Energetski visoko učinkovita novogradnja i obnova u funkciji urbane sigurnosti

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Energetska učinkovitost / *Energy Efficiency*

Energetski gotovo nulta zgrada

Nearly Zero Energy Building

Od vrlo niskoenergetske i emisijske do energetski samodostatne i plus-energetske zgrade

Početak 21. stoljeća obilježavaju nove energetske klasifikacije u graditeljstvu prema kojima su već izvedene pojedine novogradnje, ali i obnove kuća i zgrada različitih namjena. Zajedničko je obilježje svih suvremenih prijedloga energetskih modela vrlo mala – gotovo nulta energetska potrošnja koja je danas tehnološki ostvariva i financijski sve pristupačnija i isplativija, a rezultati takve gradnje bitno su jamstvo ostvarenja održivog razvoja.

Energetski *gotovo nulta* arhitektura, zbog fizikalno-građevinskih značajki ovojnice zgrade osiguravaju vrlo nisku energetsku potrošnju za zagrijavanje prostora, a preostale energetske potrebe (za rasvjetu, razne kućanske uređaje, hlađenje i dr.) vrlo lako može pokriti iz obnovljivih izvora energije kojih je uporaba zahvaljujući tehnološkom razvoju sve učinkovitija.

Direktiva o energetskim svojstvima zgrada (Energy Performance in Buildings Directive – EPBD) postaje temeljna smjernica razvoja energetske učinkovitosti u graditeljstvu, a prema njoj se vrlo niskoenergetski modeli gradnje i nazivaju gotovo nulti. Svaka će država članica Europske Unije zasebno odlučiti koja je energetska potrošnja granična za taj naziv.

Pridruživanjem Republike Hrvatske Uniji 1. srpnja 2013, scenariji energetske potrošnje EU *3 x 20 do 2020.* postaje izrimno važan za energetsku strategiju. Scenarijem su predviđena ostvarenja tri temeljna cilja; smanjenje energetske potrošnje za 20%, smanjenje emisija CO_2 i drugih staklenički plinova za 20% te uporaba obnovljivih izvora energije od 20% udjela u sveukupnoj energetskoj potrošnji.

Kako bi se scenariji ostvario u što većoj mjeri do 2020, EU je odredila da se sve zgrade javne namjene od 2018. moraju izvoditi upravo kao gotovo nulte! Štoviše, zgrade koje su predviđene za zahtjevniju obnovu također od 2018. moraju udovoljiti istim energetskim kriterijima. Od 2020. i sve ostale zgrade morat će se izvoditi kao gotovo nulte energetske.

Velika Britanija donijela je odluku po kojoj već od 2016. počinje izvođenje zgrada javne namjene bez emisija staklenićkih plinova.

Uz pojam *energetski gotovo nulte* zgrade, koji je prihvaćen u propisima Europske Unije, danas susrećemo i slijedeće nove modele energetski učinkovite gradnje i primjerene razine zaštite okoliša:

From very low energy and emission buildings to energy self-sufficient and energy-plus buildings

The beginning of the 21st century has been marked with new energy classifications in building construction according to which some new buildings have been built, and houses and buildings used for various purposes have been renovated. The common feature in all contemporary energy model drafts is a very low – nearly zero energy consumption which is now technologically feasible, financially more affordable and cost effective, whilst the results in such construction are an important guarantee in achieving sustainable development. Because of the physical and constructional features of the building envelope which provide very low energy consumption for space heating, *nearly zero energy* architecture can easily cover other energy needs (for lighting, various household appliances, cooling etc.) from renewable energy resources, which can be used more efficiently due to technological development.

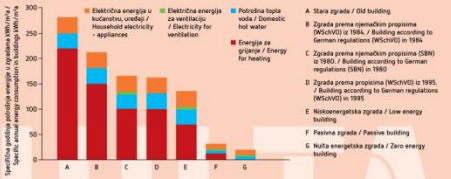
The Energy Performance in Buildings Directive – EPBD, has become a fundamental guideline for energy efficiency development in construction. Very low energy building models are now called nearly zero after the directive's instructions. Each of the EU member states will individually decide on which energy consumption is the borderline for that title.

After the accession of the Republic of Croatia into the European Union on July 1, 2013, the scenario that has been developed for the EU '3 x 20' energy consumption by 2020 will be extremely important for the country's energy strategy. The scenario is designed to achieve three fundamental objectives: a reduction of energy consumption by 20 %, reduction of CO_2 and other greenhouse gas emissions by 20 %, as well as the use of renewable energy resources from the 20 % share of total energy consumption.

In order to achieve this goal by 2020 to the full extent, the EU has decided that as of 2018, all public buildings will have to be built as nearly zero energy buildings! Furthermore, the buildings which have been opted for the more demanding renovations will also have to comply in accordance to the same energy criteria by the year 2018. In addition, from 2020 and on, all other buildings will also have to be run as nearly zero energy.

Great Britain has decided to start building no-emission public buildings as early as of 2016.

Together with the term *nearly energy zero* building which has been adopted in European Union regulations, the following new models of energy efficient construction and their corresponding levels of environmental protection are encountered today:



Gotovo nulta energetska arhitektura (vrlo niskoenergetske i pasivne kuće) / Nearly zero energy architecture (very low energy and passive houses)

Energetski nulta zgrada

Zgrada u kojoj je, kao rezultat vrlo visoke razine energetske učinkovitosti, ukupna godišnja potrošnja primarne energije jednaka energiji (proizvedenoj iz obnovljivih izvora energije) koja je dostavljena zgradi (engl. *net zero energy house*, njem. *Nullenergiehaus*).

Emisijski nulta zgrada (neto ugljičnoemisijski nulta zgrada)

Zgrada koja, na temelju materijala od kojih je izgrađena i činjenice da proizvodi višak energije iz obnovljivih izvora, osigurava da tijekom svog životnog vijeka kompenzira sve ugljične emisije povezane s izgradnjom i uporabom zgrade (*net zero carbon building, Nullemissionshaus*).

Karbonski nulta zgrada

Zgrada s godišnjom nultom neto energetskom potrošnjom i nultom ugljičnom emisijom (*zero carbon building*).

Energetski pozitivna zgrada (plus-energetska zgrada)

Zgrada u kojoj je kao rezultat vrlo visoke razine energetske učinkovitosti ukupna godišnja potrošnja energije manja od energije (proizvedene iz obnovljivih izvora energije) koja je dostavljena zgradi (*positive energy building*).

Zero energy building (Net zero energy house. Nullenergiehaus)

A building in which, as a result of its very high level of energy efficiency, the total annual primary energy consumption is equal to the energy (produced from renewable energy resources) that is distributed to the building.

Zero energy emissions building (Net zero carbon building. Nullemissionshaus)

A building which, based on its building materials and the fact that it produces a surplus of energy from renewable energy resources, compensates all carbon emissions during its life span which are associated with the construction and use of the building.

Zero carbon building

A building with annual net zero energy consumption and zero carbon emission.

Positive energy building (Energy-plus building)

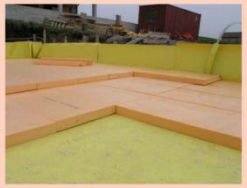
A building in which, as a result of its very low level of energy efficiency, its total annual energy consumption is lower than the energy (produced from renewable energy resources) delivered to the building.

