



HRVATSKA KOMORA INŽENJERA GRAĐEVINARSTVA

15. Dani Hrvatske komore inženjera građevinarstva

Opatija, 2021.

Smjernice ETICS na ETICS; BIM ETICS elementi

Dario Henezi

Dario Henezi, ing.građ., Knauf Insulation, Novi Marof
Voditelj tehničke grupe HUPFAS

HUPFAS – Hrvatska Udruga Proizvođača Toplinsko-Fasadnih Sustava; 10 godišnjica

- Članovi:

HUPFAS je hrvatska udruga proizvođača toplinsko-fasadnih sustava.

Članice Udruge su 18 renomiranih tvrtki s 1.500 zaposlenih u građevinskoj branši koje se bave proizvodnjom i tržišnim plasiranjem toplinsko-fasadnih sustava:

- Baumit d.o.o.
- Bifix
- Caparol
- Chromos boje i lakovi
- Chromos Svjetlost
- Ejot spojna tehnika
- Fragmat H
- JUB
- Kelteks
- Kemenović
- Knauf Insulation
- Lasselsberger Knauf
- Mapei
- Plastform
- Rockwool Adriatic
- Röfix
- Samoborka
- STO





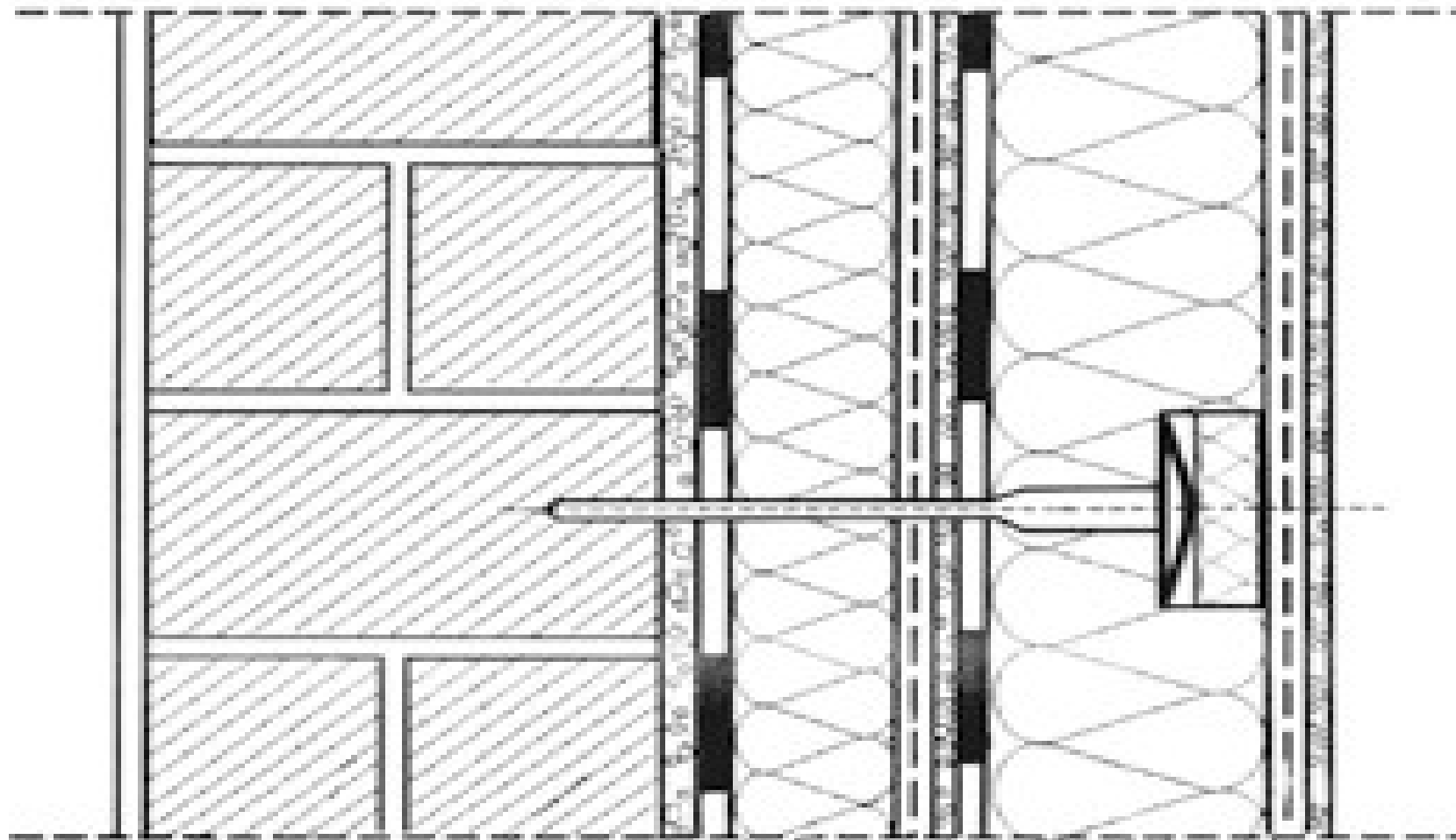
HRVATSKA KOMORA INŽENJERA GRAĐEVINARSTVA

Dani ovlaštenih inženjera građevinarstva Opatija 2013.

Obnovimo Hrvatsku

TEMA: Izazovi i problemi na projektima energetske obnove postojećih objekata

Smjernice ETICS na ETICS



ETICS prije 15g i danas



Dario Henezi



Norme i certifikati tijekom godina

Šaljem Vam kratke zaključke s prošlotjednog sastanka s g. Fučićem u Ministarstvu graditeljstva.

1. ETICS sa potvrdom i izjavom o sukladnosti u skladu s EN 12400 i 12500

