

2nd Croatian Conference on Earthquake Engineering 2CroCEE

22-24 March 2023, Zagreb, Croatia

Final Programme

Conference organizer



UNIVERSITY OF ZAGREB
FACULTY OF CIVIL ENGINEERING

Supporting organizations



The International
Association for
Earthquake Engineering



The European
Association for
Earthquake Engineering



Croatian
Center for
Earthquake Engineering



Croatian
Association for
Earthquake Engineering

Conference Programme – Short Version

Wednesday, 22 March

09:00–10:00	Registration and meeting point for technical visit through Zagreb
10:00–14:00	Technical visit through Zagreb
15:00–16:30	Opening Ceremony
16:30–17:00	Coffee break
17:00–17:45 Keynote Lecture*	Katrin Beyer Predicting the Seismic Response of Historical Masonry Buildings – Which Modelling Assumptions Matter?
17:45–18:30 Keynote Lecture*	Marco Di Ludovico Damage, Losses, Reconstruction Policies, and Retrofit Interventions on Residential Buildings in Historical Centers after Recent Italian Earthquakes
20:00–00:00	Welcome dinner (hotel Westin–the Panorama salon on the 17th floor)

Thursday, 23 March

09:00–09:45 Keynote Lecture*	Laurentiu Danciu Exploring the Complexities of the 6 February 2023 Earthquake Sequences in Türkiye and Their Insights for Regional Seismic Hazard Modeling			
	Conference Hall: Crystal Ballroom 2/3	Conference Hall: Crystal Ballroom 1/3	Conference Hall: Maksimir	Conference Hall: Zrinjevac/Tuskanac
09:45–10:30	Session: Seismic Performance of Structures	Session: Historical Structures	Session: Geotechnical Earthquake Engineering	Session: Preparedness and Emergency Management
10:30–11:00	Coffee break			
11:00–13:00	Session: Seismic Performance of Structures	Session: Historical Structures & Repair and Strengthening of Structures	Session: Geotechnical Earthquake Engineering	Session: Preparedness and Emergency Management & Lessons Learnt from Earthquake Disasters
13:00–14:00	Lunch			
14:00–14:45 Keynote Lecture*	Amr Elnashai Coupling of Highrise Building Earthquake Retrofit and Building Information Management (BIM) System			
14:45–16:00	Session: Seismic Performance of Structures	Session: Experimental Techniques for Characterization of Materials and Structures	Session: Engineering Seismology	Session: Seismic Loss and Risk Analysis
16:00–16:30	Coffee break			
16:30–17:00	Session: Seismic Performance of Structures	Session: Experimental Techniques for Characterization of Materials and Structures	Session: Engineering Seismology & Geotechnical Earthquake Engineering	Session: Preparedness and Emergency Management
17:00–18:00	PhD Special Session			DRR workshop

* All keynote lectures will take place in the conference hall Crystal Ballroom 2/3



Join us for an after-work get-together • Thursday, 23 March & Friday 24 March 2023 • 21:00

