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 signle 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 is 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 ehett 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 shoiuld 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.

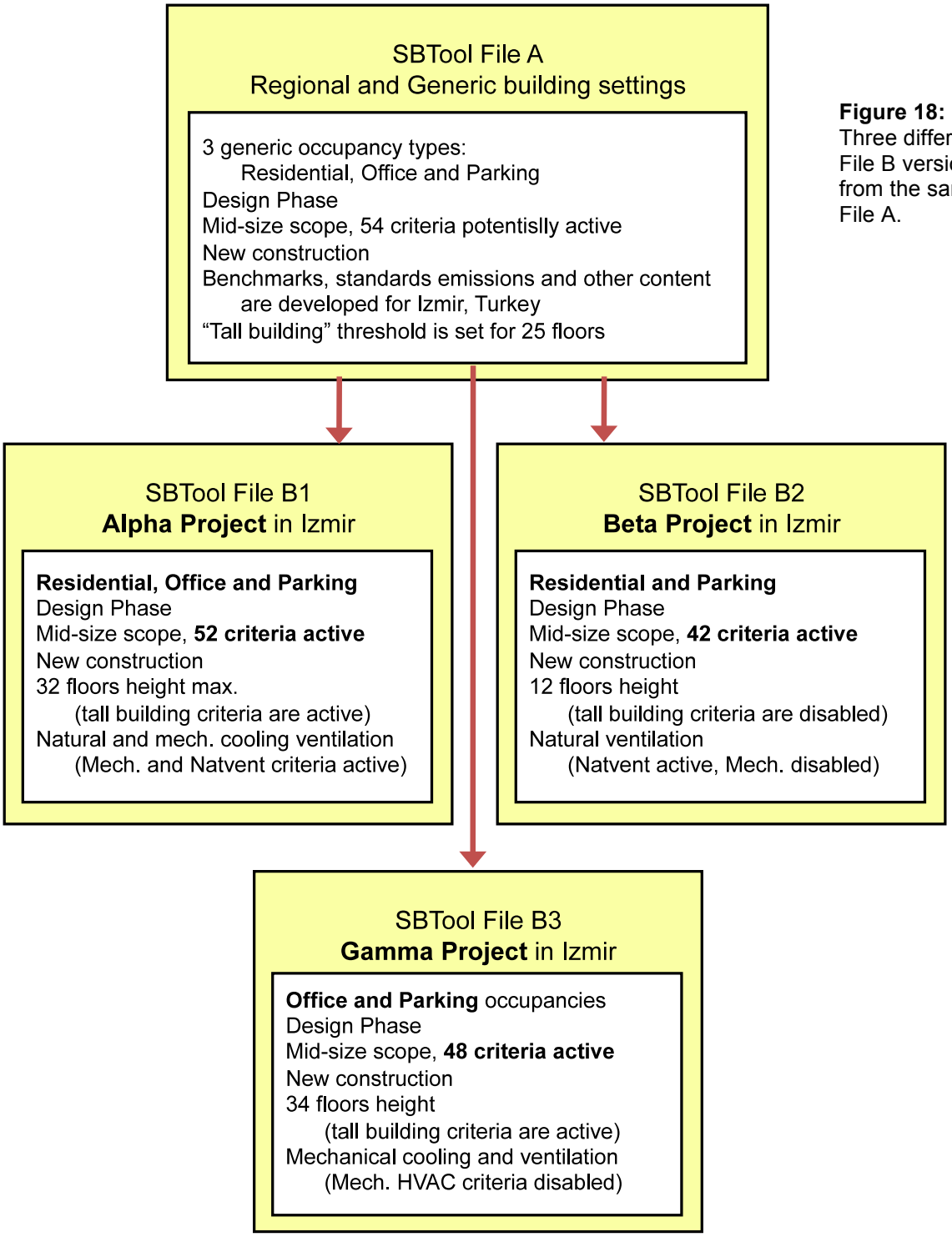
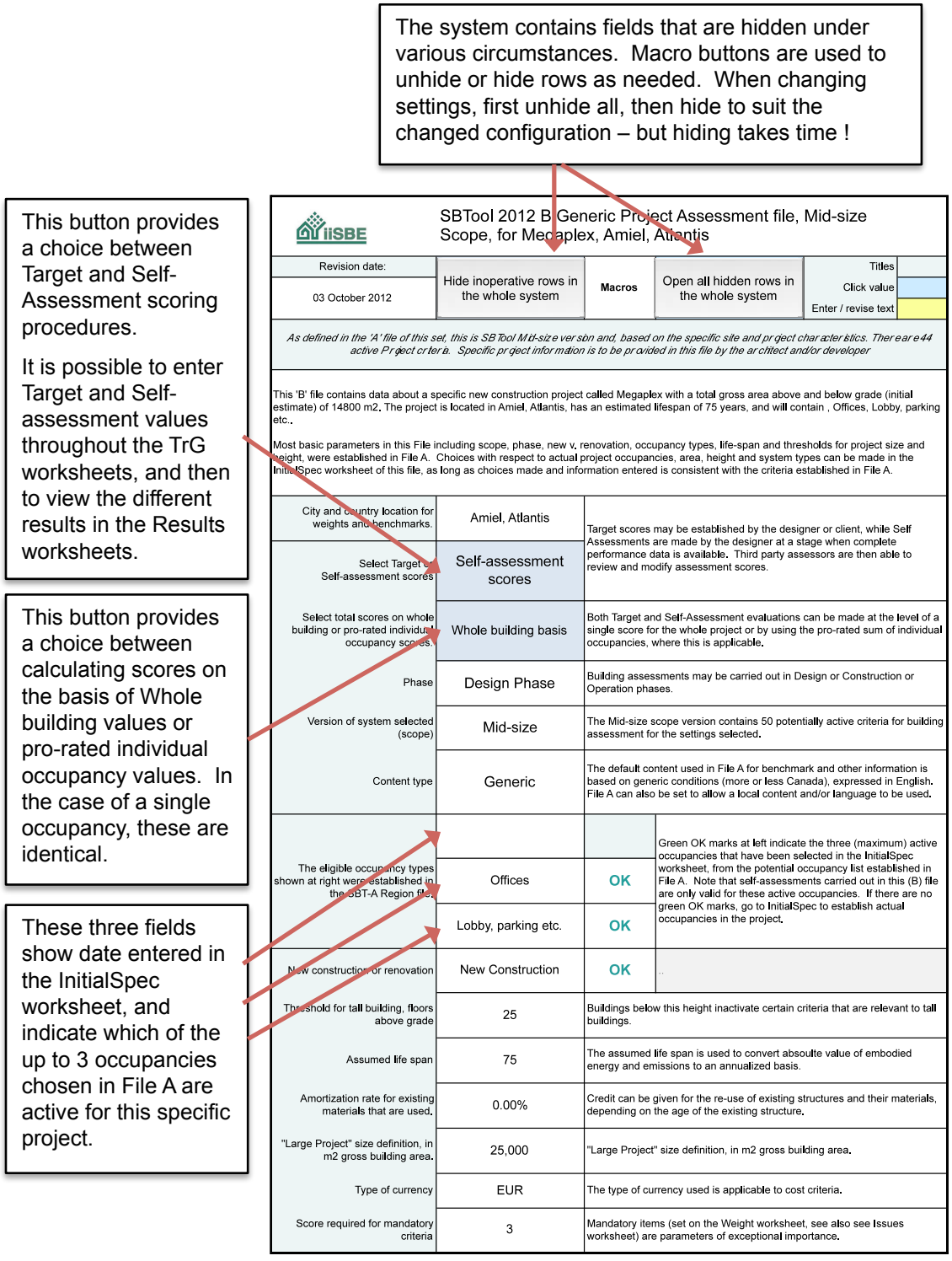


