



6D BIM-Terminal

Missing Link for the design of CO₂-neutral buildings

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IBO – Austrian Institute for Building and Ecology

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SBE Graz, 12.09.2019

Project details



Research funded by the Austrian Ministry BMVIT in the programme, 'City of Tomorrow' ('Stadt der Zukunft')

Project partners:

IBO (lead)

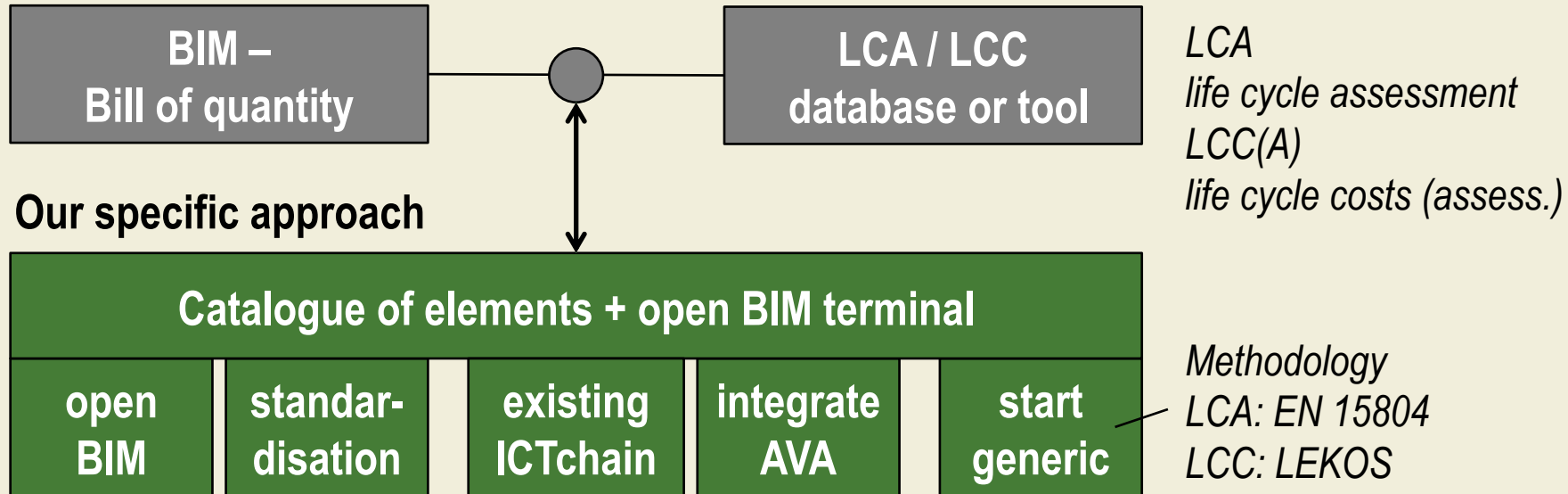
baubook | ib-data | A-NULL | AEE INTEC | GET

Duration: Nov 2017 until March 2020

Main focus



Using LCA/LCCA within the BIM method proved before – main approach:



AVA ... tender-award-accounting

Introduction to two Austrian specialities



freeBIM - Property Server (www.freebim.at)

buildingSMART + complement

ÖNORM A 6241-2: 2015 07 01 Digital structure documentation –
Part 2: Building Information modeling (BIM) - Level 3-iBIM

Standardized performance specifications (Standardisierte Leistungsbeschreibung)

- basis for bid document
- clear ID + standard text
- mandatory f. federal buildings

07.02 01

Wände aus Beton (Wand). Im Positionsstichwort sind die Dicke und die Festigkeitsklasse des Betons angegeben.
Bauteilhöhe über Null bis 3,2 m.