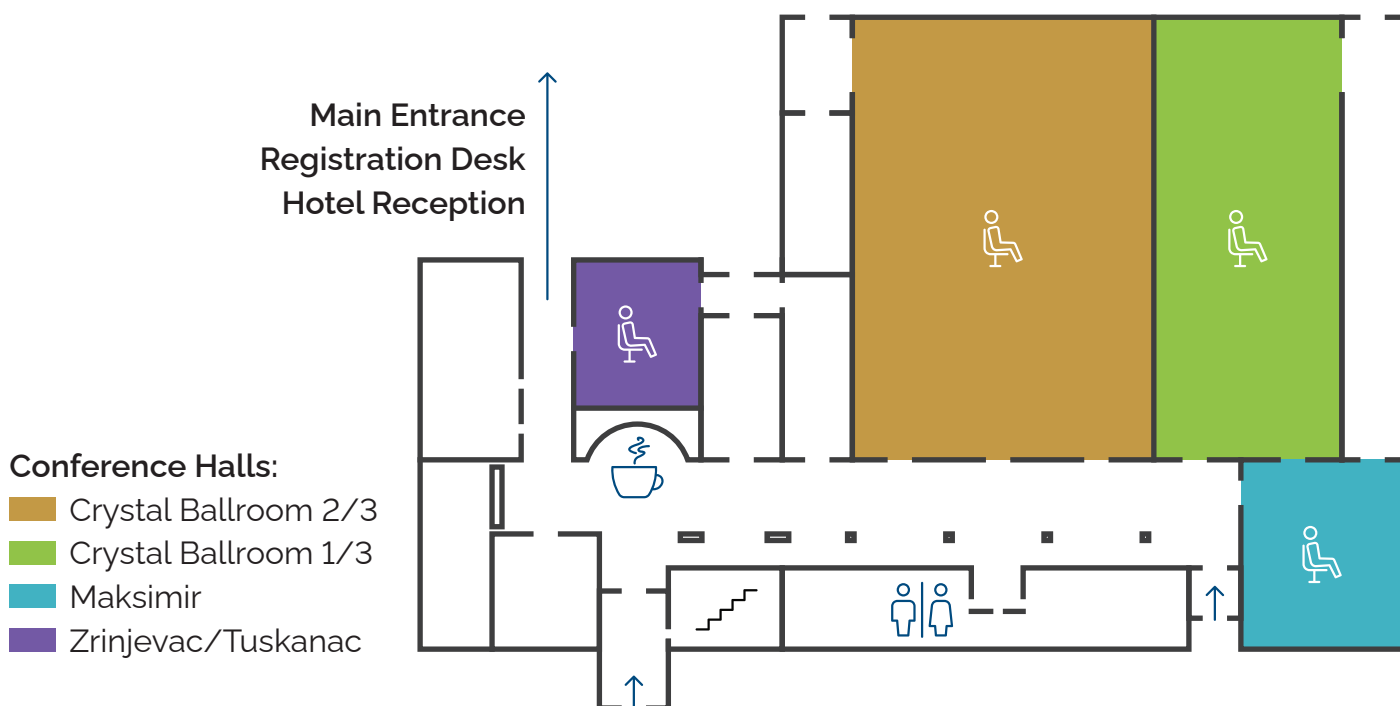
We would like to invite you to come and relax at the **Merak** pub & restaurant, where you can enjoy the pleasant company of friends and colleagues and the rustic ambience of cozy surroundings.

Your first drink is our treat!

13 min walk from hotel Westin • <https://goo.gl/maps/pRi9Y44ciZ3HFwZF8>

Friday, 24 March

	Conference Hall: Crystal Ballroom 2/3	Conference Hall: Crystal Ballroom 1/3	Conference Hall: Maksimir	Conference Hall: Zrinjevac/Tuskanac
09:00–09:45 Keynote Lecture*	Petra Gidak and Damir Lazarević Post-earthquake Retrofit of the Zagreb Cathedral			Round table 1: Seismologists and Engineers – Are We Satisfied With Our Collaboration?
09:45–10:30	Session: Historical Structures	Session: Experimental Techniques for Characterization of Materials and Structures	Session: Repair and Strengthening of Structures	
10:30–11:00	Coffee break			
11:00–13:00	Session: Historical Structures & Repair and Strengthening of Structures	Session: Seismic Performance of Structures	Session: Repair and Strengthening of Structures & Experimental Techniques for Characterization of Materials and Structures	Round table 2: Strategy of Urban Safety (in Croatian)
13:00–14:00	Lunch			
14:00–14:45 Keynote Lecture*	Vlatko Sesov IZIIS – 57 Years of Research Excellence and Buildout of European Seismic Resilience			
14:45–15:45	Session: Seismic Performance of Structures & Repair and Strengthening of Structures	Session: Historical Structures	Session: Italian Experience in Seismic Isolation of Buildings	
15:45–16:15	Coffee break			
16:15–16:30	Closing Ceremony			
17:00–19:00	Technical visit: the Zagreb Cathedral and the Archbishop's Palace			



