to adjust the shadow price within BREEAM from €0.80/m^2 GFA to €1.30/m^2 GFA. At the time of this writing (June 2014), there is still not enough data available to draw a reliable conclusion from the harmonised materials database about the shadow price of buildings. This is why the value from BREEAM is adopted for new construction. A supplemental calculation method has been defined for existing construction (see annex 3), but there is as yet insufficient data available from this calculation to establish a threshold value. This is why for renovations, requirements are set only on the drafting of the calculation. For renovation, there is as yet insufficient data available to establish a threshold value. Consequently, the performance levels for this theme have not yet been entered for renovation.

The calculation must account for materials to be newly added to the building as well as the materials removed from the building. For the latter, the period that the materials were present in the building may be deducted from the total write-down period of 50 years.

Explanation of Socially Responsible Procurement threshold
Drafting a calculation of the maximum shadow price encourages optimisation of design and construction based on a calculation of the environmental impact.

Documentation (this must be included in the contract)
Upon handover, the contractor must demonstrate that the agreed shadow price is achieved. This is demonstrated using the calculation of the shadow costs based on the materials actually used.

Sustainable Timber

Objective of requirements
Wood to be used in the building and in products to be delivered, where this wood remains in the work, must be wood that is demonstrably sustainably produced.

Explanation of Socially Responsible Procurement threshold
Raw wood to be supplied, or wood incorporated into wood products or other products to be supplied, must meet the Dutch Procurement Criteria for Timber set out in the TPAS (Timber Procurement Assessment System). The wood must be in compliance with at least 7 of the 9 principles for sustainable forest management.

Documentation
Wood will be assumed to meet the criteria if it is certified in accordance with a system approved by the TPAC (Timber Procurement Assessment Committee).

The tenderer may also furnish other evidence, accompanied by extensive, documented and verifiable data and information demonstrating that the set minimum requirement is met.
A list of approved certification systems can be found on the website: http://www.tpac.smk.nl/170/about/judgements.html

Explanation
More information on the procurement of sustainably produced wood and paper can be found on: www.inkoopduurzaamhout.nl. An example of specifications defined for sustainably produced wood can be found on: www.inkoopduurzaamhout.nl/bestek.

General information on the prescription and verification of sustainably produced wood can be found on: www.houtdatabase.nl. The complete TPAS criteria can be found on the website:
http://www.tpac.smk.nl/Public/TPAC%20documents/DutchProcurementCriteriaMAR2014.pdf

Noise in work areas, workspaces

Objective of requirements
The goal of the requirement is to prevent and limit nuisance from noise, in order to promote a healthy and comfortable work environment.

Further explanation of classes
Class A: The office building is designed for a high level of acoustic comfort, with attention to speech intelligibility and conversational discretion at the relevant workspaces. Additionally, all furnished and unfinished office spaces are in compliance with the requirements for echo and all workspaces are in compliance with tables 34-38 of the Handbook of Building-Physical Quality of Office Space, and the noise nuisance from on-site systems is limited.

Class B: All workspaces are in compliance with tables 34-38 of the Handbook of Building-Physical Quality of Office Space.

Class C: All furnished and unfinished office spaces are in compliance with the requirements for echo in the Handbook of Building-Physical Quality of Office Space. At least 60% of the workspaces in all categories meet the acoustic quality requirements of tables 34-38 of the Handbook of Building-Physical Quality of Office Space, and these spaces are identified as such.

Explanation of calculation method
NEN5077, NVBV Handbook of Building-Physical Quality of Office Space

Explanation of Socially Responsible Procurement threshold
The buildings decree does not set requirements on the noise comfort level of a space. For Socially Responsible Procurement, the class breakdown is based on the quality levels defined in the NVBV Handbook of Building-Physical Quality of Office Space. For further elaboration of the acoustic requirements in the building, see this Handbook. The minimum level for Socially Responsible Procurement is Class C. If desired, higher classes may be required or rated more highly in the tendering procedure.

