

Part B, User Guide to the SBTool 2012 assessment framework

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D. File B; project-related information and assessment

File B contains all information related to the specific project, with each File B related to a single project. Please recall that project information in File B must be consistent (in terms of phase, type of occupancies etc.) with parameters established in File A. Much of the information (e.g. benchmarks) is derived from File A, but a significant amount is expected to be entered by the designer and/or assessor.

D1. Procedures related to setting up File B by the Authorized Third Party

Settings for FileB are partly determined automatically from the settings made in File A, but there are a number of items in File B which are manually set up by the Authorized Third Party, before the file is handed over to a design and development team. These items include the following:

- Hide any worksheets that are not relevant for the generic settings. For example, if the system has been set up so that all criteria are inactive, then the TrgA Worksheet should be hidden, to prevent possible confusion (there are mandatory criteria in all other Trg worksheets, so these cannot be hidden).
- Check that the **ContextB** worksheet is structured to provide project context information that is relevant for the generic type of project.
- Hide steps in the **KeySteps** worksheet that are irrelevant for the type of project in question.
- Ensure that the **InitialSpec** and **DetailSpec** worksheets are properly set up for the type of project in question, including removing any settings that are inappropriate, but may have been retained from a previous project type.
- When the File B is ready to hand over to one or more design teams, the links between File A and File B are severed. This is needed to ensure that copies of File B can be distributed to others, but it also means that changes made to File A will no longer be reflected in File B. In other words, be very sure that you are satisfied with the status of File A before breaking the links. The Links submenu under the Edit menu of File B is where the links are severed.

D2. Procedures related to setting up File B by Project Teams

The Project Team leader now has a single File B which contains all the values pre-set from File A. Logical steps include the following:

- In the **BasicB** worksheet, choose whether you want to have **Target** or **Self-Assessed** values. In the Trg worksheets you can enter data applicable to both, then toggle back and forth to see what the score is for either of these options. Choose also between calculations based on whole-building values or by pro-rated occupancies. The latter is useful if performance by occupancy is available.
- Go to the **InitialSpec** worksheet to fill in yellow fields that need text or data, and set all blue click-boxes on the appropriate values. For the project name, choose something that is not too long, since the name is repeated in all other worksheets.
- If enough detailed design information, do the same in the **DetailSpec** worksheet. If the project is at a preliminary design stage, you can fill this in later;
- Provide relevant information in the **ContextB** worksheet.
- If the project team wishes to take advantage of the IDP features in the **KeySteps** worksheet, then use the three columns of blue click-boxes to indicate which actors on the team should be involved in specific steps.
- Now fill in the required fields in all active Trg worksheets with text and data as required. This will be a major task.
- Ensure that data from external sources for energy consumption and embodied energy is entered in the appropriate spots in **TrgB** and the **EmbodiedB** worksheets.
- See the results in the ProjectResults (or the SiteResults) worksheet.

Figure 18 below shows examples of three different project that all follow the constraints laid down in a hypothetical version of File A developed for Izmir, Turkey.

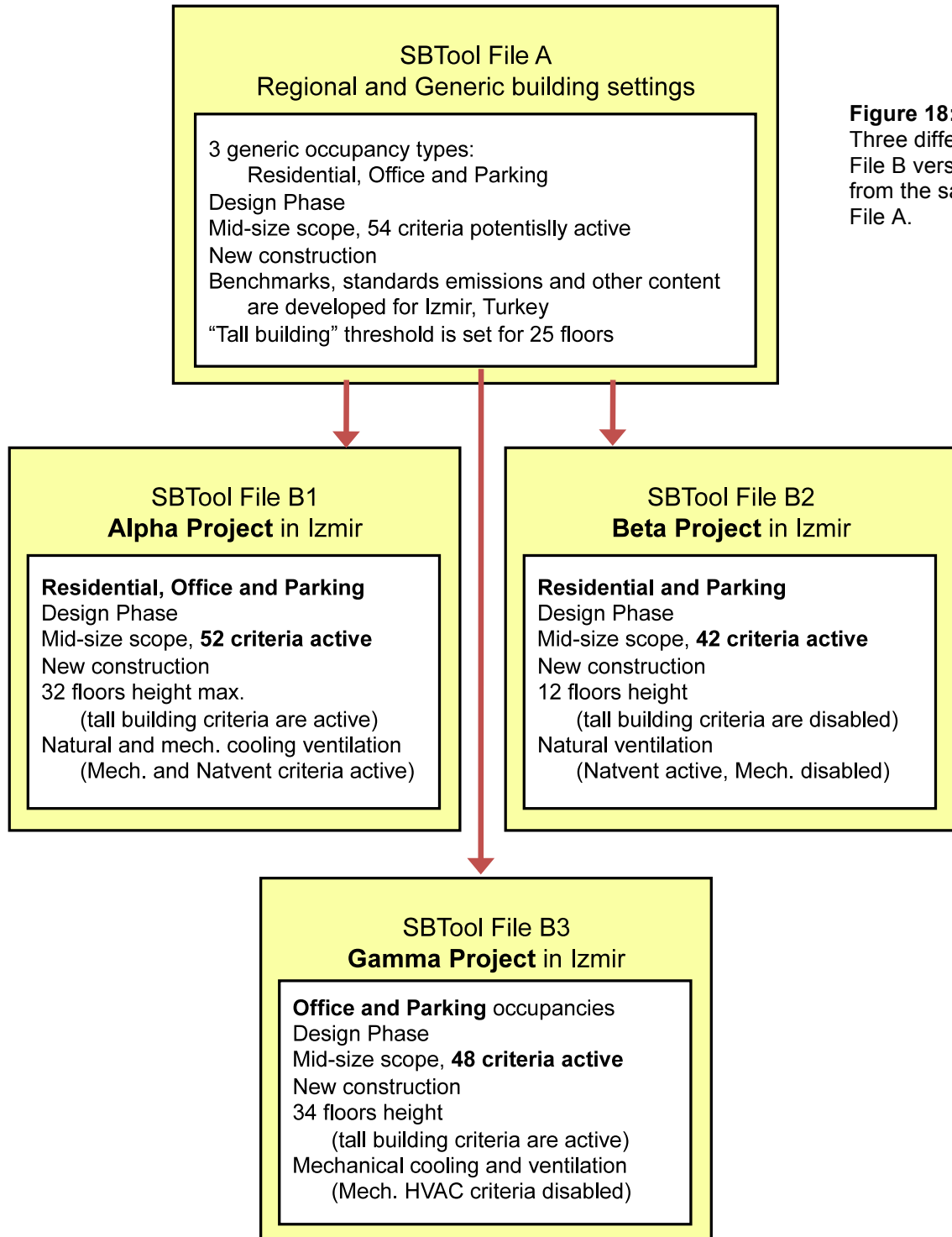


Figure 18:
Three different
File B versions
from the same
File A.

D3. The *BasicB* Worksheet

Figure 19 shows the BasicB worksheet in File B. Apart from the two Macro buttons, there are only two active fields in this worksheet.

Figure 19:
The BasicB worksheet

The system contains fields that are hidden under various circumstances. Macro buttons are used to unhide or hide rows as needed. When changing settings, first unhide all, then hide to suit the changed configuration – but hiding takes time !