- **Current ETAG 004 expires 31.12.2018**
- **New pre-final draft of EAD 04-0083-04.04 available. Definitely comes into force in 2019**
 - New EAD requirements:
 - Maximum accuracy of the width according EN 1604: ± 2 mm
 - **Minimum value of shear strength according to EN 12090: 20 kPa**
 - **Minimum value of shear modulus according to EN 12090: 1 000 kPa**
 - Minimum individual and mean value of tensile strength perpendicular to the faces after conditioning/moisture tested according 2.2.143.2 of this EAD which shall be at least 50% of the tensile strength perpendicular to the faces in dry condition tested according EN 1607.

ETICS na ETICS

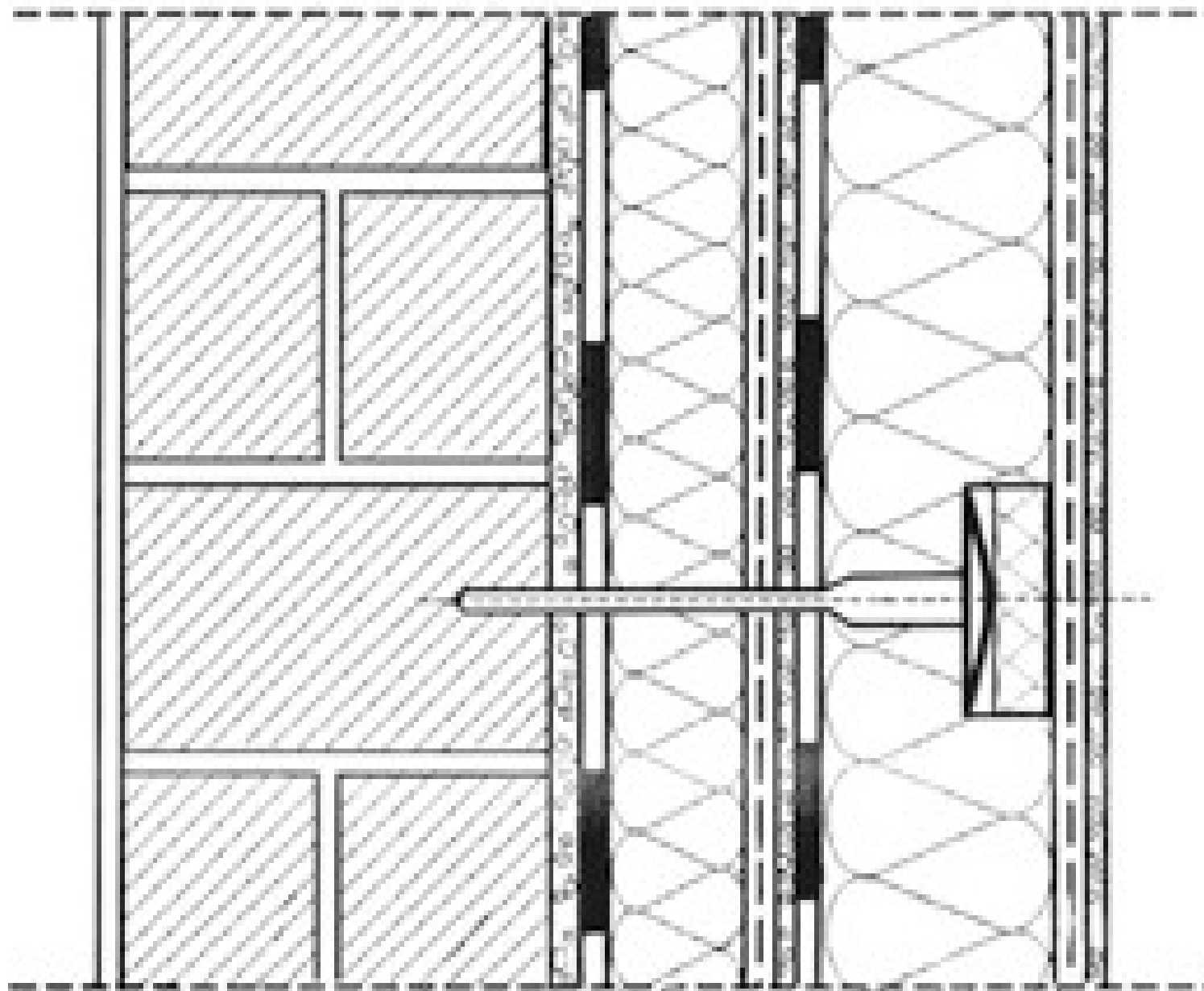
- Postoji više načina sanacije dotrajalog ETICS sustava poput nanošenja novog premaza, novog sloja temeljne žbuke, uklanjanja i postavljanja novog ETICS sustava ili postavljanja novog ETICS sustava na postojeći sa ciljem da se ranije generacije ETICS-a u ispravnom stanju, dodatno toplinski izoliraju.
- Kod energetske obnove zgrada preporučeno je postaviti novi ETICS fasadni sustav na postojeći. Prednosti takvog rješenja su:
 1. poboljšanje toplinske izolacije i veća ušteda energije
 2. dodatna zaštita od buke
 3. sanacija prljavštine, gljivica, ocrtavanja pričvrsnica i pukotina na površini
 4. integracija postojećeg, ali funkcionalnog ETICS sustava u novi ETICS sustav