If the modification of components of the anti-noise constructions (floors, walls, shell) is not part of the tender, the set requirements on these components may be departed from by agreement.

Documentation (this must be included in the contract)
Upon handover, the contractor must demonstrate that the agreed performance levels for the prevention and limitation of noise nuisance are attained. This must be demonstrated based on measurements of the result.

Indoor Air Quality, ventilation capacity

Objective of requirements
The goal of the requirement is to improve air quality in work areas, in order to promote a healthy and comfortable work environment.

Explanation of calculation method
Calculation method NEN1087
The required volume of air circulation per person must be calculated based on the number of persons in the integrated environmental permit application.

Explanation of Socially Responsible Procurement threshold
Socially Responsible Procurement assumes a volume of 8.3 dm^3/s per person. This figure is adopted from previous studies and quality levels maintained in other publications (including the Handbook of Building-Physical Quality of Office Space). Increasing the ventilation capacity further is not included in the criteria for Socially Responsible Procurement. Other aspects, such as ventilation efficiency, draught-free air circulation, etc., play a more important role in further increasing the sustainability of this aspect. At present, these cannot be easily and objectively quantified. For the time being, the higher levels will be left undefined.

Documentation (this must be included in the contract)
Upon handover, the contractor must demonstrate that the agreed performance on the ventilation capacity is achieved. This will be demonstrated by measurements coordinated for the maximum occupancy of the spaces.

Indoor Air Quality, airflow capacity

Objective of requirements
The goal of this requirement is to achieve an airflow capacity such that the users can temporarily influence the air quality in work areas to promote a healthy and comfortable work environment. Users of the building are given adequate options to influence the supply of fresh air, so that they can efficiently clear out any sudden increased air contamination.

Explanation of calculation method
Calculation method: NEN1087. The availability of adequate airflow capacity for the square footage of a work area and/or occupied space of an office function must be demonstrated.

Explanation of Socially Responsible Procurement threshold
Socially Responsible Procurement assumes 3 dm^3/s per m^2 of work area or 6 dm^3/s per m^2 of occupied space. The airflow ventilation features must be placed in each individual space/area. The requirements are set on the work areas or spaces of an office function. Meeting rooms, reception desk areas, gatehouses, etc., may be disregarded for the calculation. If there are no changes made to the airflow features, demonstration of compliance with these requirements is not required.

Documentation (this must be included in the contract)
Upon handover, the contractor must demonstrate that the agreed performance on airflow capacity is achieved. The contractor must also demonstrate that the building is constructed in accordance with the substantive content of the calculation.

Thermal comfort

Objective of requirements
The goal of the requirement is to improve thermal comfort in work areas, in order to promote a healthy and comfortable work environment.

Explanation of calculation method
ISSO 74 and ISSO 32.

Explanation of Socially Responsible Procurement threshold
Socially Responsible Procurement assumes a minimum threshold of class A in accordance with ISSO 74. Use the flowchart of ISSO 74 to determine the building/climate type for making this calculation. The Handbook and ISSO 32 also provide premises for this calculation. For further elaboration of the thermal comfort requirements in the building, see these publications. The requirements are set on all workspaces intended for long-term (more than two hours) use.

Documentation (this must be included in the contract)
Upon handover, the contractor must demonstrate with calculations that the agreed performance level for thermal comfort is attained. The contractor must also demonstrate that the building is constructed in accordance with the substantive content of the calculation.

Natural lighting incidence

Objective of requirements
The goal of the requirement is to improve natural light incidence in work areas, in order to promote a healthy and comfortable work environment.

Explanation of calculation method
The daylight factor (DF) is calculated using natural light simulation programmes with a CIE-overcast sky. Daylight factor: relationship between the illumination strength at a point in the room as compared to the horizontal illumination strength in open space under an overcast sky. The calculations for this requirement are based on workspaces at a horizontal plane 800 mm above the floor.

DF = Eroom/Eopen field *100%

Assumptions to be used in the calculations:

light reflection factors maximum: walls: 0.5; ceiling: 0.7; floor: 0.1.

