

European strawbale building methods

1. General information

Method of construction:

Infill

ID: IF-01

Representative:

Dipl.- Ing. Architect Dirk Scharmer

Contact:

www.fasba.de



Personal quotation

In this method everything is defined, approved, safe and comprehensible. Strawbales are taking no loads, are used as an approved infill insulation. The usage of wood is more than in loadbearing methods, but as long as wood is available as a sustainable material as currently in Germany it's no disadvantage. It can be prefab if needed. It's fast, easy and affordable.

Table of Content

1. General information
2. Visual description of the method-1
3. Visual description of the method -2
4. Technical drawings 2D
5. Explanation of the method
6. Calculation sheet
7. Questionnaire
9. Evaluation Sheet



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2. Visual description of the method-1

3D-1

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2. Visual description of the method-1

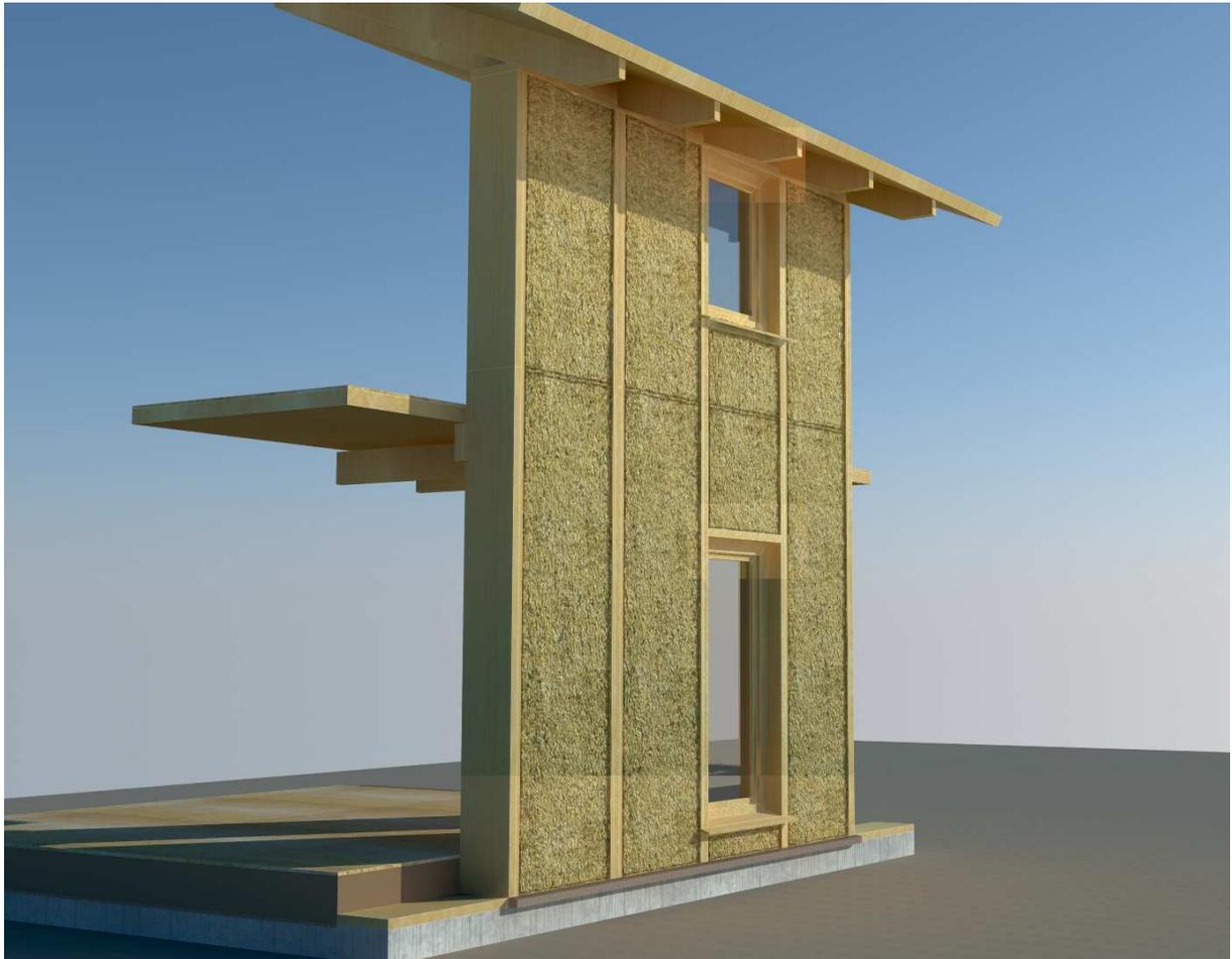
3D-1

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3. Visual description of the method -2