Conference Programme – Detailed Version

Crystal Ballroom		Wednesday, 22 March
09:00–10:00	Registration and meeting point for technical visit through Zagreb	
10:00–14:00	Technical visit through Zagreb	
15:00–16:30	Opening Ceremony	
16:30–17:00	Coffee break	
17:00–17:45	Predicting the Seismic Response of Historical Masonry Buildings – Which Modelling Assumptions Matter?	
Keynote Lecture	Katrin Beyer	
17:45–18:30	Damage, Losses, Reconstruction Policies, and Retrofit Interventions on Residential Buildings in Historical Centers after Recent Italian Earthquakes	
Keynote Lecture	Marco Di Ludovico	
20:00–00:00	Welcome dinner (hotel Westin – the Panorama salon on the 17 th floor)	

Conference Hall: Crystal Ballroom 2/3		Thursday, 23 March
09:00–09:45	Exploring the Complexities of the 6 February 2023 Earthquake Sequences in Türkiye and Their Insights for Regional Seismic Hazard Modeling	
Keynote Lecture	Laurentiu Danciu	
09:45–10:30	Session: Seismic Performance of Structures	
	Chairing: Josip Atalić & Vlatko Šešov	
Invited Lecture	Performance-Based Optimisation of Energy Dissipation Devices for Seismic Applications	
	Iman Hajirasouliha	
	Power Responses of a Building under the Excitation of Pulse-like Ground Motions	
	Jui-Liang Lin	
10:30–11:00	Coffee break	
11:00–13:00	Session: Seismic Performance of Structures	
	Chairing: Tomislav Kišiček & Ivica Guljaš	
Invited Lecture	Risk-Based Seismic Assessment of Existing Buildings. Approach Applied in Switzerland	
	Pierino Lestuzzi	
	Numerical Investigation of the Seismic Response of an Unreinforced Masonry Residential Building Hit by the Zagreb Earthquake in 2020	
	Silvia Pinasco, Marija Demšić, Marta Šavor Novak, Mario Uroš, Serena Cattari, Sergio Lagomarsino	
	Engineering Model for Analysis of Masonry Structures	
	Goran Simonović, Mustafa Hrasnica, Senad Medić	
	Seismic Performance of Rubberized Concrete in Structural Applications	
	Tanja Kalman Šipoš, Kristina Jeleč, Ivana Miličević	
	Behavior of Welded Bolt Shear Connectors Subjected to Reversed Cyclic Loading	
	Marines Perez, Carlos Alberto Bermudez, Tiziano Perea	
	Pushover Analysis of a 12-Storey Cross-Laminated Timber Building	
	Luka Naumovski, Matija Gams, Tomaž Pazlar, Boris Azinović	
	Fragility and Vulnerability Analysis of RC Buildings with Different Shapes in the Base	
	Radomir Folić, Miloš Čokić, Boris Folić	
13:00–14:00	Lunch	
14:00–14:45	Coupling of Highrise Building Earthquake Retrofit and Building Information Management (BIM) System	
Keynote Lecture	Amr Elnashai	
14:45–16:00	Session: Seismic Performance of Structures	
	Chairing: Josip Atalić, Senad Medić & Igor Gjorgjiev	
	Customized Seismic Screening toward Sustainable Public Buildings Energy Efficiency	
	Veronika Shendova, Roberta Apostolska, Vlatko Sesov	

	Statistical Seismic Performance Assessment of Viscous Damper in Benchmark Buildings under Far-Fault and Near-Fault Earthquakes M. Fahimi Farzam, T. Dehghan Kalajahi
	Numerical Study on Mechanical Parameters of Novel Drilled Plate Metallic Damper (DPMD) Peyman Shadman Heidari
	The Influence of Section Sides Ratio of Rectangular Column on Seismic Response of RC Building Igor Gjorgjiev, Aleksandar Zhurovski, Borjan Petreski
	Assessment of Fundamental Periods of Vibration through Analytical and Experimental In-Situ Measurements Marija Vitanova, Radmila Salic Makreska, Daniel Tomic, Aleksandra Bogdanovic, Julijana Bojadjeva, Kemal Edip
16:00–16:30	Coffee break
16:30–17:00	Session: Seismic Performance of Structures Chairing: Ivan Ćurković & Ivo Haladin
	Numerical Modeling of the In-Plane Behavior of Experimentally Tested Solid Brick Masonry Walls Senad Medić, Mustafa Hrasnica
	Reliability Analysis of Reinforced Concrete Frame by Finite Element Method Marin Grubišić, Jelena Ivošević, Ante Grubišić