Figure 18: Three different File B versions from the same File A.

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



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 inactived steps is 134	Key process steps for Megaplex, Amiel, Atlantis	To unprotect any worksheet, go to Tools, then Protection. Password is "iDP".	iiSBE
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
PM	Project manager
AR	Architect
AS	Acoustic specialist
BP	Building products rep
CA	Commissioning agent
CL	Client
CM	Construction manager
CS	Controls specialist
CV	Civil / services engineer
DF	Design facilitator
DS	Daylighting specialist
EC	Ecologist / env. Specialist
EE	Energy engineer

EL	Electrical engineer
GE	Geotechnical engineer
ID	Interior designer
LA	Landscape architect
LD	Lighting designer
MS	Materials specialist
ME	Mechanical engineer
OP	Operator of building
RS	Renewables specialist
ST	Structural engineer
TS	Telecoms specialist
UP	Urban planner
$$	Costing specialist

The number of completed steps is 4 and the number of inactived steps is 134		Key process steps for Megaplex, Amiel, Atlantis	To unprotect any worksheet, go to Tools, then Protection. Password is "IDP".	IISBE
	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	
17	2.08	Identify any features in adjacent properties that may place constraints on the design of the subject building.		
18	2.09	Measure typical Sound Level (Leq) at the noisiest site boundary. Report on results in ContextB worksheet.	AS UP	
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 	*The upper section of this worksheet contains a description of context conditions in the Urban Area, as defined in the SBTRegion file. The lower section contains descriptors of Site Conditions, as selected by the Project Assessor.*

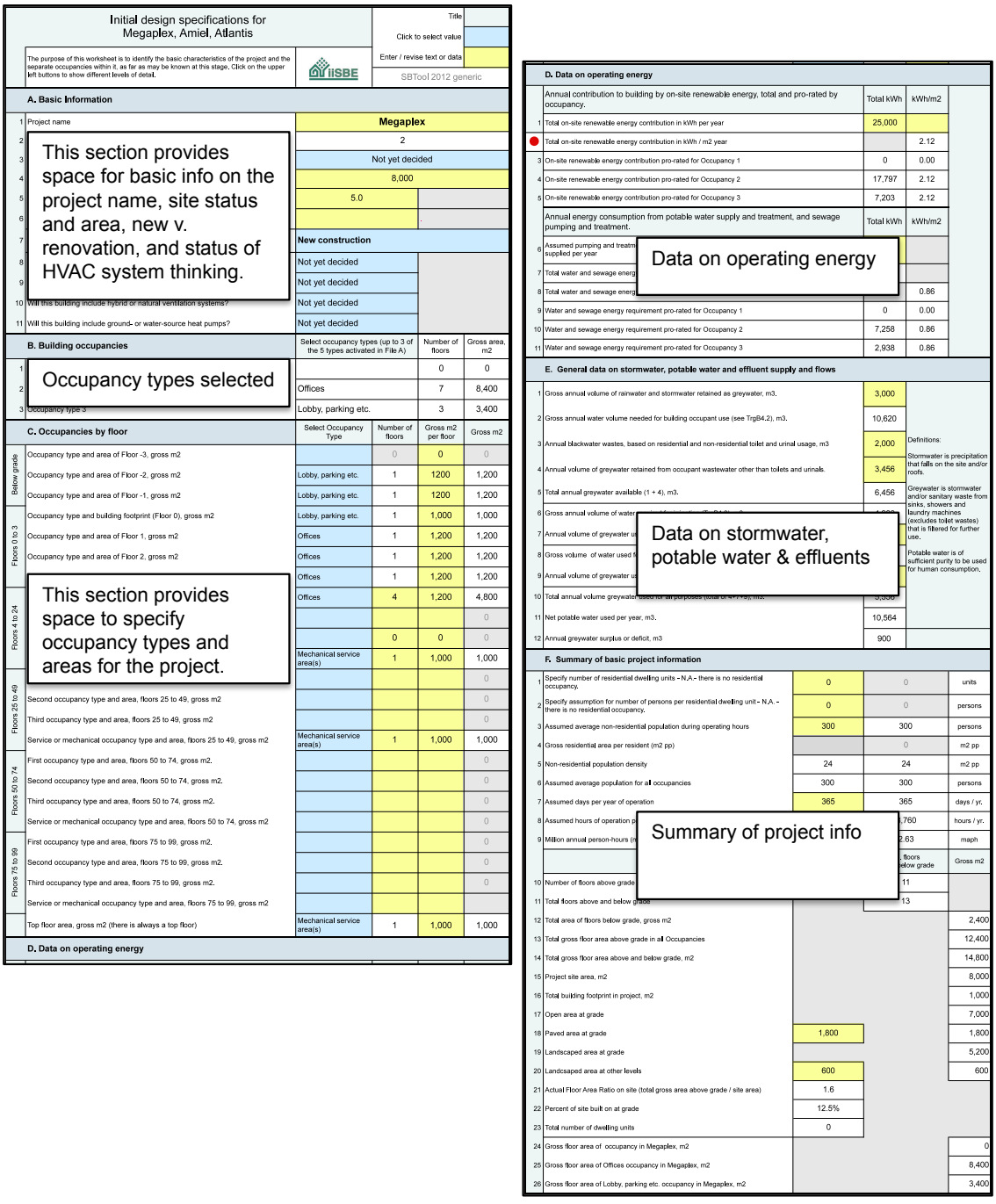
Urban Area context issues selected in ContextA worksheet (from File A)		
	Title	**Descriptors of condition**
1	Urban area type	Not yet defined
2	Seismic zone type (Uniform Building Code, USA)	Not yet defined
3	Climate zone (based on Köppen)	Not yet defined
4	Winter Design temperatures	Not yet defined
5	Average annual soil temperature 2m. below grade in ºC	Not yet defined
6	Average difference, max. and min. diurnal temperatures in warm season, ºC	Not yet defined
7	Annual heating degree days below 18ºC.	Not yet defined
8	Annual cooling degree days above 18ºC.	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 horizotal 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	

D6. The *InitalSpec* worksheet

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.

