

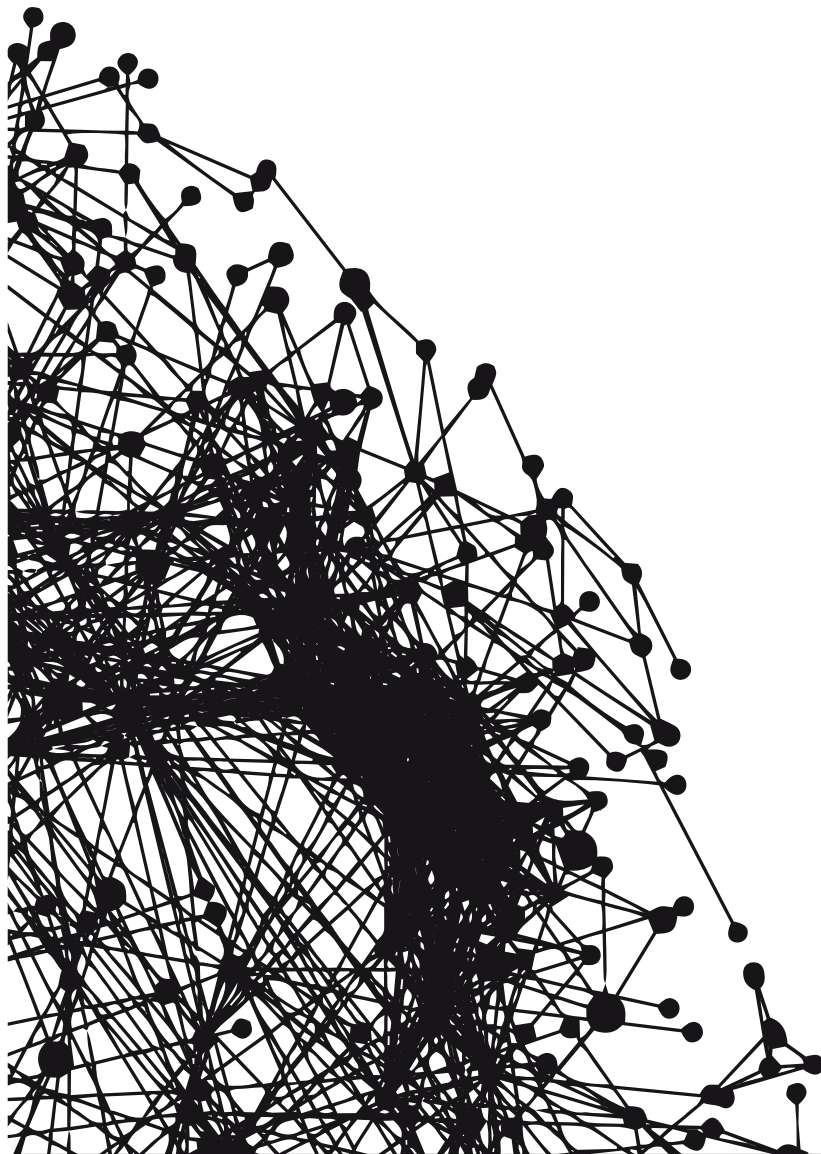
1ST INTERNATIONAL ACADEMIC CONFERENCE  
PLACES AND TECHNOLOGIES 2014

BELGRADE, 3-4. APRIL 2014 | KEEPING UP WITH TECHNOLOGIES TO IMPROVE PLACES

editors:

Eva Vaništa Lazarević, Aleksandra Đukić,  
Aleksandra Krstić - Furundžić, Milena Vukmirović

conference proceedings



ISBN 978-86-7924-114-6

[www.placesandtechnologies.eu](http://www.placesandtechnologies.eu)

Proceedings of INTERNATIONAL ACADEMIC  
CONFERENCE ON PLACES AND  
TECHNOLOGIES

APRIL 3-4, 2014, BELGRADE, SERBIA

# PLACES AND TECHNOLOGIES 2014

PROCEEDINGS OF FIRST INTERNATIONAL ACADEMIC CONFERENCE ON PLACES AND TECHNOLOGIES

International Academic Conference on Places and Technologies, Places and Technologies 2014, will be the first conference organized by University of Belgrade – Faculty of Architecture, Professional association Urban Laboratory and University of Belgrade – Faculty of Philosophy.

Editors: Dr Eva Vaništa Lazarević, Dr Aleksandra Krstić-Furundžić, Dr Aleksandra Đukić and Dr Milena Vukmirović

For publisher: Dr Vladan Đokić

Publisher: University of Belgrade – Faculty of Architecture

Design: Stanislav Mirković

Place and year: Belgrade 2014

ISBN 978-86-7924-114-6

CIP - Каталогизација у публикацији  
Народна библиотека Србије, Београд

711.4.01(082)(0.034.2)  
711.4:005.591.6(082)(0.034.2)

INTERNATIONAL Academic Conference on Places  
and Technologies (1st ; 2014 ; Belgrade)

Places and Technologies 2014 [Elektronski  
izvori] : keeping up with technologies to  
improve places : conference proceedings : 1st  
international academic conference, Belgrade,  
3-4. April 2014 / [organized by University  
of Belgrade - Faculty of Architecture,  
Professional Association Urban Laboratory and  
University of Belgrade - Faculty of  
Philosophy] ; editors Eva Vaništa Lazarević  
... [et al.]. - Belgrade : Faculty of  
Architecture, 2014 (Belgrade : Faculty of  
Architecture). - 1 USB fleš memorija ; 1 x 2  
x 14 cm

Sistemska zahtevi: Nisu navedeni. - Nasl. sa  
naslovnog ekrana. - Tiraž 150. -  
Bibliografija uz svaki rad.

