Gradimo imajući na umu planetarne granice

EcoCocon – zidni konstruktivni sustav od slame i drva

Inovacijski Forum AdriaTech2025

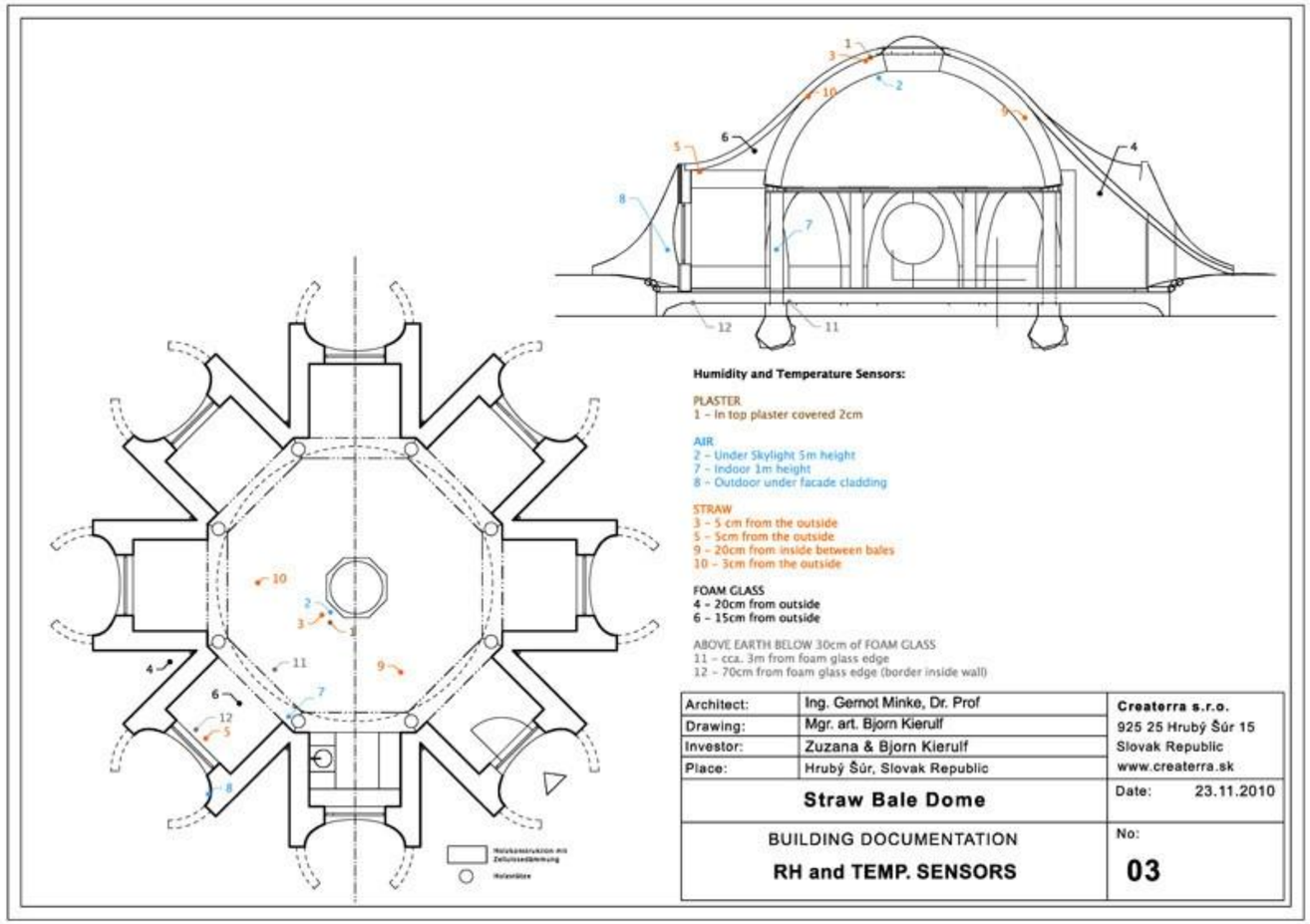
Marina Zajec / Arhitektura E.L.I.

Početak – DIY

Eksperimentalna slamnata kupola

- Arhitekt: Gernot Minke
- Koautor: Createrra s.r.o. | Bjørn Kierulf
- Završetak: 2011.

Početak – DIY



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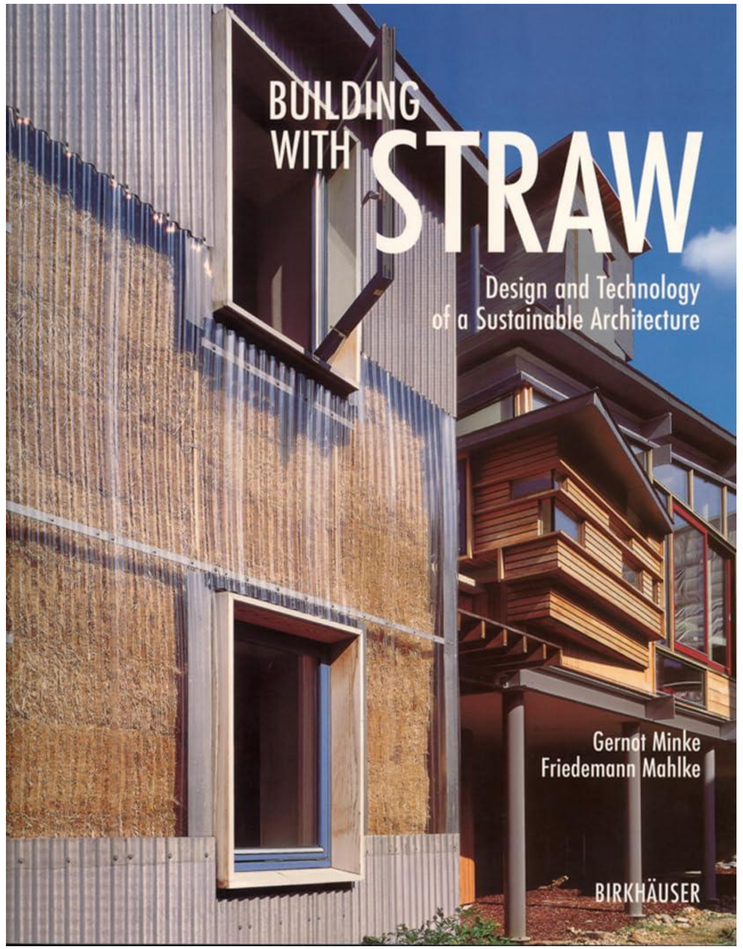


Eksperimentalna kuća od slame

- Arhitekt: Marina Zajec
- Završetak: 2011.

Početak – DIY

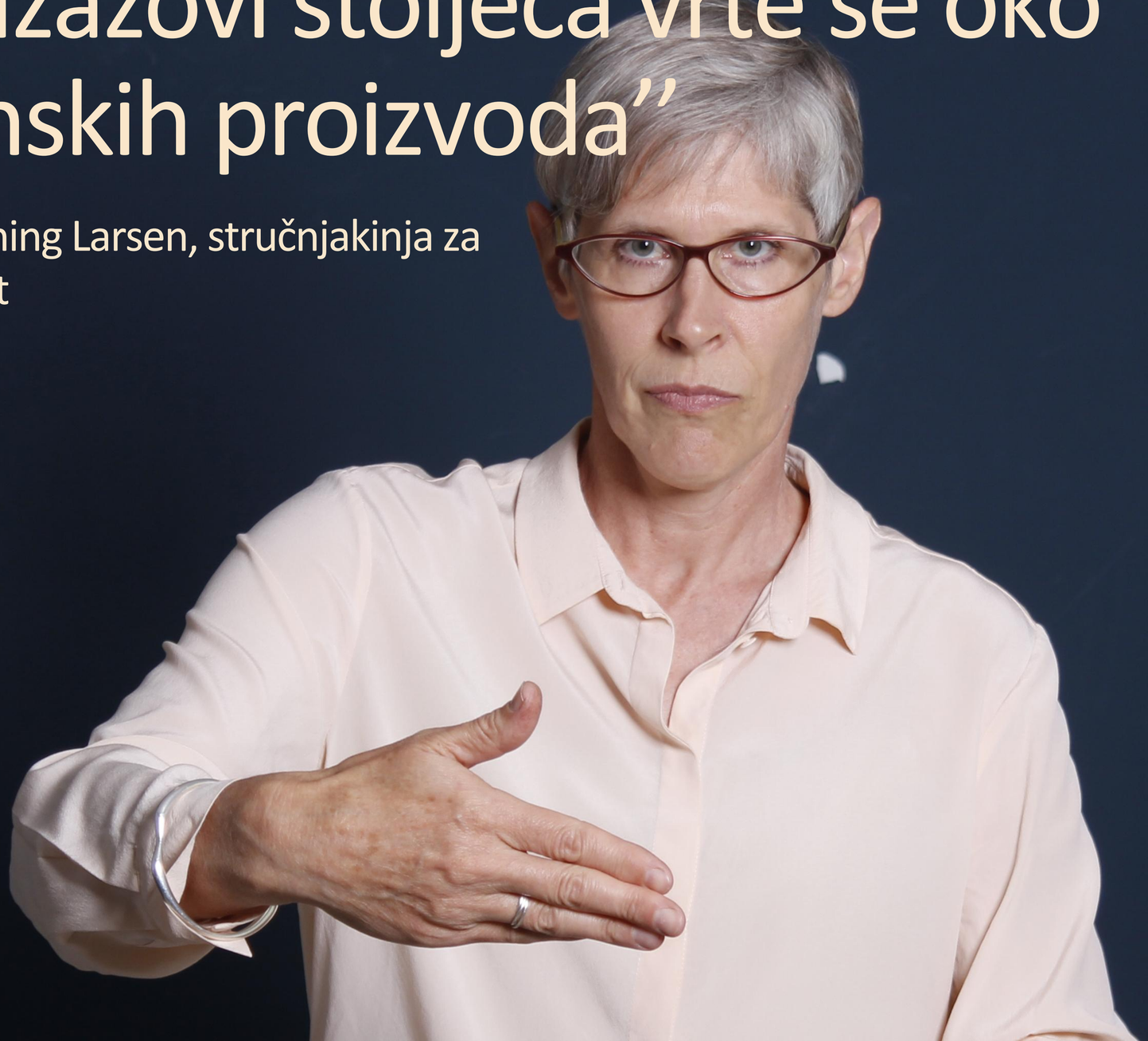
Eksperimentalna kuća od slame

- Arhitektica: Marina Zajec
- Završetak: 2011.