Conference Hall: Crystal Ballroom 1/3		Thursday, 23 March
09:45–10:30	Session: Historical Structures Chairing: Mislav Stepinac & Boris Trogrlić	
Invited Lecture	Automation of Non-destructive Evaluation Systems for the Structural Diagnosis of the Built Heritage Javier Ortega	
	Analytical Seismic Fragility Curves for Ancient Masonry Buildings in Portugal Vasco Bernardo, Alfredo Campos Costa, Paulo Candeias, Anibal Costa, Paulo B. Lourenço	
10:30–11:00	Coffee break	
11:00–13:00	Session: Historical Structures & Repair and Strengthening of Structures Chairing: Igor Tomić & Petra Gidak	
	Seismic Analysis of Ancient Masonry Towers Ivan Balić, Nikolina Živaljić, Hrvoje Smoljanović, Ante Munjiza, Boris Trogrlić, Valentina Štefković, Ana Livaja	
	Experience on Seismic Vulnerability Assessment and Retrofitting of Supreme Court Building Kirti Tiwari	
	Retrofitting of a Bridge Form Historical Station Using Seismic Isolation D. Kubin, J.Kubin, H. Sucuoglu, G. Feroglu, I.A.Ilis, U. Ozcamur, S. Yalcin	
	Seismic Retrofitting of Building Structures and Monuments in North Macedonia – Necessity, Solutions and Construction Veronika Shendova, Roberta Apostolska, Goran Jekic, Aleksandar Zlateski, Aleksandar Zurovski, Elena Delova	
	Seismic Performance of Masonry Pointed Vaults – Case Study of St. Anthony Church in Barban, Istria Paulo Šćulac, Davor Grandić, Toni Šaina	
	Equivalent Frame Models for FRP-Strengthened Masonry Buildings Ivana Božulić, Francesco Vanin, Katrin Beyer	
	Extension of Systems for Seismic Securing of Heavy Façades through Refurbishment, Strengthening and Retrofitting Samuel Hine, Matthias Roik	
	Performance Evaluation of Chevron Braced Frame and Tadas Damper on Seismic Response of Steel MRFs Marin Grubišić, Benjamin Pervan, Ivica Guljaš	
13:00–14:00	Lunch	

14:45–16:00	Session: Experimental Techniques for Characterization of Materials and Structures Chairing: Mario Uroš & Davor Grandić
Invited Lecture	Experimental Test of Unreinforced Masonry Walls under Various Boundary Conditions Ivica Guljaš
	Experimental Investigation of Seismic Behaviour of Existing Masonry Infills Riccardo R. Milanesi, Maithree Kurukulasuriya, Davide Bolognini, Luca Grottoli, Filippo Dacarro, Paolo Morandi
	Behaviour of Masonry Infills with Door Openings under Sequential In-Plane and Out-Of-Plane Loading Aleksa Milijaš, Bogdan Šakić, Marko Marinković, Christoph Butenweg, Matija Gams, Sven Klinkel
	Determination of the Dynamic Behavior of a Bridge Strengthened with Shock Transmission Units Jurica Pajan, Ivan Duvnjak, Domagoj Damjanović, Tomislav Brozović, Suzana Ereiz
16:00–16:30	Coffee break
16:30–17:00	Session: Experimental Techniques for Characterization of Materials and Structures Chairing: Maja Baniček & Igor Tomic
	Environmental Effect on the Dynamic Characteristics of Rc Bridges Marija Vitanova, Igor Gjorgjiev, Nikola Naumovski, Viktor Hristovski
	Combined Protection of Bridges Exposed to Earthquake and Flood Disasters with New RB-Upgraded Isolation System Jelena Ristic, Venera Hajdari, Labeat Misini, Danilo Ristic
17:00–18:00	PhD Special Session Chairing: Maja Baniček & Igor Tomic
	The Effect of Column Web Stiffeners on Moment Resistance and Ductility of Extended End-Plate Bolted Connection Anita Gjukaj, Petar Cvetanovski, Ferit Gashi
	Compilation of Available Seismotectonic Data for North Macedonia as an Input for PSHA Zabedin Neziri, Radmila Salic Makreska
	CRONOS Project: Main Features of Seismicity Analysis for the Central and Southern Croatian Coastal Area Iva Lončar, Snježana Markušić, Ines Ivančić
	Seismic Interferometry for Damage Identification of Large Scale Model of RC Shear Wall Structure Aleksandar Zhurovski, Igor Gjorgjiev
	Physical and Virtual Experimental Investigation of Self-Centring Concentrically Braced Frames Borjan Petreski, Igor Gjorgjiev
	Investigation of Out-Of-Plane Seismic Behaviour of Existing Masonry Infills Maithree Kurukulasuriya, Riccardo Milanesi, Paolo Morandi, Guido Magenes
	Extraction and Processing of Abaqus Output Data for Use in Seismic Analysis Romano Jevtić Rundek, Ante Pilipović, Marija Demšić, Mario Uroš
	Risk-Based Seismic Performance Assessment of a Typical Masonry Building in the Urban Area of Zagreb Ante Pilipović, Mario Uroš, Marta Šavor Novak, Snježan Prevolnik



