Dve prve nisko-energetske stambene zgrade u Srbiji Iskustvo sa terena

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Amadeo (juli 2009)

Amadeo II (avgust 2010)

Amadeo: Prva nisko-energetska stambena zgrada u Srbiji
844 m², 11 stanova

Dve strane niske-energije

Energetska efikasnost

Smanjenje potrošnje primarne energije

Obnovljiva energija

Smanjenje potrošnje energije iz fosilnih goriva

Energetska efikasnost

Zidni sistem : monolitni zidovi sa opeka blokovima (38cm širine)

Termo-fasada 4cm (λ = 0,09W/mK)

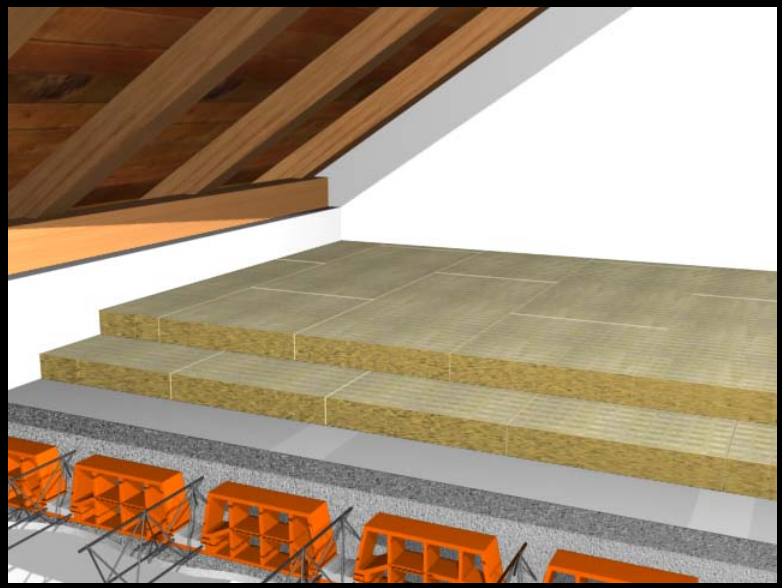
Izbegavanje toplotnih mostova

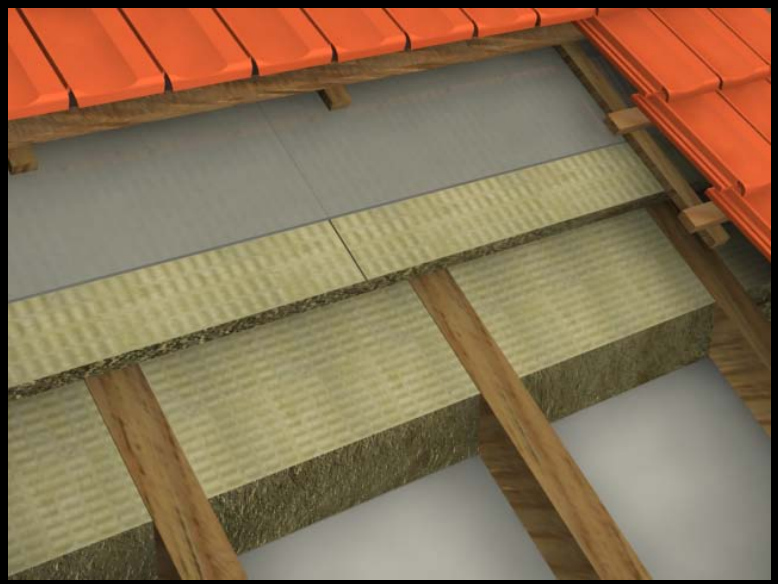
Briga o toplotnim mostovima na balkonima