E	Beton Wand b.20cm C20/25 b.3,2m	m3
F	Beton Wand ü.20-30cm C20/25 b.3,2m	m3
G	Beton Wand ü.30cm C20/25 b.3,2m	m3
H	Beton Wand b.20cm C25/30 b.3,2m	m3
I	Beton Wand ü.20-30cm C25/30 b.3,2m	m3
J	Beton Wand ü.30cm C25/30 b.3,2m	m3

*concrete wall
height < 3,2 m
thickness: < 20 cm, ...
strength: C20/25...*

Backbone: database for materials and elements



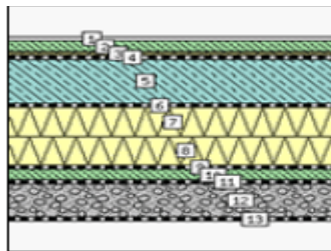
product data
specific & generic
 A1-A3, B4

generic data
 A4, C1-C4
(specific data in development)

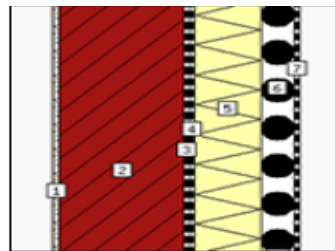
building elements



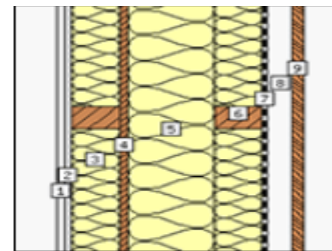
Foundations



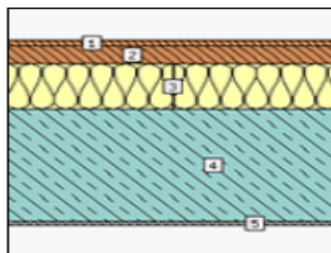
Sealed outside walls



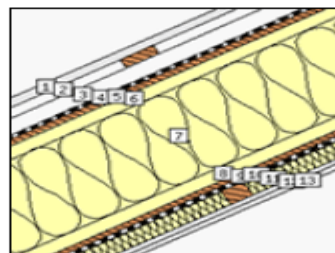
Outside walls



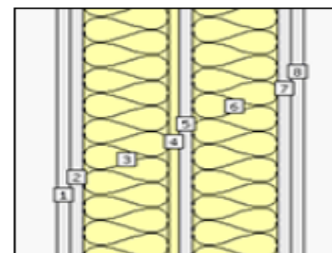
Ceilings



Roofs



Inner walls



Reference elements with main properties for LCA and U-value



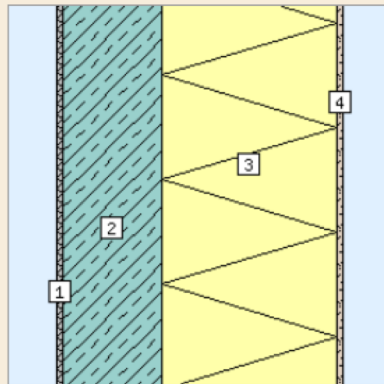
Calculator of **baubook** main page
switch to other platform
eco2soft - building calculator
Deutsch

home feedback information contact login

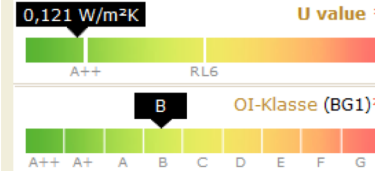
AWm 01 a Reinforced concrete outside wall, ETICS