ISBN 978-86-7924-114-6

1. Vaništa Lazarević, Eva, 1961- [urednik]  
2. Faculty of Architecture (Belgrade)  
a) Градови - Мултидисциплинарни приступ -  
Зборници b) Урбанистичко планирање -  
Технолошки развој - Зборници

COBISS.SR-ID 206380812

## ORGANIZERS



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# CONTENTS

## PART I: URBANISM

### **Urban planning and technologies**

#### **OVERCOMING BARRIERS TO GROWTH**

Stephen Platt 16

#### **URBAN CHALLENGES OF ENERGY EFFICIENCY AND CONTEXT-SENSITIVE PLANNING APPROACHES IN BULGARIA**

Elena Dimitrova 25

#### **NEW URBAN PROTOCOLS FOR FRAGMENTED TERRITORIES \_ THE EXAMPLE OF WESTERN THESSALONIKI**

Styliani Rossikopoulou-Pappa, Valia Fragkia 33

#### **A FEASIBILITY STUDY FOR A TECHNOLOGICAL PARK IN FALCONARA MARITTIMA AN, ITALY**

Giovanni Sergi 41

#### **SAVING URBAN PLANNING FROM ANOTHER UTOPIAN MODEL**

Danijela Milojkić, Marija Maruna 48

#### **THE IMPLICATIONS OF DIGITAL TECHNOLOGY ON THE PERCEPTION OF CENTRALITY**

Mihai Alexandru, Cătălina Ioniță 56

#### **TECHNOLOGY AND LANDSCAPE: REDUCE, REUSE AND RECYCLE THE MINING DROSSCAPES**

Nicola Martinelli, Francesco Marocco, Alessandro Reina, Maristella Loi, Federica Greco 63

#### **THE ILLEGAL SETTLEMENTS IN BELGRADE VS. TAMING CITY GROWTH: CASE STUDY OF BELGRADE**

Biserka Mitrović, Miodrag Ralević, Branislav Antonić 71

#### **IMPACT OF CLIMATE CHANGE IN URBAN PLANNING**

Tamara Tošić 78

#### **CONCEPT OF URBAN VILLAGE: THE APPLICATION OF THE CONCEPT AS A FOUNDATION FOR NEW TYPOLOGY OF URBAN VILLAGES**

Branislav Antonić 85

#### **RESILIENCE AND VULNERABILITY OF URBAN SYSTEMS. A METHODOLOGICAL PROPOSAL FOR SEISMIC RISK MITIGATION**

Rigels Pirgu 94

## **Urban design and technologies**

<b>PUBLIC PLACES AND SPLIT DEVELOPMENT MODEL</b> Višnja Kukoč	103
<b>AGILE LANDSCAPES: REDESIGNING URBAN SPACE</b> Anastasios Tellios, Despoina Zavraka	110
<b>PLANNING AND DESIGNING SAFE AND SECURE OPEN PUBLIC SPACES IN SERBIA</b> Svetlana Stanarević, Aleksandra Djukic	118
<b>SPATIAL AND FUNCTIONAL TRANSFORMATION OF BUSINESS AREAS UNDER THE IMPACT OF INFORMATION TECHNOLOGIES – CASE STUDY OF NIŠ ADMINISTRATIVE DISTRICT</b> Aleksandar Ristić, Petar Mitković	130
<b>THE IMPACT OF NEW TECHNOLOGIES ON CITY ACUPUNCTURE METHODOLOGY AND INTERVENTIONS</b> Kristina Careva, Rene Lisac	138
<b>COMFORT OF OPEN PUBLIC SPACES: CASE STUDY NEW BELGRADE</b> Aleksandra Djukic, Nevena Novakovic	145
<b>005 PUBLIC ART IN BERLIN</b> Biljana Arandjelovic	151
<b>PROTECTION OF PERSON WHIT DISABILITIES: IMPLEMENTATION OF ACCESSIBILITY STANDARDS</b> Dragana Vasiljevic Tomic, Radojko Obradović	160
<b>VERTICAL PUBLIC SPACE</b> Sorana Cornelia Radulescu, Roger Riewe	167
<b>READY-AVAILABLE HYBRID METHODOLOGIES FOR CONTEMPORARY PUBLIC SPACE RESEARCH</b> Milena Ivkovic, Berit Piepgras, Robin van Emden	175
<b>RETAIL – NEW TECHNOLOGIES AND URBAN CENTRALITY</b> Martin Brabant	181
<b>TECHNOLOGY AND NEOLIBERAL URBAN PLACES</b> Marija Cvjetković	191
<b>NEURAL CITIES OR HOW CITIES TEACH US TO DESIGN THEM BETTER</b> Angelica Stan	198
<b>MORPHOLOGICAL AND TYPOLOGICAL CLASSIFICATION OF GREEN STREET FORMS: MLADEN STOJANOVIC STREET IN BANJA LUKA</b> Tanja Trkulja	206