EcoCocon – od DIY do MAINSTREAM

„Glavni izazovi stoljeća vrte se oko građevinskih proizvoda"

-Martha Lewis, Henning Larsen, stručnjakinja za materijale i održivost



Zidni konstruktivni sustav osmišljen u skladu s prirodom

- 98% sirovi, obnovljivi materijali
- Konstrukcija koja pohranjuje CO_2
- super-izolirani, paropropusni zidovi
- visoka udobnost u unutarnjem prostoru
- Izrađen po mjeri, u skladu s individualnim dizajnom
- dosljedna i certificirana kvaliteta

Panel

» nosivi dupli drveni okvir

» ispuna stlačenom slamom

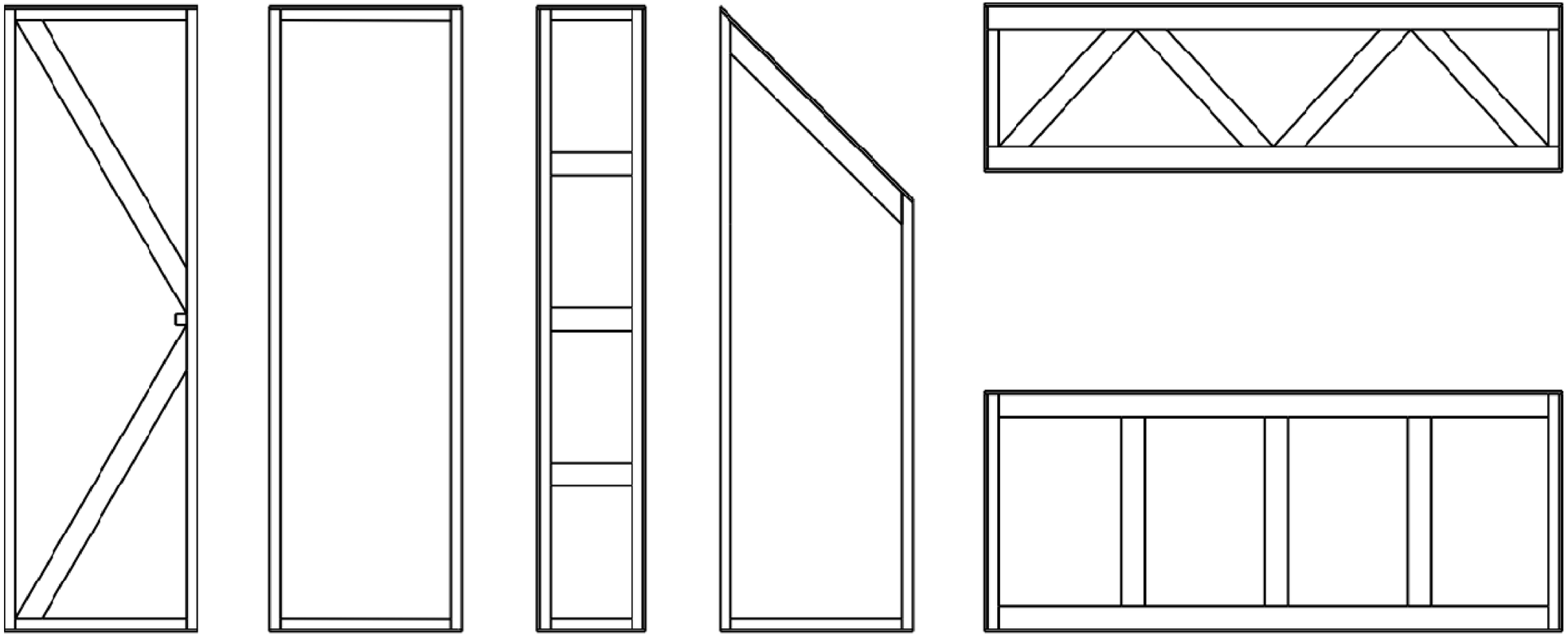
» panel širine od 400 to 1200 mm

» standardna debljina 400 mm

» do 3 m visine

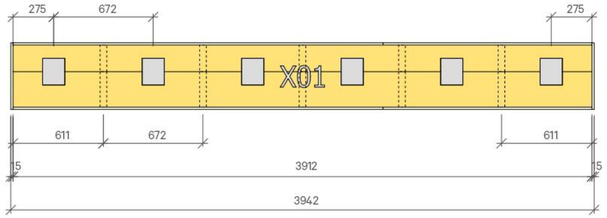
Vrste panela

- » Ukrutni
- » Standardni
- » Stup
- » Kosi
- » Nadvoj
- » Parapet

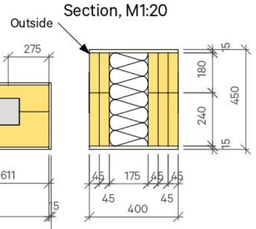


X-box elementi

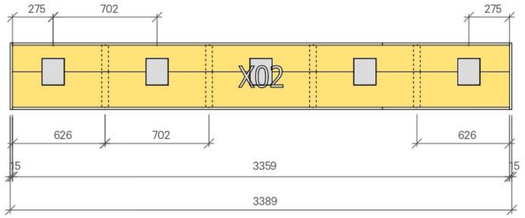
X01, Quantity: 1, M1:30



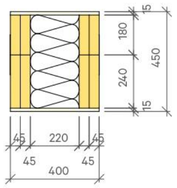
Section, M1:20



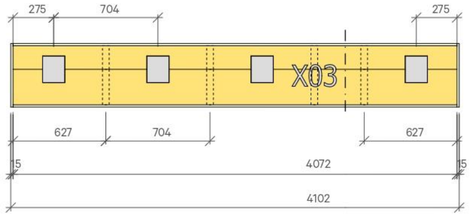
X02, Quantity: 1, M1:30



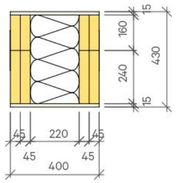
Section, M1:20



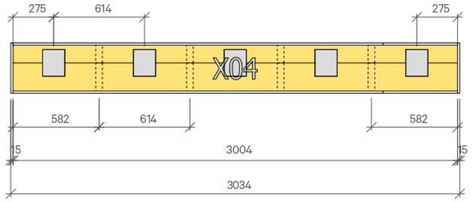
X03, Quantity: 1, M1:30



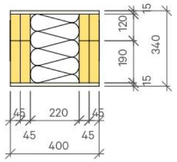
Section, M1:20



X04, Quantity: 1, M1:30



Section, M1:20



Standardni sastav zida

VANI

1. Ventilirana obloga / Žbuka
2. Izolacijska ploča od drvenih vlakanaca (60 – 100 mm)
3. Zrakonepropusna paropropusna membrana
4. Panel od drva i slame (400 ili 300 mm)
5. Podložna glinena žbuka (25 mm)
6. Armaturna mrežica
7. Fina glinena žbuka (3 mm)

UNUTRA

Svojstva panela

Svojstvo	Deklarirana vrijednost
Reakcija na požar	B-s1, d0
Zračna zvučna izolacija	54 dB
Vertikalna nosivost	do 110 kN/m *
Preciznost	2 mm na 3 m duljine *
Prosječna gustoća slame	115 kg/m^3 *
CO_2 emitiran u proizvodnji	2.8 kg/m^2 *
CO_2 vezani	97.6 kg/m^2 *
Vrijeme ugradnje	20-40 min per m^2 *

Nosivost panela:

Vrsta panela	Characteristic vertical loadbearing capacity (kN/m)
Standardni panel	60.0
Ukrutni panel	38.5