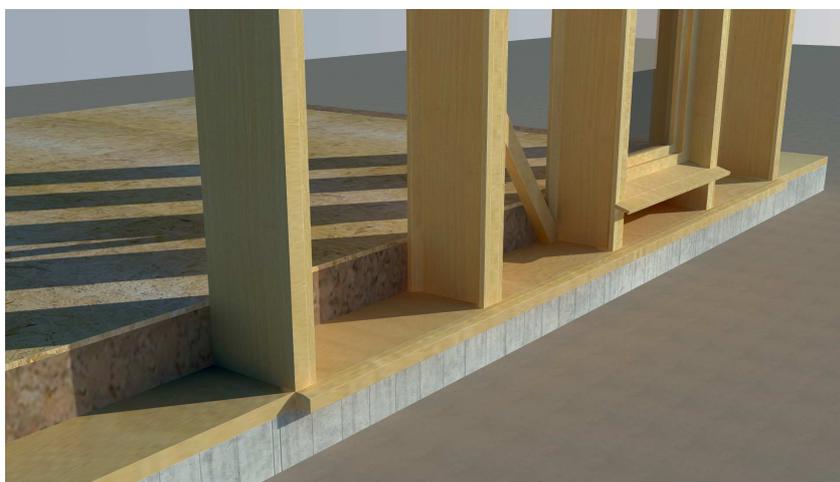
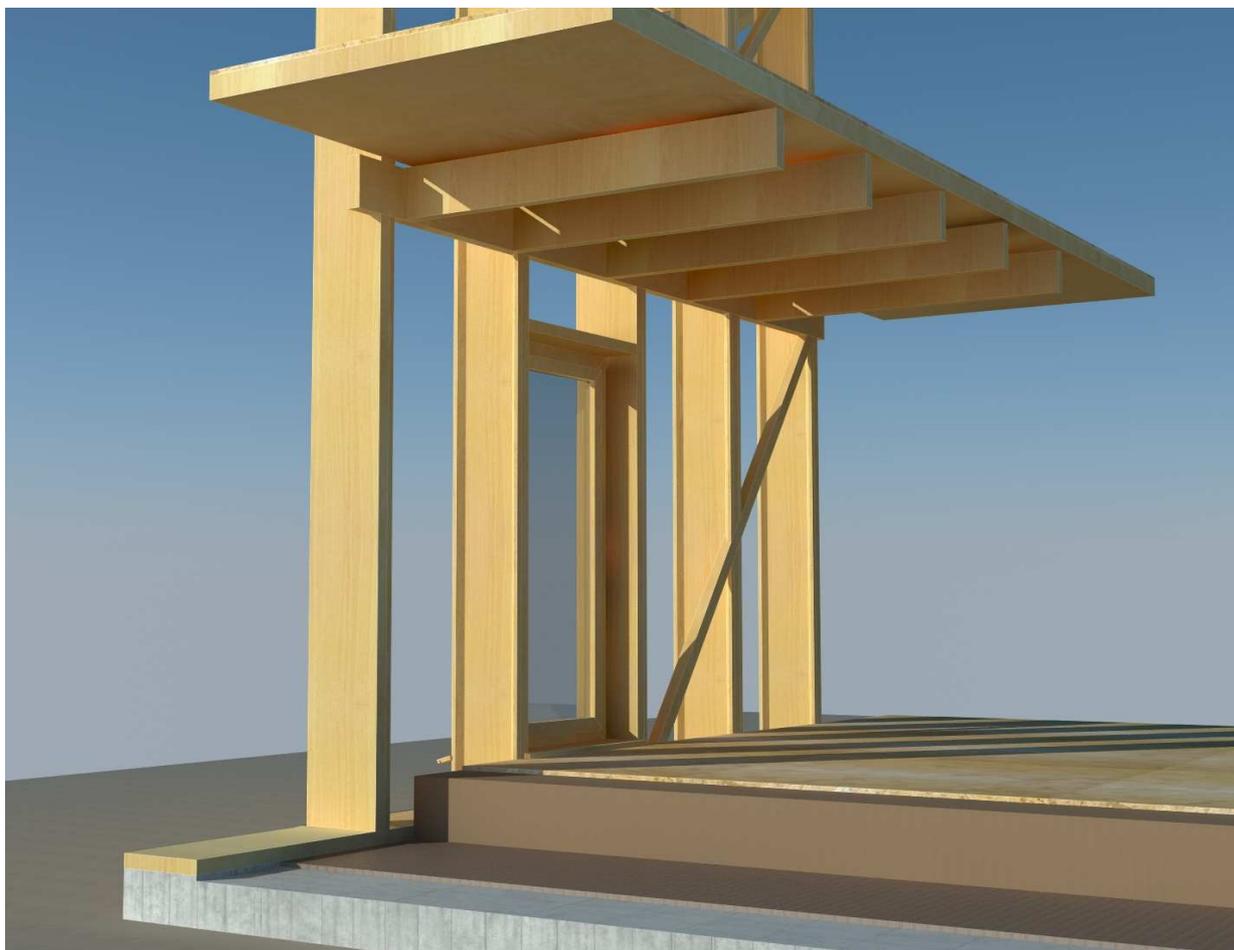
3D – 2