Wall: exposed to outside air – not back-ventilated (BG1)

login and edit copy of this building element



no.	type	layer (from inside to outside)	d cm	λ W/mK	R m ² K/W
1		Filler - gypsum filler	0,30	0,800	0,00
2		Normal concrete with reinforcement 1 % (2300 kg/m ³)	18,00	2,300	0,08
3		EPS-F (15.8 kg/m ³)	32,00	0,040	8,00
4		Silicate plaster (without synthetic resin additive)	0,19	0,800	0,00
			$R_{Si} / R_{Se} =$		0,130 / 0,040
			R' / R'' (max. relative error: 0,0%)		8,254 / 8,254
			=		
building element			50,49		8,254



mass	426,4 kg/m ²
PENRT	997 MJ/m ²
PENRE	795 MJ/m ²
PENRM	202 MJ/m ²
GWP100 S	75,4 kg CO ₂ equ./m ²
GWP100 P	75,5 kg CO ₂ equ./m ²
GWP100 C	0,0840 kg CO ₂ equ./m ²
AP	0,207 kg SO ₂ equ./m ²
EP	0,0969 kg PO ₄ ³⁻ /m ²
PERT	22,0 MJ/m ²
PERE	22,0 MJ/m ²
PERM	0 MJ/m ²
POCP	0,0507 kg C ₂ H ₄ /m ²
ODP	0,00000252 kg CFC-11/m ²