3D-crtež vrlo niskoenergetske kuće drvene i betonske konstrukcije M6 (arhitekt prof. Ljubomir Mišćević), Gornji Stupnik, Hrvatska

3D drawing of a timber-frame and concrete very low energy house M6 (architect Prof. Ljubomir Mišćević), Gornji Stupnik, Croatia

Detalj izgradnje vrlo niskoenergetske kuće drvene i betonske konstrukcije u Gornjem Stupniku, Hrvatska

Detail of the construction of a timber-frame and concrete very low energy house in Gornji Stupnik, Croatia



Detalj izgradnje vrlo niskoenergetske kuće drvene i betonske konstrukcije u Gornjem Stupniku, Hrvatska

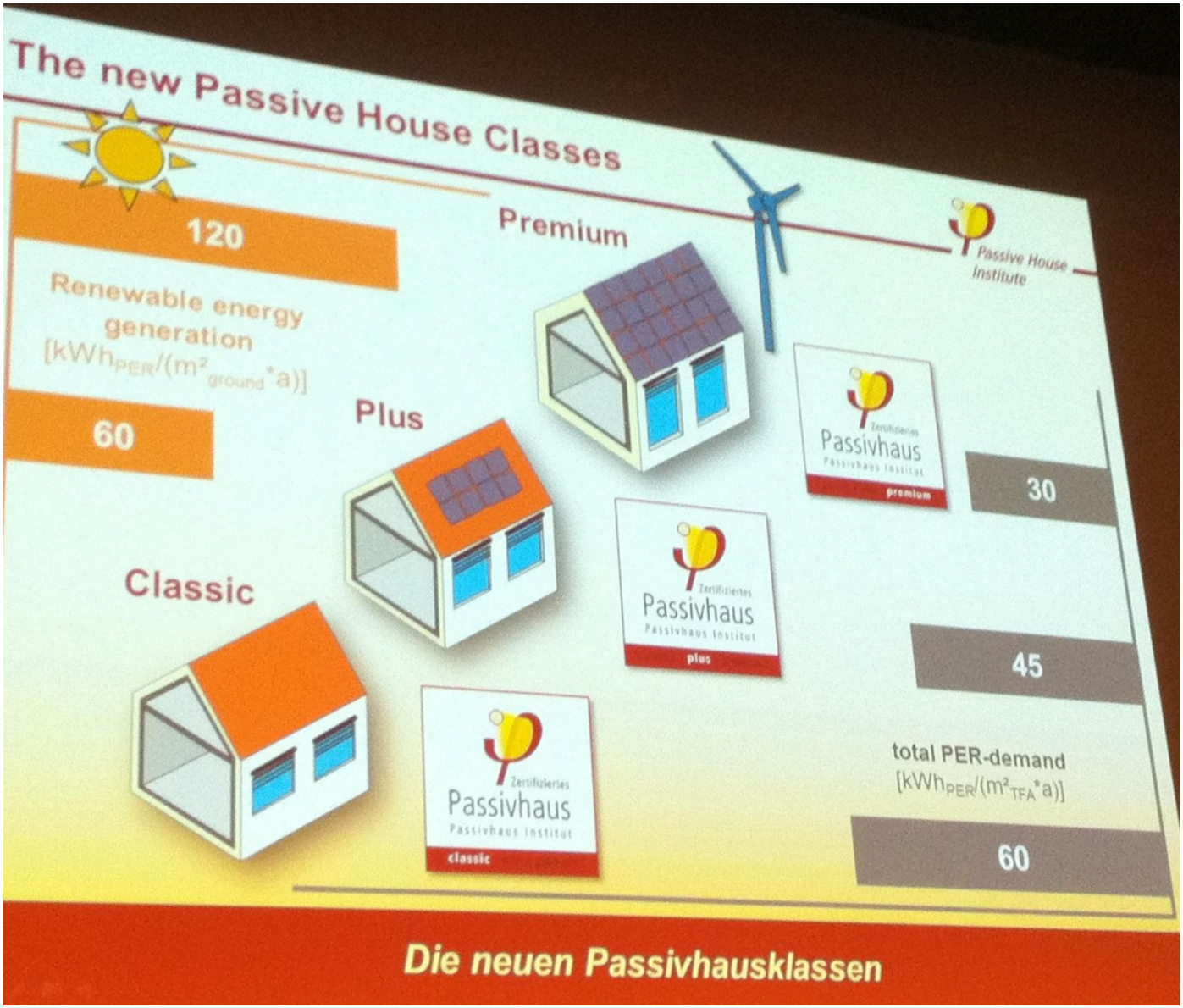
Detail of the construction of a timber-frame and concrete very low energy house in Gornji Stupnik, Croatia

Detalj izolacije drvenog zida vrlo niskoenergetske kuće drvene i betonske konstrukcije u Gornjem Stupniku, Hrvatska

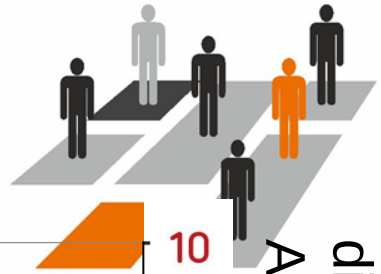
Detail of the wooden wall insulation of a timber-frame and concrete very low energy house in Gornji Stupnik, Croatia

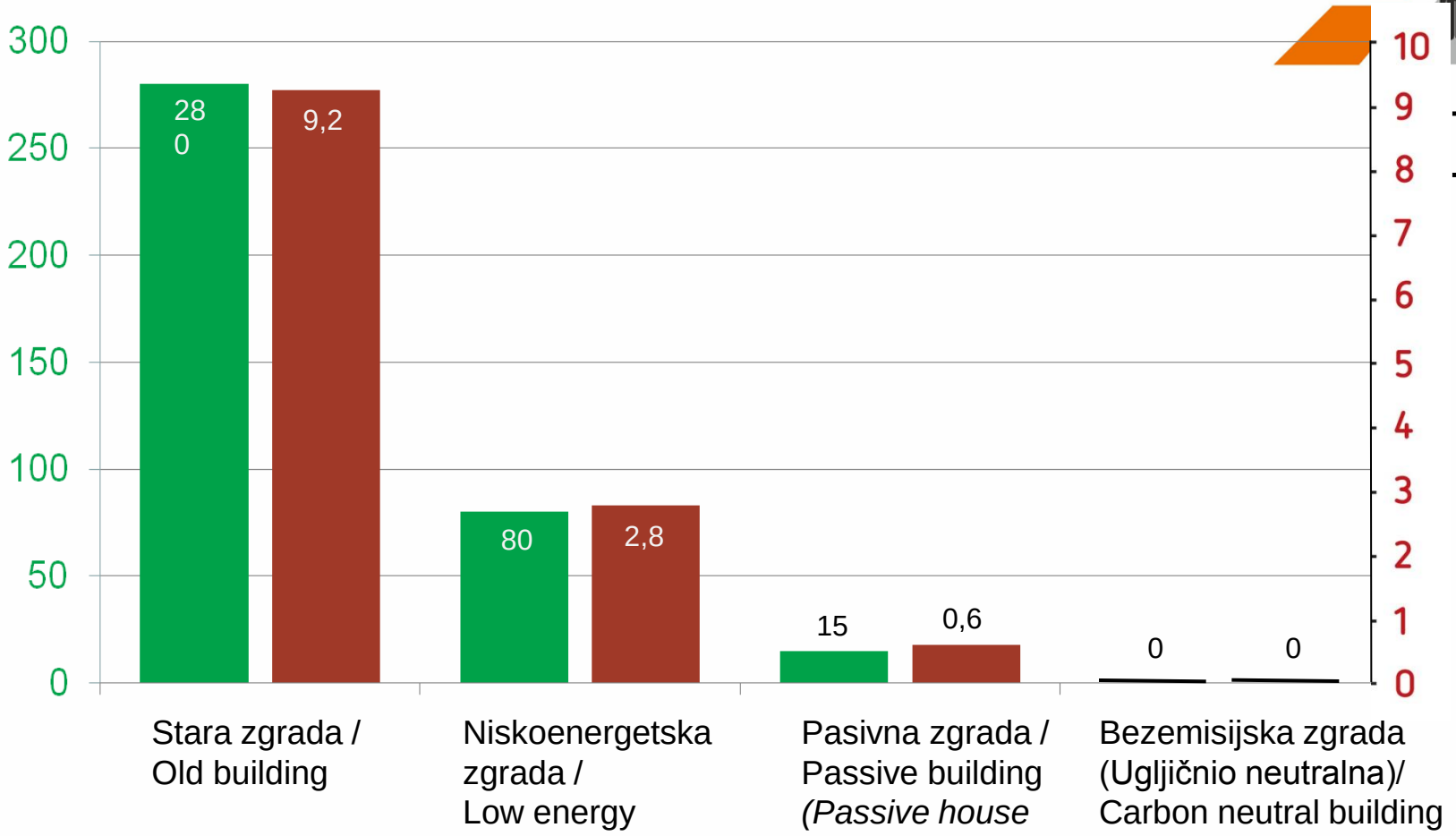
Vrlo niskoenergetska kuća M6 (arhitekt prof. Ljubomir Mišćević) drvene i betonske konstrukcije u Gornjem Stupniku, Hrvatska, u izgradnji