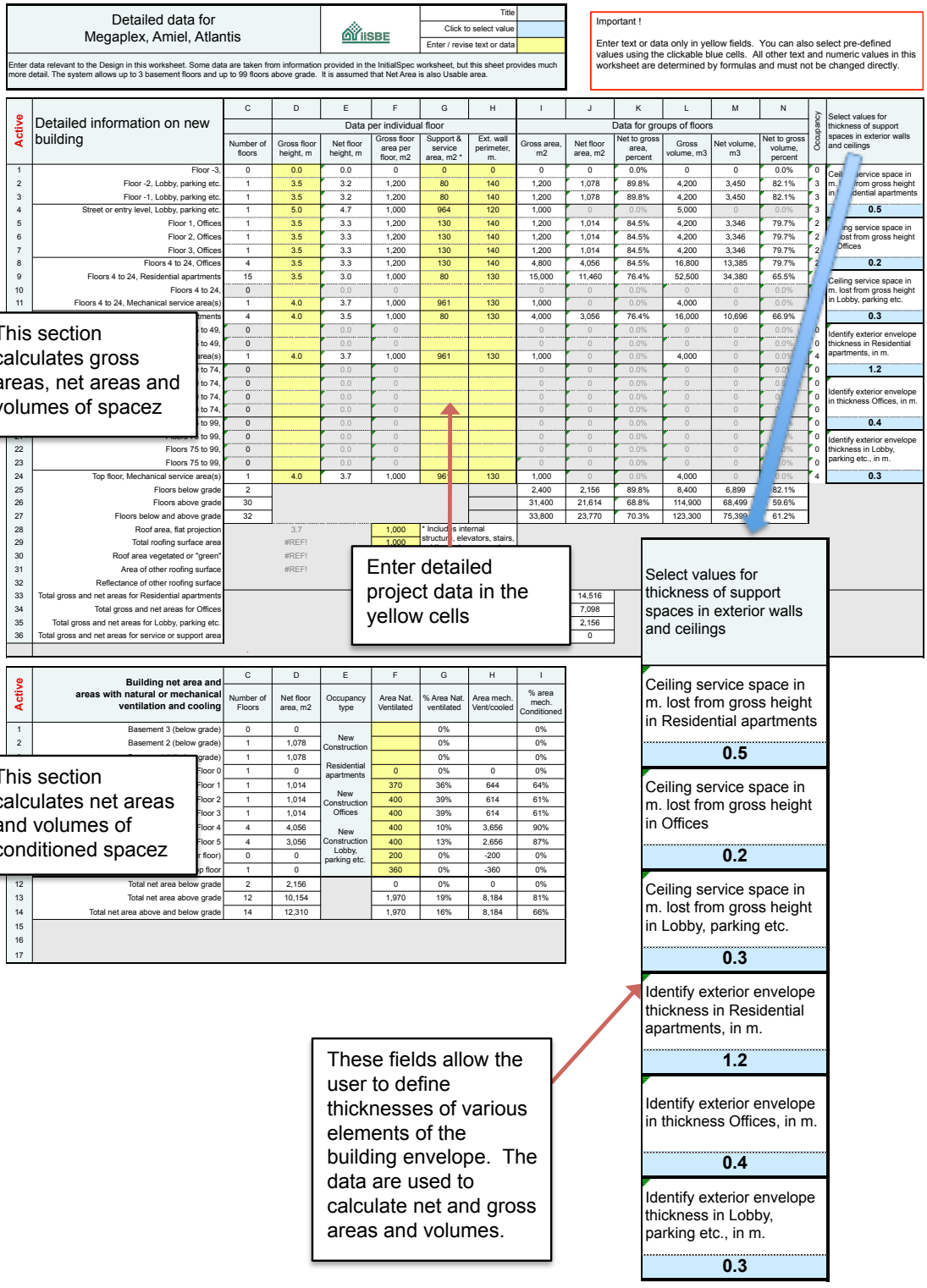
Figure 23: The InitialSpec worksheet



D7. The *DetailSpec* worksheet

This worksheet contains more detailed information about the project, mainly relating to gross and net areas and volumes, as well as conditioned areas and volumes.