This button provides a choice between Target and Self-Assessment scoring procedures.

It is possible to enter Target and Self-assessment values throughout the TrG worksheets, and then to view the different results in the Results worksheets.

This button provides a choice between calculating scores on the basis of Whole building values or pro-rated individual occupancy values. In the case of a single occupancy, these are identical.

These three fields show date entered in the InitialSpec worksheet, and indicate which of the up to 3 occupancies chosen in File A are active for this specific project.

SBTool 2012 B Generic Project Assessment file, Mid-size Scope, for Megaplex, Amiel, Atlantis			
Revision date:	Hide inoperative rows in the whole system	Macros	Open all hidden rows in the whole system
03 October 2012			Titles Click value Enter / revise text
As defined in the 'A' file of this set, this is SBTool Mid-size version and, based on the specific site and project characteristics. There are 44 active Project criteria. Specific project information is to be provided in this file by the architect and/or developer			
This 'B' file contains data about a specific new construction project called Megaplex with a total gross area above and below grade (initial estimate) of 14800 m2. The project is located in Amiel, Atlantis, has an estimated lifespan of 75 years, and will contain , Offices, Lobby, parking etc.,.			
Most basic parameters in this File including scope, phase, new v. renovation, occupancy types, life-span and thresholds for project size and height, were established in File A. Choices with respect to actual project occupancies, area, height and system types can be made in the InitialSpec worksheet of this file, as long as choices made and information entered is consistent with the criteria established in File A.			
City and country location for weights and benchmarks.	Amiel, Atlantis	Target scores may be established by the designer or client, while Self Assessments are made by the designer at a stage when complete performance data is available. Third party assessors are then able to review and modify assessment scores.	
Select Target or Self-assessment scores	Self-assessment scores		
Select total scores on whole building or pro-rated individual occupancy scores.	Whole building basis	Both Target and Self-Assessment evaluations can be made at the level of a single score for the whole project or by using the pro-rated sum of individual occupancies, where this is applicable.	
Phase	Design Phase	Building assessments may be carried out in Design or Construction or Operation phases.	
Version of system selected (scope)	Mid-size	The Mid-size scope version contains 50 potentially active criteria for building assessment for the settings selected.	
Content type	Generic	The default content used in File A for benchmark and other information is based on generic conditions (more or less Canada), expressed in English. File A can also be set to allow a local content and/or language to be used.	
The eligible occupancy types shown at right were established in the SBT-A Region file.	Offices	OK	Green OK marks at left indicate the three (maximum) active occupancies that have been selected in the InitialSpec worksheet, from the potential occupancy list established in File A. Note that self-assessments carried out in this (B) file are only valid for these active occupancies. If there are no green OK marks, go to InitialSpec to establish actual occupancies in the project.
	Lobby, parking etc.	OK	
New construction or renovation	New Construction	OK	...
Threshold for tall building, floors above grade	25	Buildings below this height inactivate certain criteria that are relevant to tall buildings.	
Assumed life span	75	The assumed life span is used to convert absolute value of embodied energy and emissions to an annualized basis.	
Amortization rate for existing materials that are used,	0.00%	Credit can be given for the re-use of existing structures and their materials, depending on the age of the existing structure.	
"Large Project" size definition, in m2 gross building area.	25,000	"Large Project" size definition, in m2 gross building area.	
Type of currency	EUR	The type of currency used is applicable to cost criteria.	
Score required for mandatory criteria	3	Mandatory items (set on the Weight worksheet, see also see Issues worksheet) are parameters of exceptional importance.	

D4. The KeySteps Worksheet (integrated design process)

Although the SBTool system is designed to carry out assessments of performance, the KeySteps worksheet in File B is designed to serve as a management support tool for the design, construction and operations process, using the Integrated Design Process. The worksheet provides a generic form of project development steps. Some of these will, of course, be inappropriate for certain projects, but as with all other worksheets, the authorized third party can alter sequence, eliminate or add steps and change text wording or language.

Figure 20: The KeySteps worksheet at the most general level
































The number of completed steps is 4 and the number of inactive steps is 134	Key process steps for Megaplex, Amiel, Atlantis		To unprotect any worksheet, go to Tools, then Protection. Password is "iDP".	
Click 1 to 3 at upper left for detail	IDP key steps are shown in a linear sequence, but some steps may be performed in a different sequence or may be repeated. You may therefore wish to change the order or content, on the IDPsteps worksheet. See Level 3 for detailed comments. To see text for inactive steps, see IDPlist worksheet.	Select up to 6 actors involved	AR DF ME	
		Links within file and to websites	  	
		Relevance (0=no, 1=yes, 2=resid., 3=renov.)		1
		Click and select "a" to mark each step completed		
		Relevant steps completed		4
1.0 Develop a functional program, examine assumptions and establish performance targets				
2.0 Assess site characteristics				
3.0 Assess any existing structures and materials that may be re-used				
4.0 Assemble the design team				
5.0 Develop Reference design and benchmarks				
6.0 Hold an initial Design Workshop				
7.0 Develop Concept Design				
8.0 Consider site development issues				
9.0 Determine building structure				
10.0 Develop building envelope design				
11.0 Develop preliminary daylighting, lighting and power system design				
12.0 Develop preliminary ventilation, heating & cooling and wet services designs				
13.0 Decide on major design options for detailed development				
14.0 Screen non-structural materials for environmental performance				
15.0 Complete design and documentation				
16.0 Develop QA strategies for construction and operation				
17.0 Site takeover, existing building decontamination & deconstruction, excavation & foundations				
18.0 Complete above-grade construction				
19.0 Prepare a set of as-built construction documents				
20.0 Operate and maintain the building				
21.0 Carry out post-occupancy evaluation and monitor performance				

Figure 21: The KeySteps worksheet at a more detailed level. At the highest level of detail, notes can be added.

The small blue click-boxes show how specific members of the design and development team can be selected from a list of all main actors in the process.


All	All	EL	Electrical engineer
PM	Project manager	GE	Geotechnical engineer
AR	Architect	ID	Interior designer
AS	Acoustic specialist	LA	Landscape architect
BP	Building products rep	LD	Lighting designer
CA	Commissioning agent	MS	Materials specialist
CL	Client	ME	Mechanical engineer
CM	Construction manager	OP	Operator of building
CS	Controls specialist	RS	Renewables specialist
CV	Civil / services engineer	ST	Structural engineer
DF	Design facilitator	TS	Telecoms specialist
DS	Daylighting specialist	UP	Urban planner
EC	Ecologist / env. Specialist	\$\$	Costing specialist
EE	Energy engineer		