09:45–10:30 Session: Geotechnical Earthquake Engineering
Chairing: Meho Saša Kovačević & Miroslav Nastev

Invited Lecture **Liquefaction Assessment of Gravels Based on Case Histories**
Kyle Rollins

Strategies for Seismic Design of Shallow Foundations for Steel Building Structures
Sanda Koboevic, Angel Reyes-Fernandez, Usthanthan Murugananthan, Lydell Wiebe

10:30–11:00 Coffee break

11:00–13:00 Session: Geotechnical Earthquake Engineering
Chairing: Ingrid Tomac & Mario Bačić

Geotechnical and Geophysical Tests Following the 2020 Earthquake-Induced Liquefaction Phenomena
Sara Amoroso, Kyle M. Rollins, Giuseppe Di Giulio, Lara Wacha et al.

Geotechnical Reconnaissance of Cover-Collapse Sinkhole Area Following Petrinja 2020 Earthquake
Ingrid Tomac, Biljana Kovačević Zelić, Dunja Perić, Dubravko Domitrović et al.

Geophysical Reconstruction of Bedrock Depth at the Large Sinkhole in the 2020 Petrinja Earthquake
Eric Ntambakwa, Ivan Salković, Ingrid Tomac

Liquefaction Susceptibility Based on an Artificial Neural Network
Matija Lozić, Sonja Zlatović, Ivan Mihaljević, Igor Gukov, Boris Uremović, Marija Čačić

Influence of the Seismic Action on the Stability of Retaining Cantilever Walls and Comparison between Ex-YU Regulations and Eurocodes
Dejan Ivanovski, Kemal Edip, Julijana Bojadjeva, Vlatko Sheshov, Toni Kitanovski,

Experiences in Modeling and Analysis of Mine Seal Structures
Viktor Hristovski, Emil Jankulovski, John Burke

Effect of Prior Cyclic Loading on Triaxial Monotonic Experiments
Toni Kitanovski, Vlatko Sheshov, Julijana Bojadjeva, Kemal Edip, Dejan Ivanovski

Site Response Analysis Based on Borehole Acceleration Records from Location Tower, Ohrid 3D Seismic Network
Juijana Bojadjeva, Vlatko Sheshov, Aleksandra Bogdanovic, Kemal Edip, Dejan Ivanovski, Irena Gjorgjeska, Toni Kitanovski, Dejan Filipovski

13:00–14:00 Lunch

14:45–16:00 Session: Engineering Seismology
Chairing: Iva Dasović & Davor Stanko

Invited Lecture **Seismic Characterization of the Shallow Subsoil by Ambient Vibration Measurements: A Tool for Seismic Microzonation Studies**
Dario Albarello