Tablica 1. Razlozi i postupci sanacije ETICS sustava

	RAZLOG SANACIJE						
POSTUPAK	energetska obnova	prljavština/ gljivice	pukotine	ljuštenje	mehanička oštećenja	dotrajali spojevi	upitna nosivost



- po
- nos
- tre
- učv
- plo
- na
- mn
- plo
- mo
- she
- izol
- ost
- Sm



biti

o se
15

jav

ske

a



Zaštita od požara-klasificirani ETICS ili komponente

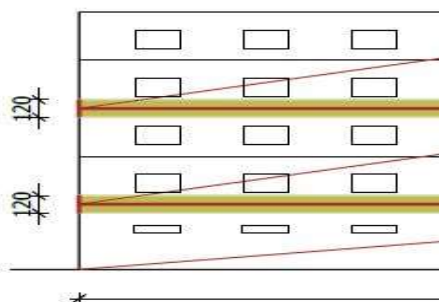
PRILOG 2.

REAKCIJA NA POŽAR

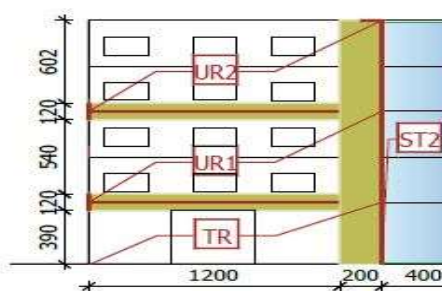
Tablica 4. Pročelja

Građevni dijelovi	Zgrada podskupine (ZPS)											
	ZPS1		ZPS2		ZPS3		ZPS4		ZPS5		Visoke zgrade	
Ovješeni ventilirani elementi pročelja												
Klasificirani sustav	E		D-d1		D-d1		C -d1			B -d1		A2-d1
ili												
Izvedba sa sljedećim klasificiranim komponentama												
Vanjski sloj	E		D		D		A2-d1		B-d1		B-d1	A2-d1
<u>Podkonstrukcija</u>												
– štapasta	E		D		D		D	ili	D		C	A2
– točkasta	E		D		A2		A2		A2		A2	A2
Izolacija	E		D		D		B		A2		A2	A2
Toplinski kontakti sustav pročelja  E T I C S - sustavi												
Klasificirani sustav	E		D		D-d1		C-d1			B -d1		A2-d1
ili												
Sastav slojeva sa sljedećim klasificiranim komponentama												
– pokrovni sloj	E		D		D		C			B-d1		A2-d1
– izolacijski sloj	E		D		C		B			A2		A2