Timber-frame and concrete very low energy house M6, (architect Prof. Ljubomir Mišćević) structure in Gornji Stupnik, Croatia, under construction


The new Passive House Classes
120
Renewable energy generation
[kWhPER/(m²ground*a)]
60
Premium
Plus
Classic
Passive House Institute
Zertifiziertes Passivhaus
premium
30
plus
45
classic
total PER-demand
[kWhPER/(m²TFA*a)]
60
Die neuen Passivhausklassen

Godišnja potrebna toplinska energija za grijanje / Annual required thermal energy for heating





Stara zgrada / Old building

Niskoenergetska zgrada / Low energy building

Pasivna zgrada / Passive building *(Passive house* energy standard)

Bezemisijska zgrada (Ugljičnio neutralna)/ Carbon neutral building

kWh/m²god / kWh/m²a

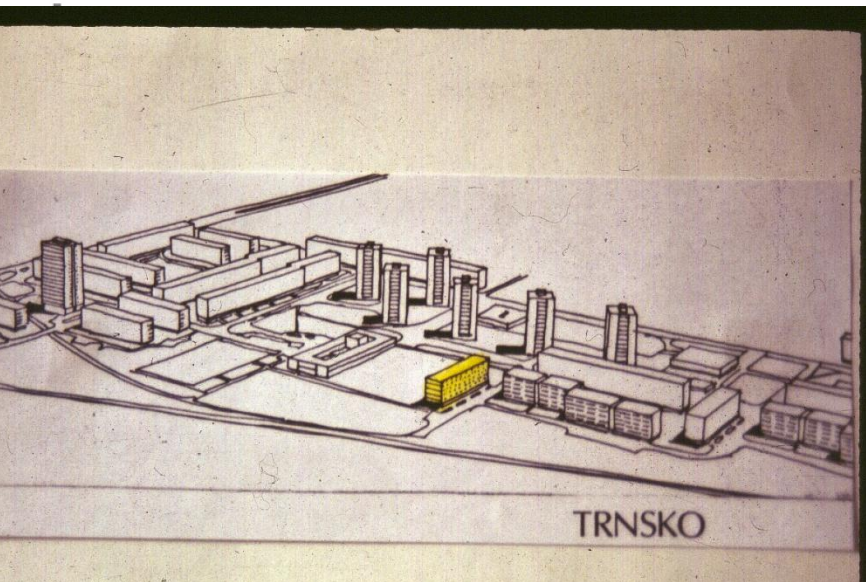
Tona CO_2/god / A tonne of CO_2/a

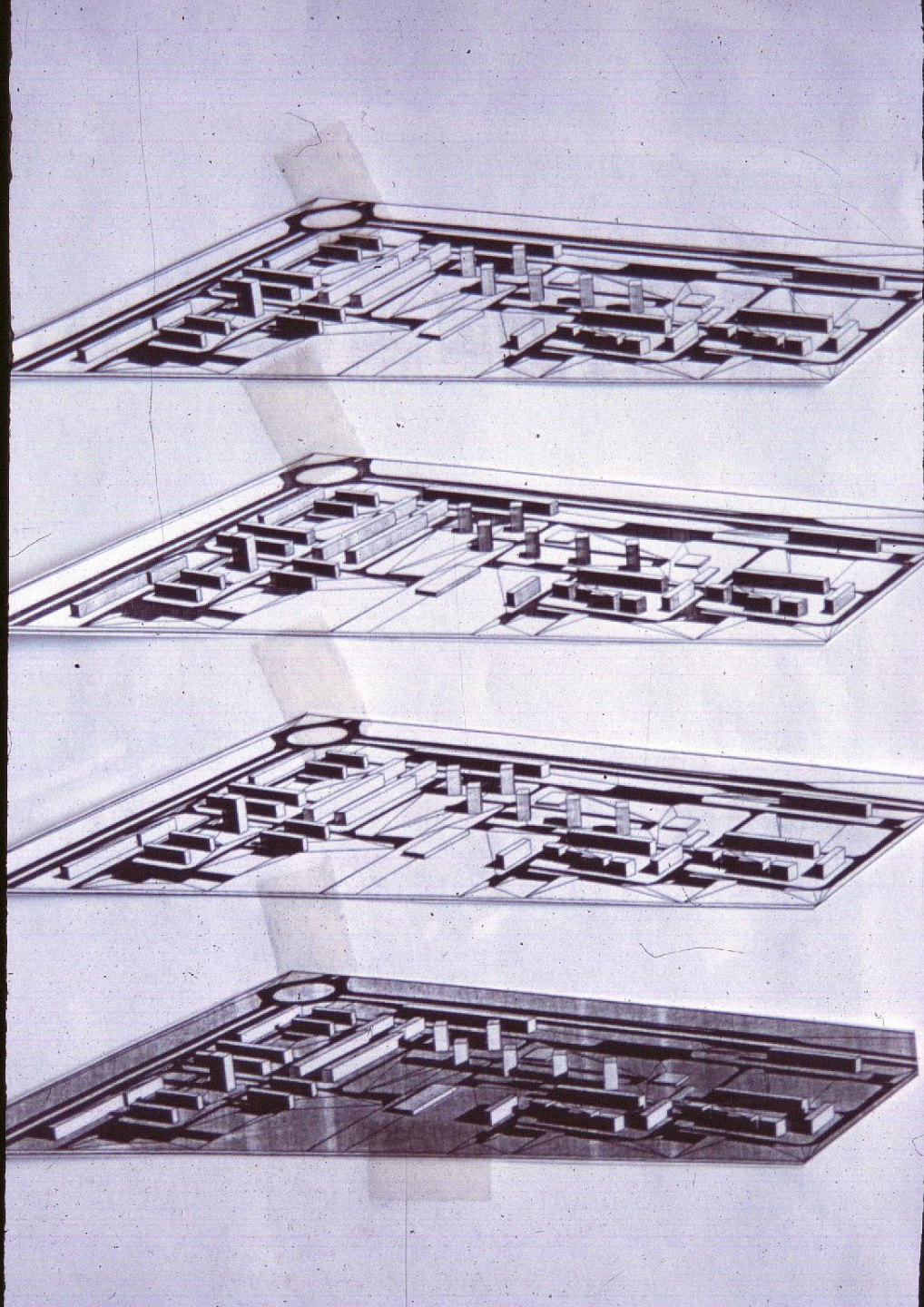
Energy and environmental rehabilitation of dwellings

Trnsko, Zagreb, 1985

International USA-HR project (DOE No. PN 777)

Voditelj (UNI ZG AF):
prof.dr.sc. Grozdan Knežević, M.Arch
Suradnici (UNI ZG HR):
prof. Ljubomir Miščević, M.Arch
prof.dr.sc. Bojan Baletić, M.Arch
Supervisor:
prof.dr.sc. Vladimir Bazjanac
Lawrence Berkeley Nat. Lab, Ca, USA





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Vol. 8 No. 3
August 1993

PROJECT REPORTS

Bioclimatic rehabilitation of dwellings in Croatia

Ljubomir Miscevic

University of Zagreb, Faculty of Architecture, Kaciceva 26, 41000 Zagreb, Croatia

Introduction

Croatia is lacking in conventional sources of energy, but at the same time enjoys a virtually optimal climatic predisposition for the utilisation of solar energy through passive design, according to the estimates of the Commission of the European Community (1) and through an active installation system. Typical passive solar architectural elements were investigated: sunspaces, air collectors, heat storage, thermal storage walls of the Trombe-Michel type and so forth, on the basis of computer simulation of original software.

The first generation of contemporary passive solar architecture has confirmed the expected results of energy savings. The gap between applied architectural concepts, elements and systems, investment and execution levels for various functional types of architecture and the settings of locations, climate, urban regulation and research into the values of traditional and contemporary building is a solid foundation for further development, and use in both new building and rehabilitation.