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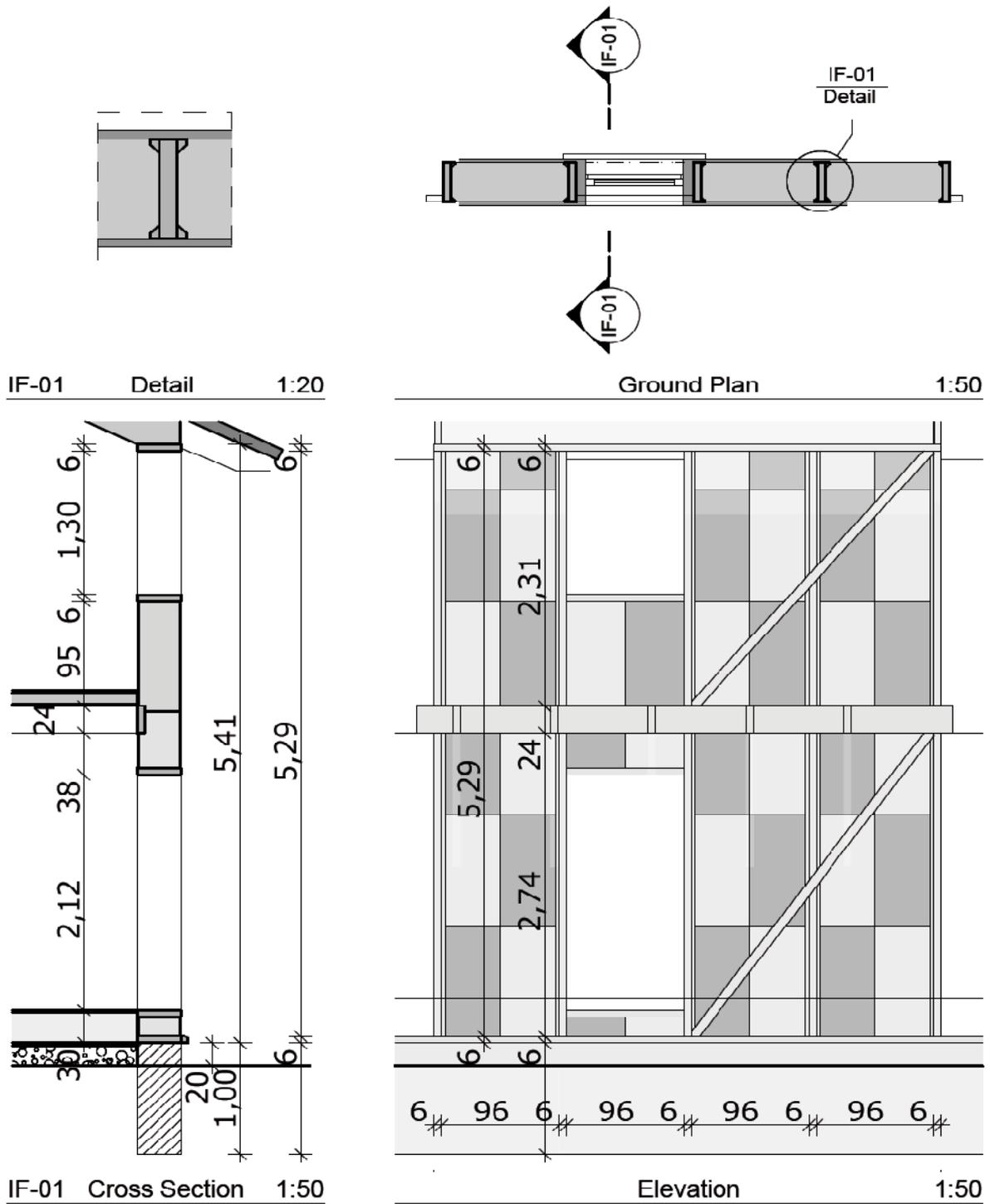
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4. Technical drawings 2D