If there are no changes in the outside wall openings, the requirement is: direct natural light incidence is mandatory. The new classification of the work areas must be such that at least 80% of the workspaces are located within 3 metres of an opening in the outside wall.

Explanation of Socially Responsible Procurement threshold
For Socially Responsible Procurement, an additional requirement for a healthy and comfortable work environment is set above the natural light incidence requirement of the Buildings Decree. For all workspaces in an office function intended for long-term use (more than two hours), compliance with the set requirements for daylight factor must be demonstrated.

Socially Responsible Procurement assumes a minimum daylight factor of 1% on the workspaces (horizontal plane at height of 800 mm above the floor).

If there are no changes made to the natural light incidence features, demonstration of compliance with these requirements is not required; however, every effort must be made in the layout of the building to create optimum light incidence and an optimum natural light experience for the user. It must be demonstrated that at least 80% of the workspaces (> 2 hour occupancy) are placed within 3 m from an outer wall with natural light openings.

Documentation (this must be included in the contract)
Upon handover, the contractor must demonstrate that the agreed performance level on natural light incidence is attained. Calculations must be used to demonstrate that the daylight factor is adequate. The contractor must also demonstrate that the agreed natural light features are actually present.

Annex 2 - Assumptions

The following premises were assumed in the creation of this document:

- Sustainability is becoming an increasingly important principle in the quality policy pursued within the construction sector. Sustainability is a broad concept. Under the three Ps of sustainable development (People, Planet, Profit), new aspects are emerging alongside older and more familiar ones as elements of "sustainability" in office buildings and building systems. The goal is to reduce the environmental effects of material and energy use over the entire life cycle of a building or construction work, without compromising the quality of the indoor environment in the process. Reuse of buildings and materials is part of this.

- A performance-based approach, in which the sustainability effects across the entire life cycle are considered, and built on the prescriptions and calculation methods of the Buildings Decree, is called for. The trend in construction is to work under integrated contracts and with functional and performance-based requirements at the building-level (solution-free). Working with performance requirements is preferable to working with a checklist or list of measures.

- This means commitments with the parties in the construction process on reductions and threshold values to be achieved.

- An important point of attention here is using consistent calculation methods for the various environmental themes, in order to allow clarity and verifiability for all parties. Wherever possible, this must be done using calculation methods already stipulated in other legislation. One calculation can be used for several purposes. This leads to a minimum of administrative burden and offers opportunities for benefits to the business sector and society. Parties and institutions can then build on these to create their own quality classes. A national classification system should emerge to foster a level playing field and clear communication, and prevent undue administrative burden.

- The performance-based focus at the level of building or construction offers design freedom and opportunities for innovation. This type of approach depends on the environmental effects of energy and material use being clearly and verifiably calculated, and that the aspects of health and comfort in the indoor environment can be tested. This way, sustainability values can be declared and expressed in joint contracts, Socially Responsible Purchasing, building certifications, etc. This performance-based approach is in keeping with the European policy agenda on the individual construction products and complete construction works (including activities within CEN/TC 350 "Sustainability of Construction works"). The performance-based approach is also being further pursued in consultations at the European level.

Based on the foregoing, performance criteria have been drafted for:

- energy conservation
- materials use
- health in buildings

Annex 3 - Addendum for calculation method for environmental performance of buildings and Groundwork, Road and Hydraulic Engineering Works

Supplements/changes to current calculation rules

Calculation rules for new and existing construction

The Calculation Rules 2013 produce the result of calculation rule 14. This is the environmental performance of the building, per m2 GFA per year. In the calculation instruments, this result is referred to as the EPB.

The numbering of the Calculation Rules 2013 is adopted from the DGMR calculation rules. Where rules must be further broken down, letters are added to the number references. The additions are numbered in continuing sequence, such that (as with the DGMR calculation rules) the numbering starts with the end result.