## **Urban regeneration and technology**

### **PROPERTY ISSUES IN THE TURKISH URBAN REGENERATION PROJECTS**

Mehmet Çete, Yunus Konbul 215

### **URBAN ENERGY AND URBAN REGENERATION STRATEGIES: EVALUATION OF IZMIR-UZUNDERE URBAN REGENERATION PROJECT**

Yakup Egercioğlu, Çilem Türkmen 222

### **THE EMPTY URBAN SPACES AS AN OPPORTUNITY FOR THE CITY TO REINVENT ITSELF: THE CASE OF THE INDUSTRIAL TECHNOLOGICAL OBSOLETENESS**

Cătălina Ioniță, Mihai Alexandru 230

### **ENHANCEMENT OF URBAN LIFE QUALITY IN URBAN REGENERATION PROJECTS: IZMIR-BAYRAKLI URBAN REGENERATION PROJECT**

Yakup Egercioğlu, Tuğçe Ertan 238

### **THE INDUSTRIAL BUILDINGS WHICH USED IN SAUDI ARABIA AND SUSTAINABILITY**

Wael Al-Buzz 246

### **AN OVERVIEW OF URBAN REGENERATION PROJECTS IN TURKEY**

Yunus Konbul, Mehmet Çete 257

### **ART AND CULTURE AS INITIATORS OF ARCHITECTURAL AND URBAN TRANSFORMATION IN SAVAMALA**

Ksenija Pantović, Iva Čukić, Jasna Kavran 265

## **Smart cities/regions and network protocols**

### **SMART CITY GRAZ: FROM THE VISION TO THE ACTION**

Carlos Varela Martín, Ernst Rainer, Hans Schnitzer 276

### **RESIDENTS INTERACTION WITH HOME RESOURCES**

Cerasela Dinu, Constantin-Daniel Oancea 285

### **RENEWABLE AND DISTRIBUTED SOURCES WITHIN SMART ENERGY REGIONS**

Jovan Todorovic 293

### **THE SMART CITY FOR THE FUTURE. HOW A SPATIALLY ENABLED AFFECTED BY THE URBAN POPULATION?**

Shahryar Habibi 300

### **PERFORMANCE EVALUATION OF ROUTING PROTOCOLS FOR AD-HOC NETWORKS**

Ledina Karteri, Valma Prifti 306



<b>SMART CITIES AND CHALLENGES OF SUSTAINABILITY</b>	
Rigels Pirgu	315
<b>A FUZZY BASED CALL CONTROL SYSTEM IN MOBILE NETWORKS, CONSIDERING PRIORITY COMMUNICATIONS</b>	
Valma Prifti, Ledina Karteri	323
<b>Historical centers, Building heritage and Technologies</b>	
<b>ICT AND VGI TO PROMOTE MINOR HISTORIC CENTRES AND THEIR LANDSCAPE</b>	
Pierangela Loconte, Francesco Rotondo	331
<b>THE SUSTAINABILITY AND CULTURAL HERITAGE MANAGEMENT</b>	
Christian Kersten Hofbauer, Elham Madadi Kandjani, Jean Marie Corneille Meuwissen	339
<b>CONCEPTS OF FORMING OF URBAN SOLUTIONS IN HOUSING SETTLEMENTS IN BELGRADE BUILT IN PRECAST INDUSTRIALIZED SYSTEMS IN SECOND HALF OF XX CENTURY</b>	
Dragana Mekanov	346
<b>NEW ARCHITECTURE IN HISTORICAL CENTRES</b>	
Alessandro Bruccoleri	355
<b>INFORMATION AND COMMUNICATION TECHNOLOGIES TO IMPROVE THE KNOWLEDGE OF PLACES. THE ROME HISTORICAL CENTRE AS A CASE STUDY</b>	
Francesca Geremia	363
<b>CONTEMPORARY INTERVENTIONS IN HISTORIC PLACES _ THE EXAMPLE OF THESSALONIKI METRO</b>	
Stavros Apotsos	372
<b>Image and Identity of place</b>	
<b>THE IMAGE OF TRIFKOVIĆ SQUARE (NOVI SAD, SERBIA) THEN AND NOW</b>	
Ivana Blagojević, Ksenija Hiel	380
<b>IDENTITY OF NEW MEDIA SPACES</b>	
Jelena Brajković, Lidija Đokić	388
<b>THESSALONIKI: A MULTICULTURAL ARCHITECTURAL DESTINATION</b>	
Niki Manou-Andreadis, Maria Milona	400
<b>ELEMENTS OF IDENTITY AND UNUSED POTENTIALS OF CENTRAL ZONE IN NOVI SAD</b>	
Milena Krklješ, Dijana Apostolović, Aleksandra Milinković	408