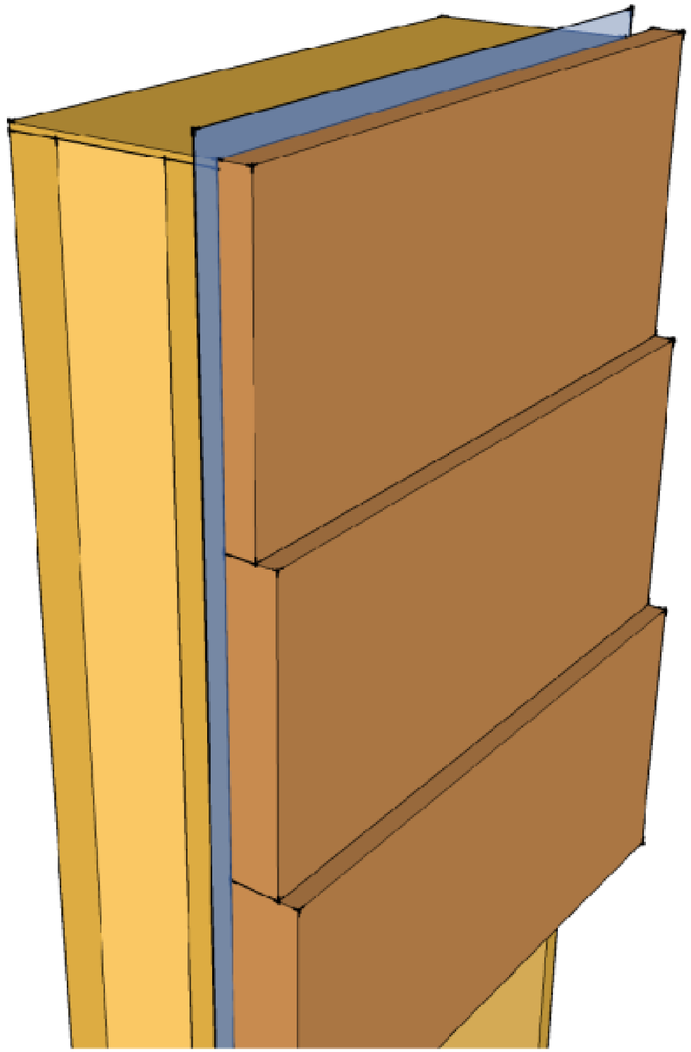
Vrsta panela	Characteristic vertical loadbearing capacity (kN/m) under horizontal load q (kN/m2)		
Horizontalno opterećenje	60.0	60.0	60.0
Standardni panel	38.5	38.5	38.5
Ukrutni panel	38.5	38.5	38.5

*samo EcoCocon paneli

Certificirani građevni blok

- » Tehničko dopuštenje koje vrijedi diljem EU
- » Kiwa Inspecta: redovita kontrola kvalitete od treće strane
- » Otpornost na požar i reakcija na požar – provedena ispitivanja
- » Certifikati - Passivhaus, Cradle2Cradle, akustična svojstva & EPD (Okolišna deklaracija proizvoda)
- » WUFI simulacije
- » Usklađeno s EU taksonomijom

Izolacijska svojstva



U-values with wood fibre board:

60 mm - U=0.121 W/m²K

100 mm - U=0.110 W/m²K

140 mm - U=0.100 W/m²K

Calculated layer values:

0.700 W/mK for clay (30 mm)
0.056 W/mK for Straw (400 mm, 90%)
0.130 W/mK for Wood (400 mm, 10%)
0.046 W/mK for wood fibre board
1.400 W/mK for plaster (7 mm)

- Izvanredna toplinska izolacija (U = 0.121 W/m²K)
- Passivhaus Institut certificirana komponenta

Reakcija na požar

4.2 CLASSIFICATION

The product, Loadbearing wall composed of EcoCocon straw modules, in relation to its reaction to fire behaviour is classified:

B

The additional classification in relation to smoke production is:

s1

The additional classification in relation to flaming droplets/particles is:

d0

The format of the reaction to fire classification for construction products excluding floorings is:

Fire behaviour		Smoke production			Flaming droplets	
B	-	s	1	,	d	0

Reaction to fire classification: B – s1, d0

4.2.1. Classification

The product, wooden frame outside panels with thermoinsulating straw filling in relation to its reaction to fire behavior is classified:

E

The format of reaction to fire classification construction products excluding floorings and linear pipe thermal insulation products is:

Fire behaviour		Smoke production			Flaming droplets	
E	-	-	-	,	-	-

i.e. E

Gaisrinių tyrimų centras PTS

Reaction to fire classification: E

Otpornost na požar

REI 120

4.2 CLASSIFICATION

The element, **Loadbearing wall composed of EcoCocon v02 twin-stud timber frame panels with straw insulation infill covered from external face with vapour barrier**, is classified according to the following combinations of performance parameters and classes as appropriate.

Fire resistance classification:

Note: valid only for fire action on the internal face of the wall – SOLITEX MENTO 3000 diffusion-open membrane on the external wall face.

RE 45 / REI 45 / REW 45

4.2 CLASSIFICATION

The element, **a load-bearing wall composed of EcoCocon straw modules covered on its external face with Steico Protect H wood fibre boards and on its internal face with clay base plaster (Variant A)**, is classified according to the following combinations of performance parameters and classes as appropriate:

Fire resistance classification:

(Valid for fire action on internal wall face covered with clay base plaster)

RE 120 / REI 120 / REW 120

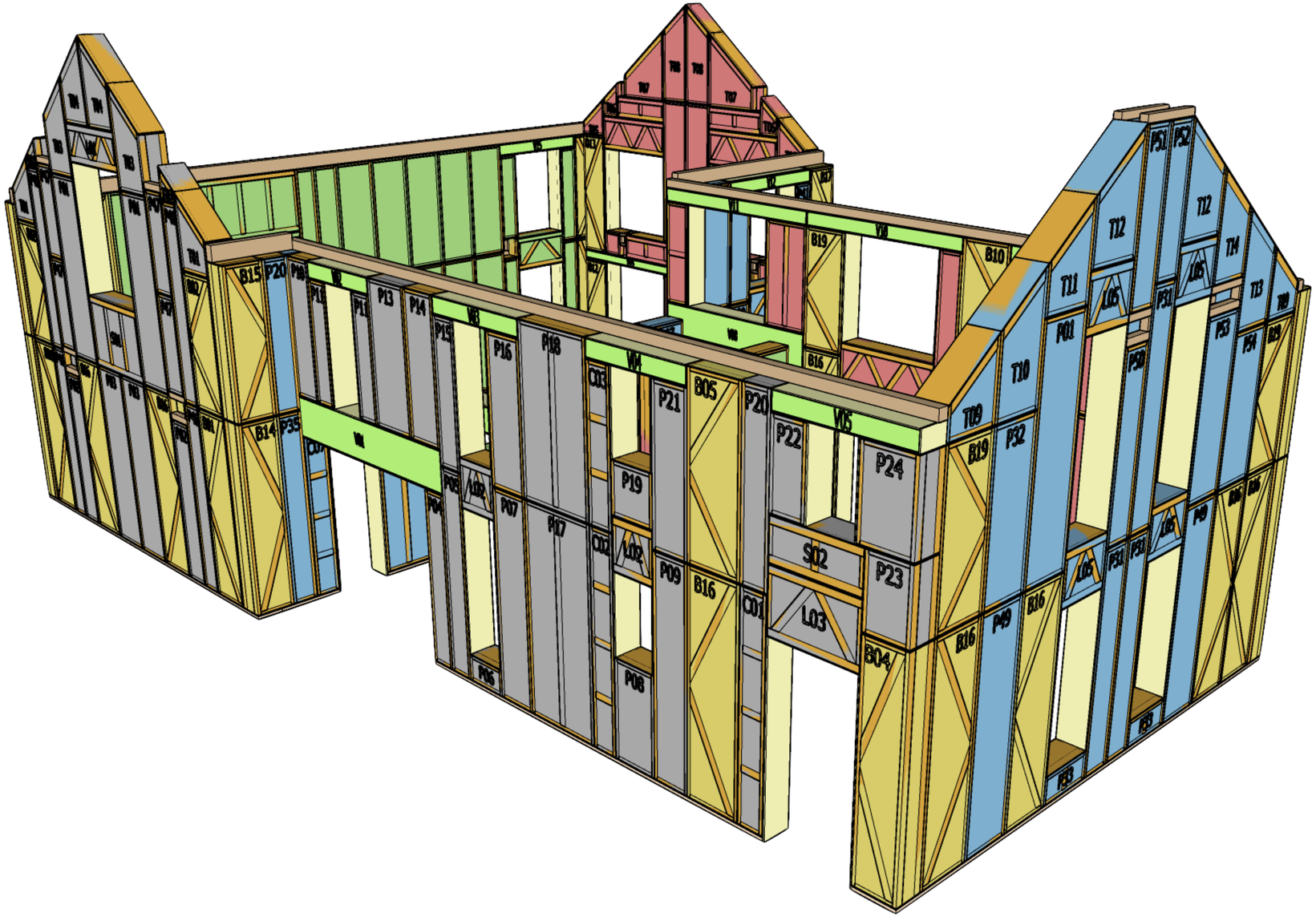
Fire resistance classification:

(Valid for fire action on external wall face covered with wood fibre boards Steico Protect H)

RE 120-ef / REI 120-ef / REW 120-ef

Projekt panela

- » izrađuje EcoCocon konstruktor u suradnji s arhitektom i projektantom konstrukcije
- » opisuje sve vrste panela i njihove dimenzije
- » paneli označeni bojama i oznakama
- » osnova za izradu finalne ponude
- » služi kao plan montaže



Učinkovite tehnike predmontaže

- cijeli zidni segmenti mogu se unaprijed sastaviti u zaštićenim uvjetima
- prozori, membrane, izolacijske ploče, čak i žbuke mogu se nanijeti unaprijed
- ubrzavanje montaže na gradilištu
- smanjenje negativnih utjecaja vremenskih uvjeta

EcoCocon kao tvrtka

- Osnovana u Litvi
- Sjedište u Bratislavi, Slovačka
- 15+ godina iskustva
- Aktivna u 25 država na tri kontinenta
- 2 tvornice: Litva i Slovačka
- Godišnji kapacitet proizvodnje: 71,000 m²

Cilj za 2034:

1 milijun m²

godišnje proizvodnje

Photo credits: Milan Hutera

EcoCocon Tvornica

Veličina: 620 m²
Godina: 2024

Arhitekt: Createrra
CO_2 vezani: 46,5 tona

Photo credits: Milan Hutera

EcoCocon Tvornica

- Prva automatizirana tvornica slamnatih zidnih panela na svijetu.
- Mogućnost proizvodnje duboko zelenog biogenog građevinskog rješenja u industrijskim razmjerima.
- Sadrži jedinstvenu automatiziranu proizvodnu liniju.
- Napaja se uglavnom solarnom energijom.
- Sama glavna dvorana izrađena je od EcoCocon panela, što potrebe za grijanjem svodi gotovo na nulu.