Passive solar family houses

Family housing in Croatia in which there has been practically no control over thermal insulation, takes around 70-80% of the total housing funds of the Republic. In the course of the war, over 220,000 housing units have been destroyed and damaged. Energy rational building, energy efficient architecture, ecological building and rehabilitation, the use of healthy materials and the application of latest technologies are the obligation of each professional which must be accepted, solved and carried out.

The coming rehabilitation and further building requires prompt changes and improvement of the existing regulations concerning thermal insolation and building physics. New instructions, guidelines and regulations must bring thermal storage to the European level of standard for rational use of energy in buildings and must also draw on the experience of passive solar architecture. The present experiences of energy rational and efficient architecture in Croatia, based on professional research, software, architectural and technological solutions, may prove useful in renewal.

The passive solar family houses which are described here were designed by the author between 1985 and 1990. These four houses, identified as "P2", "V1", "M2", and "P3" differ in terms of their location , program and cost. They are situated between 45°48' and 46° 11'N, 15°55' and 16°50'E and between 100 and 175m elevation.

The passive solar performance of the buildings is simulated with computer programs BUMP 1 and BUMP 2. All designs demonstrate an attempt to maximise the benefits from insulation without sacrificing the formal and spatial characteristics of the particular site and the building design.

Fig. 1 House "P2" in Marija Bistrica 1985. South-east elevation and detail of the sunspace with massive stone wall

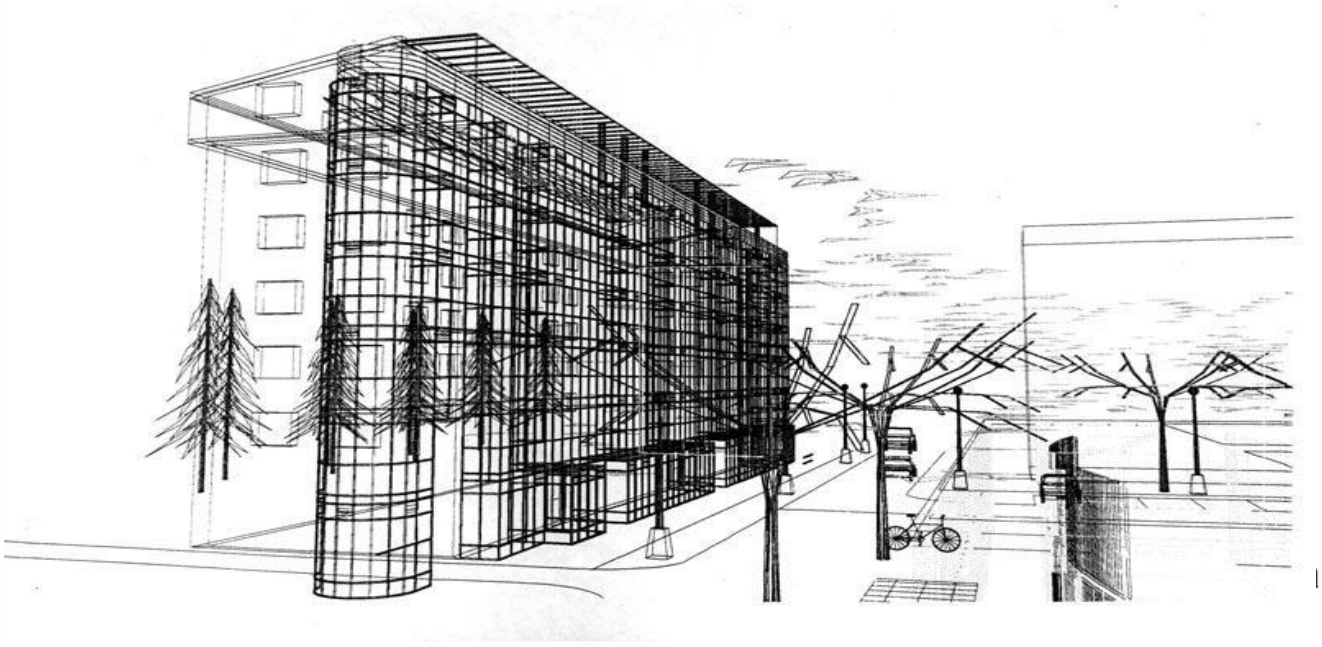
Energy and environmental rehabilitation of dwellings

Trnsko, Zagreb, 1985

International USA-HR project (DOE No. PN 777)

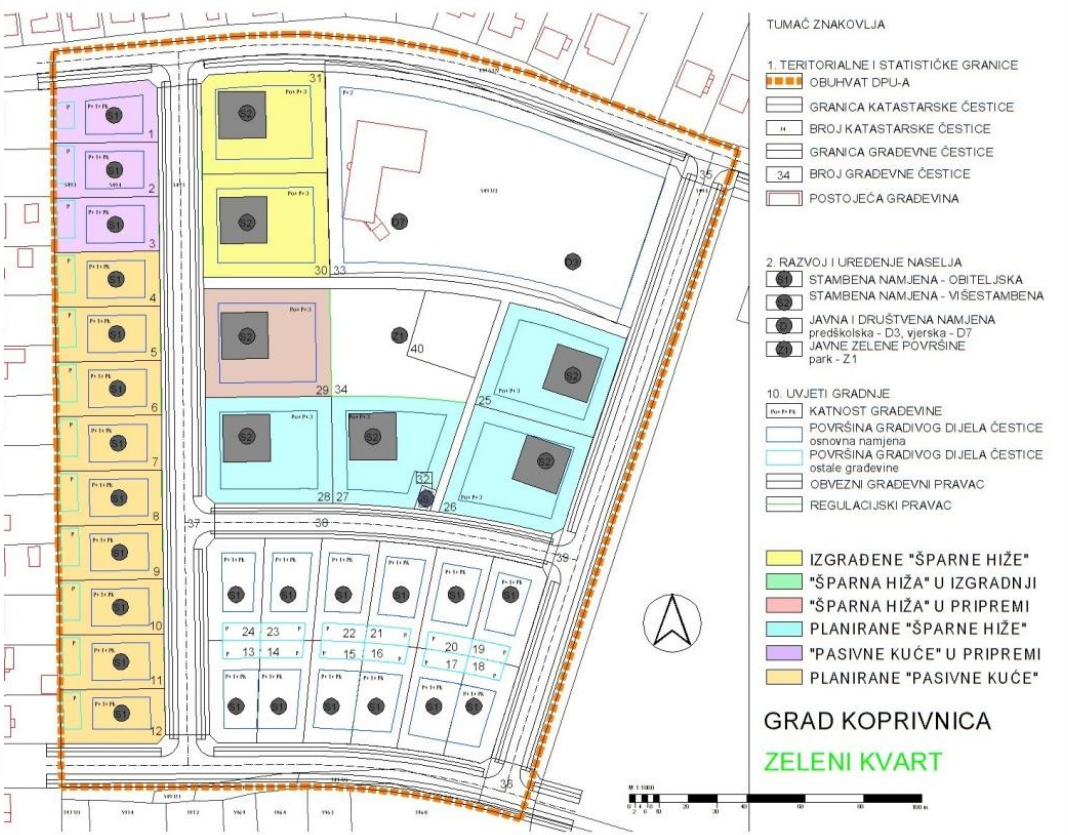
University of Zagreb, Faculty of Architecture, Croatia &
Lawrence Berkeley National Laboratory, USA,CA

Author of design
prof. Ljubomir Miščević, M. Arch



“Zeleni kvart” u Koprivnici

Stambena zona “Lenišće istok”