Calculation of the building shadow price (EPB)

$SPm2 = \Sigma_i (MEFm2_i \times SPmef_i)$ (14)

Where:

SPm2	shadow price of construction work per m2 GFA (EPB), [kg eq/m2 GFA]
MEFm2	environmental effect of construction work per m2 GFA [kg eq/m2 GFA]
i	11 environmental effects
$SPmef_i$	shadow price per unit of environmental effect [euro/kg eq]

Summation of environmental effects over all elements

$MEFm2 = \Sigma_i MEFe;m2_i$ (15)

Where:

MEFm2	environmental effect of construction work per m2 GFA [kg eq/m2 GFA]
$MEFe;m2_i$	environmental effect of element per m2 GFA [kg eq/element]
i	number of elements in construction work

Summation of environmental effects across sub-flows of intervention options

MEFe;m2 = MEFe;m2;han + MEFe;m2;ver + MEFe;m2;toe (16)

Where:

MEFe;m2	environmental effect of element per m2 GFA [kg eq/element]
MEFe;m2;han	environmental effect of element to be maintained per m2 GFA [kg eq/element]
MEFe;m2;ver	environmental effect of element to be removed per m2 GFA [kg eq/element]
MEFe;m2;toe	environmental effect of element to be added per m2 GFA [kg eq/element]

Offsetting of quantities and deduction of sub-flows of intervention options

In this step, the result is multiplied by the quantity (number of units) of elements in the building, and the result is then reduced to 1m2 GFA and one year.

Maintaining

The quantity after the renovation is determined using the quantity before the renovation and the fraction (entered by user) to be maintained. Any discrepancy between the GFA before and after the renovation must be accounted for in the write-down before and after. This is done in proportion to the period of time before and after. During the period before (LDg;voor), the impact (MEFe;han x Fhan x He;voor) is written down over the GFA and the number

of years prior to the renovation; and during the period thereafter (LDg:na), over the GFA and the number of years after the renovation.

MEFe;m2;han = als (GFAna = 0 ; 0 ; MEFe;han x Fhan x He;voor x

((LDg;voor / LDg) / (GFAvoor x LDg;voor) + (LDg;na / LDg) / (GFAna x LDg;na)) (17a)

Where:

MEFe;m2;han	environmental effect of element to be maintained per m2 GFA [kg eq/element]
MEFe;han	environmental effect per unit of element to be maintained [kg eq/element]
Fhan	portion to be maintained of the total quantity of element, entered by user
He;voor	quantity (number of units) of element, situation prior to renovation (unit m1, m2, m3 or pieces), entered by user
LDg;voor	lifetime of building; period from building to renovation of construction work [years]
LDg;na	lifetime of building; period from renovation to demolition of construction work [years]
GFAvoor	gross floor area, situation prior to renovation [m2/construction work], entered by user
GFAna	gross floor area, situation after renovation [m2/construction work], entered by user
LDg	lifetime of building; period from building to demolition of construction work [years]

Removal

Elements are removed for replacement or to reduce the number of units in the construction work. The quantity is derived from the proportion maintained, as entered by the user. The write-down is determined based on the GFA and the period of the situation prior to the renovation (the situation in which the elements functioned).

MEFe;m2;ver = MEFe;ver x (1 – Fhan) x He;voor / (GFAvoor x LDg;voor) (17b)

Where:

MEFe;m2;ver	environmental effect of element to be removed per m2 GFA [kg eq/element]
MEFe;ver	environmental effect per unit of element to be removed [kg eq/element]
Fhan	portion to be maintained of the total quantity of element, entered by user
He;voor	quantity (number of units) of element, situation prior to renovation (unit m1, m2, m3 or pieces), entered by user
GFAvoor	gross floor area, situation prior to renovation [m2/construction work], entered by user
LDg;voor	lifetime of building in situation prior to renovation; period from building to demolition of construction work [years]

Addition

Elements are added for replacement or to increase the number of units in the construction work. The quantity is derived from the difference between the quantity entered by the user after renovation and the maintained proportion. The write-down is determined based on the GFA and the period of the situation prior to the renovation (the situation in which the elements will be functioning).