Prva automatizirana proizvodnja takve vrste

Foto: EcoCocon

Hyllie

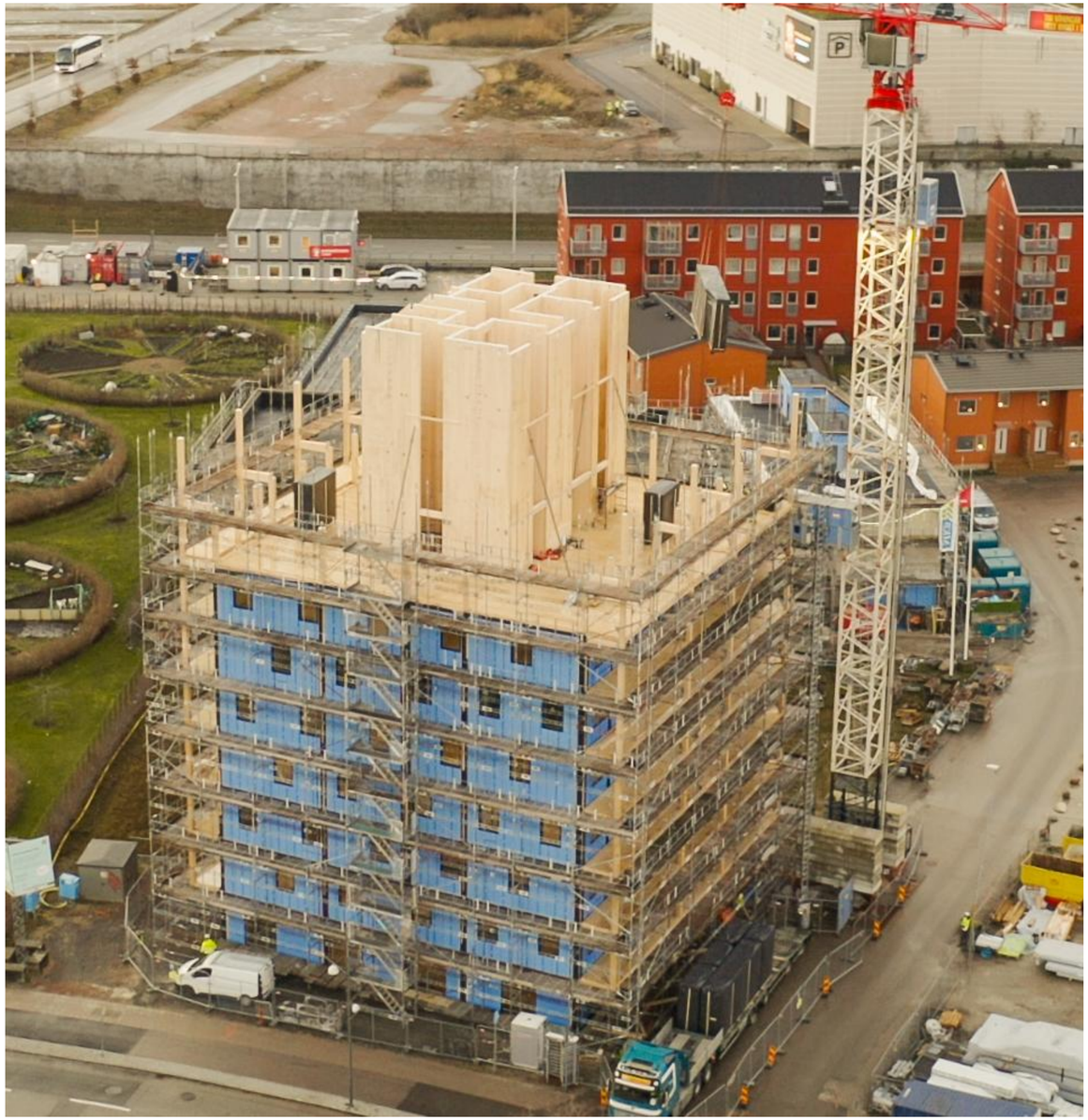
Godina: 2025
Arhitekt: Kaminsky Architects

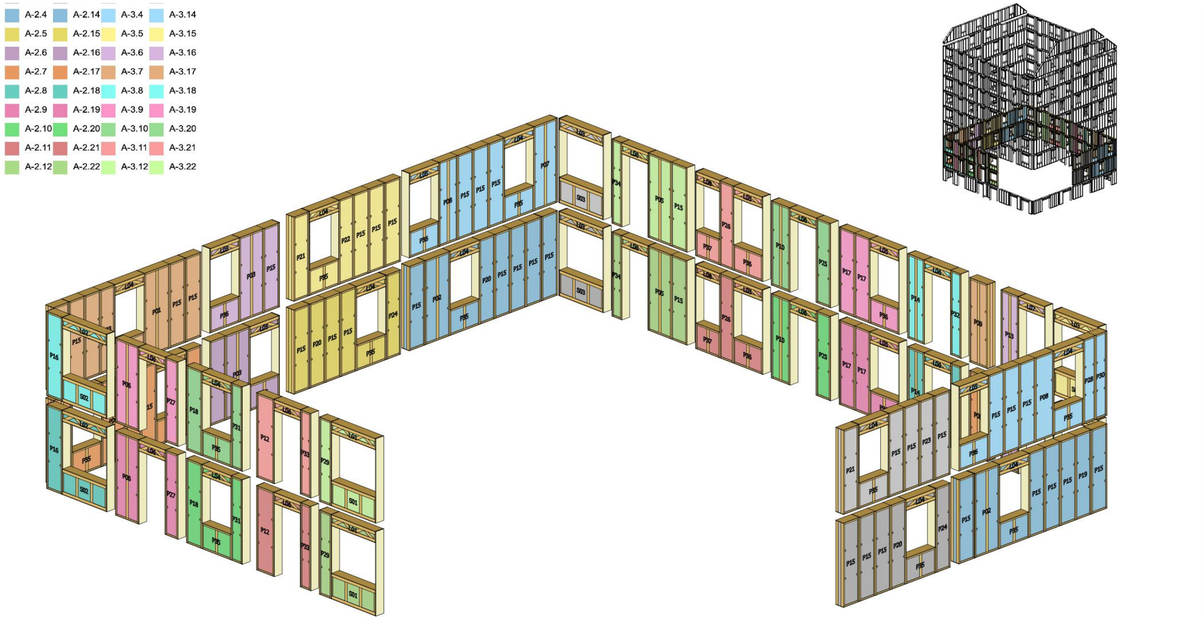
1389 m² EcoCocon panela

52 stana za najam + uredi i ugostiteljski sadržaji

CLT jezgra & Prefabrikacija

Photo credits: ETC BYGG





Veličina: 250 m²

Godina: 2022.

Arhitekt: Henning Larsen

Feldballe Škola

Feldballe Škola

Photo credits: Rasmus Hjortshøj and Helene Høyer Mikkelsen.

Photo credits: Rasmus Hjortshøj and Helene Høyer Mikkelsen.

Feldballe Škola

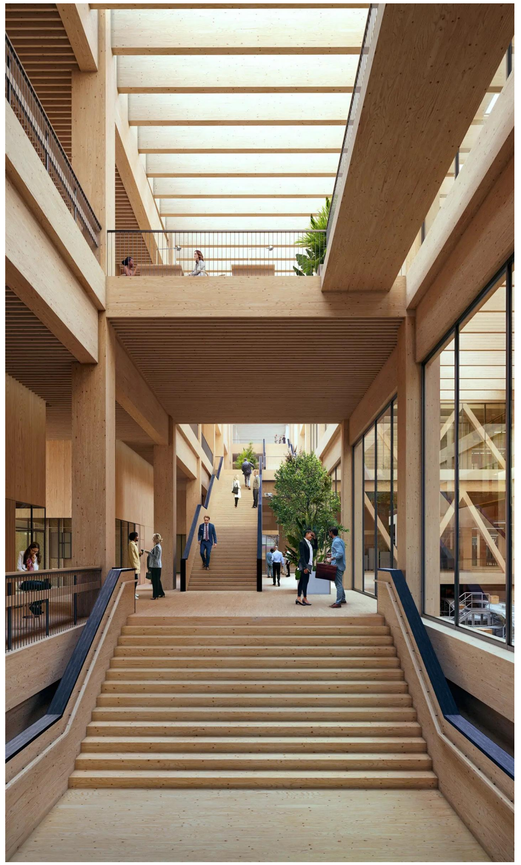
Logistički centar West

Veličina: 155 000 m²

Godina: 2025.