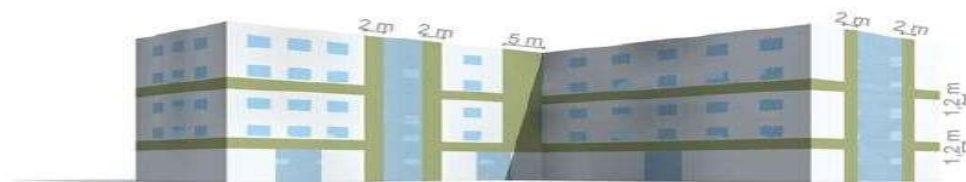


Slika 49 Shematski prikaz sjevernog pročelja



Slika 50 Shematski prikaz južnog pročelja

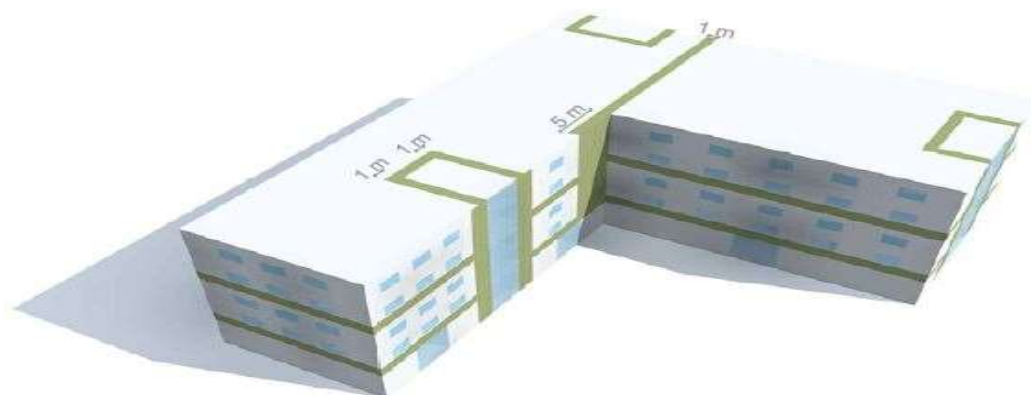
- POJASEVI NEGO SIGURNOSNIM
- DIJELOVI PROČELJA
- SIGURNOSNO E
- POŽARNI ODJEL



Slika 53 3D shematski prikaz jugozapadnog pročelja

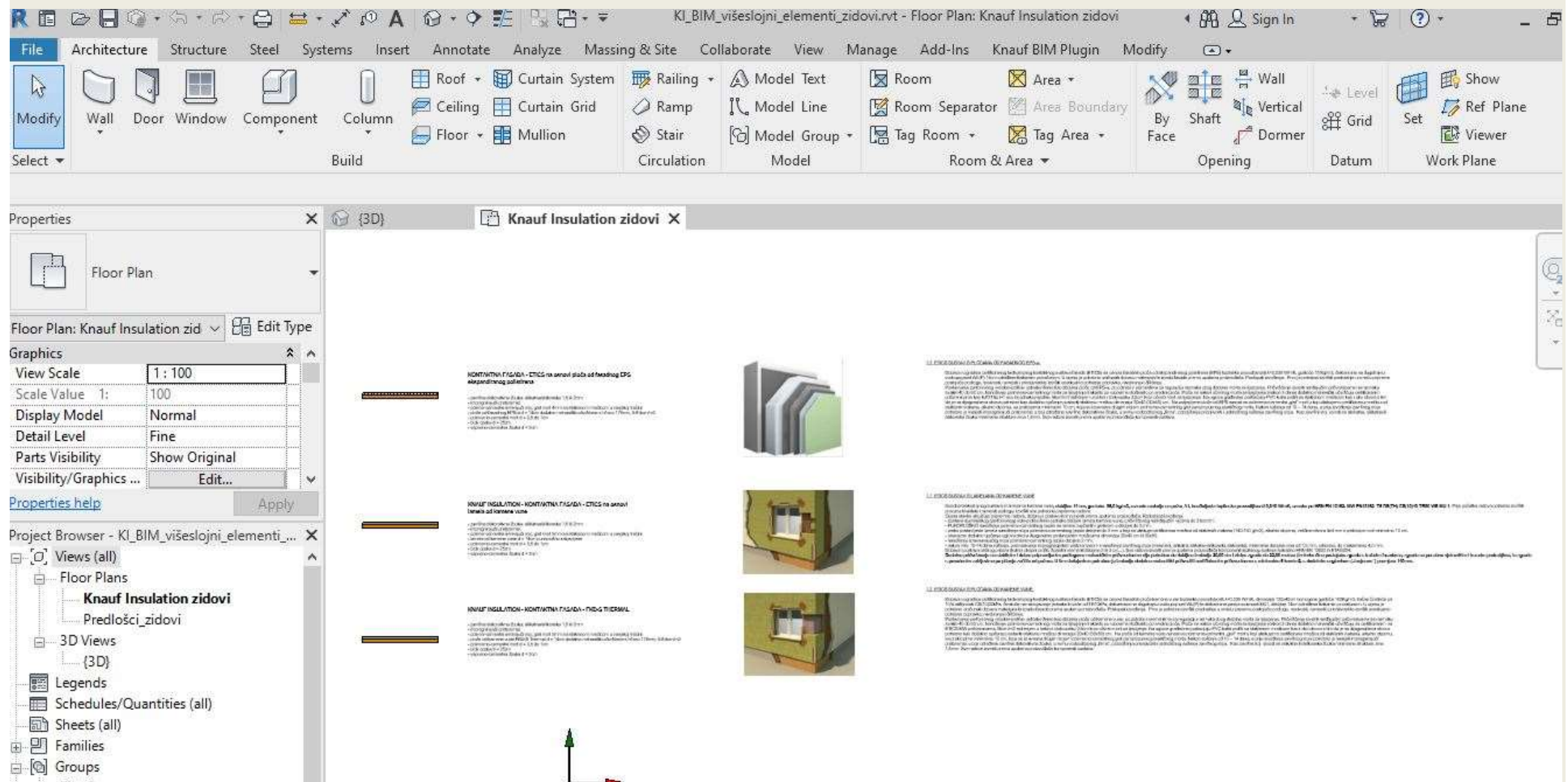


Slika 54 3D shematski prikaz sjeveroistočnog pročelja

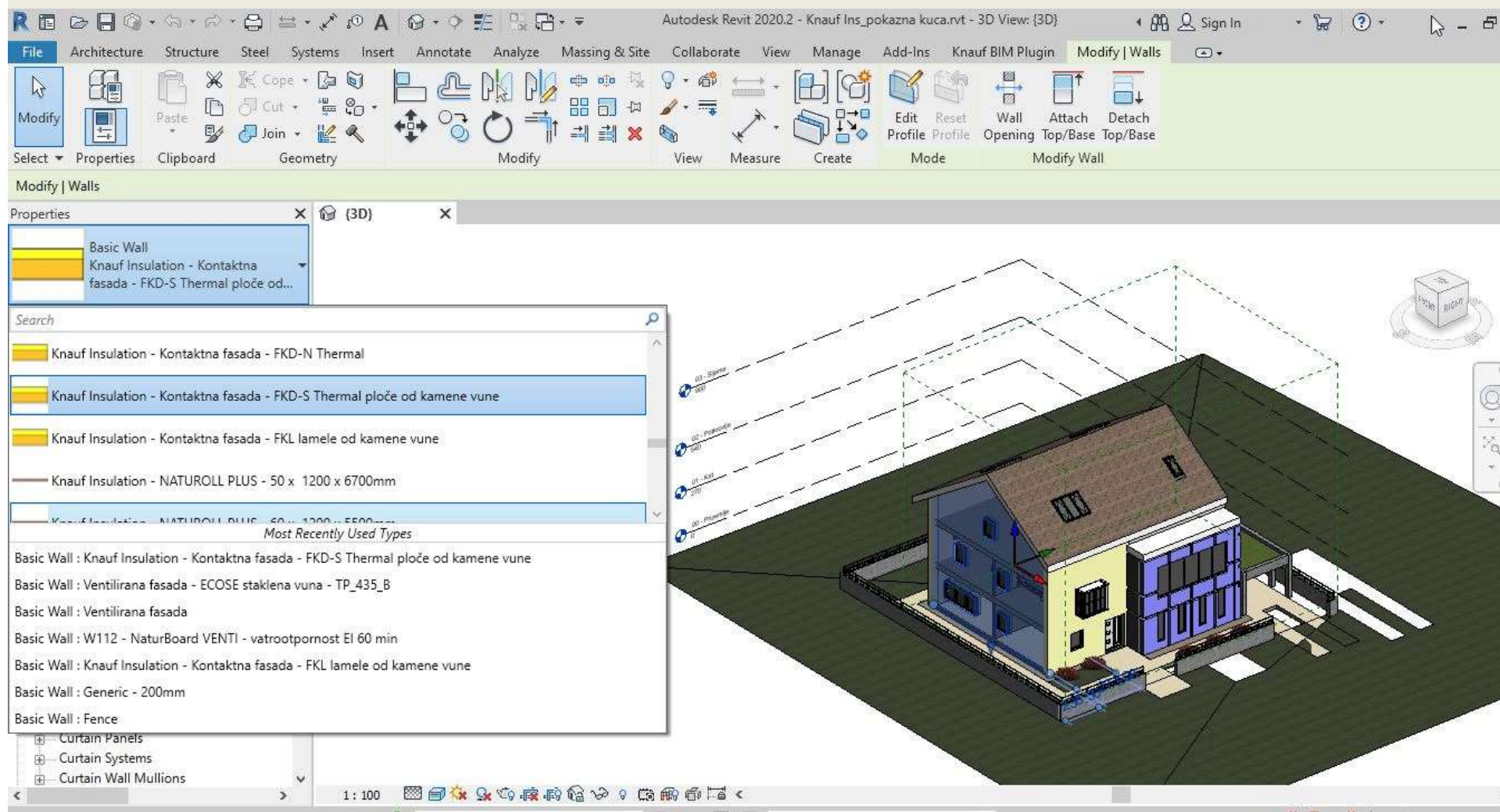


Slika 55 3D shematski prikaz krova i jugozapadnog pročelja

Building information modeling



HUPFAS BIM ETICS



Standardni podaci za toplinske izolacije sukladno IFC (Industry Foundation Classes)

- Materijal: broj, grupa, proizvodni pogon, jezik, građevni dio, serijski broj-Revit, naziv proizvoda, dimenzije, duži opis, kraći opis, ključna