<b>BELGRADE SKYLINE: CONTINUITY, PARADOXES &amp; DESIRES</b> Vladimir Milenković, Snežana Vesnić, Tatjana Stratimirović	416
<b>CITY OF THE MIND - INVISIBLE IN THE MAP</b> Jelena Stankovic, Milenko Stankovic	424
<b>WHAT MAKES A PLACE?</b> Saskia I. de Wit, Denise Piccinini	432
<b>SUSTAINABILITY, IDENTITY AND ROLE OF TRADITIONAL MATERIALS</b> Olivera Ilić Martinović, Mirjana Miletić	441
<b>IDENTITY OF URBAN SPACES; ASSESSMENT AND EVALUATION</b> Elham Madadi-Kandjani, Christian Kersten Hofbauer, Jean Marie Corneille Meuwissen	448
<b>IMAGE OF SUSTAINABLE PLACES</b> Vladimir Parežanin, Miloš Mihajlović	456
<b>PRESERVATION OF IDENTITY OF SPACE WITHIN RAPID ECONOMIC AND TECHNOLOGICAL DEVELOPMENT OF TOURIST DESTINATIONS IN THE EXAMPLE OD JIJOCA DE JERICOACOARA IN BRAZIL</b> Maja Momirov	469
 <b>PART II: ARCHITECTURE AND TECHNOLOGIES</b>	
<b>Sustainability, Sustainable buidings and technologies</b>	
<b>SUSTAINABLE RETROFITTING OF EXISTING AND HISTORIC BUILDINGS</b> Marina Traykova, Tanya Chardakova	477
<b>OSMOTIC LANDSCAPES - RECOVERED IDENTITIES</b> Venetia Tsakalidou, Anastasia Papadopoulou	485
<b>DESIGN SCENARIOS FOR AN OFFICE BUILDING – ENERGY AND ENVIRONMENTAL ASPECTS</b> Aleksandra Krstic-Furundzic, Tatjana Kosic	493
<b>TECHNOLOGICAL AND ENVIRONMENTAL ASPECTS OF RAPID HOUSING CONSTRUCTION</b> Nikola Macut, Bojana Stanković, Nataša Ćuković-Ignjatović	507
<b>ENERGY ANALYSIS AND REFURBISHMENT STRATEGY FOR ZAGREB UNIVERSITY BUILDINGS: FORMER FACULTY OF TECHNOLOGY IN ZAGREB BY ALFRED ALBINI</b> Stanka Ostojić, Zoran Veršić, Iva Muraj	515

<b>SUSTAINABLE REUSE OF OLD STRATEGIC INFRASTRUCTURE CANAL DANUBE-TISA-DANUBE</b> Mirjana Jočić, Nataša Kuburović	523
<b>PLACE ATTACHMENT AS POTENTIAL FOR SUSTAINABLE LOCAL DEVELOPMENT IN SERBIA</b> Anđelka Mirkov	533
<b>LOW ENERGY BUILDINGS: CONCEPT OF ENERGY PERFORMANCE OPTIMIZATION OF SINGLE-FAMILY HOUSES</b> Katarina Slavković	540
<b>TECHNOLOGY AND PRODUCTIVE PROCESS: MINING REJECTIONS FROM WASTE TO SUSTAINABLE RESOURCE</b> Vincenzo Paolo Bagnato, Giovanna Mangialardi, Silvana Milella, Michele Mundo	549
<b>ADAPTATION OF AN INDUSTRIAL BUILDING INTO HIGHER EDUCATION INSTITUTION IN ACCORDANCE WITH IMPROVED ENERGY PERFORMANCE</b> Branko Slavković, Komnen Žižić, Danilo Dragović	557
<b>FUNCTION OF A DESOLATE SPACE</b> Aleksandra Pešterac, Daniela Dimitrovska	565
<b>ENVIRONMENT CERTIFICATION OF REHABILITATION DESIGN PROJECTS: PUT AND SHU BUILDINGS AS CASE STUDY</b> Florian Nepravishhta, Gerta Veliu, Ramadan Alushaj	570
<b>Green strategies and technologies</b>	
<b>GREEN URBAN STRATEGIES IN THESSALONIKI IN THE CONTEXT OF CRISIS</b> Evangelia Athanassiou	580
<b>GEOSCIENTIFIC EDUCATIVE CENTRE AS SUSTAINABLE COMMUNITIES BUILDING MODEL – POSITIVE COOPERATION EXAMPLE OF LIKA-SENJ COUNTY (CROATIA) AND UNA-SANA COUNTY (BIH)</b> Ivan Brlić, Anita Bušljeta-Tonković, Katarina Milković	587
<b>THE OCCUPANTS' PERSPECTIVE AS CATALYST FOR LESS ENERGY INTENSIVE BUILDINGS</b> Lucia Martincigh, Marina Di Guida, Giovanni Perrucci	597
<b>THE COLLECTIVE SELF ORGANIZED HOUSING EXPERIENCE IN ITALY</b> Silvia Brunoro, Giacomo Bizzarri	605