Figure 24: The DetailSpec worksheet

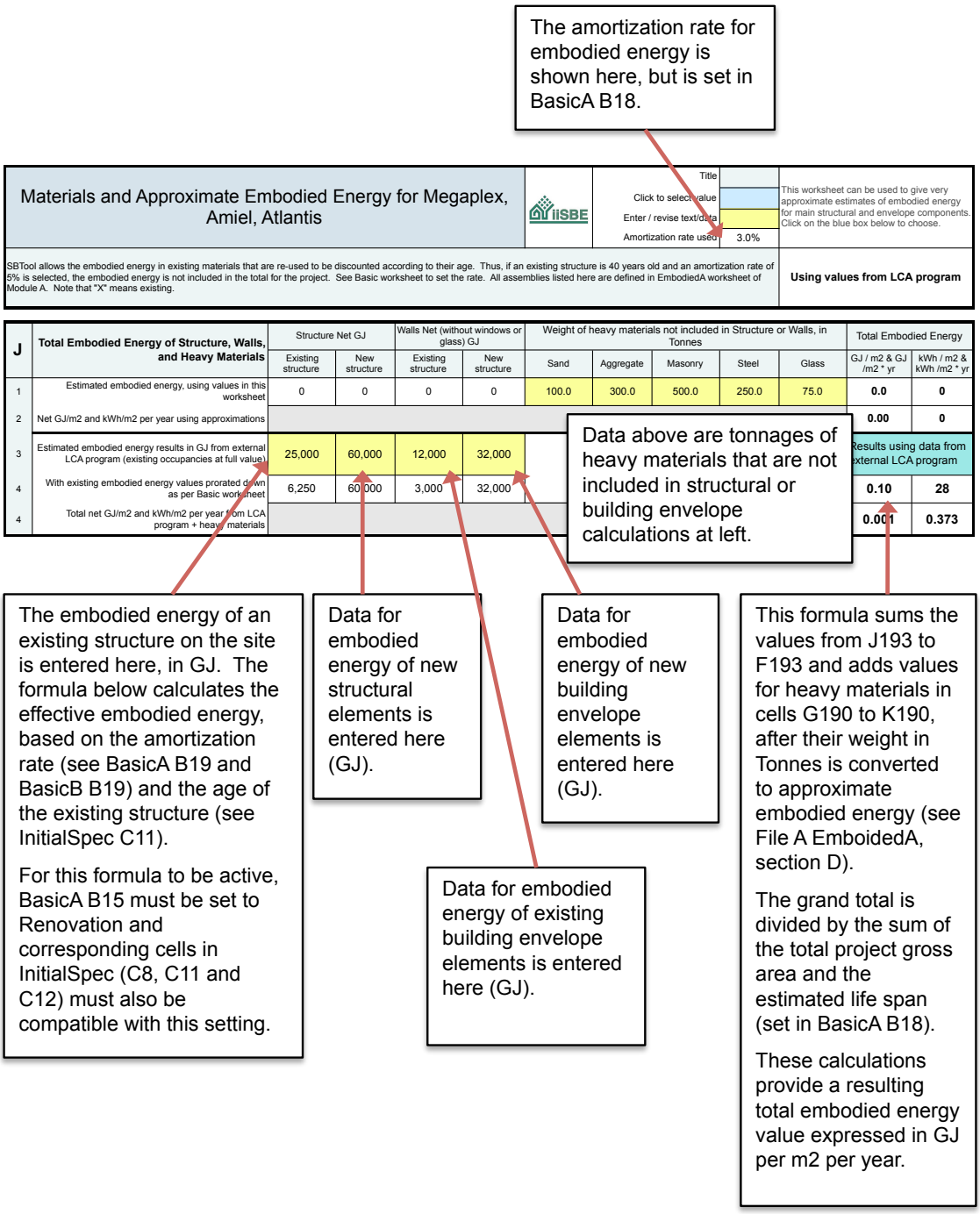


D8. The *EmbodiedB* worksheet

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.