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!!! Without scale !!!

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5. Explanation of the method

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Strip footing, gravel in between, thin layer of concrete as base plate



If prefab: After framing, stacking bales, compression done by hand and personal weight



If prefab: Erecting wall elements by crane



If infield: Stacking bales in standing wall



Interior earth plaster with spraying machine. Reed on timber parts. Airtightness with masking tapes.



Exterior lime plaster. Rounded soffits. Oak timber piece against moisture at window sill.

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6. Calculation sheet

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Material amounts

per chosen wall area of:

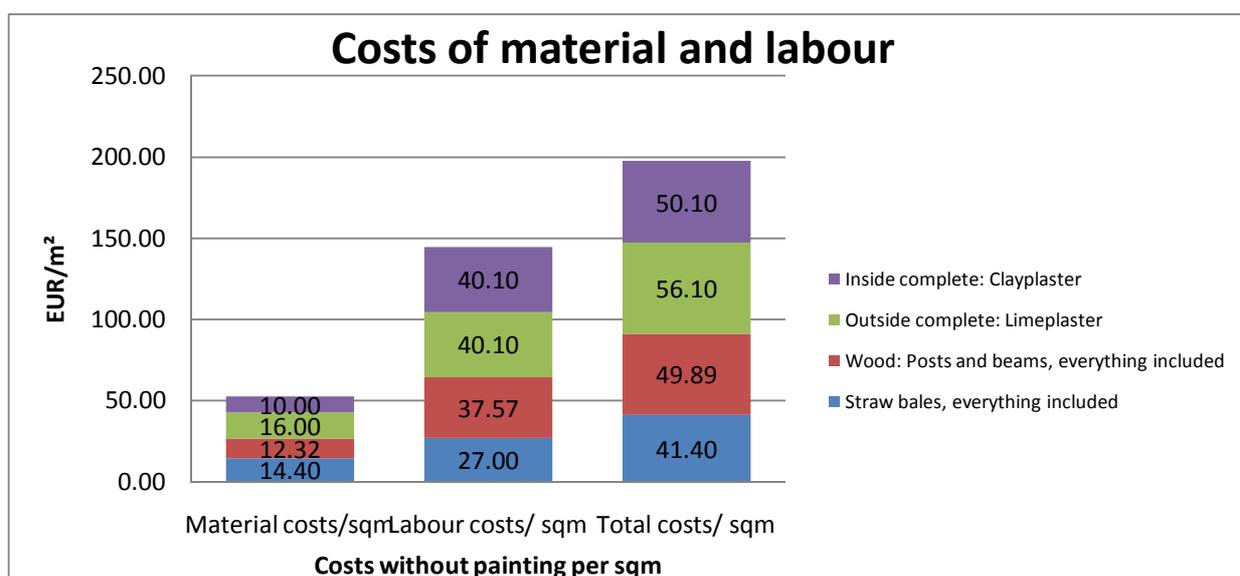
Total wall area	22.397 m²	Wall length	4.140 m	Wall height	5.410 m
Total wall volume	8.063 m³			Wall thickness	0.360 m
Strawbales	8.063 m³				
Wood	0.690 m³				
Laminated timber	m ³				
Regular timber	0.690 m ³				
Metal parts	kg/m²				