<b>APPLICATION OF ROOF GARDENS IN THE DEFINING IMAGE OF THE CITY</b>	
Mirjana Sekulić, Bojana Stanković, Ljiljana Dosenović	613
<b>STRATEGY FOR NATIONAL DEFINITION OF NEARLY ZERO ENERGY BUILDINGS</b>	
Milica Jovanović Popović, Bojana Stanković, Jasna Kavran	621
<b>ENERGY OPTIMIZATION OF THE BUILDING ENVELOPE OF THE REPRESENTATIVE SAMPLE OF THE EXISTING RESIDENTIAL BUILDING IN BANJA LUKA</b>	
Darija Gajić, Aleksandra Krstić – Furundžić	629
<b>BLUE GREEN DREAM AND DAYLIGHT</b>	
Srdjan Stankovic, Cedo Maksimovic, Milenko Stankovic	637
<b>POSSIBILITIES FOR ENERGY REHABILITATION OF TYPICAL SINGLE FAMILY HOUSE IN BELGRADE – CASE STUDY</b>	
Bojana Stanković, Dušan Ignjatović, Nataša Ćuković-Ignjatović	646
<b>BLUE-GREEN INTEGRATED MODELING SOLUTIONS IN URBAN PLANNING AND ARCHITECTURAL DESIGN</b>	
Miloš Mirosavić, Ivana Mirosavić, Srđan Stanković, Čedo Maksimović, Ranko Božović	654
<b>POTENTIALS AND LIMITATIONS FOR ENERGY REFURBISHMENT OF MULTI-FAMILY RESIDENTIAL BUILDINGS BUILT IN BELGRADE BEFORE THE WORLD WAR ONE</b>	
Ljiljana Đukanović, Ana Radivojević, Aleksandar Rajčić	661
<b>FROM BUILDING INFORMATION MODELS TO SIMPLIFIED GEOMETRIES FOR ENERGY PERFORMANCE SIMULATION</b>	
Daniel Ladenhauf, René Berndt, Eva Eggeling, Torsten Ullrich, Kurt Battisti, Markus Gratzl-Michlmair	669
<b>ENERGY CITY GRAZ - REININGHAUS: FIRST RESULTS FROM AN ENERGY SELF-SUFFICIENT QUARTER</b>	
Heimo Staller, Ernst Rainer, Carlos Varela Martín	677
<b>ENERGY EFFICIENCY AS ADVANCED TECHNOLOGY FOR A SOLUTION TO THE PROBLEM OF DEPOPULATION OF RURAL AREAS IN SERBIA</b>	
Jovana Stanišić	684
<b>THE ENERGY EFFICIENT CITY</b>	
Ivan Dochev	692

**Innovative materials, systems and technology**

**INVESTIGATION OF FLY ASH INFLUENCE ON CEMENT MORTARS PROPERTIES**

Dragica Jevtić, Aleksandar Savić 701

**INFLUENCE OF GLASS COMPONENT JOINTS ON THE STRUCTURAL GLASS FACADE DESIGN**

Aleksandra Krstic-Furundzic, Tatjana Kosic, Jefto Terzovic 709

**QUANTIFYING THE THERMAL BRIDGING EFFECT WITH REGARD TO THE FAÇADE'S CONFIGURATION**

Katerina Tsikaloudaki, Theodore Theodosiou, Dimitris Aravantinos, Karolos Nicolaos Kontoleon, Dimitrios Bikas 720