Arhitekt: Henning Larsen

EcoCocon Paneli: 40,900 m²



Logistički centar West

Bygningskomponentprisen
286 followers
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Thank you for an inspiring celebration of the Building Component Award 2025, which is awarded by VELUX FONDEN and Villum Fonden 🌿
A big thank you to everyone who participated and helped celebrate the big in detail – and not least this year's award winners Lars Keller from EcoCocon and Simon Ingvartsen from Henning Larsen Architects for their pioneering work with straw elements on a large scale. Their efforts make it possible to build Bestseller's new logistics centre in the Netherlands with 155,000 m² of biogenic materials – an important step towards more sustainable construction.
Lars Bo Nielsen, CEO of Villum Fonde, reminded us that we are in a time of upheaval, where the climate crisis requires new thinking – and that building components play a special role in that transition, while
Chairman of the Villum Foundation, Jens Kann-Rasmussen pointed out that even the smallest details in our surroundings can have a great impact – and that green construction requires perseverance, courage and ingenuity
Thank you for a festive and inspiring afternoon – and to everyone who contributes every day to developing the construction in a more sustainable direction.

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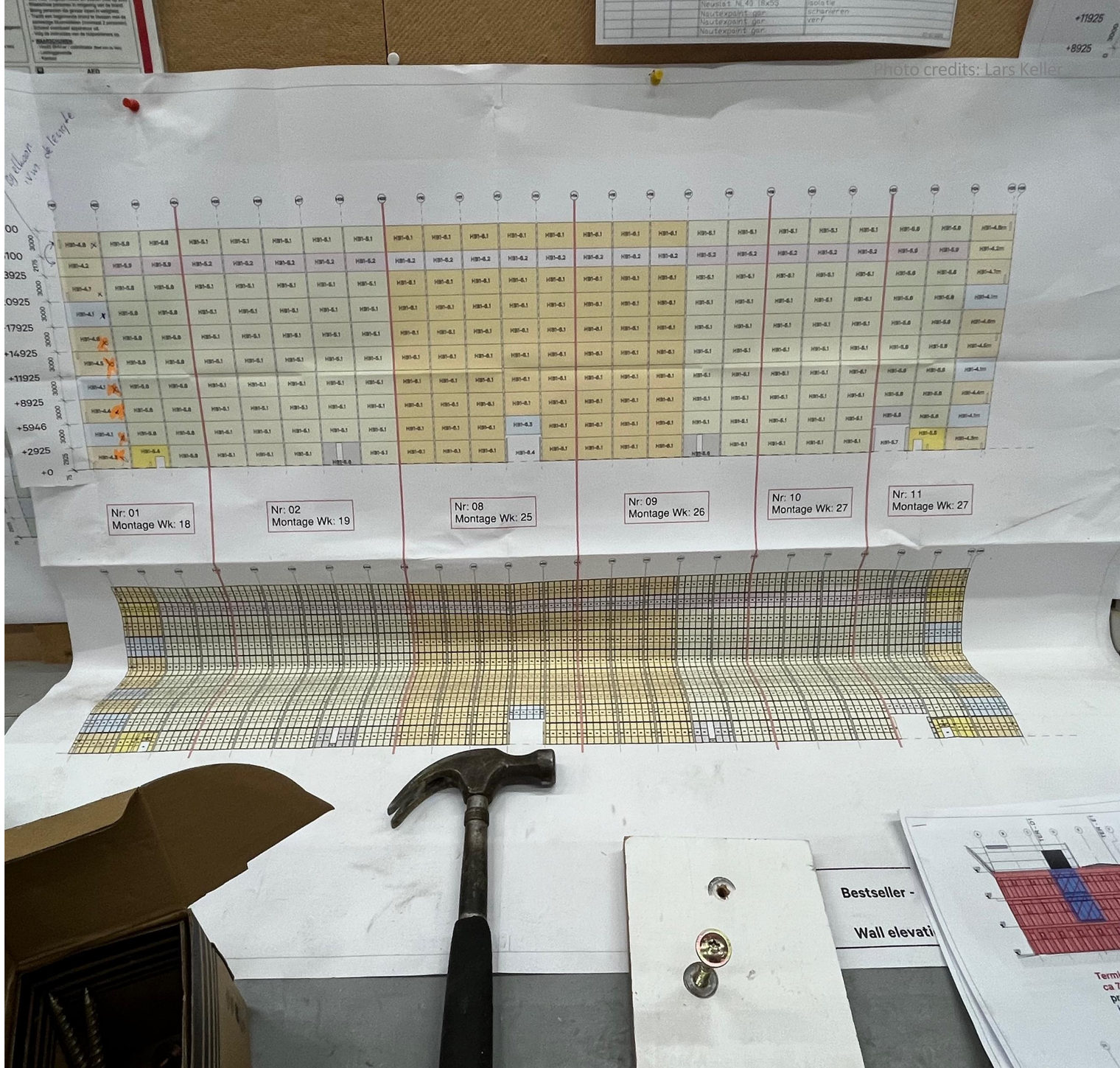
Photo credits: Photo Aesthetica

Mock-up i prefab-elementi za zgradu Terminala

Photo credits: Lars Keller, Robbert Urlings, Van de Ven

Pohrana i plan proizvodnje za zgradu High Bay 1



Prefabrikacija za zgradu High Bay

Photo credits: Hans Keller

Zgrada High Bay visoka 30 m u izgradnji (11.154 m² EcoCocon elemenata)

Photo credits: Van de Ven

EcoEspai

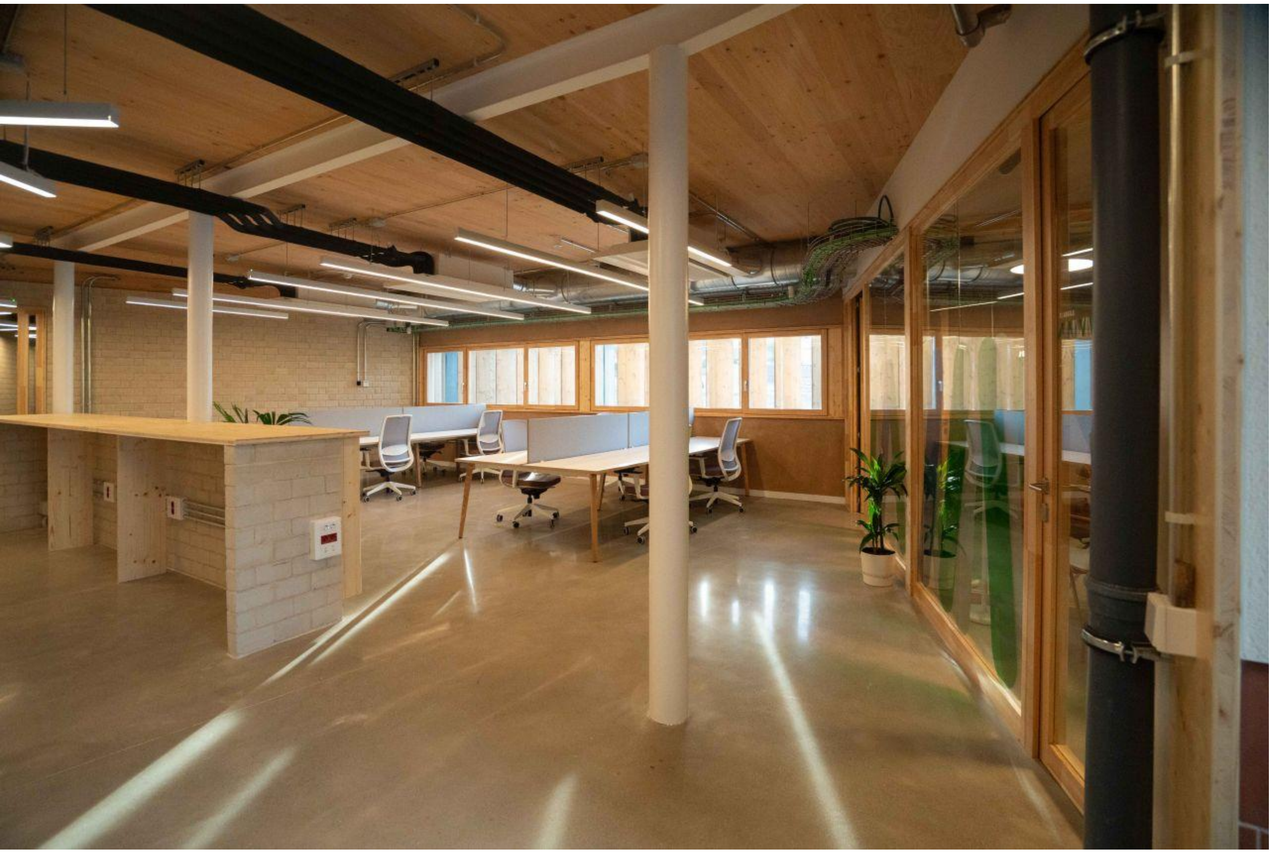
Photo credits: gpK | Architect: Pepe Milá

EcoEspai

Površina: 1000 m²
Godina: 2025
Arhitekt: Pepe Milà (OP Team)
Namjena: administrativni uredi, kultura i coworking prostori