Costs of material and labour

Calculated in subject to the conditions of the producing country

Total **197.48 €/m²**

	Labour input/	Material costs/sqm	Labour costs/ sqm	Total costs/ sqm
Straw bales, everything included	h	14.40	27.00	41.40 €/m ²
[1] Wood: Posts and beams, everything included	h	12.32	37.57	49.89 €/m ²
Outside complete: Limeplaster	h	16.00	40.10	56.10 €/m ²
Inside complete: Clayplaster	h	10.00	40.10	50.10 €/m ²



[1] Material costs for metal parts and screws etc. included in Labour costs

[2] Material costs for metal parts and screws etc. included in material costs

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7. Questionnaire

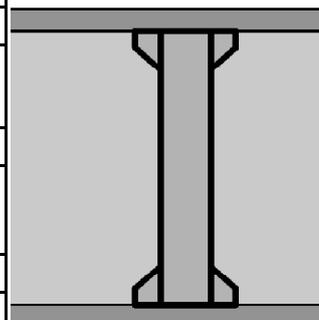
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1	Fixation of bales
1.1	How are your bales secured in the wall? <i>With small wooden batten 3x5cm fixed at each corner of a post where strawbale is touching. Also vertical compression is done by hand.</i>
2	Bales without gaps
2.2	How do you ensure tightness of the strawbale wall insulation (stuffing gaps between bales with loose straw for example)? <i>Stuffing the gaps with loose straw</i>
3	Moisture
3.1	How do you deal with potential of rain bouncing from the ground surface and ground humidity ? <i>Bottom of the first row of bales is lifted minimum 20 cm above the</i>
3.2	How do you deal with possibility of water intrusion from building's interior at each floor level? <i>Strawbale "Infill systems walls don't need to be protected against this.</i>
3.3	How do you protect straw in your walls against wind driven rain ? <i>With 3 layers of lime plaster with a hydrophobic paint.</i>
3.4	How do you protect your wall during it's construction from weather? <i>Either roof is already finished before stacking the bales (if infield construction) or wall elements are covered with PE- sheets.</i>
3.5	How do you prevent water leakage at the window sill detail? <i>The window sill is detailed for resisting reliable against this.</i>
4	Bales
4.1	What are your criteria of bale quality (shape, density, moisture content...)? Give the borderline values. <i>Humidity < 15% / density 85-115 kg/m3 / bales : well shaped, fresh golden yellow colour, log straw fibres, certain dimensions</i>



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5	Wall coating
5.1	How do you ensure bond of the plaster/render (if included in your wall's assembly) with the straw?
	First layer of plaster is installed with power, if done by hand with a massage, if done by machine with it's pressure. If earth plaster, then mixtures with a lot earth and straw fibres are preferred.
5.2	How do you ensure that your plaster/render (if included in your wall's assembly) doesn't crack over connection of two different supporting materials (for example timber-straw connection)?
	Reed mats are fixed on the wooden parts and mesh is used within the plasters.
5.3	In case of using Boards, etc. What is important for you?
	It is important to install the boards without any gaps, especially on the outside of the wall (danger of moisture appearance)
6	Airtightness
6.1	What do you do to secure airtightness of the walls? Wall to ceiling, opening or ground floor. Is there a blowerdoor test?
	Using paper and sheets and masking tapes at corners material transitions, wall to ceilings edges of interior wall to SB- walls. Blowerdoortest gave $n_{50}=0.3$
7	Fire resistance
7.1	How do you protect the walls from fire, while building and after? Do you refer to official approvals?
	SB- walls are protected against fire with plaster. With 1cm thickness we've approvals for REI 30 and flameresistant.