**THE INFLUENCE OF NEW TECHNOLOGIES ON MODERN CITY FACADES**

Jasna Čikić Tovarović, Jelena Ivanović Šekularac, Nenad Šekularac 728

**DYNAMIC APPEARANCE OF URBAN AND ARCHITECTURAL SURFACES**

Tihana Hrastar, Tamara Marić, Bojana Bojanić 736

**TOWARDS GENERATIVE CONVERGENCE IN DESIGN OF ARCHITECTURAL STRUCTURES**

Jelena Milošević, Zoran Šobić, Miodrag Nestorović 744

**APPLICATION OF WOOD AS AN ELEMENT OF FACADE CLADDING IN CONTEMPORARY ARCHITECTURE OF BELGRADE**

Jelena Ivanović Šekularac, Jasna Čikić Tovarović, Nenad Šekularac 752

**COMPARISON OF INSULATION APPLIED ON SURFACES OF MODEL PLACED IN THE AREA OF SKOPJE**

Aleksandar Petrovski, Todorka Samardzioska, Ana Trombeva Gavriloska 758

**APPLICATION AND EFFECTS OF PHASE CHANGE MATERIALS IN A MODERN ARCHITECTURAL AESTHETICS**

Vladana Stanković, Goran Jovanović, Mirko Stanimirović 766

**INTEGRATED DESIGN OF STRUCTURAL SYSTEMS**

Aleksandra Nenadović 772

**NEW COMPOSITE SLAB SYSTEM – LIGHTWEIGHT CONCRETE, STEEL SHEETING AND REINFORCEMENT**

Zoran Šobić, Jelena Milošević, Miodrag Nestorović 780

**MODERN METHODS OF STRENGTHENING MASONRY WALLS**

Nenad Šekularac, Jasna Čikić Tovarović, Jelena Ivanović Šekularac 788

**NEW PERSPECTIVES FOR FERROCEMENT**

Ornela Lalaj, Yavuz Yardim, Salih Yilmaz 796

**Cultural patterns, Architecture and technologies**

<b>SPATIAL AND SOCIAL ASPECTS OF THE ARSENAL TRANSFORMATION, MILITARY PORT IN TIVAT INTO NAUTICAL – TOURISM SETTLEMENT AND PORT „PORTO MONTENEGRO“</b> Goran Radović	805
<b>DIGITAL FABRICATION IN THE FIELD OF ARCHITECTURE</b> Roberto Vdović, Morana Pap	816
<b>THE IMPACT OF SMART HOME TECHNOLOGIES ON ARCHITECTURAL DESIGN</b> Goran Petrović, Marko Aleksendrić	822
<b>BETWEEN THE PLACE AND NON-PLACE: ARCHITECTURE AND TERRITORY ON THE EXAMPLE OF SKOPJE</b> Saša Tasić, Mitko Hadzi Pulja, Minas Bakalchev	830
<b>INTEGRATED ARCHITECTURAL COMPLEXITY - FROM ABSTRACTION TO TECHNOLOGY AND MATERIALISATION</b> Rada Čahtarević, Dženana Bijedić, Amra Taso	838
<b>EVOLUTION DIGITIZED: ARCHITECTURE OF THE SUBLIME DREAM</b> Mihailo Popović, Vladimir Milenković	846
<b>MONOCHROMATIC IN THE ARCHITECTURAL COMPOSITION: WITH SPECIAL REFERENCE TO THE APPLICATION OF WHITE COLOUR</b> Dragana Vasiljevic Tomic, Rifat Alihodzic, Dragana Mojsilovic	853
<b>(RE)GENERATION &amp; REFLECTIONS OF THE SCHOOL OF ARCHITECTURE – BANJALUKA IN THE CENTURY OF KNOWLEDGE AND SKILLS</b> Milenko Stanković, Una Umićević	864
<b>QUANTUM ARCHITECTURE, NON-PLACE AND ACCULTURATION</b> Dubravko Aleksić	873
<b>PLACES AND PRACTICES OF CONSUMPTION IN THE POST-SOCIALIST CONTEXT</b> Dejana Nedučtin, Dušan Ristić, Vladimir Kubet	880
<b>INTERACTIONS BETWEEN LIGHT AND ARCHITECTURE: AN EXPERIMENT USING MODELS AND PHOTOGRAPHS</b> Anita Stoilkov-Koneski	888
<b>THE INTERPLAY OF MUSIC AND ARCHITECTURE: LAYERING OF SOUND AND SPACE</b> Anja Kostanjšak, Morana Pap	895
<b>CULTURAL PATTERNS AND SENSITIVITY TODAY: FROM THE PHILOSOPHY TO THE TECHNOLOGY IN ARCHITECTURAL DESIGN PROCESS</b>	

Małgorzata Kądziela, Anna Sachse-Rynkowska	904
<b>PART III: PLACES, TECHNOLOGIES AND RELATED FIELDS</b>	
<b>Big data, apps, social networks and microblogs in urban planning and design</b>	
<b>PLACE COMPETITIVENESS EXPRESSED THROUGH DIGITAL DATA. MEASURING THE PLACE ATTRACTIVENESS TRACKING THE GEOTAG DATA VISUALS</b>	
Milena Vukmirovic, Eva Vanista Lazarevic	914
<b>ROOM BOOK 2.0 – BRING BACK THE INFORMATION TO ITS PLACE</b>	
Christoph Breser, Stefan Zedlacher	926
<b>THE INTERCONNECTED OBJECT: ARE YOU AT HOME IN A NETWORK?</b>	
Kalina Ntampiza, Polina Zioga	936
<b>THE INTERACTION TIME IN A NETWORKED SOCIETY</b>	
Danijel Baturina	944
<b>GOOGLE EARTH AS A MICROWORLD</b>	
Milena Zindović	962
<b>TRANSPARENCY OF SCALE: GEOGRAPHICAL INFORMATION PROGRAM (GOOGLE EARTH) AND THE VIEW FROM BEYOND</b>	
Pavle Stamenović, Dunja Predić, Davor Ereš	970
<b>Geodesy and modern cartography</b>	
<b>ROBUST ESTIMATION APPLIED TO GEODETIC DATUM TRANSFORMATION USING A METAHEURISTIC ALGORITHM</b>	
Mevlut Yetkin	979
<b>THE STATE OF THE ART SURVEYING BY TECHNOLOGY OF THE TERRESTRIAL LASER SCANNING</b>	
Marko Pejić, Branko Božić, Verica Erić, Jelena Pandžić	987
<b>ROLE OF CARTOGRAPHY IN MAKING A “SMART CITY”: CASE STUDY OF INDIJA</b>	
Dragutin Protić, Ivan Vučetić, Ivan Nestorov	995
<b>MODERN CARTOGRAPHY IN PROJECT OF CENSUS</b>	
Maja Kalinić, Dragoljub Sekulović	1002

## **Mobility and technologies**

### **PERSONAL RAPID TRANSIT – A SUSTAINABLE URBAN TRANSPORT SYSTEM**

Ljupko Šimunović, Luka Novačko, Mario Ćosić 1011

### **FLIGHTPATH TO AN ENVIRONMENTAL FRIENDLY AIR TRANSPORT**

Ivana Čavka, Olja Čokorilo, Slobodan Gvozdenović 1020

### **PRESERVATION OF PLACE-IDENTITY THROUGH URBAN TRANSFORMATIONS BASED ON SUSTAINABLE FORMS OF TRANSPORT**

Miloš Kopic 1029

### **BELGRADE RIVERSIDE TRAFIC INTERCHANGES**

Ksenija Stevanović, Milena Stevanović 1037

### **SUSTAINABLE URBAN MOBILITY PLANS IN EUROPE**

Davor Brčić, Ljupko Šimunović, Marko Slavulj 1045

### **URBAN DEVELOPMENT IN BELGRADE IN THE CONTEXT OF GLOBAL TRENDS: CHANCES OF ILLEGAL HOUSING INTEGRATION**

Biserka Mitrović, Miodrag Ralević, Branislav Antonic 1051

### **RE-THINKING INFRASTRUCTURE PROJECT FOR THE METROPOLIS: LABORATORY GRANADA**

Juan Luis Rivas Navarro, Belén Bravo Rodríguez 1059

## **Public participation, e-governing and tehcnology**

### **COMMUNITY PARTICIPATION AND GREEN INFRASTRUCTURES: A DELIBERATIVE EVALUATION METHOD**

Saverio Miccoli, Fabrizio Finucci, Rocco Murro 1067

### **RESULTS OF INTRODUCTION OF PARTICIPATORY TOOLS IN URBAN PLANNING IN SERBIA – 7 CASE STUDIES**

Ratka Čolić, Harald Mueller 1075

### **WAYS TOWARDS A CITY OF NEW TECHNOLOGIES**

Miodrag Ralevic, Tatjana Mrdjenovic, Natasa Krstic, Djemila Beganovic 1083

### **PARTICIPATION OF CITIZENS IN TOWN PLANNING PROCEDURES IN NEIGHBOURHOODS WITH FORMER REFUGEE AND DISPLACED POPULATION IN PRIJEDOR, BOSNIA AND HERZEGOVINA**