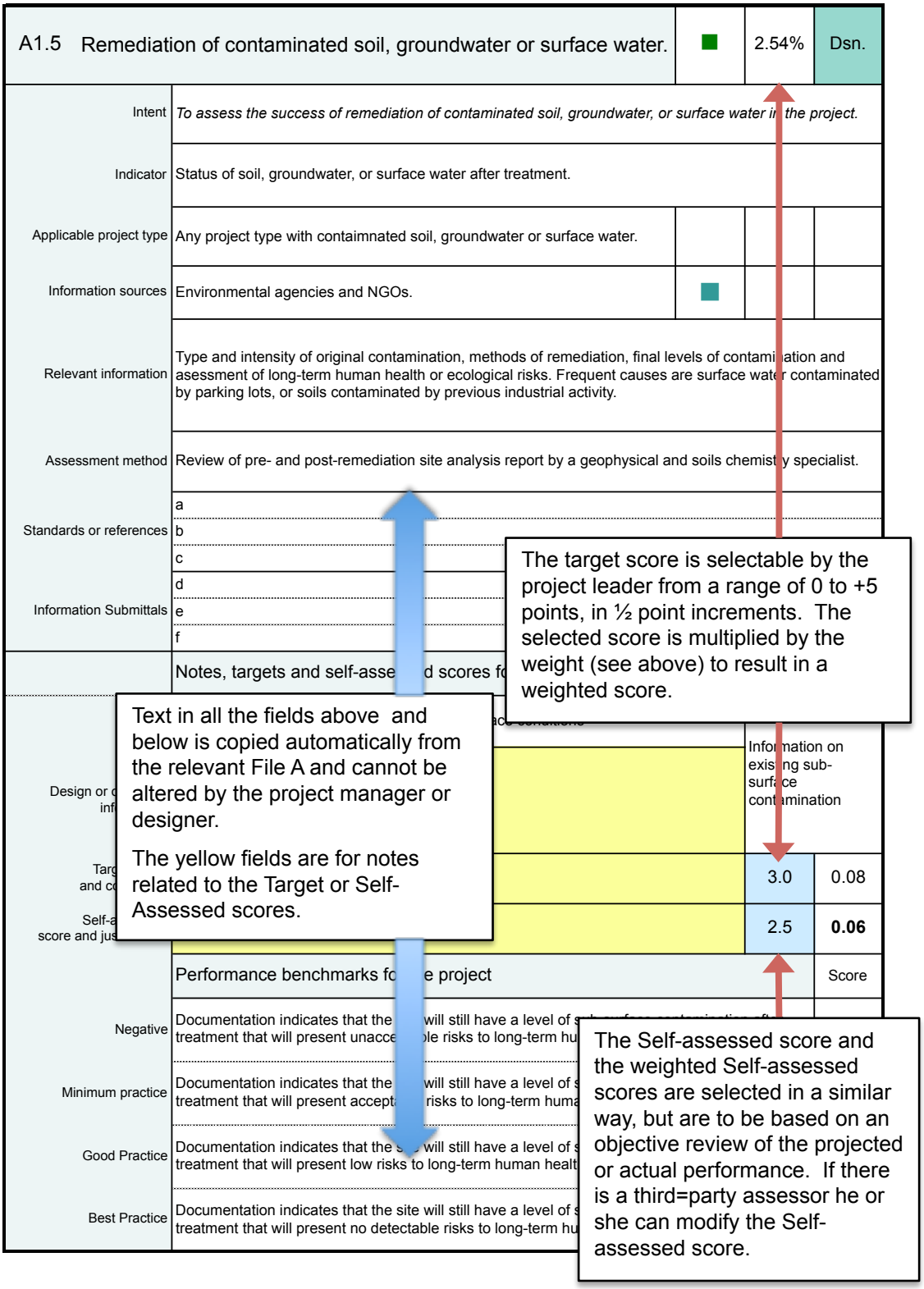
As the notes below indicate, there is a provision for setting an amortization rate for materials in existing structures that form part of the project. This feature (see BasicA B19 or BasicB B19) is intended to recognize that a differentiation should be made between the embodied energy assumptions for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