Nosivi toplotni prekidi za balkone

Smanjuju prosečnu λ za 91%

Toplotna izolacija : krov/pod





Bazirana na kamenoj mineralnoj vuni / ekstrudiranom polistirenu

Kosi krov /Ravni krov

- 20cm
- U ≈ 0.18 W/m²K

Srbija: U ≤ 0.65 W/m²K

Pod

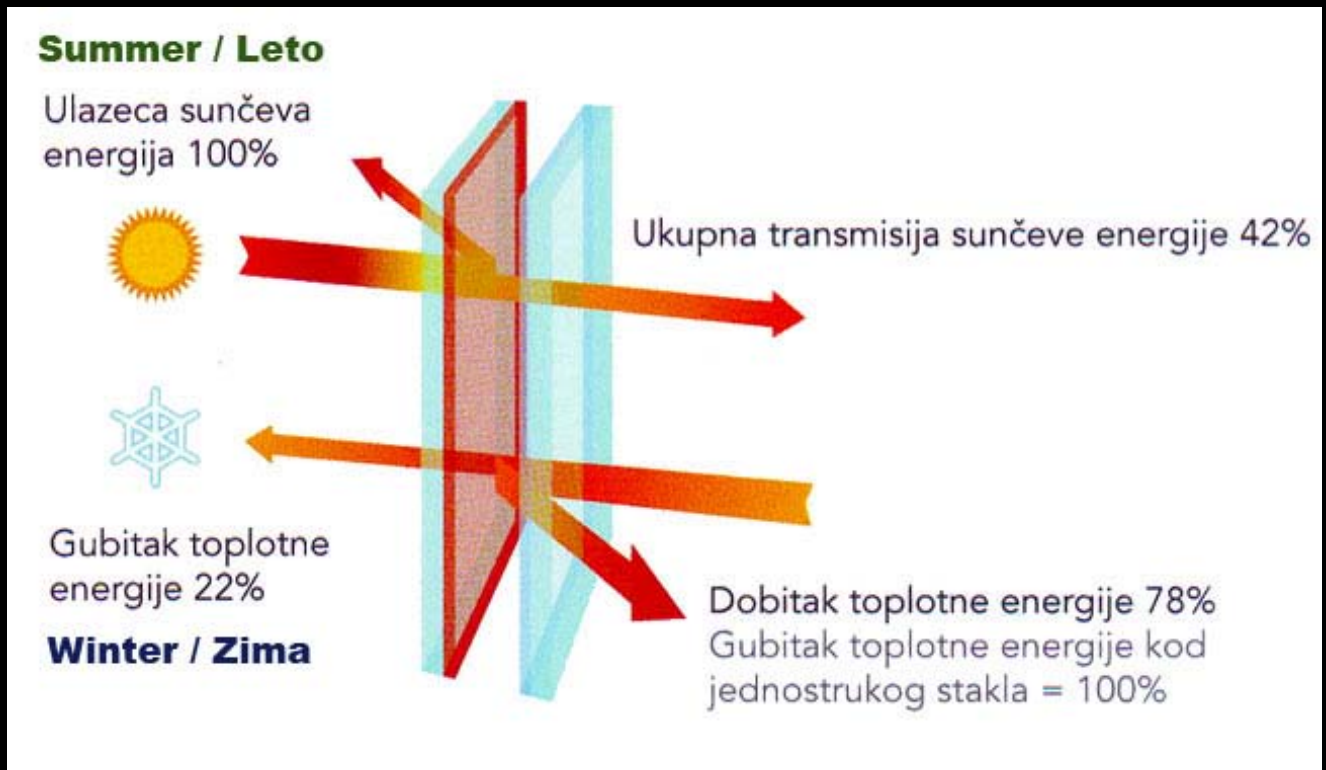
- 10cm
- U ≈ 0.36 W/m²K

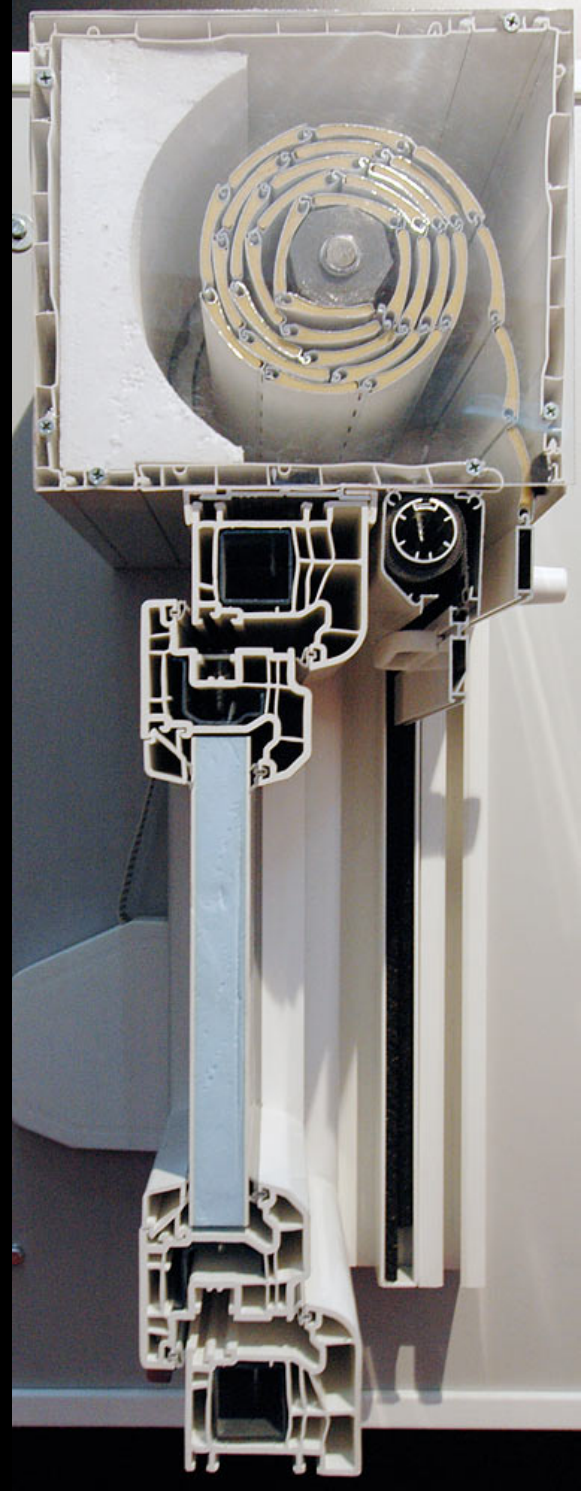
Srbija: U ≤ 0.75 W/m²K

Prozori i roletne

Kutije roletni sa toplotnom izolacijom
PVC-profili 5-komorni

Duplo-staklo, low-e, argon punjenje
U ≈ 1.10 W/m²K





Izolacija cevi

Obnovljiva energija

Geotermalno grejanje/hlađenje

Toplotna pumpa pokreće sistem podnog grejanja i hlađenja

Ušteda do 75% električne energije

Proizvodnja : Geotermalna Toplotna Pumpa

Distribucija: podno grejanje i hlađenje

Termalna solarna proizvodnja sanitarne tople vode