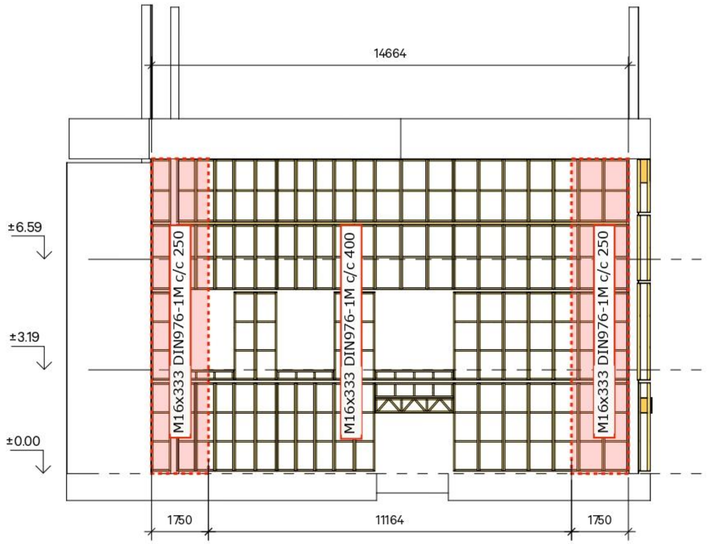
Korištena rješenja:

- Hibridna struktura koja kombinira CLT i EcoCocon zidne panele
- Izloženi prirodni materijali: drvo, glina, slama i nabijena zemlja
- Izloženi tehnički sustavi (u edukativne svrhe)
- Velika unutarnja udobnost prilagođena suvremenim potrebama
- Organski arhitektonski dizajn („Hobotnica“)



Aranda de Duero

Aranda de Duero



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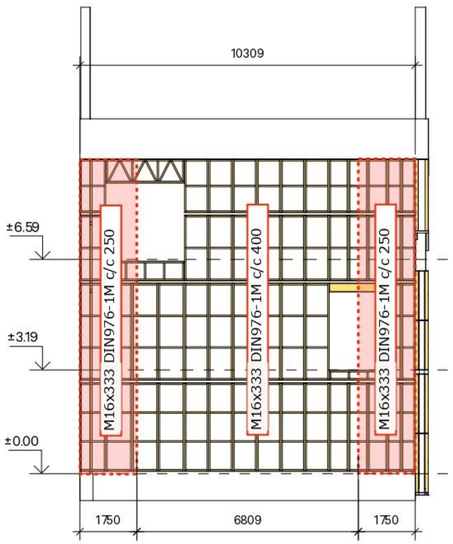
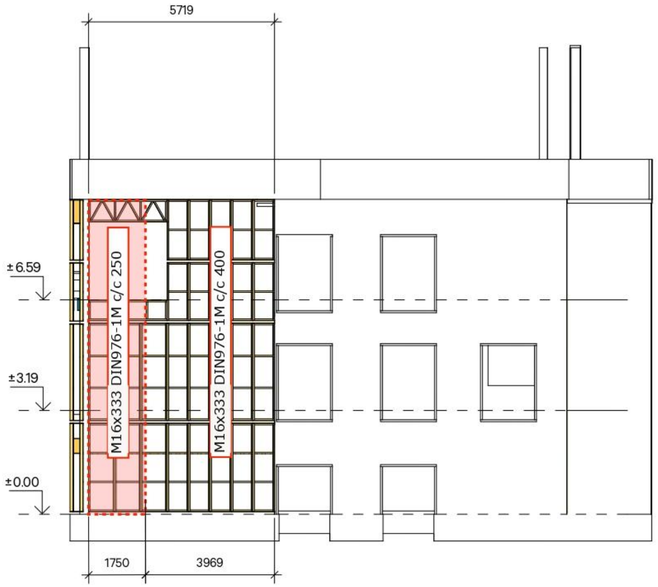


A-0.3

Fastener Specification			
N	Code	Name	c/c mm
1	110353	Rock Senkkopf; Stahl verzinkt; TX40 7,5x140	400
2	975705	Gewindestange DIN976-1M, M16x250; verzinkt Stahl 4.8 10	400
2	800281	NUT Sechskantmutter M16 DIN 934; galvanisch verzinkt	400
2	800253	WHASER Unterlegscheiben DIN 440; galvanisch verzinkt 13,5x44	400
2	200085	Injektionsmörtel, inkl. Statikmischer 300ml, Injection mortar Classic	400
3	975705	Gewindestange DIN976-1M, M16x333; verzinkt Stahl 4.8 10	See drawing 240207-11
3	800281	NUT Sechskantmutter M16 DIN 934; galvanisch verzinkt	See drawing 240207-11
3	800253	WHASER Unterlegscheiben DIN 440; galvanisch verzinkt 13,5x44	See drawing 240207-11
3	200085	Injektionsmörtel, inkl. Statikmischer 300ml, Injection mortar Classic	See drawing 240207-11
4	945648	Paneltwistec AG Senkkopf; Stahl blau verzinkt; TX30 6x320	500
5	944594	Paneltwistec AG Tellerkopf; Stahl blau verzinkt; TX40 8x200	400
6	944591	Paneltwistec AG Tellerkopf; Stahl blau verzinkt; TX40 8x140	400
7	944589	Paneltwistec AG Tellerkopf; Stahl blau verzinkt; TX40 8x100	400



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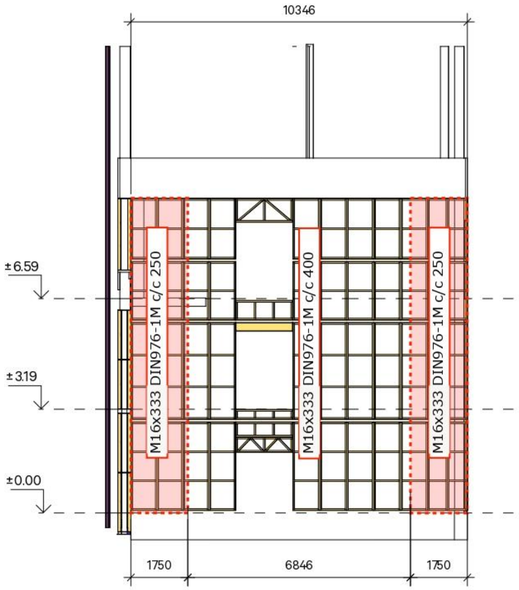


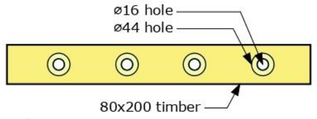
A-0.7

Paper size: 420 × 297

Project title:	Project code:	Date:	Check:
Aranda de Duero, ES	240207Det	09-07-2025	
Drawing title:	Scale:	Drawing no.:	Rev.:
M16 Bolt Fixing – Spacing Specification	1:150	240207-11	00

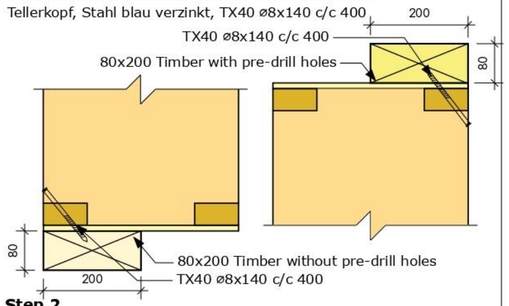
Aranda de Duero

Pre-drill ø16 hole in the 80x200 timber
Pre-drill ø44 hole for the washer 14mm deep



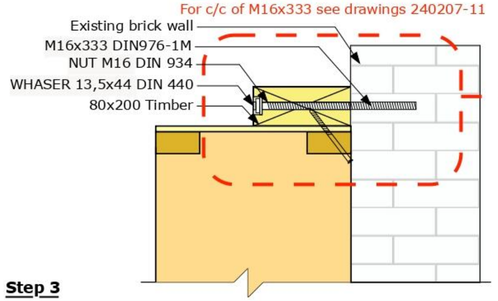
Step 1

Fix the timber to EcoCocon wall using Paneltwistec AG
Tellerkopf, Stahl blau verzinkt, TX40 ø8x140 c/c 400



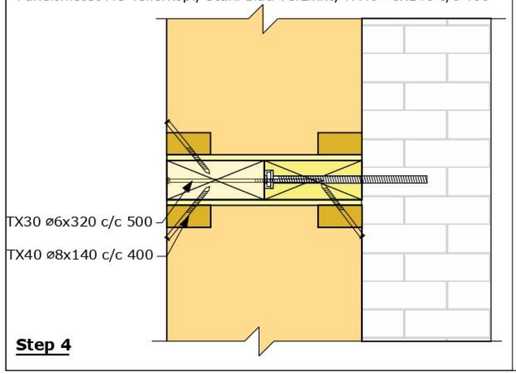
Step 2

Fix the timber to existing brick wall using chemical anchor
Gewindestange DIN976-1M, M16x333 verzinkt Stahl 4.8 10
NUT Sechskantmutter M16 DIN 934, galvanisch verzinkt
WHASER Unterlegscheiben 13,5x44 DIN 440, galvanisch verzinkt
Injection mortar Classic, Injektionsmörtel, inkl. Statikmischer 300ml
See the instructions in the red frame
For c/c of M16x333 see drawings 240207-11



Step 3

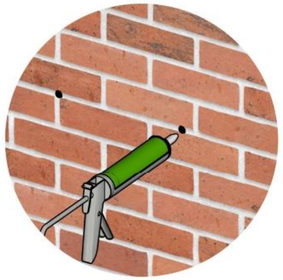
Stack two EcoCocon walls vertically.
Secure the two timber pieces attached to the EcoCocon wall using
Paneltwistec AG Senkkopf, Stahl blau verzinkt, TX30 ø6x320 c/c 500
Paneltwistec AG Tellerkopf, Stahl blau verzinkt, TX40 ø8x140 c/c 400



Step 4

Step 3

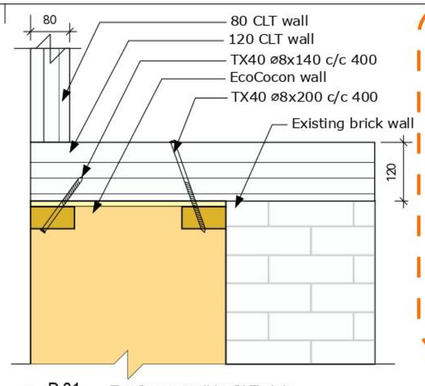
1. Mark hole positions on the brick wall
2. Drill ø18 holes into Brick Wall
3. Clean the hole



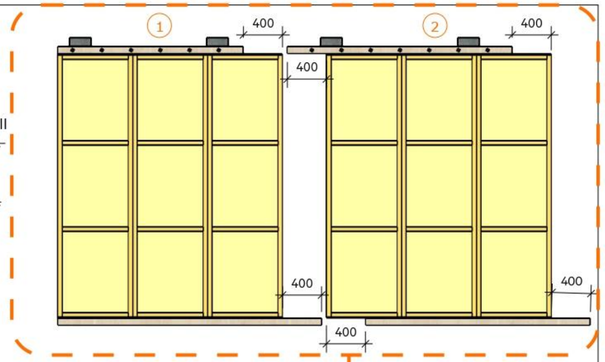
4. Inject the resin into the bottom of the hole, filling about 2/3 full.