Pokazni projekt stambene izgradnje

prvi „zeleni kvart“ u gradu

Ukupno planirano 7 zgrada višestambene izgradnje i 12 manjih stambenih građevina (2-3 stana) – Agencija za društveno poticanu stanogradnju Grada Koprivnice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CITY OF KOPRIVNICA
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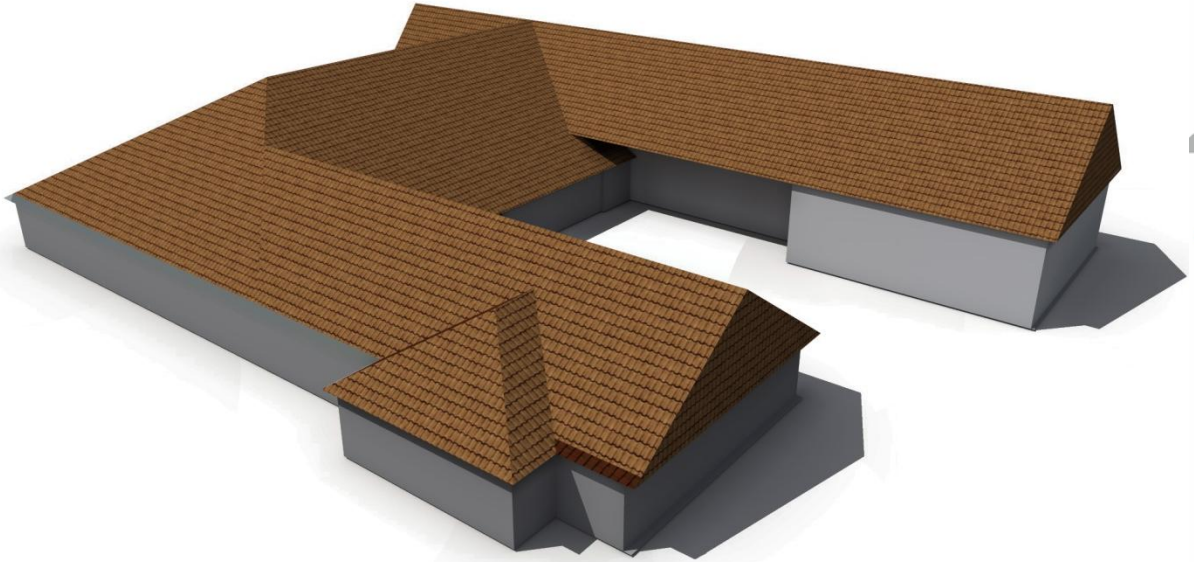

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Burgas Municipality | Bulgaria | www.burgas.bg

Cover photo: Nieuw Zuid development in Antwerpen | Belgium © Studio Associato Secchi-Viganò

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radova

Multi - functional public use passive house "Sunny“ On the Lake Bundek in Zagreb is choosed as referent beacon project

2nd phase project, 2009-2012

Author: Lj. Miščević

Višenamjenska građevina javne namjene energetskog standarda *pasivne kuće* "SUNČICA" – projekt prve gradske fotonaponske energane

Zagreb, park Bundek uz Veliko jezero

Investitor: Grad Zagreb
Autor idejnog rješenja
i projektant Lj. Miščević

1. faza projekta, 2006.-2007.

2. faza projekta, 2008.-2009.

Defining the Nearly Zero Energy Building

Passive House + renewables

Co-funded by the Intelligent Energy Europe Programme of the European Union

PassREg

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Municipalities lead the way

Photos: Detached single family house M6 | Ljubomir Miščević | Zagreb | Croatia
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"In a time of recession and crisis, rational use of energy, energy efficiency, the application of new green technologies and renewable energy sources is an imperative but also a challenge and impulse for economic development, opening new workplaces and a brighter perspective for our young generations."

Marijan Maras, M. Electrical Engineer
City of Zagreb, Head of Office for Energy, Environment and Sustainable

> Beacon: Croatia

M6 House | Zagreb County Area

M6 is a single-detached Passive House building in the Zagreb County Area, designed by architect Ljubomir Miščević. Located in the Gornji Stupnik area, south-west to the city centre of Zagreb, it has a usable floor area (TFA) of 334 square metres.

M6 was one of the first structures built with a reinforced concrete base plate to achieve very high standards of thermal insulation. The basement and ground level floors are made of reinforced concrete. The stairs and all remaining vertical wall constructions were made using layered wooden columns and beams.

The building envelope was conceived as a wooden door system ensuring integration and easy access to the central chambers. This Passive House building is an exemplary project as it demonstrates how well the plan and systems of a building can be adjusted to meet Passive House requirements. M6 already complies with the EU Directive on the Energy Performance of Buildings (EPBD).

Urban Development

Whole city districts

Urban Development

Passive City District Bahnstadt,
Heidelberg, Germany

Urban Development

Winner

Passive City District Bahnstadt, Heidelberg, Germany

The first urban district built entirely with passive houses

Carbon Neutral district

Multifamily residential buildings I hotel I vacation homes I offices I administrative building I kindergarten I school I student campus I university I church I commercial buildings I fire brigade housel etc.

Central heating, based on combined heat and power generation using wood biomass

PassREg

Special PassREg Award

Urban Development

Winner

Passive City District Bahnstadt, Heidelberg, Germany

PassREg

Special PassREg Award

Multi - functional public use passive house "Sunny“ on the Lake Bundek in Zagreb is choosed as referent project

2nd phase project, 2009-2012

Author: Lj. Miščević

“Solar city Zapresic”

Functional complexes are connected through a network of communications in an orthogonal raster.

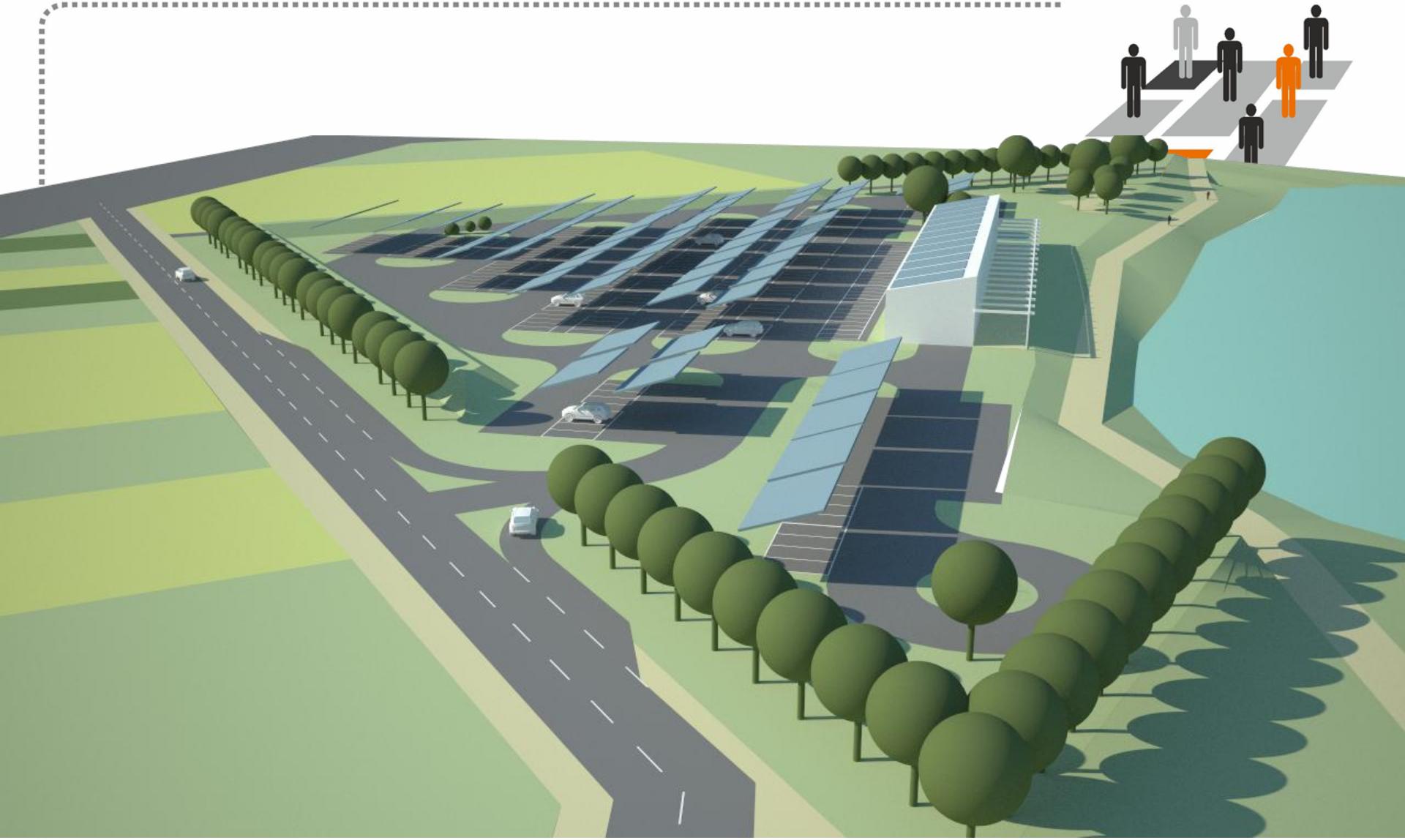
Zapresic, Croatia
Project, 2004.
Author: Lj. Miscevic