riječ, CE certifikat o stalnosti svojstva, model proizvoda, URL na proizvod, šifra DoP-a Izjave o svostvima i URL, svi tehnički podatci s vezom na normu (Toplinska provodljivost, Razred reakcije na požar, Specifični toplinski kapacitet, Volumenska težina, Faktor otpora difuziji vodene pare, Raspon debljina, Otpor prolasku topline, Čvrstoće: tlačna, vlačna, posmična, Moduli elastičnosti, Tlačno puzanje, Tolerancia debljine, Točkasto opterećenje, Kratkotrajna i dugotrajna vodoupojnost, Dinamička krutost, Stišljivost, Uzdužni otpor strujanju zraka, URL na prospekt i tehnički list, URL na sigurnosni list, kontakt e-mail i telefon, URL na EPD ekološku deklaraciju proizvoda, Kod EPD, LCA analiza životnog ciklusa proizvoda: podatci o ukupnoj potrošnji primarne energije (MJ), potrošnja vode (lit), rizičan otpad (Kg), nerizičan otpad (Kg), promjena klime (Kg CO₂), Acidifikacija atmosfere (Kg SO₂), Potrošnja obnovljive i neobnovljive energije (MJ), Osiromašenje resursa (Kg Sb), Inertni otpad (Kg), Radioaktivni otpad (Kg), Razaranje ozonskog sloja stratosfere (Kg CFC11 freon), Stvaranje fotokemijskog ozona (Kg Ethen), Eutrofikacija-cvjetnje voda..
- Cijena



LCA: Calculation rules

Declared Unit

The declared unit is 1 m³ of glass mineral wool. The density used for the calculation of the LCA is 19.5 kg/m³.

Declared unit

Name	Value	Unit
Declared unit	1	m³
Gross density	19.5	kg/m³
Conversion factor to 1 kg	0.051	-

System boundary

The system boundary of the EPD follows the modular approach defined by /EN 15804/.

The type of EPD is cradle-to-gate with options.