Figure 25: The Embodied worksheet



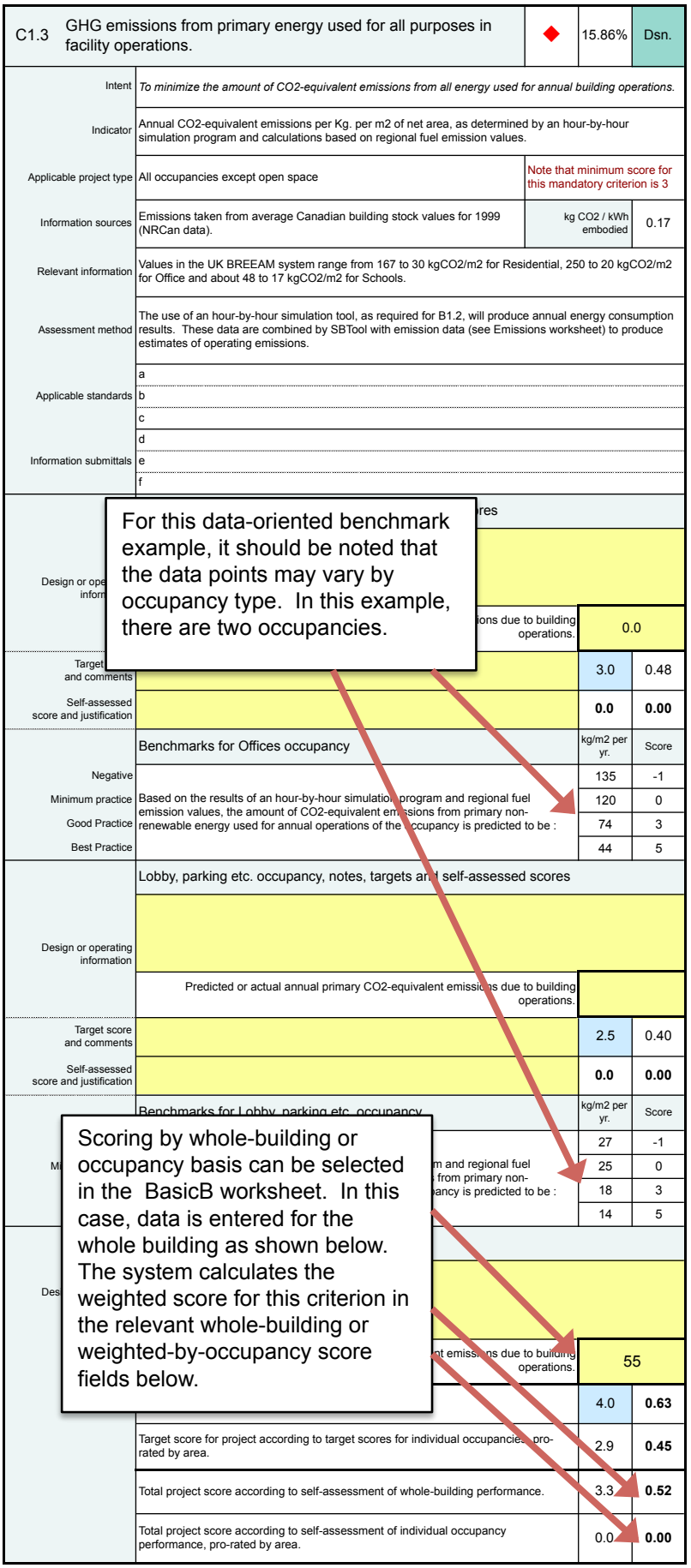
D9. Example of a text-oriented crtiterion

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.



D10. Example of a data-oriented crtiterion, 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.



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.

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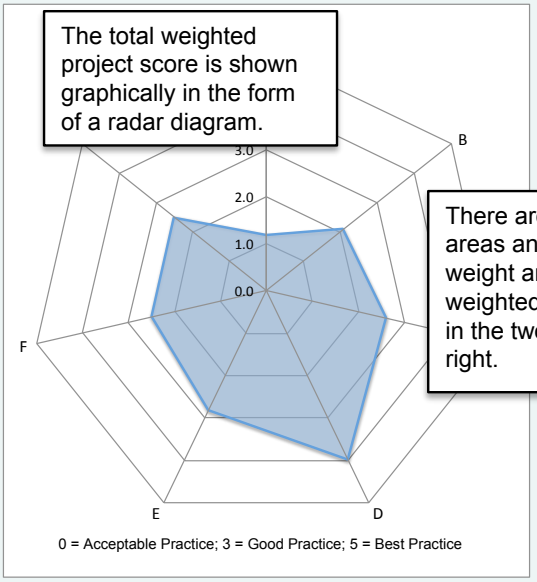
SBTool 2012