Rada Latinović 1090

### **THE ROLE OF INFORMATION AND COMMUNICATION TECHNOLOGY IN A VIRTUAL ORGANIZATION**

Jelena Lukić 1098



## APPLICATION OF WOOD AS AN ELEMENT OF FACADE CLADDING IN CONTEMPORARY ARCHITECTURE OF BELGRADE

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### **ABSTRACT**

*Wood is a natural – environmentally friendly (eco-friendly) material. Wood can be recycled and contemporary architecture buildings use numerous wood-based products obtained by adding certain chemical compounds. The use of wood, as both old and new material, in modern architecture has affected the elements of traditional architecture, as an attempt to change aesthetic, constructive and stimulating effects on the overall concept of architecture. Global trends in wood re-application and wood-based products, as construction and architectural coating material, are present not only because of aesthetic, artistic and design requirements or tradition and nature-based inspiration, but also because wood is known to be eco-friendly and energy-efficient and it adapts to modern trends in sustainable development and applied technology solutions to the production of materials, with the aim of maintaining connection with Nature, environment and tradition. The spirit of regionalism, the application of autochthonous materials and traditional building techniques, as well as methods of particular design situation (on-site construction) are the key to creating original works of authorship. Striving to preserve the regional spirit of architecture is a vital, strategically important element of national expression in architecture, from the perspective of: proper and rational land use, identity and uniqueness protection, formation of quality environment within the natural or built surroundings, energy efficiency and natural resources protection and development of living conditions. This paper presents the examples of wood application and wood-based products as the elements of façade cladding in contemporary architecture of Belgrade.*

*Keywords: wood, wood-based products, composite materials, modern façade cladding*

## INTRODUCTION

Timber industry development has contributed to the growing interest in wood construction. Both architects and builders have demonstrated a significant commitment to applying wood and wood-based products in contemporary architecture. Modern wood processing technologies offer new composite materials that are extremely stable, resistant and much more durable products than wood itself. Still, when it comes to their aesthetic quality and uniqueness, these products keep all the best characteristics of wood.

Water, air and sunlight cause wood to decay. Our regional climate - long and cold winters with rainy and windy days and hot summers, causes wood to break down. Therefore, constant maintenance and periodical replacement of wooden façade cladding are necessary.

When it comes to function and shape of wood as an element of architectural cladding in Belgrade, it is necessary to apply the wood-based products as the exterior cladding elements, in order to adapt to the requirements of our climate. It is possible to use natural wood for façade cladding of modern Belgrade buildings provided that specific protection measures have been undertaken.

## THE EFFECT OF TRADITIONAL ARCHITECTURE ON CONTEMPORARY WORKS OF ARCHITECTURE

One part of Serbian contemporary architecture deals with affirmation and continual connection with traditional architecture. This is reflected in the protection of architectural heritage, studying the works of national architecture and striving to apply the principles and spirit of traditional architecture to contemporary architecture.

Our own architectural tradition has great potential and can be an everlasting inspiration for architects while trying to explore modern building methods and house forms in order to find the most suitable solutions to be applied to our regions. This statement can be seen as one of potential approaches to the world of contemporary architecture design. Whatever is regarded to be important and suitable in the world of architecture should be applied to the regions of Serbia provided our climate, functional, morphological and economic conditions permit it. It means that our regional building should introduce both modern architecture elements and the most successful and stable elements of our traditional architecture. Our architectural tradition should be inspirational for finding modern building methods and house forms, suitable for our regions.

Nowadays, when architects applies the principles of eco-friendly construction while designing a building that is supposed to be in accordance with its surroundings, they are to use natural materials and apply proper protection measures, in each phase of construction and object exploitation: adequate use of materials depending on its function, material protection, maintenance and replacement for damaged parts [1].

## THE APPLICATION OF NATURAL WOOD IN CONTEMPORARY ARCHITECTURE OF BELGRADE

Wood from coniferous and deciduous trees is a natural wood that can be applied as façade cladding for the architectural structures in this region. Coniferous trees are called softwood and are used as construction materials for exterior cladding. Softwood types that can be used for façade cladding are spruce, larch and pine.

Weather factors cause raw, unprotected wood turn grey. However, excessive moisture conditions (humidity) can cause damage to wood such as fungi or unsightly stains. When softwood is not impregnated with protection products, wood surface is unprotected and exposed and natural wood darkening remains visible. Splitting and cracking of wood surface occur in most cases. Subsequent protection of the already built-in wood is recommended – it is a type of total protection.

Softwood, such as veneer, wood wool, sawdust, wood chips and fiber, with the addition of glue or other adhesives, is used for obtaining new composite products that can be façade cladding.

Hardwood comes from deciduous trees (oak-tree, hornbeam, etc.) and is more durable than soft, coniferous wood.

Hardwood is used for windows, door frames and various ways of façade cladding (board cladding). Depending on specific requirements, there are three types of such cladding: vertical, horizontal and diagonal.