The number of completed steps is 4 and the number of inactive steps is 134		Key process steps for Megaplex, Amiel, Atlantis		To unprotect any worksheet, go to Tools, then Protection. Password is "IDP"			
Click 1 to 3 at upper left for detail		IDP key steps are shown in a linear sequence, but some steps may be performed in a different sequence or may be repeated. You may therefore wish to change the order or content, on the IDPsteps worksheet. See Level 3 for detailed comments. To see text for inactive steps, see IDPlist worksheet.	Select up to 6 actors involved		AR	DF	ME
			Links within file and to websites				
			Relevance (0=no, 1=yes, 2=relid., 3=renov.)				
			Click and select "a" to mark each step completed				
			Relevant steps completed			4	
17	2.08	Identify any features in adjacent properties that may place constraints on the design of the subject building.	AR				
18	2.09	Measure typical Sound Level (Leq) at the noisiest site boundary. Report on results in ContextB worksheet.	AS				
19	2.10	Prepare a Site Characteristics Report.	DF	UP	PM		
			AR				
3.0 Assess any existing structures and materials that may be re-used							
20	3.01	Assess the suitability of any existing structure(s) on the site for adaptation to all or part of the planned new uses.					
21	3.02	If an existing structure is to be re-used, carry out an assessment of structural condition, and determine scope of remedial work required.					
22	3.03	N.A. - the existing structure has little or no heritage value.					
23	3.04	If an existing roof is to be re-used, carry out a condition assessment and determine scope of remedial work required.					
24	3.05	If existing exterior walls are to be re-used, carry out a condition assessment and determine scope of remedial work required.					
25	3.06	If existing electrical or mechanical equipment may be re-used, carry out an assessment for code compliance and operational efficiency, and determine scope of remedial work required.					
26	3.07	Assess suitability of materials in an existing building on the site for use in a new or renovated building. Report on results in ContextB worksheet.					
27	3.08	If existing materials are to be re-used, determine the extent of any asbestos, mold or other contamination problems, and develop a remediation action plan.					
4.0 Assemble the design team							
28	4.01	Identify and retain design team members (beyond the architect and energy engineer) with skills and experience related to the program.					
29	4.02	Ensure that the proposed design team is aware that the project has high-performance goals.					
30	4.03	Ensure that contract conditions do not create a disincentive for the design team, especially the mechanical engineer.					
31	4.04	If the budget permits, include performance incentive payments in contracts for the principal designers.					
5.0 Develop Reference design and benchmarks							
32	5.01	Develop a sketch design for a simple (hypothetical) Reference building fulfilling the functional requirements.					

D5. The ContextB worksheet

It will be seen that the upper half of the worksheet is a copy of selections made and information entered in the ContextA worksheet of File A. The lower half provides an opportunity to define the contextual conditions that are applicable to the site and project. In this example, the file indicates that there is an existing structure on the site that can be used as part of a new project.

Figure 22: The ContextB worksheet

Context for Megaplex, Amiel, Atlantis		
Click 1 or 2 at upper left to show or hide details 		<i>The upper section of this worksheet contains a description of context conditions in the Urban Area, as defined in the SBT Region file. The lower section contains descriptors of Site Conditions, as selected by the Project Assessor.</i>
Urban Area context issues selected in ContextA worksheet (from File A)		
	Title	Descriptors of condition
1	Urban area type	Not yet defined
2	Seismic zone type (Uniform Building Code, USA)	Not yet defined
3	Climate zone (based on Köppen)	Not yet defined
4	Winter Design temperatures	Not yet defined
5	Average annual soil temperature 2m. below grade in °C	Not yet defined
6	Average difference, max. and min. diurnal temperatures in warm season, °C	Not yet defined
7	Annual heating degree days below 18°C.	Not yet defined
8	Annual cooling degree days above 18°C.	Not yet defined
9	Average relative humidity during warm season	Not yet defined
10	Average relative humidity during warm season	Not yet defined
11	Annual precipitation, mm	Not yet defined
12	Solar irradiance, kWh/m2 per year on horizontal surface	Not yet defined
Site context conditions defined by Architect		
	Title	Descriptors
13	Solar availability for a new building on the site	
14	Height of immediately adjacent buildings	
15	Availability & adequacy of sub-surface aquifer.	
16	Presence of Radon	
17	Soil contamination	
18	Existing land use on the site	
19	Pre-development ecological status of the site	
20	Pre-development agricultural value of land used for the project.	
21	Ambient noise conditions at the noisiest site boundary. If residential occupancy is included, measure average of peak values during hours of 2300-0600.	
22	Existence and suitability of existing structure(s) on the site.	There is an existing structure on the site, and it can be adapted to meet the functional requirements with a moderate amount of renovation.
23	Feasibility of re-using materials or components from an existing building on the site.	A significant proportion of materials and components of an existing structure on the site can be re-used to meet new requirements.
24	Heritage value of existing structure(s) on the site	

This worksheet contains all of the information about the project that is available at the preliminary design stage. Because of its length, the worksheet is shown here in its upper and lower halves.