Self-assessment scores for Megaplex, Amiel, Atlantis

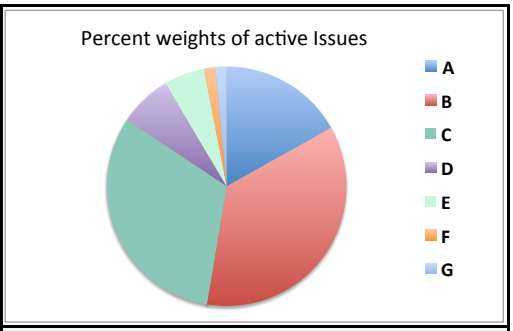
Mid-size version	Design Phase	Self-assessment scores

Whole building basis



0 = Acceptable Practice; 3 = Good Practice; 5 = Best Practice

Relative Performance Results **C+**



Project Information

Assumed life span is 75 years, and monetary units are in EUR		Amortization rate for embodied energy of existing materials is set at 0 %	
With current context and building data, the number of active low-level is:	44	Max. potential low-level parameters:	50
ory is:	7	Active low-level mandatory parameters:	6
s and Criteria, go to metersB worksheet.		Active Weights	Weighted scores
evelopment, tructure		16.9%	1.2
B Energy and Resource Consumption		35.8%	2.1
C Environmental Loadings		31.7%	2.6
D In		7.1%	4.0
E S		5.5%	2.8
cts		1.5%	2.5
G Cost and Economic Aspects		1.5%	2.5
Weighted project score			2.29

The total weighted project score is shown graphically in the form of a radar diagram.

There are 7 main Issue areas and the relevant weight and summary weighted scores are shown in the two columns at the right.

The total weighted score for the project is converted to a single letter score.

Absolute Performance Results

	These data are based on the Self-Assessment values	By area	By area & occupancy	
1	Total net consumption of primary embodied energy for structure and envelope, GJ/m2	0.3	0.1	GJ/m²*maph
2	Net annualized consumption of embodied energy for envelope and structure, kWh/m2*yr	12	5	kWh/m2*maph
3	Net annual consumption of delivered energy for b	208	79	kWh/m2*maph
4	Net annual consumption of primary (source) non- *yr.	272	103	kWh/m2*maph
7	Net annualized primary embodied energy and an	284	108	kWh/m2*maph
8	Total on-site renewable energy used for operation	2.1	0.81	kWh/m2*maph
9	Net annual consumption of potable water for build	0.90	0.34	m³/m²*maph
10	Annual use of grey water for building operations,	0.47	0.18	m³/m²*maph
11	Net annual GHG emissions from building operatio	63.8	24.28	kg/m²*maph
12	Total present value of 25-year life-cycle cost fot to	2800 EUR		
13	Proportion of gross area of existing structure(s) re-used in the new project, percent			
14	Proportion of gross area of project provided by re-use of existing structure(s), percent			

This section of the worksheet shows key performance indicators, converted in the next column to values that are normalized by annual occupancy density (million annual person-hours).

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

$kgCO_2eq = kg\ CO_2 + kg\ CO \times 2 + kg\ N_2O \times 320 + kg\ CH_4 \times 24.5$

Emissions leading to destruction of the stratospheric ozone layer

Kg eq CFC_{11} = kg HCFCx0.05 + kgHALON-1201x1.4 + kgHALON-1202x1.25 + kgHALON-1211x3+ kgHALON-1301x10+……..

Emissions leading to acidification of land and water sources

$SO_2Kg + (NO_2*0.7+NO*1.07+NH3*1.88+HF*1.6+HCL*0.88)$

Emissions leading to eutrophication

$kgPO_4eq = kgPO_4 + kg\ DQOx2.02E\text{-}2 + kg\ Nitrates \times 1.0E\text{-}1 + \ldots\ldots$

Emissions leading to formation of tropospheric ozone photochemical oxidants

$kgC_2H_4eq = kgC_2H_4 +$ kgHALON-**x 0.021+kgCH4x0.007+ kgCFC/HCFCx0.021+kgNMVOCx0.4

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 form 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.

$$PEU_{energy\_use} = \sum_{i}^{Energy\_Carrier} n(i) EPB_{(i)} + \sum_{i}^{Energy\_Carrier} n(i) \times EPD_{(i)}$$

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 describie 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]I ISO 21929-2010 Sustainability in building construction — Sustainability indicators — Part 1: Framework for the development of indicators for buildings

[2]I ISO 21930-2007 — Sustainability in building construction -Environmental declaration of building products

[3]I 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