5. Fix the timber in place
6. Slowly twist the threaded bolt into the hole
7. Let the resin fully cure

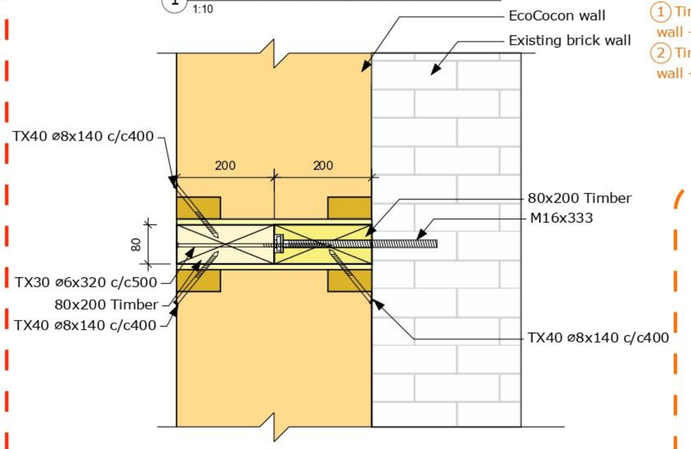
8. Add washers and nuts on the exposed ends and tighten them with a wrench.



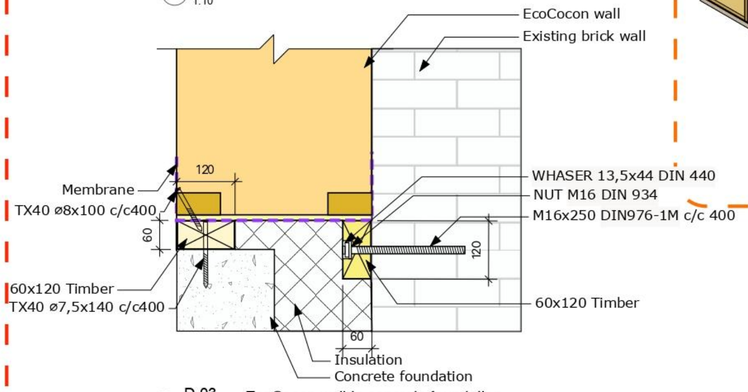
1 D.01 EcoCocon wall to CLT slab
1:10



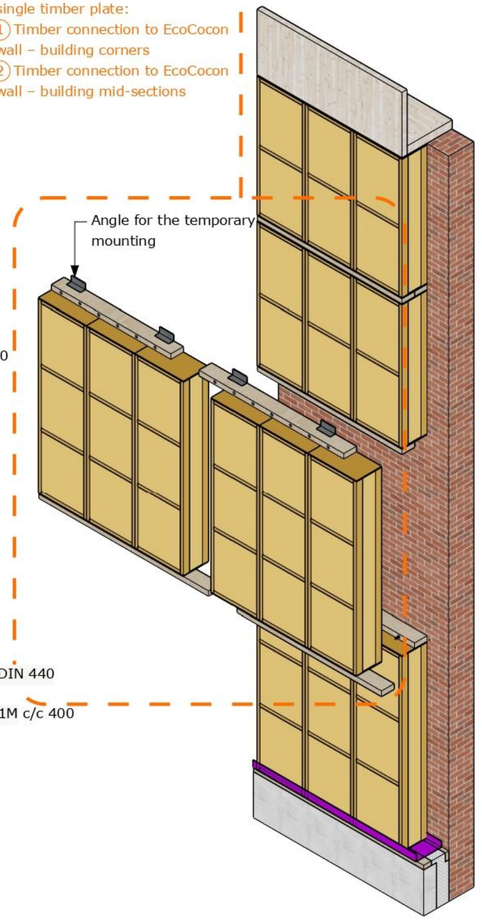
Fix three EcoCocon panels using a single timber plate:
1 Timber connection to EcoCocon wall – building corners
2 Timber connection to EcoCocon wall – building mid-sections



2 D.02 EcoCocon Wall-to-Wall Connection
1:10



3 D.03 EcoCocon wall to concrete foundation
1:10



Project title:	Project code:	Date:	Check:
Aranda de duero, ES	**240207det**	**09-07-2025**	
Drawing title: **EcoCocon Wall – Detail and Assembly Guide: Concrete Foundation & Existing Brick Wall**	Scale:	Drawing no.: **1**	Rev.: **00**

Paper size: 420 × 297

Stambeno naselje Eindhoven

Godina: 2019-2022

Stambeno naselje Trudo

Veličina: 3600 m²

Godina: 2025

Arhitekt: Faam Architecten Eindhoven

- 89 jedinica socijalnog stanovanja
- u potpunosti je dizajniran od biomaterijala
- stambeni objekti su blizu standarda pasivnih kuća i imaju minimalnu potrošnju energije
- uređenje okoliša zadovoljava visoke ekološke standarde, potičući bioraznolikost i društvenu povezanost kroz zajedničke vrtove koji se nalaze iza stambenih objekata