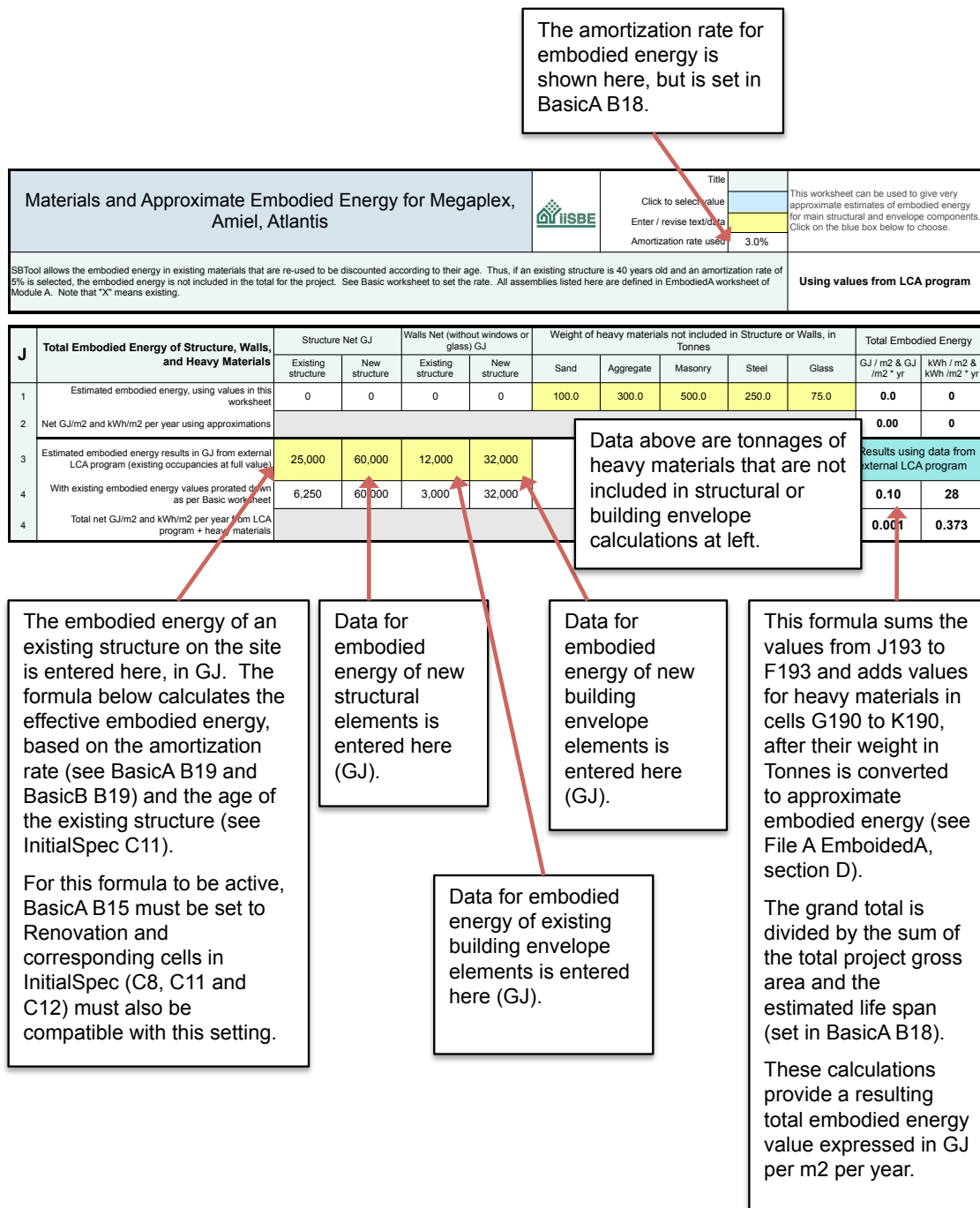
Initial design specifications for Megaplex, Amiel, Atlantis			Title
			Click to select value
The purpose of this worksheet is to identify the basic characteristics of the project and the separate occupancies within it, as far as may be known at this stage. Click on the upper left buttons to show different levels of detail.			Enter / revise text or data
			SBDTool 2012 generic
A. Basic Information			
1 Project name	Megaplex		
2	2		
3	Not yet decided		
4	8,000		
5	5.0		
6			
7	New construction		
8	Not yet decided		
9	Not yet decided		
10 Will this building include hybrid or natural ventilation systems?	Not yet decided		
11 Will this building include ground- or water-source heat pumps?	Not yet decided		
B. Building occupancies			
1	Select occupancy types (up to 3 of the 5 types activated in File A)	Number of floors	Gross area, m ²
2		0	0
3	Offices	7	8,400
4	Lobby, parking etc.	3	3,400
C. Occupancies by floor			
	Select Occupancy Type	Number of floors	Gross m ² per floor
Below grade	Occupancy type and area of Floor -3, gross m ²		
	Occupancy type and area of Floor -2, gross m ²		
	Occupancy type and area of Floor -1, gross m ²		
Floors 0 to 3	Occupancy type and building footprint (Floor 0), gross m ²		
	Occupancy type and area of Floor 1, gross m ²		
	Occupancy type and area of Floor 2, gross m ²		
Floors 4 to 24			
	Offices	1	1,200
	Lobby, parking etc.	1	1,200
	Lobby, parking etc.	1	1,200
	Lobby, parking etc.	1	1,000
	Offices	1	1,200
	Offices	1	1,200
	Offices	1	1,200
	Offices	4	1,200
	Offices		4,800
	Mechanical service area(s)	1	1,000
Floors 25 to 49			
	Second occupancy type and area, floors 25 to 49, gross m ²		
	Third occupancy type and area, floors 25 to 49, gross m ²		
	Service or mechanical occupancy type and area, floors 25 to 49, gross m ²		
Floors 50 to 74			
	First occupancy type and area, floors 50 to 74, gross m ²		
	Second occupancy type and area, floors 50 to 74, gross m ²		
	Third occupancy type and area, floors 50 to 74, gross m ²		
	Service or mechanical occupancy type and area, floors 50 to 74, gross m ²		
Floors 75 to 99			
	First occupancy type and area, floors 75 to 99, gross m ²		
	Second occupancy type and area, floors 75 to 99, gross m ²		
	Third occupancy type and area, floors 75 to 99, gross m ²		
	Service or mechanical occupancy type and area, floors 75 to 99, gross m ²		
	Top floor area, gross m ² (there is always a top floor)		
	Mechanical service area(s)	1	1,000
D. Data on operating energy			
Annual contribution to building by on-site renewable energy, total and pro-rated by occupancy.			Total kWh kWh/m ²
1 Total on-site renewable energy contribution in kWh per year			25,000
2 Total on-site renewable energy contribution in kWh / m ² year			2.12
3 On-site renewable energy contribution pro-rated for Occupancy 1			0.00
4 On-site renewable energy contribution pro-rated for Occupancy 2			2.12
5 On-site renewable energy contribution pro-rated for Occupancy 3			2.12
Annual energy consumption from potable water supply and treatment, and sewage pumping and treatment.			Total kWh kWh/m ²
6 Assumed pumping and treated supplied per year			
7 Total water and sewage energy			
8 Total water and sewage energy			0.86
9 Water and sewage energy requirement pro-rated for Occupancy 1			0.00
10 Water and sewage energy requirement pro-rated for Occupancy 2			0.86
11 Water and sewage energy requirement pro-rated for Occupancy 3			0.86
E. General data on stormwater, potable water and effluent supply and flows			
1 Gross annual volume of rainwater and stormwater retained as greywater, m ³ .			3,000
2 Gross annual water volume needed for building occupant use (see TrgB4.2), m ³ .			10,620
3 Annual blackwater wastes, based on residential and non-residential toilet and urinal usage, m ³			2,000
4 Annual volume of greywater retained from occupant wastewater other than toilets and urinals.			3,456
5 Total annual greywater available ((1 + 4) . m ³).			6,456
6 Gross annual volume of water used for all purposes, excluding rainwater, m ³ .			
7 Annual volume of greywater used for all purposes, excluding rainwater, m ³ .			
8 Gross volume of water used for all purposes, excluding rainwater, m ³ .			
9 Annual volume of greywater used for all purposes, excluding rainwater, m ³ .			
10 Total annual volume greywater used for all purposes, excluding rainwater, m ³ .			6,000
11 Net potable water used per year, m ³ .			10,564
12 Annual greywater surplus or deficit, m ³			900
F. Summary of basic project information			
1 Specify number of residential dwelling units –N.A.– there is no residential occupancy.	0	0	units
2 Specify assumption for number of persons per residential dwelling unit – N.A. – there is no residential occupancy.	0	0	persons
3 Assumed average non-residential population during operating hours	300	300	persons
4 Gross residential area per resident (m ² pp)			m ² pp
5 Non-residential population density	24	24	m ² pp
6 Assumed average population for all occupancies	300	300	persons
7 Assumed days per year of operation	365	365	days / yr.
8 Assumed hours of operation		750	hours / yr.
9 Million annual person-hours (maph)		2.63	maph
10 Number of floors above grade		11	floors above grade
11 Total floors			

D8. The *EmbodiedB* worksheet

This worksheet provides fields for the entry of embodied energy estimates that are prepared by external programs or calculations, as well as fields to enter the weight of heavy materials that are not included in the structural or building envelope calculations.

As the notes below indicate, there is a provision for setting an amortization rate for materials in existing structures that form part of the project. This feature (see BasicA B19 or BasicB B19) is intended to recognize that a differentiation should be made between the embodied energy assumptions for the re-use of existing structures of various ages.