List and explanation of the modules declared in the EPD.

The product stage (A1-A3) includes:

- A1 - raw material extraction and processing, processing of secondary material input (e.g. recycling processes),
- A2 - transport to the manufacturer and
- A3 - manufacturing.

This includes provision of all materials, products and energy, packaging processing and their transport, as well as waste processing up to the end-of waste state or disposal of final residues during the product stage. The LCA results are given in an aggregated form for the product stage, meaning that the modules A1, A2 and A3 are considered as a **unique module A1-A3**.

The construction process stage includes:

- A4 - transport to the construction site and
- A5 - installation into the building.

~~The transport to the building site (A4) is included in the LCA calculation.~~ For GMW 035 unfaced rolls, the average transport distance is assumed to be 600 km with a truck capacity utilization of 70%. Module A5 has neither been included nor declared in this EPD, since it depends on the application, and method or tools used which can be very diverse, as GMW 035 unfaced rolls are used in different applications. Therefore, the treatment of the packaging waste after the installation of the product has not been considered.

The use stage.

Because they are a location, none of the building maintenance has been taken into account.

The end-of-life stage

- C1 - de-construction
- C2 - transport
- C3 - waste processing and recycling and
- C4 - disposal.

This includes provision of products and related only modules C2 are considered the most mineral wool products. Although glass mineral Insulation are partly yet an established assumption chosen the use phase, is the

Module D includes potentials.

According to /EN 15804/ loads from net flow allocated as co-product waste state shall be No benefits and loads not included in the LCA.

Comparability

Basically, a comparison is only possible if all were created according to context, respective characteristics of products.

LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA, MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE								END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential	
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	
X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	MND	X	MND	

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m³ GMW 035 unfaced rolls

Parameter	Unit	A1 - A3	A4	C2	C4
Global warming potential	[kg CO₂e]	19.000	1.080	0.065	0.364
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq]	1.560E-8	5.180E-12	3.100E-13	3.590E-12
Acidification potential of land and water	[kg SO₂-Eq]	1.830E-1	2.980E-3	1.970E-4	1.680E-3
Eutrophication potential	[kg PO₄³⁻-Eq]	2.200E-2	4.180E-5	4.180E-5	2.300E-4
Formation potential of tropospheric ozone photochemical oxidants	[kg Ethen Eq]	1.000E-2	-7.570E-4	-5.590E-5	1.580E-4
Abiotic depletion potential for non fossil resources	[kg Sb Eq]	1.170E-3	4.070E-8	2.430E-9	5.900E-8
Abiotic depletion potential for fossil resources	[MJ]	315.000	14.900	0.893	3.470

RESULTS OF THE LCA - RESOURCE USE: 1 m³ GMW 035 unfaced rolls

Parameter	Unit	A1 - A3	A4	C2	C4
Renewable primary energy as energy carrier	[MJ]	47.000	-	-	-
Renewable primary energy/resources as material utilization	[MJ]	0.000	-	-	-
Total use of renewable primary energy/resources	[MJ]	47.000	0.589	0.035	0.299
Non renewable primary energy as energy carrier	[MJ]	351.000	-	-	-
Non renewable primary energy as material utilization	[MJ]	28.400	-	-	-
Total use of non renewable primary energy/resources	[MJ]	419.000	15.000	0.896	3.630
Use of secondary material	[kg]	16.100	-	-	-
Use of renewable secondary fuels	[MJ]	0.000	0.000	0.000	0.000
Use of non renewable secondary fuels	[MJ]	0.000	0.000	0.000	0.000
Use of net fresh water	[m³]	1.350E-1	4.150E-4	2.480E-5	-1.390E-2

RESULTS OF THE LCA - OUTPUT FLOWS AND WASTE CATEGORIES: 1 m³ GMW 035 unfaced rolls

Parameter	Unit	A1 - A3	A4	C2	C4
Hazardous waste disposed	[kg]	2.050E-2	3.410E-5	2.040E-6	1.630E-4
Non hazardous waste disposed	[kg]	0.815	0.002	0.000	19.500
Radioactive waste disposed	[kg]	4.120E-2	1.960E-5	1.170E-6	6.340E-5
Components for re-use	[kg]	-	-	-	-
Materials for recycling	[kg]	-	-	-	-
Materials for energy recovery	[kg]	-	-	-	-
Exported electrical energy	[MJ]	-	-	-	0.000
Exported thermal energy	[MJ]	-	-	-	0.000

INTERPRETATION

USE OF RESOURCES

The primary energy demand from non-renewable resources is dominated by the production of glass mineral wool products (especially due to the energy consumption) and the packaging. The renewable energy demand is dominated by the packaging (wood pallets), the binder (bio-based) and production (electricity mix).