Projekt Sunčanog grada u Zaprešiću

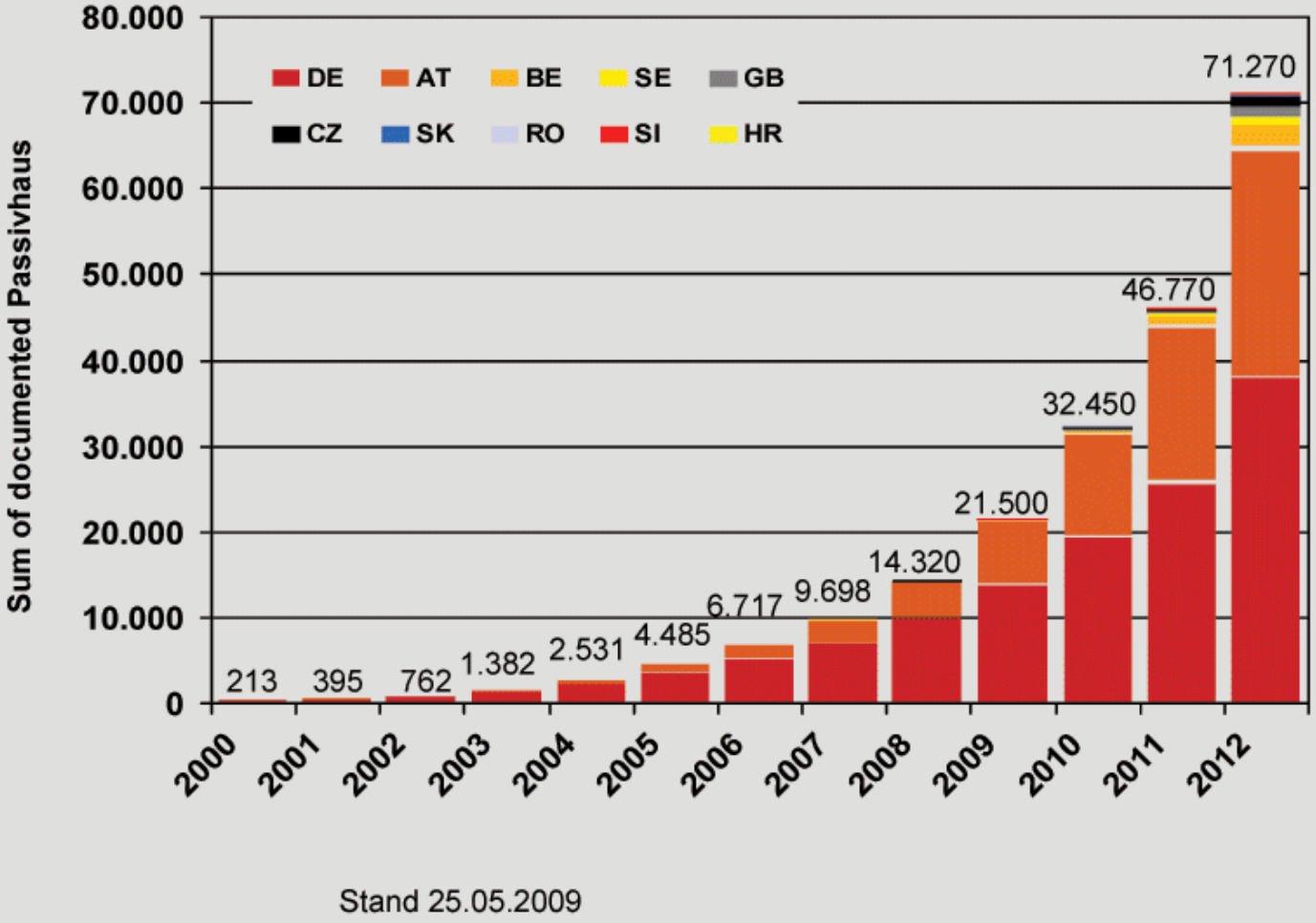
Godina projektiranja: 2004. - 2005.

Autor urbanističko arhitektonskog rješenja:

prof. Ljubomir Miščević, dipl. ing. arh.



Passivhaus trends in the 10 PASS-NET countries



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www.passivehousedatabase.eu Croatia / Hrvatska

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Search result summary

Search parameters: Country: Croatia
Result details: **10** match(es)

Single-family detached house: **9**
Two-family house | single family house + seperate apartment: **0**
Semi-detached house: **0**
Terraced house: **0**
Multi-family-dwelling | apartment house: **0**
Residential- and commmercial building: **1**
Nursing home | retreat home: **0**
Residential school | hall of residence: **0**
Hotel | hostel | holiday dwelling: **0**
Urban settlement | housing colony: **0**
Model house | example house: **0**
Kindergarten | day care: **0**
School | campus | university: **0**
Sports centre | recreation centre: **0**
Public swimming pool: **0**
Public building | church: **0**
Office | administration building: **0**
Office | comercial building: **0**
Factory | industrial building: **0**
Archive: **0**
Fire station: **0**
Hospital: **0**
Workshop | atelier | garage | depot: **0**
Others (please note in field: "project description"): **0**

Search result list

Sort by: Country | Postcode | Town | Type | Construction period | Construction | Floor area || Rev. order

mark

HR-10257 Kupinečki Kraljevec (Zagrebačka županija) — **HR-0001**
ČV1 | Architect: Ljubomir Miščević, dipl. ing. arh
Single-family detached house | Timber construction | m²
Construction period: 2006 - 2009
Number of apartments: 1 | Number of units: 1

mark

HR-10437 Bestovje (Zagrebačka županija) — **HR-0002**
M4 | Architect: Ljubomir Miščević, dipl. ing. arh
Single-family detached house | Masonry construction | m²
Construction period: 2004 - 2005
Number of apartments: 1 | Number of units: 1

mark

HR-42000 Varaždin (Varaždinska županija) — **HR-0003**
Ilčić | Architect: Lidija Ilčić, dipl. ing. arh.
Single-family detached house | Masonry construction | m²
Construction period: 2005 - 2007
Number of apartments: 1 | Number of units: 1

mark

HR-51315 Begovo Razdolje (Primorsko-goranska županija) — **HR-0004**
L2 | Architect: Ljubomir Miščević, dipl. ing. arh
Single-family detached house | Timber construction | m²
Construction period: 2006 - 2009
Number of apartments: 1 | Number of units: 1

INTENSE

From Estonia till Croatia: Intelligent Energy Saving Measures for Municipal Housing in Central and Eastern European Countries

Project is carried out in 12 European countries in the frame of the IEE programme. Regional Environmental Centre for Central and Eastern Europe (REC).

IEE Info-day
3 February 2010, Brussels
Ingrida Bremere,
Project manager

intense energy efficiency

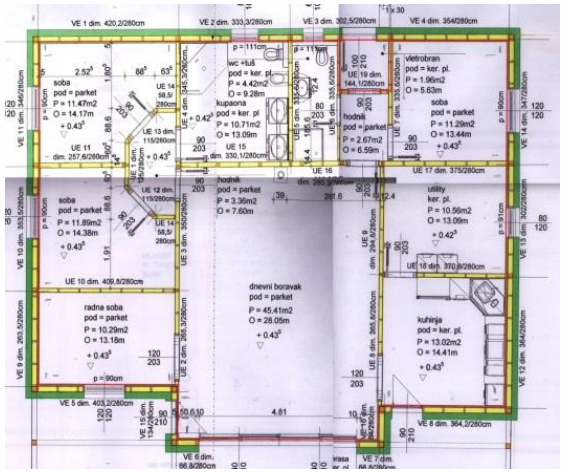
The first ten realizations of passive houses in Croatia

The first thirteen passive houses in Croatia realised till February 2012.

The first residential passive house building in Salatići on island Krk (right).