Figure 25: The Embodied worksheet



D9. Example of a text-oriented criterion

This criterion is an example of one of the many text-oriented criteria worksheets, all of which correspond to worksheets in File A, but in the case of File B have the prefix Trg (Target). The only fields modifiable by the project manager or designer are the yellow fields (to enter information about the rationale for Target or Self-assessment scores) and the blue click boxes, used to select scores from 0 to +5, in ½ point increments. The example below is TrgA A1.5, and the content is in English, but the use of Local Content could of course change the language or the content itself.

A1.5 Remediation of contaminated soil, groundwater or surface water.		■	2.54%	Dsn.
Intent	To assess the success of remediation of contaminated soil, groundwater, or surface water in the project.			
Indicator	Status of soil, groundwater, or surface water after treatment.			
Applicable project type	Any project type with contaminated soil, groundwater or surface water.			
Information sources	Environmental agencies and NGOs.	■		
Relevant information	Type and intensity of original contamination, methods of remediation, final levels of contamination and assessment of long-term human health or ecological risks. Frequent causes are surface water contaminated by parking lots, or soils contaminated by previous industrial activity.			
Assessment method	Review of pre- and post-remediation site analysis report by a geophysical and soils chemistry specialist.			
Standards or references	a			
	b			
	c			
Information Submittals	d			
	e			
	f			
	Notes, targets and self-assessed scores for this criterion			
Design or other information			Information on existing sub-surface contamination	
Target and/or Self-assessed scores			3.0	0.08
			2.5	0.06
	Performance benchmarks for the project			Score
Negative	Documentation indicates that the site will still have a level of contamination that will present unacceptable risks to long-term human health and the environment.			
Minimum practice	Documentation indicates that the site will still have a level of contamination that will present acceptable risks to long-term human health and the environment.			
Good Practice	Documentation indicates that the site will still have a level of contamination that will present low risks to long-term human health and the environment.			
Best Practice	Documentation indicates that the site will still have a level of contamination that will present no detectable risks to long-term human health and the environment.			

The target score is selectable by the project leader from a range of 0 to +5 points, in ½ point increments. The selected score is multiplied by the weight (see above) to result in a weighted score.

Text in all the fields above and below is copied automatically from the relevant File A and cannot be altered by the project manager or designer.

The yellow fields are for notes related to the Target or Self-Assessed scores.

The Self-assessed score and the weighted Self-assessed scores are selected in a similar way, but are to be based on an objective review of the projected or actual performance. If there is a third-party assessor he or she can modify the Self-assessed score.

D10. Example of a data-oriented criterion, project with two occupancies

Many criteria are scored on the basis of data benchmarks that are set in File A. The example shows a mandatory criterion (♦) in TrgC C1.3, a project with two active occupancies.

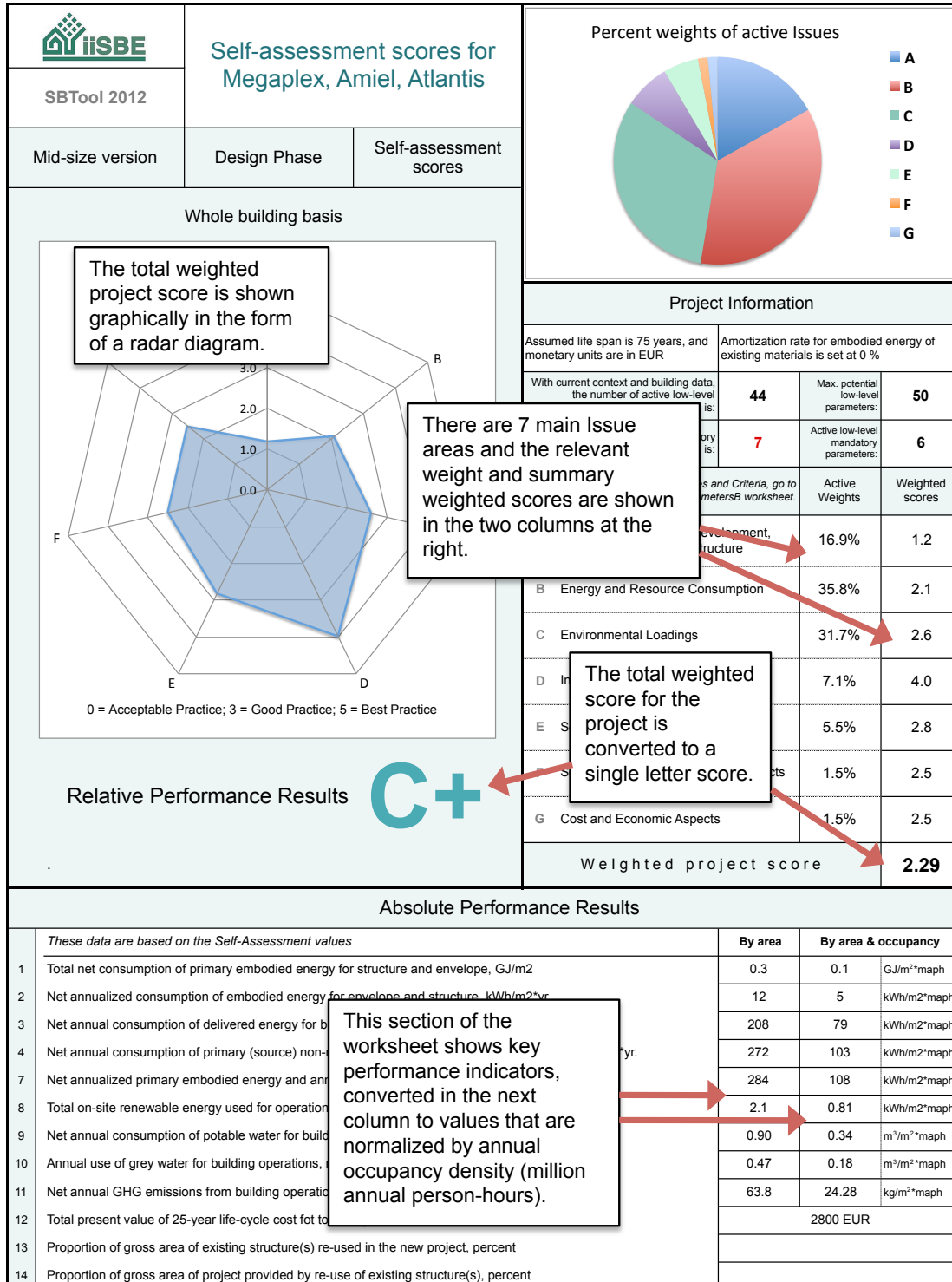
C1.3		GHG emissions from primary energy used for all purposes in facility operations.		♦	15.86%	Dsn.
Intent	To minimize the amount of CO2-equivalent emissions from all energy used for annual building operations.					
Indicator	Annual CO2-equivalent emissions per Kg. per m2 of net area, as determined by an hour-by-hour simulation program and calculations based on regional fuel emission values.					
Applicable project type	All occupancies except open space				Note that minimum score for this mandatory criterion is 3	
Information sources	Emissions taken from average Canadian building stock values for 1999 (NRCan data).				kg CO2 / kWh embodied	0.17
Relevant information	Values in the UK BREEAM system range from 167 to 30 kgCO2/m2 for Residential, 250 to 20 kgCO2/m2 for Office and about 48 to 17 kgCO2/m2 for Schools.					
Assessment method	The use of an hour-by-hour simulation tool, as required for B1.2, will produce annual energy consumption results. These data are combined by SBTool with emission data (see Emissions worksheet) to produce estimates of operating emissions.					
Applicable standards	a					
	b					
	c					
	d					
Information submittals	e					
	f					
Design or operating information	For this data-oriented benchmark example, it should be noted that the data points may vary by occupancy type. In this example, there are two occupancies.					
	Predicted or actual annual primary CO2-equivalent emissions due to building operations.				0.0	
Target score and comments					3.0	0.48
Self-assessed score and justification					0.0	0.00
Negative Minimum practice Good Practice Best Practice	Benchmarks for Offices occupancy				kg/m2 per yr.	Score
					135	-1
	Based on the results of an hour-by-hour simulation program and regional fuel emission values, the amount of CO2-equivalent emissions from primary non-renewable energy used for annual operations of the occupancy is predicted to be :				120	0
					74	3
					44	5
Design or operating information	Lobby, parking etc. occupancy, notes, targets and self-assessed scores					
	Predicted or actual annual primary CO2-equivalent emissions due to building operations.					
Target score and comments					2.5	0.40
Self-assessed score and justification					0.0	0.00
Minimum practice Good Practice Best Practice	Benchmarks for Lobby, parking etc. occupancy				kg/m2 per yr.	Score
					27	-1
	Based on the results of an hour-by-hour simulation program and regional fuel emission values, the amount of CO2-equivalent emissions from primary non-renewable energy used for annual operations of the occupancy is predicted to be :				25	0
					18	3
					14	5
Design or operating information	Predicted or actual annual primary CO2-equivalent emissions due to building operations.				55	
					4.0	0.63
Target score for project according to target scores for individual occupancies, pro-rated by area.					2.9	0.45
Total project score according to self-assessment of whole-building performance.					3.3	0.52
Total project score according to self-assessment of individual occupancy performance, pro-rated by area.					0.0	0.00