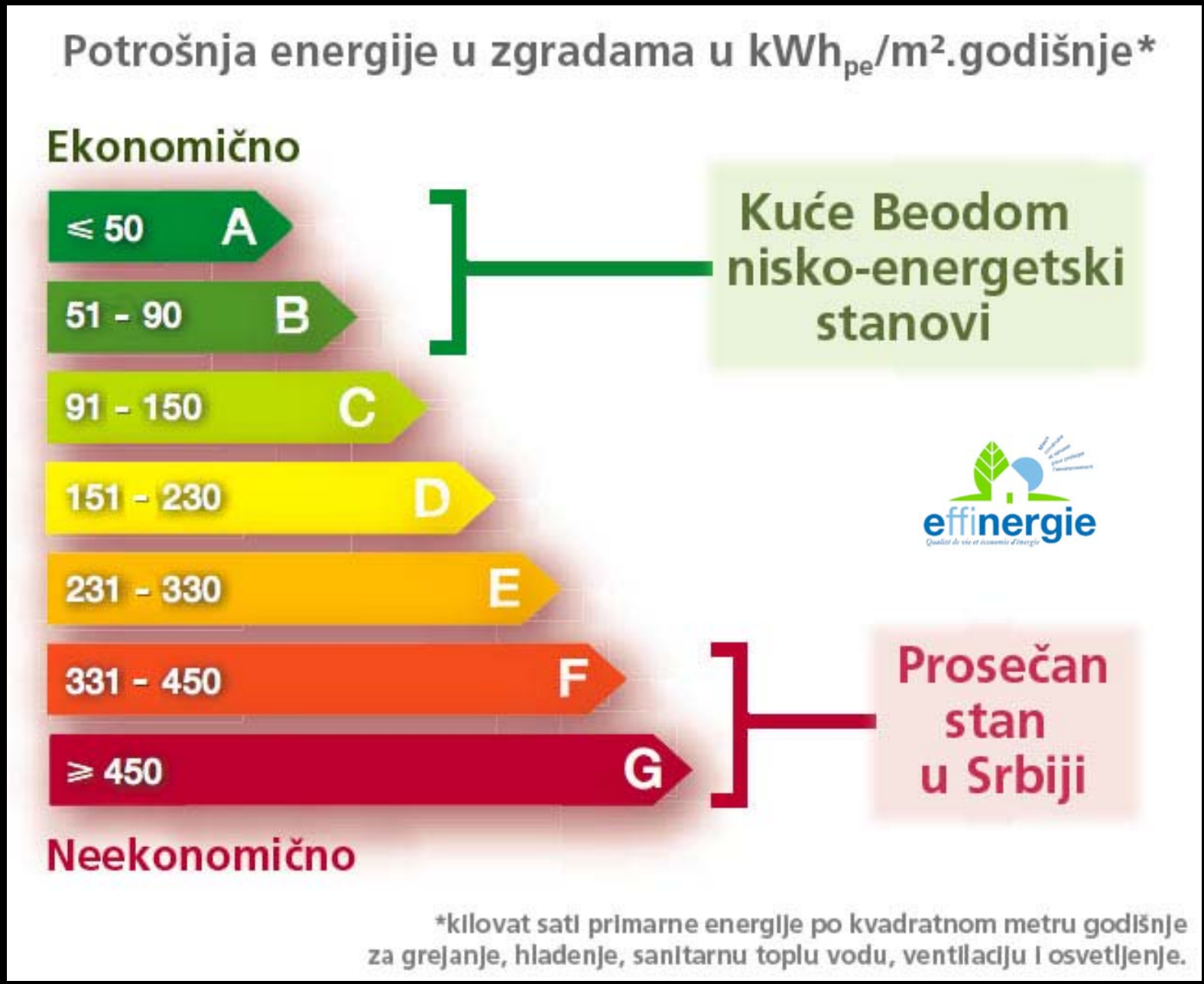
12 solarnih kolektora, korisna površina na krovu: 26m²

2 bojlera od po 500 litara (1000 litara ukupno)

Solarna energija može da pokrije do 85% godišnje potrošnje sanitarne tople vode u Beogradu

Solarni kolektori za toplu vodu

Šta očekujemo ?



Zabuna o energiji

Električna energija:
sekundarna energija

Potrošnja energije kWh / m^2.godišnje	Daljinsko grejanje	Prirodni gas	Elekt. energ.
Grejanje	171	230	130
Sanitarna topla voda	55	55	55
Hlađenje	25	25	25

Manje od 30% primarne energije koja se koristi za proizvodnju električne se konvertuje u korisnu električnu energiju.

Primarna energija = Električna energija x 3

Potrošnja primarne energije

Potrošnja energije kWh / m^2.godišnje	Daljinsko grejanje	Prirodni gas	Elekt. energ.
Grejanje	171	230	390
Sanitarna topla voda	165	165	165
Hlađenje	75	75	75
Ukupno	411	470	630

Poteškoće

- Počeli smo veoma rano
- Bez pomoći i podrške
- Formiranje pravog tima
- Neinformisanost u EE

BELRE 2008: Poseta Olivera Dulića

AUREA 2009: Specijalno priznanje za društvenu korisnost

Amadeo u Evropskom Karbon Atlasu 2010

Low Carbon Urban Built Environment

European Carbon Atlas

Editors: Phil Jones, Paulo Pinho, Jo Patterson, Chris Tweed

cost

Case study 1: Amadeo, energy efficient house in Belgrade

Context

In the Southeast part of Belgrade, in Zvezdara municipality, precisely in the part of Veliki Mokri Lug, the energy-efficient apartment house Amadeo is located. The location is in the larger-city area, close to the highway, on the northeast, and to the housing settlement Medakovic III, on the northwest (Figure XV.iii).