Author: M. Popović, Mag. Eng. Arch. Urb. Author of energy concept and consultant R. Karabaić, Mag. Eng. Elec.

Passive family house Vilić in Buzet, Istria, Croatia



The author of energy concept, consultant and construction works supervisor Mladen Vilić, Mag.Eng.Elec. Is the owner of the house.
Author: V. Bralić, Mag.Eng.Arch.Urb. The plan shows airtight zone marked with red line. Photograph shows a Blower-Door testing of the house.
It is **in the process of certification in Passive House Institut in Darmstadt** (PHI), 2011-2012.
The price for m^2 netto surface is about **600,00 €**

Energy concept and certification consultant Lj. Miščević Mag.Eng.Arch.Urb.

Single-family passive house “L2” in Čazma, Croatia

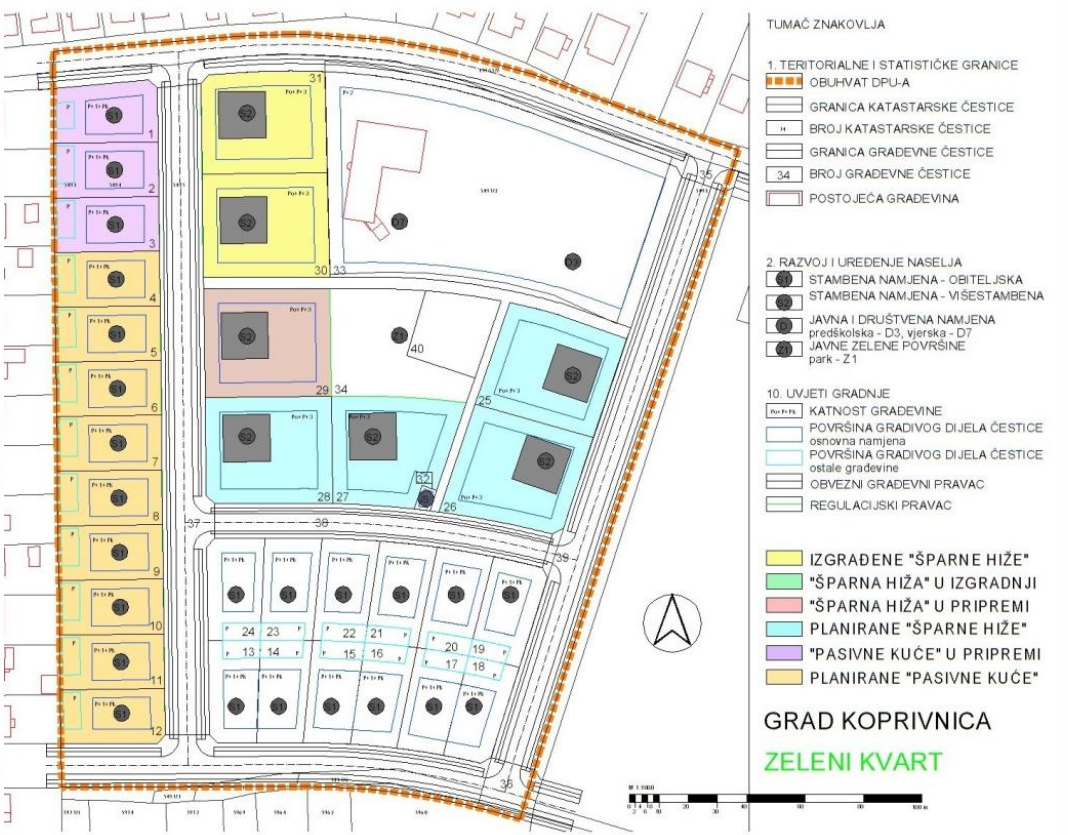
Single-family detached house “L2” in Čazma (Bjelovarsko – Bilogorska County) is **developed from type “Y” house project for “three litres house”** (40,0 kWh/m^{2}a) energy consumption.

<u>This is the first example of increasing of type project for low-energy standard house to passive house energy efficiency level.</u>

Author: prof. Ljubomir Miščević, Mag.Eng.Arch.Urb. Design 2009, realized in 2011

“Zeleni kvart” u Koprivnici

Stambena zona “Lenišće istok”



Pokazni projekt stambene izgradnje

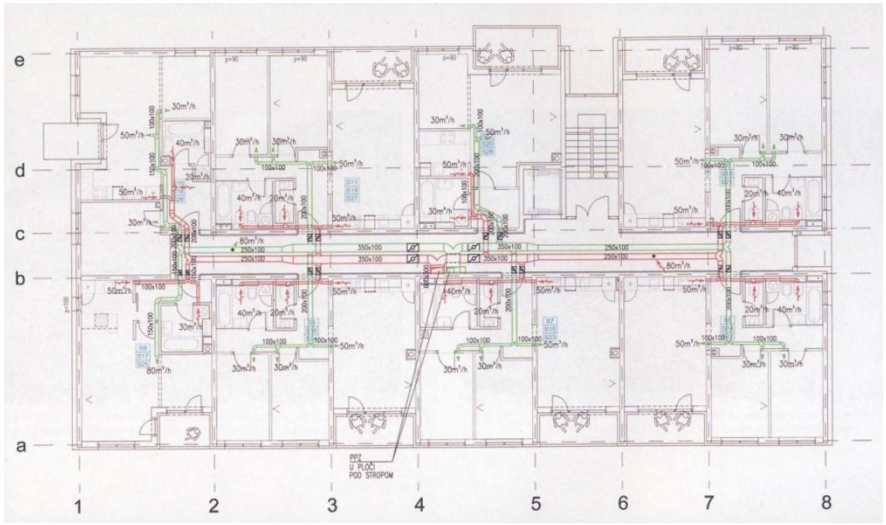
prvi „zeleni kvart“ u gradu

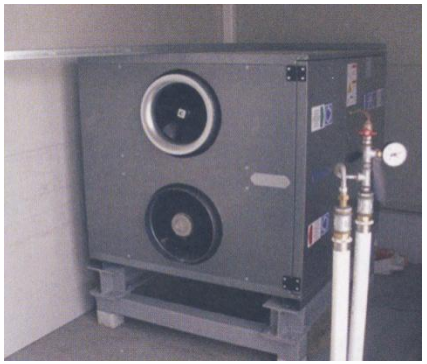
Ukupno planirano 7 zgrada višestambene izgradnje i 12 manjih stambenih građevina (2-3 stana) – Agencija za društveno poticanu stanogradnju Grada Koprivnice

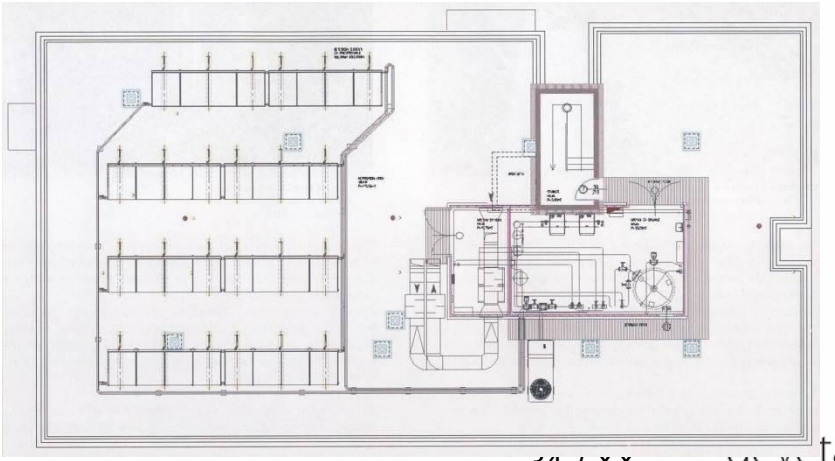
Zeleni kvart „Lenišće istok”

The first residential building from the social housing program (POS) in Koprivnica, Croatia, 2011

Energy certificate for A+ class. Author: Tehnika d. d.