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8. Sustainability

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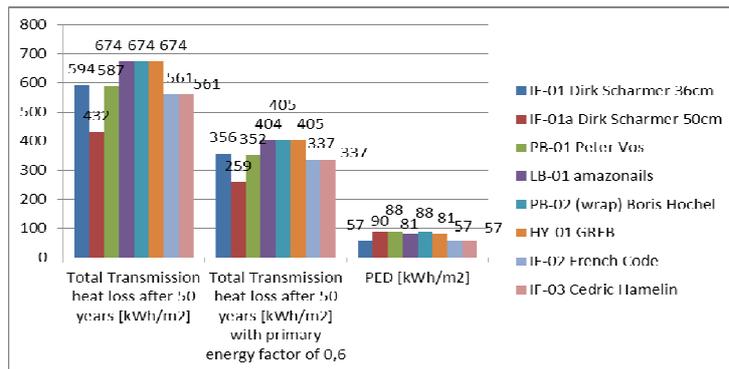
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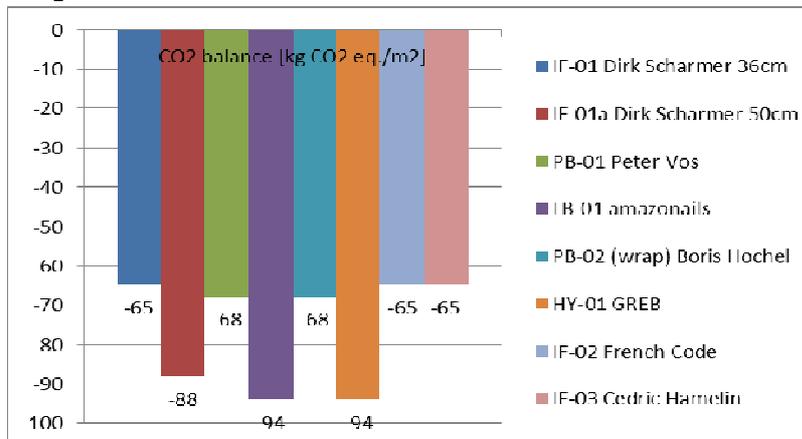
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Primary energy demand non renewable (PED) for construction and total transmission heat loss after 50 years



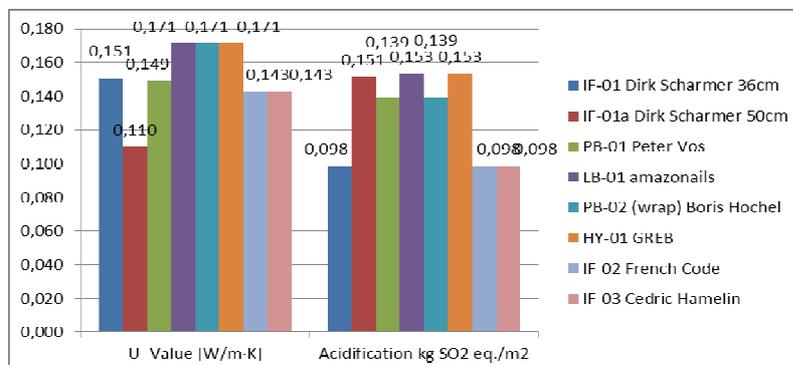
THL [kWh/m ²]	594
THL fp=0,6 [kWh/m ²]	356
PED [kWh/m ²]	57

CO₂- Balance for construction



CO ₂ - Balance [kg CO ₂ eq./m ²]	-65
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U- Value and acidification potential



U- Value [W/m ² K]	0.151
Acidification [kg SO ₂ eq./m ²]	0.098

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9. Evaluation Sheet

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	Assessment value	Present	Validation
Technical properties			
Thermal behaviour			
Thermal resistance R [K·m ² /W]	≥ 5,7 [at λ=0,051]	6.79	✓
Fire behaviour			
Fire resistance	≥ REI 30	REI 30 - 90	✓
Moisture behaviour			
Approved absence of mould	[1], [2], [3]	[1], [2], [3]	✓
Sound insulation			
Rw [dB]	≥ 44	44 dB	✓
Airtightness			
Blowerdoor test passed	n50 < 1,5 (air change at 50pa)	n50=0,3	✓
Costs/ Effort			
Labour input [h/m ²]	< 15 h/m ²	not calculated	o
Labor costs [EUR/m ²]	< 125 EUR/m ²	144.77	✓
Material costs [EUR/m ²]	<125 EUR/m ²	52.72	✓
Total costs [EUR/m²]	<250 EUR/m ²	197.48	✓
Sustainability			
CO2-Storage [Kg/m²]	> 60	61.40	✓
PED nre [kWh/m²]	< 100	50.24	✓
Wood usage [kg/m ²]			
Metal usage [kg/m ²]			
Professional execution			
Fixation of bales			✓
Handling/ installing of bales			✓
Protection to moisture/ water bouncing from ground			✓
intrusion from interior floors etc. during construction			o
at wall openings			✓
Bale quality [Quality Assurance]			✓
Cladding			✓
Plaster			✓
Boards/ other			✓

[1] visual examination of installed straw after years.

[2] Microbiological investigation in laboratory of installed straw

[3] General approval for mould absence