Figure XV.iii - Location of apartment house Amadeo on the map of central and south-east area of Belgrade

The location is characterised by low residential density. It is detached house with no shading obstructions in the surroundings, giving favourable conditions for solar systems integration. Belgrade has a moderate continental climate, with four seasons which influenced building construction design. The characteristic of Belgrade climate is also Košava - the southeast-east wind, with an average speed of 25-43km/h, but certain strokes can reach up to 130 km/h. Košava is the largest air cleaner of Belgrade.

Apartment house Amadeo is energy efficient building designed and constructed by Kuce Beodom, contractor that is committed to build apartments spending less than 90kWhpetrl/year (kilowatt hour of primary energy for square meter and per year for heating, cooling, sanitary hot water, ventilation and light). Regarding the threshold of primary energy consumption apartments are rated as class B according to the France norm Effinergie (www.beodom.com). Low-energy consumption is obtained by energy

efficient building construction and using renewable energy to replace the energy derived from fossil fuels (Figure XV.iv).

Figure XV.iv - South facade of Apartment house Amadeo (photo Kuće Beodom, www.beodom.com)

Apartment house Amadeo has 11 apartments, from 44 to 85m², on 3 levels (Figure XV.v). Usable floor area is 607m², but including balconies about 650 m².

Figure XV.v - Apartment house Amadeo-layouts of the first (left) and the second floor (right) www.beodom.com

The Building

Energy efficiency comes with excellent thermal insulation and smart choice of building materials and usage of renewable energy sources.

Building Structure

Structure of apartment house Amadeo is built with clay blocks, with thermal bridges break, and windows with low-e glazing filled with argon are applied.

Walls made of POROTHERM 38 clay blocks with thermal mortar (Figure XV.vi), have a thermal transmittance U=0.35W/m²K, i.e. total thermal resistance R=2.86m²K/W (www.beodom.com). The wall system fulfils both static and thermal insulation function, provides healthy indoor climate and very good thermal inertia needed for comfort in summer.

Figure XV.vi - Placing horizontal and vertical cerclage elements with thermal insulation on Apartment house Amadeo (photo Kuće Beodom, www.beodom.com)

The thickness of clay blocks allows thermal bridges to be broken on the floor slabs by placing a cerclage element with thermal insulation all around the concrete floor. For vertical reinforcements typical corner elements are used. They are specially designed to fit in a POROTHERM 38 wall together with 5cm of thermal insulation and a POROTHERM 8 brick. For the part of the ceiling that is directly under the roof, the insulating material is applied directly under the roof (20cm thick layer, or two 10cm thick layers of the same material). That gives a thermal transmittance around 0.18 W/m²K.

Windows are a key component of a low-energy construction. Ideally, they should have a U-factor as close as possible to the one of the walls. Windows made of Alphacan 5-chambers PVC profiles, with low-e double-glazing and argon fill, having U-value around 1.2 W/m²K, are selected. Rolling shutters with thermal insulation are integrated in the wall on top of the frame.

Usage of Renewable Energy

Because the construction of apartment house Amadeo is energy efficient, the demand on heating and cooling is greatly reduced. To further save energy, renewable energy is used to provide heating and cooling.

Figure XV.vii - Passage of the geothermal probes into Amadeo building (photo Kuće Beodom)

Ideje za unapređenje

Edukacija i promocija EE

- Edukacija škole/univerziteti
- Internet (portal za EE)
- Učiniti ljude odgovornim za svoju potrošnju energije
- Mali referentni objekat

Konkretna podrška investitorima

- Problem sa električnim brojilima
- Debljina zidova
- Ekstra troškovi za EE

- Propuštena šansa : Dulićev program masovne izgradnje

Zaključak

- Finansijska i ekonomska kriza je imala pozitivne efekte
- Interes za EE raste

- Da li možemo očekivati više od moralne podrške za veliki projekat?

www.beodom.com