ManagEnergy Local Energy Action Award 2013
European Commission
This is to certify that the
ManagEnergy Local Energy Action Award 2013
has been granted to:
The Bold New Face of Koprivnica
implemented by City of Koprivnica
William Gillett
European Commission, EACI
ManagEnergy
Co-funded by the Intelligent Energy Europe Programme of the European Union
This energy action was selected by a jury comprising representatives of energy agencies, industry and public authorities, as the winning entry from the Good Practices which were submitted by public authorities, energy agencies and other local energy actors from across the EU.
ManagEnergy is an initiative of the European Commission which is supported under the Intelligent Energy Europe Programme. It promotes sustainable energy in local and regional communities.


SUSTAINABLE ENERGY
WEEK 24 - 28 JUNE 2013
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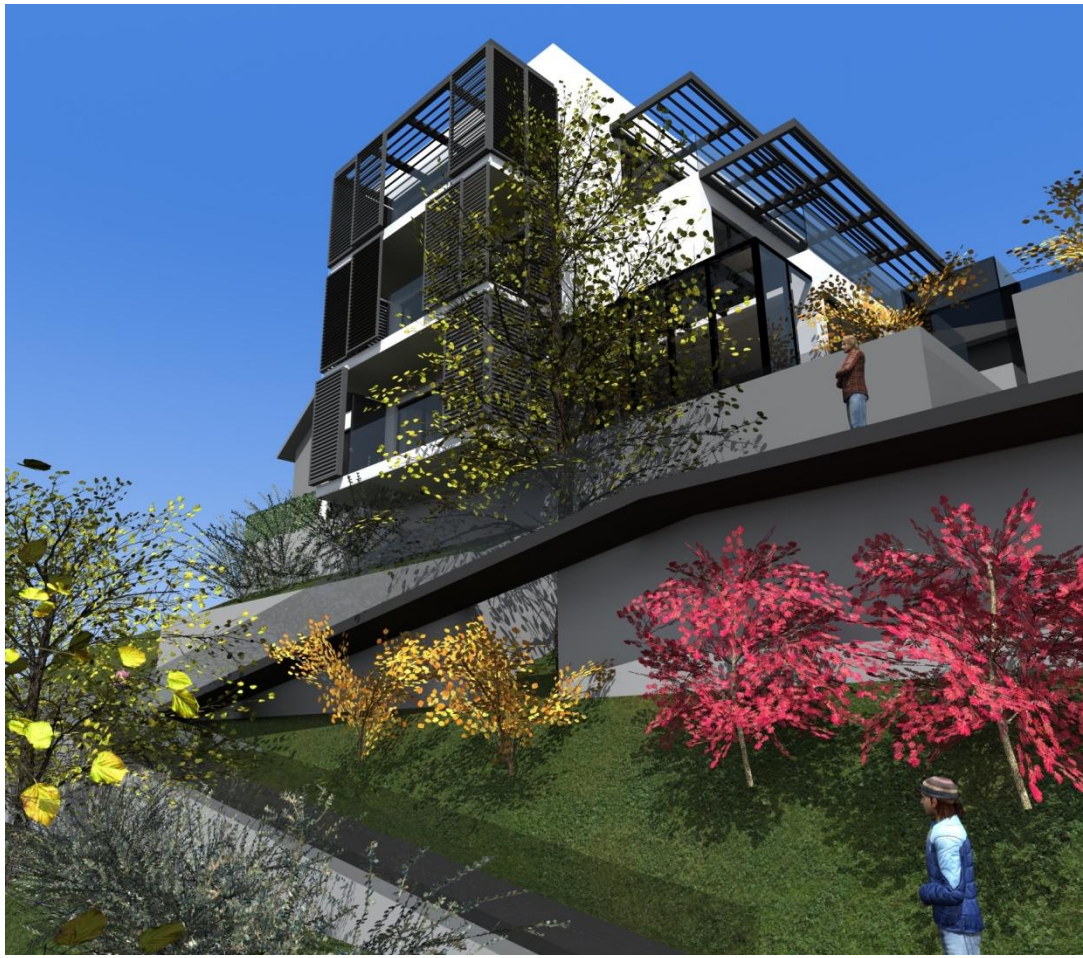
Trg Ivana Pavla II
Ul. Mije Stanića
Ul. Zvonimira Goluba

Obiteljska pasivna kuća „H2“, Zagreb

Projekt 2014.-2015.

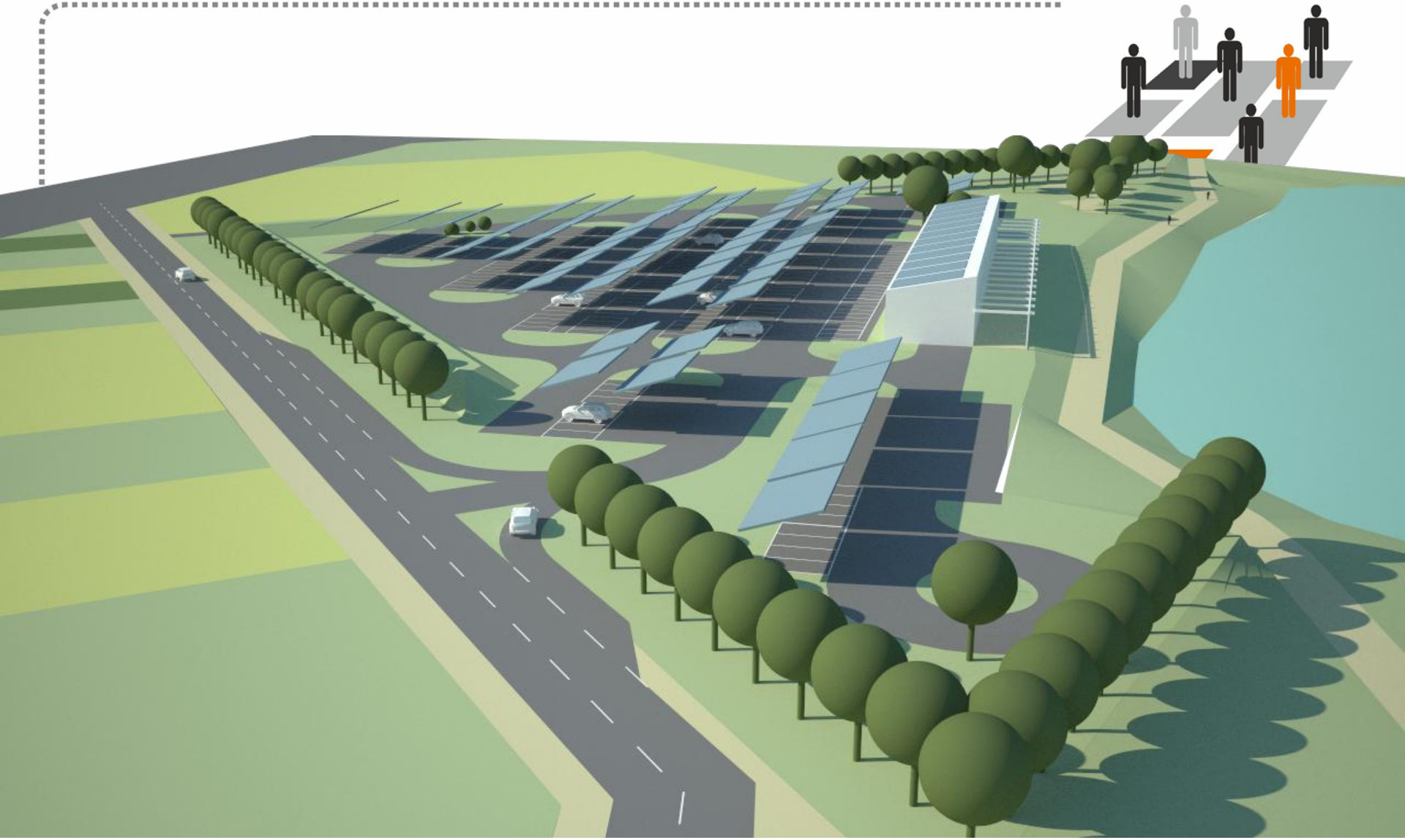
Autor: Lj. Miščević



Multi - functional public use passive house "Sunny“ on the Lake Bundek in Zagreb is choosed as referent project

2nd phase project, 2009-2012

Author: Lj. Miščević



Zahvaljujem na pozornosti!

Red.prof.art. Ljubomir Miščević, dipl.ing.arh.

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