Scoring by whole-building or occupancy basis can be selected in the BasicB worksheet. In this case, data is entered for the whole building as shown below. The system calculates the weighted score for this criterion in the relevant whole-building or weighted-by-occupancy score fields below.

D11. The *ProjectResult* worksheet

This worksheet brings together the results from all other criteria worksheets in File B. Note that the results in the upper half, by Issue area and for the project as a whole, are related to the Minimum acceptable benchmarks. So, in this example, a weighted project score of 3.0 instead of the 2.29 shown, would result in an overall Good Practice, resulting in a B+ letter score.

The lower half of the worksheet provides a selection of absolute performance results, or key performance indicators. These are normalized automatically to produce results that reflect annual person-hours of occupancy.



Appendix:

Examples of focused variants of SBTool, active criteria and weights

SBTool focused on *Social and Perceptual* issues

Design phase, 21 active criteria, total 100%

■	A1.9	Provision of public open space(s).	0.54%
■	A1.10	Provision and quality of children's play area(s).	1.07%
■	A1.12	Provision and quality of bicycle pathways and parking.	1.07%
■	A1.13	Provision and quality of walkways for pedestrian use.	1.07%
◆	B1.3	Consumption of non-renewable energy for all building operations.	20.07%
◆	B3.1	Degree of re-use of suitable existing structure(s) where available.	5.35%
◆	B4.2	Use of water for occupant needs during operations.	9.63%
◆	C1.3	GHG emissions from primary energy used for all purposes in facility operations.	33.45%
◆	D1.5	CO2 concentrations in indoor air.	3.21%
◆	D3.1	Appropriate daylighting in primary occupancy areas.	1.61%
◆	E1.8	Occupant egress from tall buildings under emergency conditions.	6.69%
◆	F1.1	Access for mobility-impaired persons on site and within the building.	3.21%
■	F1.2	Access to direct sunlight from living areas of dwelling units.	1.07%
■	F1.3	Visual privacy in principal areas of dwelling units.	1.07%
■	F1.4	Access to private open space from dwelling units.	1.61%
■	F2.2	Impact of the design on existing streetscapes.	2.14%
■	F2.3	Maintenance of the heritage value of the exterior of an existing facility.	2.14%
■	F3.1	Impact of tall structure(s) on existing view corridors.	2.14%
■	F3.2	Quality of views from tall structures.	1.07%
■	F3.7	Access to exterior views from interior.	1.07%
◆	G1.5	Affordability of residential rental or cost levels.	0.71%

Red diamonds indicate mandatory criteria for all versions

The total of all active criteria in each version always equals 100%

SBTool focused on *Energy and Emission* issues

Design phase, 22 active criteria, total 100%

■	A1.6	Shading of building(s) by deciduous trees.	2.64%
■	A2.3	Impact of orientation on the passive solar potential of building(s).	1.65%
■	A2.5	Impact of site and building orientation on natural ventilation of building(s) during warm season(s).	1.10%
■	A2.6	Impact of site and building orientation on natural ventilation of building(s) during cold season(s).	1.10%
■	B1.1	Embodied non-renewable energy in original construction materials.	8.25%
◆	B1.3	Consumption of non-renewable energy for all building operations.	8.25%
■	B2.1	Electrical peak demand for building operations.	4.95%
◆	B3.1	Degree of re-use of suitable existing structure(s) where available.	2.20%
◆	B4.2	Use of water for occupant needs during operations.	3.96%
■	C1.1	GHG emissions from energy embodied in original construction materials.	9.16%
■	C1.2	GHG emissions from energy embodied in construction materials used for maintenance or replacement(s).	9.16%
◆	C1.3	GHG emissions from primary energy used for all purposes in facility operations.	13.75%
■	C1.4	GHG emissions from primary energy used for project-related transport	13.75%
■	C2.2	Emissions of acidifying emissions during facility operations.	3.52%
■	C5.1	Impact on access to daylight or solar energy potential of adjacent property	6.60%
■	C5.7	Contribution to Heat Island Effect from roofing, landscaping and paved areas.	2.64%
◆	D1.5	CO2 concentrations in indoor air.	1.32%
◆	D3.1	Appropriate daylighting in primary occupancy areas.	0.66%
◆	E1.8	Occupant egress from tall buildings under emergency conditions.	2.75%
■	E4.5	Adaptability to future changes in type of energy supply.	0.99%
◆	F1.1	Access for mobility-impaired persons on site and within the building.	1.32%
◆	G1.5	Affordability of residential rental or cost levels.	0.29%