MEFe;m2;toe = als (GFAna = 0 ; 0 ; MEFe;toe x (He;na - Fhan x He;voor) /

(GFAna x LDg;na)) (17c)

Where:

MEFe;m2;toe	environmental effect of element to be added per m2 GFA [kg eq/element]
MEFe;toe	environmental effect per unit of element to be added [kg eq/element]

He;na	quantity (number of units) of element, situation after renovation (unit m1, m2, m3 or pieces), entered by user
Fhan	portion to be maintained of the total quantity of element, entered by user
He;	for quantity (number of units) of element, situation prior to renovation (unit m1, m2, m3 or pieces), entered by user
GFAna	gross floor area, situation after renovation [m2/construction work], entered by user
LDg;na	lifetime of building; period from building to demolition of construction work [years]

Determination of building lifetime

Users do not need to define and enter the building lifetime values (LDg, LDg;voor, LDg;na) themselves. These are derived based on the life cycle characteristics, in years, as provided by the user.

Building lifetime

Unlike in the DGMR calculation rules, LDg is not a constant, but a variable. For new construction, a default value of 75 (residential buildings) or 50 (utilities buildings) may be used for this variable.

LDg = Jsl - Jbo (18a)

Where:

LDg	lifetime of building; period from building to demolition of construction work [years]
Jsl	expected year of demolition, entered by user
Jbo	construction year, entered by user

Period from construction to renovation

LDg;voor = Jre - Jbo (18b)

Where:

LDg;voor	lifetime of building; period from building to renovation of construction work [years]
Jre	expected year of renovation, entered by user
Jbo	construction year, entered by user

Period from renovation to demolition

LDg;na = Jsl – Jre (18c)

Where:

LDg;na	lifetime of building; period from renovation to demolition of construction work [years]
Jsl	expected year of demolition, entered by user
Jre	expected year of renovation, entered by user

Correction for replacement frequency of sub-flows of intervention options

In this step, the number of cycles (replacement frequency) over the course of the (full or partial) building lifetime is accounted for.

Maintaining

Here there is a better picture of the lifetime expectation. LDg will often differ from the defaults assumed at the moment of new construction.

MEFe;han = MAX (1; LDg / LDp) x MEFp (1a)

LDg / LDp rounded to 2 decimal places for calculation purposes

Where:

MEFe;han	environmental effect per unit of element to be maintained [kg eq/element]
MAX(x;y)	maximum value of x or y
LDg	lifetime of building; period from building to demolition of construction work [years]
LDp	lifetime of product [years]
MEFp	environmental effect of product [kg eq/product], determined according to (DGMR calculation rule 2).

Removal

By removing the element, the write-down period is reduced from "construction to demolition" to "construction to renovation".

MEFe;ver = MAX (1; LDg;voor / LDp) x MEFp (1b)

LDg;voor /	LDp rounded to 2 decimal places for calculation purposes

Where:

MEFe;ver	environmental effect per unit of element to be removed [kg eq/element]
MAX(x;y)	maximum value of x or y
LDg;voor	lifetime of building; period from building to renovation of construction work [years]
LDp	lifetime of product [years]
MEFp	environmental effect of product [kg eq/product], determined according to (DGMR calculation rule 2).

Addition

These elements placed during and after renovation are written down over the period from renovation to demolition.

MEFe;toe = MAX (1; LDg;na / LDp) x MEFp (1c)

LDg;na /	LDp rounded to 2 decimal places for calculation purposes

Where:

MEFe;toe	environmental effect per unit of element to be added [kg eq/element]
MAX(x;y)	maximum value of x or y
LDg;na	lifetime of building; period from renovation to demolition of construction work [years]
LDp	lifetime of product [years]
MEFp	environmental effect of product [kg eq/product], determined according to (DGMR calculation rule 2).

Quality classes

To be entered.