Less resistant wood can be previously protected by being impregnated or protected by coating that contains a wood colour, thus preventing darkening. These coatings can be opaque, completely covering both the colour and structure of the wood, or transparent, where both colour and structure are visible. Depending on added pigments, coatings cause wood to obtain different shades.

Hardwood is known to have extraordinary visual characteristics and that is why it is mostly used to make composite products, in which the veneers of the chosen hardwood are dominant.

## THE APPLICATION OF THERMO-TREATED WOOD IN CONTEMPORARY ARCHITECTURE OF BELGRADE

Thermo-treated wood products (thermo-wood products) are used for external cladding. In Serbia, ash and hornbeam are exposed to thermo-treatments.

Thermo-wood is a thermally-processed wood. Wood processing uses high temperatures (160 -260°C). There are several reasons to explain wood exposure to high temperatures. Thermal treatment increases dimensional stability and resistance, thus contributing to wood durability. High temperatures reduces bending, swelling and shrinkage of wood by 50%, which means that thermally processed wood can be exposed to high moisture levels and direct atmospheric

influences, typical for our climate conditions. Thermally processed wood has lower balanced level of humidity, which means that such wood is extremely resistant to decay fungi.

The colour of wood darkens in the thermal modification process. Depending on the level of temperature the colour ranges from light beige to dark brown. When treated in this way, the colours of domestic wood resemble tropical wood species. Thermally treated wood is an environmentally friendly product that does not contain any harmful substances. This new technology makes thermally treated wood suitable for external use, such as façade cladding, which significantly improves the quality of wood cladding and prolongs its duration. The original look of wood gradually changes but this thermal treatment delays wood decay and aging. The application of this technology and these products means that all unique characteristics and specific aesthetic quality of natural wood remain unchanged.

#### THE APPLICATION OF WOOD AND WOOD PRODUCTS AS FAÇADE CLADDING ELEMENTS IN CONTEMPORARY ARCHITECTURE OF BELGRADE

Rarely is wood used for external cladding in contemporary Belgrade architecture. There are only few examples of the buildings having this wood façade cladding. It can be explained by unfavourable climate conditions, humidity, high temperature oscillations and extremely hot summers and harsh, snowy winters. Apart from the mentioned reasons, the effects of solar radiation are harmful for external claddings made of natural wood, and that is why a constant maintenance is required, which means additional financial resources are needed as well.

As a façade cladding, wood is exposed to all external negative effects of our climate conditions. Therefore, wood weathers naturally. The application of natural wood as a façade cladding and leaving it to change, age and decay naturally is the principle of organic architecture [2].



**Figure 1. Wood as an element of façade cladding combined with other material (brick, artificial stone): a. Residential building on Milovana Marinkovica Street, b. Residential-business building on Kumanovska street.**

Striving to follow global trends in the world of modern architecture, eco-friendly design and modern materials, their combination and application to the latest trends in sustainable development and close connection with Nature and tradition, leads to the application of contemporary technological and technical solutions to the field of design and realization of certain architectural works. (Figure 1).

The contemporary architecture building contains the elements of modern architecture; a part of the façade is made of natural wood as an exterior finish. Wood is combined with painted walls and parts of the façade claddings made of other composite materials – the result is a unique work architecture (Figure 2).



**Figure 2. The façade is the mixture of wood and painted walls: a. Multi-family apartment building Kondominijum 41-7, on Velisava Vulovica Street, b. Residential building on Heroja Milana Tepica Street**

Wood can only be applied to certain parts of architectural objects, provided suitable protection measures have been undertaken. When it comes to modern construction industry, timber industry products have a great advantage over the application of wood, since the exceptional characteristics of these products compensate for any disadvantage of wood as a material. The application of composite materials instead of natural wood eliminates unfavourable weather conditions and harmful effects of moisture and solar radiation. Composite materials can be applied to a new façade cladding during the reconstruction of a building. Striving to perform façade cladding by applying small-dimensions elements made of natural wood (sawn lumber) initiated the application of composite materials in smaller dimensions. Façade claddings of some Belgrade buildings are made of board-shaped composite materials.

High-quality composite materials that are used for façade cladding and have natural veneer front surface (natural wood) possess extraordinary aesthetic qualities and contribute to uniqueness of wood as a material. This modern cladding performed by composite materials has managed to find its modest place on some contemporary architectural works of Belgrade (Figure 3).

Modern architectural buildings meet the wishes and expectations of their clients in order to provide a comfortable space, fulfill extremely demanding aesthetic requirements and present a high-quality building construction based on knowledge,

skills and abilities of designers, contractors as well as the whole construction industry with high performance and quality of all its products.



**Figure 3. Composite material as a façade cladding: a. A building on Jagiceva Street, b. Residential building on Velisava Vulovica Street, c. "Square Nine" hotel at Students' square.**

## CONCLUSION

The weathering of natural wood is caused by air, water and solar radiation. Natural wood as an element of façade cladding in Belgrade is rarely used because of specific climate conditions of our region. The application of natural wood as an element of façade cladding is possible provided there are constant maintenance and protection measures, in order to meet extremely demanding aesthetic criteria and duration principles. Thermo-treatment cause wood to have improved quality and prolonged duration, and thermally modified wood can be used for external use, such as façade cladding of architectural structures in Belgrade. Based on this research paper results, it can be concluded that there is a need to apply wood-based products – composite materials, to façade cladding of architectural structures in Belgrade.

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