SBTool focused on *Indoor Environmental Quality* issues

Design phase, 34 active criteria, total 100%

■	A1.5	Remediation of contaminated soil, groundwater or surface water.	5.70%
■	A2.5	Impact of site and building orientation on natural ventilation of building(s) during warm season(s).	2.14%
■	A2.6	Impact of site and building orientation on natural ventilation of building(s) during cold season(s).	2.14%
◆	B1.3	Consumption of non-renewable energy for all building operations.	16.03%
◆	B3.1	Degree of re-use of suitable existing structure(s) where available.	4.27%
◆	B4.2	Use of water for occupant needs during operations.	7.69%
◆	C1.3	GHG emissions from primary energy used for all purposes in facility operations.	26.71%
■	D1.1	Pollutant migration between occupancies.	0.43%
■	D1.3	Mold concentration in indoor air.	1.71%
■	D1.4	Volatile organic compounds concentration in indoor air.	2.56%
◆	D1.5	CO2 concentrations in indoor air.	2.56%
■	D1.6	Effectiveness of ventilation in naturally ventilated occupancies during Summer.	3.42%
■	D1.7	Effectiveness of ventilation in naturally ventilated occupancies during Spring/Fall.	2.56%
■	D1.8	Effectiveness of ventilation in naturally ventilated occupancies during Winter.	0.43%
■	D1.9	Air movement in mechanically ventilated occupancies.	0.43%
■	D1.10	Effectiveness of ventilation in mechanically ventilated occupancies.	0.43%
■	D2.1	Appropriate air temperature and relative humidity in mechanically cooled occupancies.	1.28%
■	D2.2	Appropriate air temperature in naturally ventilated occupancies.	1.28%
◆	D3.1	Appropriate daylighting in primary occupancy areas.	1.28%
■	D3.2	Control of glare from daylighting.	0.85%
■	D3.3	Appropriate illumination levels and quality of lighting.	1.28%
■	D4.1	Noise attenuation through the exterior envelope.	0.43%
■	D4.2	Transmission of facility equipment noise to primary occupancies.	0.43%
■	D4.3	Noise attenuation between primary occupancy areas.	0.43%
■	D4.4	Appropriate acoustic performance within primary occupancy areas.	0.85%
◆	E1.8	Occupant egress from tall buildings under emergency conditions.	5.34%
■	E1.9	Maintenance of core building functions during power outages.	0.64%
■	E3.2	Capability for partial operation of facility technical systems.	0.85%
■	E3.3	Degree of local control of lighting systems.	0.85%
■	E3.4	Degree of personal control of technical systems by occupants.	0.57%
■	E5.1	Operating functionality and efficiency of key facility systems.	0.43%
◆	F1.1	Access for mobility-impaired persons on site and within the building.	2.56%
■	F1.2	Access to direct sunlight from living areas of dwelling units.	0.85%
◆	G1.5	Affordability of residential rental or cost levels.	0.57%

SBTool focused on *Site Regeneration, Urban Design and Infrastructure* issues
Design phase, 35 active criteria, total 100%

■	A1.5	Remediation of contaminated soil, groundwater or surface water.	4.67%
■	A1.6	Shading of building(s) by deciduous trees.	4.20%
■	A1.7	Use of vegetation to provide ambient outdoor cooling.	0.70%
■	A1.8	Reducing irrigation requirements through the use of native plantings.	2.10%
■	A1.9	Provision of public open space(s).	0.35%
■	A1.10	Provision and quality of children's play area(s).	0.70%
■	A1.12	Provision and quality of bicycle pathways and parking.	0.70%
■	A1.13	Provision and quality of walkways for pedestrian use.	0.70%
■	A2.1	Maximizing efficiency of land use through development density.	3.50%
■	A2.2	Reducing need for commuting transport through provision of mixed uses.	2.10%
■	A2.3	Impact of orientation on the passive solar potential of building(s).	2.63%
■	A2.5	Impact of site and building orientation on natural ventilation of building(s) during warm season(s).	1.75%
■	A2.6	Impact of site and building orientation on natural ventilation of building(s) during cold season(s).	1.75%
■	A3.6	Provision of solid waste collection and sorting services.	1.87%
■	A3.8	Provision of split grey / potable water services.	3.15%
■	A3.9	Provision of surface water management system.	0.70%
■	A3.10	On-site treatment of rainwater, stormwater and greywater.	2.80%
■	A3.11	On-site treatment of liquid sanitary waste.	2.80%
■	A3.13	Provision of on-site parking facilities for private vehicles.	2.10%
■	A3.14	Connectivity of roadways.	0.47%
■	A3.15	Provision of access roads and facilities for freight or delivery.	0.47%
■	A3.16	Provision and quality of exterior lighting.	0.47%
◆	B1.3	Consumption of non-renewable energy for all building operations.	13.13%
◆	B3.1	Degree of re-use of suitable existing structure(s) where available.	3.50%
◆	B4.2	Use of water for occupant needs during operations.	6.30%
◆	C1.3	GHG emissions from primary energy used for all purposes in facility operations.	21.89%
◆	D1.5	CO2 concentrations in indoor air.	2.10%
◆	D3.1	Appropriate daylighting in primary occupancy areas.	1.05%
◆	E1.8	Occupant egress from tall buildings under emergency conditions.	4.38%
■	E2.5	Provision of exterior access and unloading facilities for freight or delivery.	0.18%
◆	F1.1	Access for mobility-impaired persons on site and within the building.	2.10%
■	F2.2	Impact of the design on existing streetscapes.	1.40%
■	F2.3	Maintenance of the heritage value of the exterior of an existing facility.	1.40%
■	F3.1	Impact of tall structure(s) on existing view corridors.	1.40%
◆	G1.5	Affordability of residential rental or cost levels.	0.47%

SBTool focused on *Residential* design issues (Design phase, 41 criteria)

■	A1.6	Shading of building(s) by deciduous trees.	2.79%
■	A1.7	Use of vegetation to provide ambient outdoor cooling.	0.47%
■	A1.8	Reducing irrigation requirements through the use of native plantings.	1.40%
■	A1.9	Provision of public open space(s).	0.23%
■	A1.10	Provision and quality of children's play area(s).	0.47%
■	A1.12	Provision and quality of bicycle pathways and parking.	0.47%
■	A1.13	Provision and quality of walkways for pedestrian use.	0.47%
■	A2.1	Maximizing efficiency of land use through development density.	2.33%
■	A2.3	Impact of orientation on the passive solar potential of building(s).	1.75%
■	A2.5	Impact of site and building orientation on natural ventilation of building(s) during warm season(s).	1.16%
■	A3.9	Provision of surface water management system.	0.47%
■	A3.13	Provision of on-site parking facilities for private vehicles.	1.40%
■	B1.1	Embodied non-renewable energy in original construction materials.	8.73%
◆	B1.3	Consumption of non-renewable energy for all building operations.	8.73%
◆	B3.1	Degree of re-use of suitable existing structure(s) where available.	2.33%
■	B3.4	Use of virgin non-renewable materials.	1.86%
◆	B4.2	Use of water for occupant needs during operations.	4.19%
■	B4.3	Use of water for irrigation purposes.	2.79%
■	B4.4	Use of water for building systems.	4.19%
■	C1.1	GHG emissions from energy embodied in original construction materials.	9.70%
◆	C1.3	GHG emissions from primary energy used for all purposes in facility operations.	14.55%
■	C3.2	Solid non-hazardous waste from facility operations sent off the site.	3.73%
■	C3.5	Liquid effluents from building operations that are sent off the site.	3.73%
■	C5.1	Impact on access to daylight or solar energy potential of adjacent property	6.98%
■	C5.7	Contribution to Heat Island Effect from roofing, landscaping and paved areas.	2.79%
◆	D1.5	CO2 concentrations in indoor air.	1.40%
■	D1.6	Effectiveness of ventilation in naturally ventilated occupancies during Summer.	1.86%
■	D2.2	Appropriate air temperature in naturally ventilated occupancies.	0.70%
◆	D3.1	Appropriate daylighting in primary occupancy areas.	0.70%
■	D4.3	Noise attenuation between primary occupancy areas.	0.23%
■	E1.9	Maintenance of core building functions during power outages.	0.35%
■	E1.10	Personal security for building users during normal operations.	0.47%
■	E4.5	Adaptability to future changes in type of energy supply.	1.05%
■	E5.2	Adequacy of the building envelope for maintenance of long-term performance.	1.05%
■	E5.6	Retention of as-built documentation.	0.23%
◆	F1.1	Access for mobility-impaired persons on site and within the building.	1.40%
■	F1.2	Access to direct sunlight from living areas of dwelling units.	0.47%
■	F1.3	Visual privacy in principal areas of dwelling units.	0.47%
■	F1.4	Access to private open space from dwelling units.	0.70%
■	F2.2	Impact of the design on existing streetscapes.	0.93%
◆	G1.5	Affordability of residential rental or cost levels.	0.31%