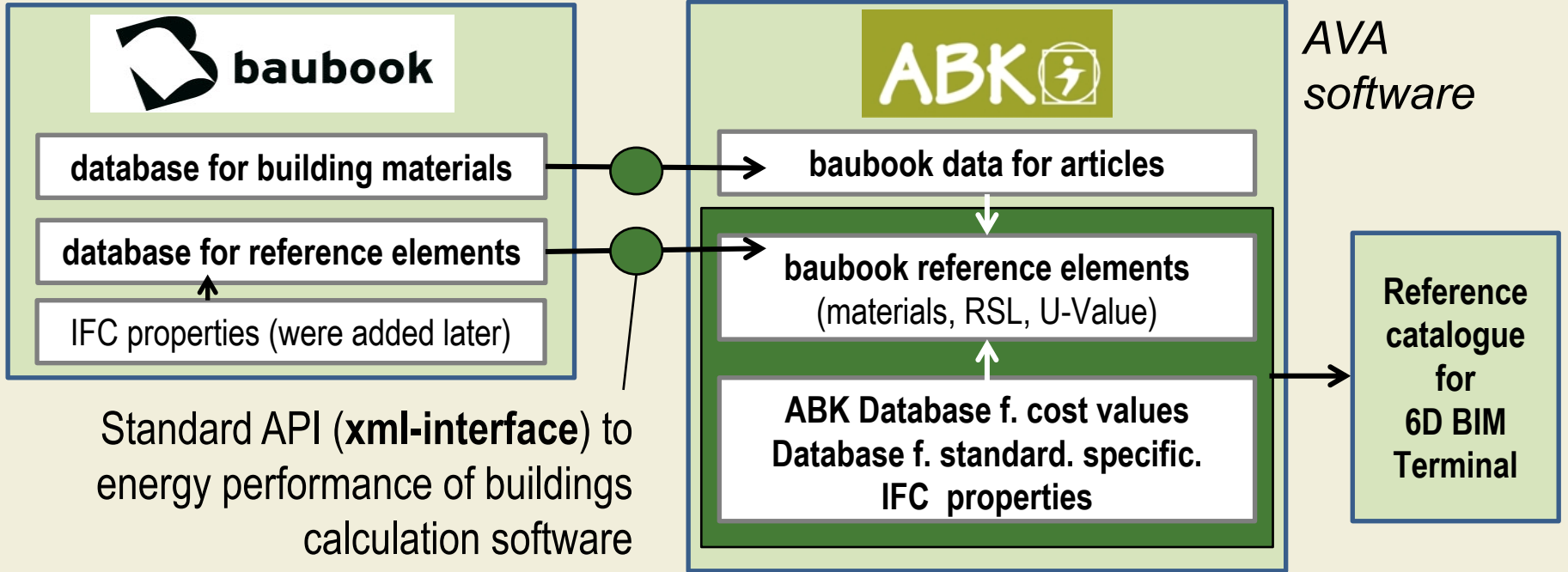
Quantity & type of material / m²

raw density

λ and U-value

LCA-indicators per layer & per m²

Methode: Referenzelemente



6D BIM Terminal prototype



Simply2Rooms DevPkg #2 | BIMterminal

Datei Bearbeiten Ansicht Fenster Entwickler Hilfe

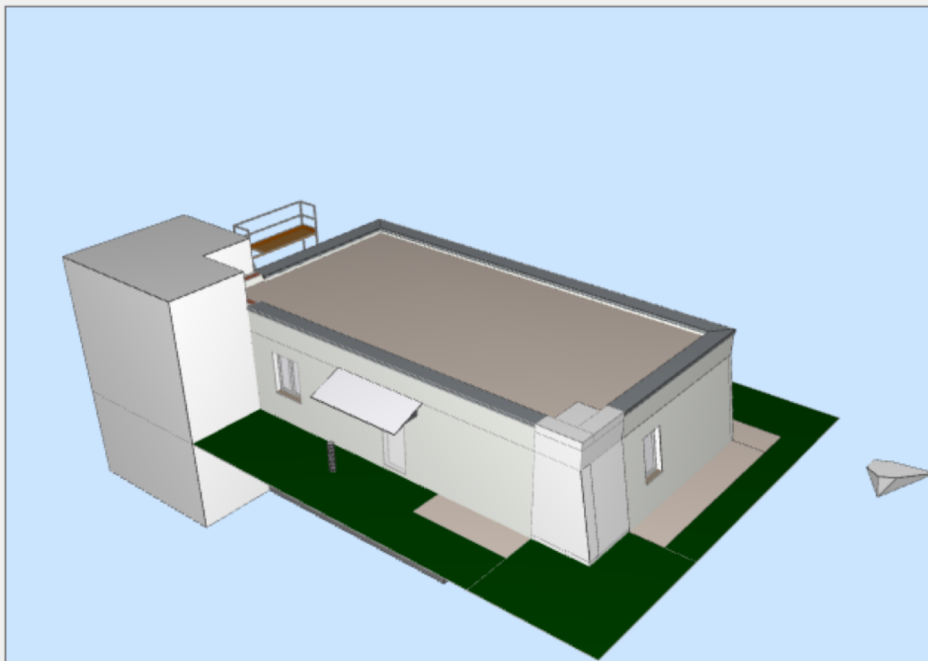
IFC models

3D Ansicht

Catalogues

- Architektur
 - das Grundstück
 - Gebäude
 - K01.01
 - Wall
 - ELEM-0000
 - ELEM-0001
 - ELEM-0002
 - ELEM-0006
 - ELEM-0007
 - ELEM-0003
 - ELEM-0005

Name	
Allgemeines	
IFC	
IfcElement	IfcElement
Guid	3U
Name	ELE
PredefinedType	NC
TypeName	AW
BIMterminal	
GlobalPosZ	-1,