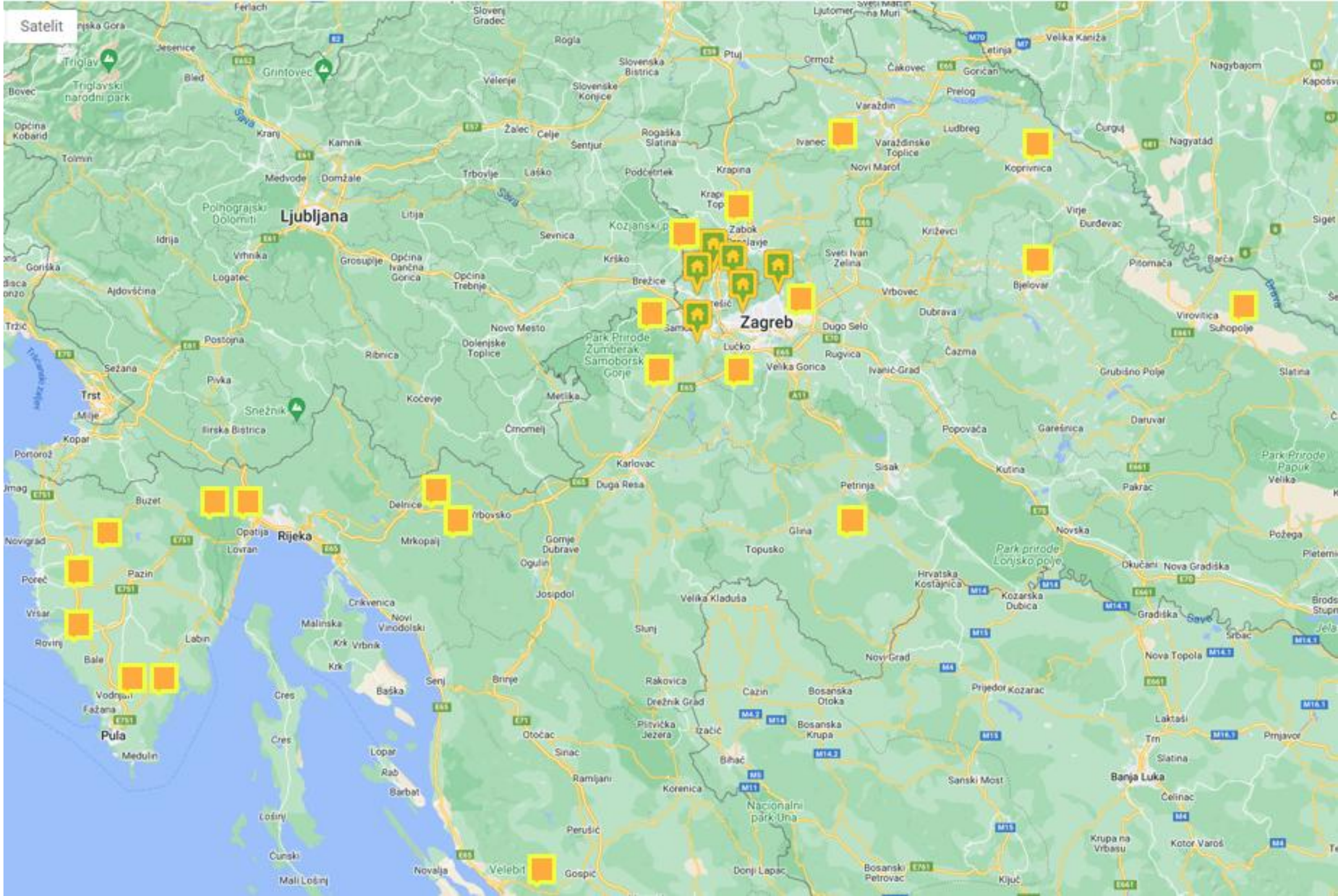
Stambeno naselje Trudo

Stambeno naselje Trudo

Stambeno naselje Trudo

EcoCocon u Hrvatskoj

Hrvatska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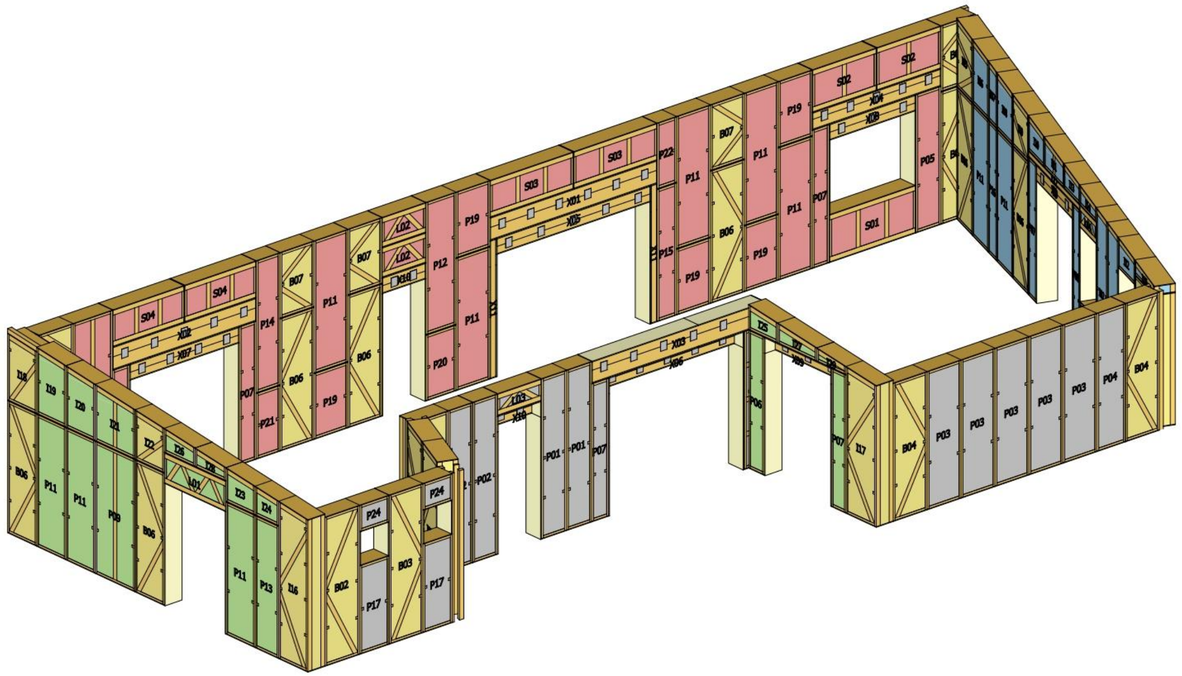

Figure 1. 3D view A, panels

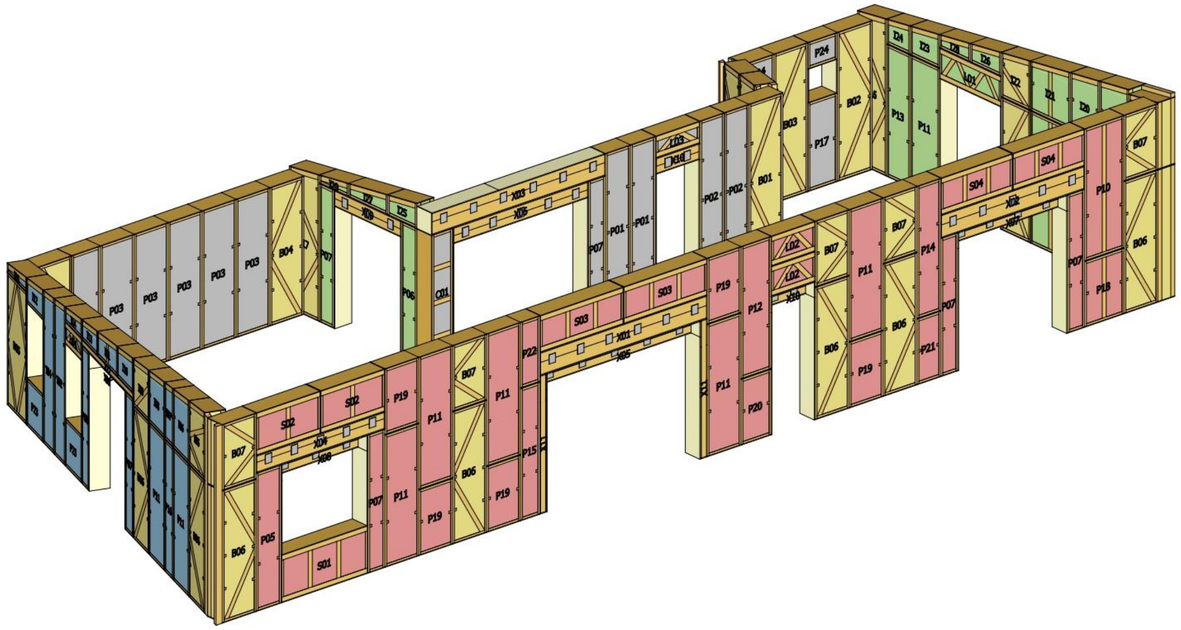

Figure 2. 3D view B, panels

V.N.

M.Z.

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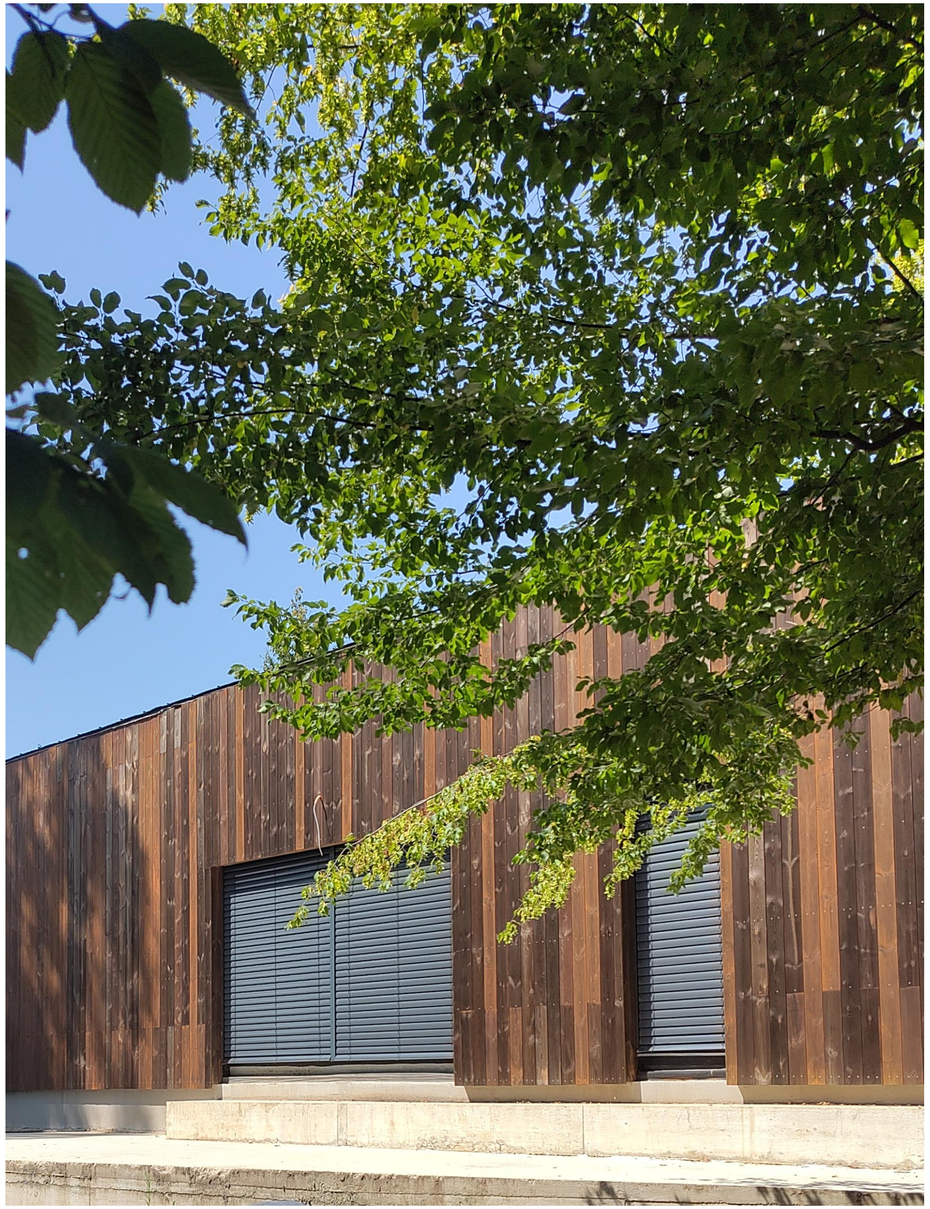

Gradimo bolju budućnost, slamom.

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