Appendix 2 (Manuel Macias)

X1. Calculation of Loadings for data-oriented criteria

To evaluate loadings we must define suitable indicators. An environmental indicator of a building addresses an environmental aspect either in terms of loadings or impacts. It can and should be as closely related as possible to impacts. An indicator is a function that provides a measure (with a proper unit) for the relevant loading category.

To avoid any confusion between performance and loadings, it is convenient to interpret the first as a physical property that must be measured, and the second as a method to measure that physical property. Note that in principle, several indicators can be associated to the same criterion i.e. several ways to measure the same physical property can be defined.

A list of some indicators for the loadings calculation is show below.

Greenhouse gas emissions

$$\text{kgCO}_2\text{eq} = \text{kg CO}_2 + \text{kg CO} \times 2 + \text{kg N}_2\text{O} \times 320 + \text{kg CH}_4 \times 24.5$$

Emissions leading to destruction of the stratospheric ozone layer

$$\text{Kg eq CFC}_{11} = \text{kg HCFC} \times 0.05 + \text{kg HALON-1201} \times 1.4 + \text{kg HALON-1202} \times 1.25 + \text{kg HALON-1211} \times 3 + \text{kg HALON-1301} \times 10 + \dots$$

Emissions leading to acidification of land and water sources

$$\text{SO}_2\text{Kg} + (\text{NO}_2 \times 0.7 + \text{NO} \times 1.07 + \text{NH}_3 \times 1.88 + \text{HF} \times 1.6 + \text{HCL} \times 0.88)$$

Emissions leading to eutrophication

$$\text{kgPO}_4\text{eq} = \text{kgPO}_4 + \text{kg DQO} \times 2.02\text{E-}2 + \text{kg Nitrates} \times 1.0\text{E-}1 + \dots$$

Emissions leading to formation of tropospheric ozone photochemical oxidants

$$\text{kgC}_2\text{H}_4\text{eq} = \text{kgC}_2\text{H}_4 + \text{kg HALON-}^{**} \times 0.021 + \text{kgCH}_4 \times 0.007 + \text{kgCFC/HCFC} \times 0.021 + \text{kgNMVOC} \times 0.4$$

Primary Energy Use PEU_{energy} (MJ) and Total Mass Requirement (TMR) indicators

If the building does not provide energy outside of the site, the quantification specific to the operational energy and embodied energy are obtained from Energy Performance of Building (EPB) and the Environmental Product Declaration (EPD) of the different energy carriers. Embodied energy is annualized to be consistent with annual operating energy, using the estimate of lifespan set by the authorized third party.

$$PEU_{\text{energy_use}} = \sum_i^{Energy_Carrier} n(i) EPB_i + \sum_i^{Energy_Carrier} n(i) \times EPD_i$$

where $n(i)$ corresponds to the amount of final energy delivered to the building from the energy carrier i .

If the building provides energy outside of the site, the quantification shall consider the PEU of the on-site energy production.

TMR indicator is related to the extraction of virgin abiotic material e.g. extraction of aggregates/metal ores/minerals/earth etc.

The indicator calculates the total resource use associated with any use of any non-energy, abiotic materials, wherever the resource use occurs. For example, for steel use, it traces back to tones of iron ore extraction wherever this occurs. The TMR indicator includes material that is extracted as a result of economic activities, but not used as input for production or consumption activities, for example mining overburden. Excavated and dredged material is also included. For normalization purposes, the Eurostat data provides relevant figures covering imports of

materials as well as resource use within Europe. The reference unit is the mass unit [kg] or [ton].

X2. Estimation of Loadings for criteria that are not data-oriented

There are many criteria that can not be assessed according to data-oriented indicators, but nevertheless remain of major importance in a system that is designed to provide a comprehensive sustainability assessment. Some examples of such “soft” indicators include most criteria related to Service Quality and to Social, Cultural and Perceptual and many aspects of Site development issues; but even certain aspects of Resource consumption and Environmental loadings will involve judgements that are somewhat subjective, even if assessed by expert panels.

For these soft criteria, the scalar scoring system (see below) provides a stepped mechanism that can be linked to text statements that describe performance aspects in a way that provides an assessment framework that supports judgements that are as objective as possible. The following example shows the approach. An expert panel is desirable; in any case values selected in the scoring can be interpolated in half-point increments.

E4.2 Adaptability constraints imposed by structure of floor-to-floor heights

- 1 Adaptation to another building use is not possible, because of a layout of core and columns that is unsuitable for the new occupancy.
- 0 Adaptation to another building use would result in sub-optimal functionality of the new occupancy. Typical floor load capacity is sufficient for residential uses.
- 3 Adaptation to another building use would result in an acceptable level of functionality of the new occupancy. Typical floor load capacity is sufficient for normal commercial uses.
- 5 Adaptation to another building use would result in a high level of functionality of the new occupancy. Typical floor load capacity is sufficient for heavy commercial uses.

X3 References

- [1] ISO 21929-2010 Sustainability in building construction — Sustainability indicators — Part 1: Framework for the development of indicators for buildings
- [2] ISO 21930-2007 — Sustainability in building construction -Environmental declaration of building products
- [3] ISO 21931-1 Sustainability in building construction. Framework for methods of assessment for environmental performance of construction work. Part 1: Buildings.
- [4] prEN 15643-1. Sustainability of construction works – Integrated assessment of building performance. Part 1: General framework
- [5] prEN 15643-2. Sustainability of construction works – Integrated assessment of building performance. Part 2: Framework for the assessment of environmental performance
- [6] prEN 15643-3. Sustainability of construction works – Integrated assessment of building performance. Part 3: Framework for the assessment of social performance
- [7] prEN 15643-4. Sustainability of construction works – Integrated assessment of building performance. Part 4: Framework for the assessment of economic performance
- [8] prEN15804- . Sustainability of construction works – Environmental product declaration.- Product Category Rules
- [9] EN 15978:2011. Sustainability of construction works – Assessment of environmental performance of building. Calculation methods