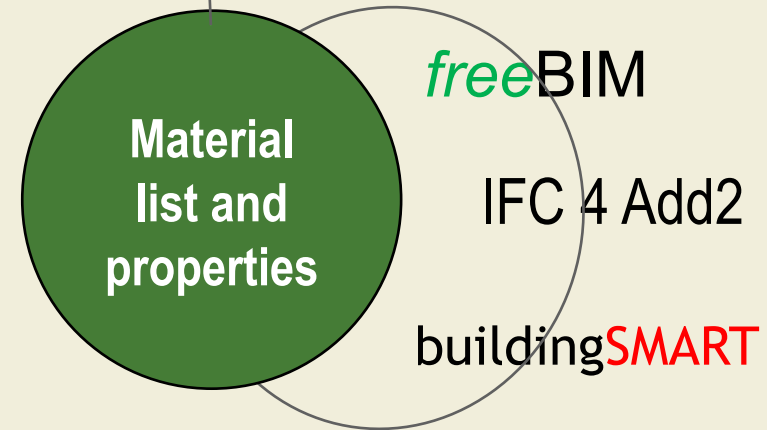
- baubook
 - Außendecken
 - Aussenwände
 - Dächer
 - Erdberührte Außenwände
 - Fundamente
 - Geschoßdecken
 - Innenwände
 - Kellerdecken
- BIM-Elemente für AVA
 - AWh 01 a Brettstapel-Außenwand, hinterl...
 - AWh 01 b Brettstapel-Außenwand, hinterl...
 - AWI 01 a Holzständer-Außenwand, hinterl...
 - AWI 02 a Holzständer-Außenwand, verputzt
 - AWI 03 a Holzständer-Außenwand, verputzt
 - AWI 04 a Brettstapel-Außenwand, hinterl...
 - AWI 04 b Brettstapel-Außenwand, hinterl...
 - AWI 05 a Boxträger-Außenwand, hinterlüf...
 - AWI 05 b Boxträger-Außenwand, hinterlüf...
 - AWI 06 a Doppel-T-träger-Außenwand, hi...
 - AWI 06 b Doppel-T-träger-Außenwand, hi...
 - AWm 01 a Stahlbeton-Außenwand, WDVS

Reference catalogue



Background work: ‚Standardisation‘

- (A) Defining the property set
- (B) Defining a material list
- (C) Workflow



Pset Environmental Impact indicators



IFC4 Add2

AtmosphericAcidificationPerUnit

EN: not defined unambiguously

EN: Quantity of gases responsible for the

kg is missing!

atmospheric acidification calculated in equivalent SO₂

FR: Quantité de gaz responsables de l'acidification atmosphérique exprimée en kg d'équivalent SO₂

FR: old standard!

[NDT: ... prEN15804:2008 et NF P01-010]

Unit: IfcMassMeasure

kg SO₂-equivalent is not a 'mass measure'!

wrong standard or wrong indikator respectively

Example acidification - continuation



IFC: AtmosphericAcidificationPerUnit

EN: Quantity of gases responsible for the atmospheric acidification

No longer used in
LCA of buildings

New Indicator: SoilAndWaterAcidificationPerUnit

EN: acidification potential of soil and water per unit
in kg SO₂-eq acc. to EN 15804:2012+A1:2013 [6D-BIMt]

New Indicator
coming up

New Indicator: AccumulatedExceedanceAcidificationPerUnit

EN: Accumulated Exceedance, Acidification potential (AP) in equivalent mol H⁺ per unit according to EN 15804:2013+A2:2019 [6D-BIMt]

(B) Defining a material list

(Harmonisation work in ASI-WG 015.11 still in progress!)