ENVIRONMENTAL IMPACT

Every impacts category except the abiotic ADPe and ODP are dominated by the production. This is due to the consumption of energy (electricity and thermal energy) during the production of glass mineral wool products. The ADPe elements are dominated by the basic material production. The GWP is dominated by the production, mostly due to energy consumption (gas and electricity). The basic materials and transport to site also have a limited impact. The binder (bio-based) has overall no impact. The ODP is influenced by basic materials, production and packaging. The AP is also dominated by the production due to the emissions related to the processes and the energy consumption. Mostly, the impact refers to emissions to air: sulphur dioxide, ammonia and nitrogen oxides. The EP is significantly influenced by the production due to emissions from the furnace, curing oven and electricity consumption.

The POCP is particularly dominated by the production (emissions in curing oven, electricity consumption). The results from the transport are negative due to the NO emissions; NO counteracts the POCP.

EPD Information															
EPD (Source)	EPD (EPD)	TotalPrimaryEnergyConsumption	WaterConsumption	HazardousWaste	NonHazardousWaste	ClimateChange	AtmosphericAcidification	RenewableEnergyConsumption	NonRenewableEnergyConsumption	ResourceDepletion	InertWaste	RadioactiveWaste	StratosphericOzoneLayerDestruction	PhotochemicalOzoneFormation	Eutrophication
Text	URL	MJ	m ³	kg	kg	kg CO ₂	kg SO ₂	MJ	MJ	kg Sb	kg	kg	kg CFC11	kg Ethen	kg PO ₄ 3-
EPD informacije															
EPD (Izvor)	EPD (EPD)	Ukupna potrošnja primarne energije	Potrošnja vode	Rizičan otpad	Nerizičan otpad	Promjena klime	Acidifikacija atmosfere	Potrošnja obnovljive energije	Potrošnja neobnovljive energije	Osiromašenje resursa	Inertni otpad	Radioaktivni otpad	Razaranje ozonskog sloja stratosfere	Stvaranje fotokemijskog ozona	Eutrofikacija
Text	URL	MJ	m ³	kg	kg	kg CO ₂	kg SO ₂	MJ	MJ	kg Sb	kg	kg	kg CFC11	kg Ethen	kg PO ₄ 3-
Dostupan EPD dokument na http://www.knaufinsulation.com/en/environmental-product-declaration-epd Ako nije dostupan, ostavi neispunjeno	Dostupan EPD dokument na http://www.knaufinsulation.com/en/environmental-product-declaration-epd Ako nije dostupan, ostavi neispunjeno	Dostupan EPD dokument na http://www.knaufinsulation.com/en/environmental-product-declaration-epd Ovo treba ručno izdvojiti iz EPD dokumenta Ako nije dostupan, ostavi neispunjeno													
BREG EN EPD No.:000061	http://www.knaufinsulation.com/en/glass-mineral-wool-ecose-gmw	466	0,135	0,205	0,815	19	1,83	47	419	0,0000117		0,0412	1,56E-08	0,01	0,032
BREG EN EPD No.:000061	http://www.knaufinsulation.com/en/glass-mineral-wool-ecose-gmw	466	0,135	0,205	0,815	19	1,83	47	419	0,0000117		0,0412	1,56E-08	0,01	0,032
BREG EN EPD No.:000061	http://www.knaufinsulation.com/en/glass-mineral-wool-ecose-gmw	466	0,135	0,205	0,815	19	1,83	47	419	0,0000117		0,0412	1,56E-08	0,01	0,032
BREG EN EPD No.:000061	http://www.knaufinsulation.com/en/glass-mineral-wool-ecose-gmw	466	0,135	0,205	0,815	19	1,83	47	419	0,0000117		0,0412	1,56E-08	0,01	0,032
BREG EN EPD No.:000061	http://www.knaufinsulation.com/en/glass-mineral-wool-ecose-gmw	466	0,135	0,205	0,815	19	1,83	47	419	0,0000117		0,0412	1,56E-08	0,01	0,032



HVALA NA PAŽNJI!



info@hupfas.hr

Vučak 34, 10090 Zagreb