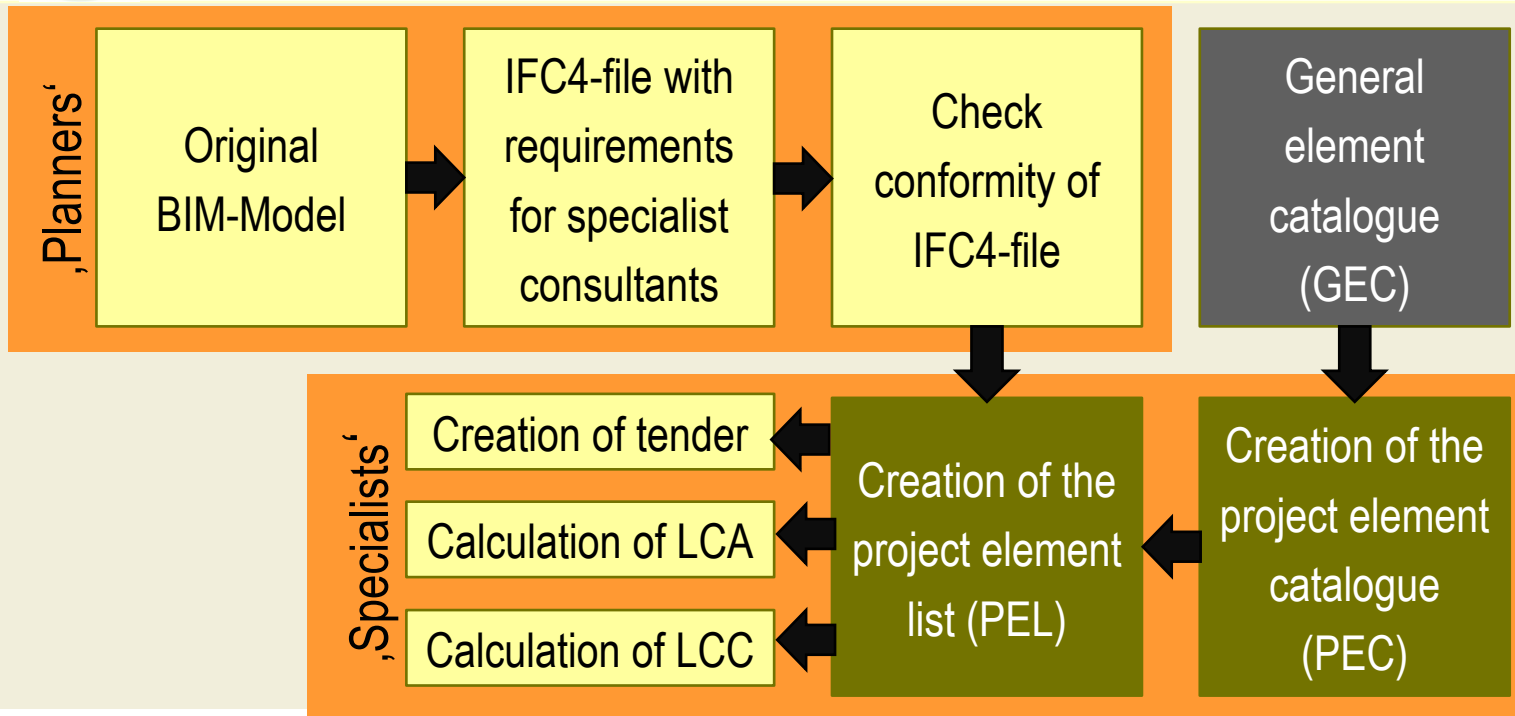


ID	Main application	Material	Building material name	Property M01 (classification by material)	M01 code acc. to property server
138	Screed	calcium sulphate	Screed	calcium sulphate screed	fbim_calciumSulfateScreed
139	Screed	mastic asphalt	Screed	mastic asphalt screed	fbim_masticAsphaltScreed
140	Screed	cold bitumen	Screed	cold bitumen screed	fbim_coldBitumenScreed
141	Screed	lime	Screed	lime screed	fbim not available yet
142	Screed	synthetic resin	Screed	synthetic resin screed	fbim_syntheticResinScreed
143	Screed	clay	Screed	clay screed	fbim not available yet
144	Screed	magnesia	Screed	magnesia screed	fbim not available yet
145	Screed	cement	Screed	cement screed	fbim_cementaryScreed

(C) Work flow (harmonisation work still in progress!)



Source: ASI-WG 015.11 , draft ON A 2063-2 *)



*) Automation-supported procedures for tendering and billing - considering BIM level 3

Thank you for your attention



More information wanted?

- <https://www.ibo.at/en/research/reference-projects/data/6d-bim-terminal/>
- <https://www.abk.at/produkte/bim/bim-forschung/>
- <https://www.archiphysik.at/6d-bim-terminal/>
- [https://www.freebim.at/?r=010\\$icon\\$\\$\\$\\$29940\\$\\$\\$\\$\\$\\$\\$\\$\\$\\$@@"](https://www.freebim.at/?r=010$icon$$$$29940$$$$$$$$$$@@)
- <https://www.baubook.info/>
- email: hildegund.figl@ibo.at