Evaluation of the Local Site Effects of the Unesco World Heritage Site Old City of Dubrovnik (Croatia)
Davor Stanko, Tvrtko Korbar, Jakov Stanislav Uglešić, Iva Lončar, Mario Gazdek, Snježana Markušić

FRIBAS: A Parametric Database of Building and Soil Features Including the Fundamental Frequency of Resonance
Chiara Scaini, Bojana Petrovic, Maria Rosaria Gallipoli, Giuseppe Calamita, Nicola Tragni, Carla Barnaba, Marco Vona, Stefano Parolai

Damage Assessment for Rapid Response: The Central Italy 2016 M6 Event
Bojana Petrovic, Chiara Scaini, Stefano Parolai

16:00–16:30 Coffee break

16:30–17:00 Session: Engineering Seismology & Geotechnical Earthquake Engineering
Chairing: Iva Dasović & Davor Stanko

Petrinja Earthquake Aftershocks – Locations, Focal Mechanisms and Related Coulomb Stress Change
Marijan Herak, Davorka Herak

Late Holocene Relative Sea-Level Change and Palaeoearthquakes at the Elafiti Islands (Southern Adriatic, Croatia)
Sanja Faivre, Tatjana Bakran-Petricioli, Marijan Herak, Jadranka Barešić, Davor Horvatić

09:45–10:30 Session: Preparedness and Emergency Management

Chairing: Svetlana Brzev & Zvonko Sigmund

Invited Lecture **Advancements in Implementing Short-Term Countermeasures after the Recent Earthquakes in Italy**
Stefano Grimaz

The Crisis Platform: A Cross-Border Platform for Risk Assessment and Management

Antonella Di Meo, Barbara Borzi, Davide Quaroni, Antonino Famà, Vlatko Sheshov, Roberta Apostolska, Kemal Edip, Marija Vitanova, Julijana Bojadjeva, Aleksandra Bogdanovic, Goran Jekic, Markel Baballëku, Neritan Shkodrani, Genti Qirjazi, Stavroula Fotopoulou, Christos Pedritis, Evi Riga, Dimitris Pitilakis

10:30–11:00 Coffee break**11:00–13:00 Session: Preparedness and Emergency Management & Lessons Learnt from Earthquake Disasters**

Chairing: Radmila Šalić & Zvonko Sigmund

Harmonized Regional Risk Exposure Model of Basic Services and Transport Infrastructure of CBR Between N. Macedonia, Greece and Albania

Vlatko Sheshov, Roberta Apostolska, Marija Vitanova, Goran Jekic, Aleksandar Zlateski, Radmila Salic, Stevko Stefanoski, Markel Baballëku, Neritan Shkodrani, Dimitris Pitilakis, Christos Pedritis

Simulation Systems in Support of the Organization and Implementation of Crisis Management Exercises

Marko Šimić, Zvonko Sigmund

The Role of Disaster Risk Governance in Post-disaster Recovery

Zvonko Sigmund, Marko Šimić

Seismic Resilience of the Schools in Banja Luka–Some Constructional and Preparedness Aspects

Vesna Šipka, Velibor Lalić, Slavica Radovanović, Cvjetko Sandić

Impact of Moderate Size Earthquakes through Skopje 2016 and Zagreb 2020 Case Studies

Radmila Salic Makreska, Katerina Drogreska, Cvetan Sinadinovski, Zabedin Neziri, Ljubco Jovanov, Zoran Milutinovic, Lazo Pekevski, Jasmina Najdovska, Dragana Chernih Atanasovska, Daniel Tomic

Architectural Design and Earthquake Consequences in Buildings

Marsida Tuxhari, Markel Baballëku, Merlin Asllani

Most Affected Typologies from the 26 November 2019 Earthquake

Markel Baballëku, Rikard Luka, Klajdi Shaholli

Lessons of the Lugovsky Earthquake in the Republic of Kazakhstan

Yeraly Shokbarov, Begman Kulbaev, Gani Temiraliuly

13:00–14:00 Lunch**14:45–16:00 Session: Seismic Loss and Risk Analysis**

Chairing: Svetlana Brzev & Marta Šavor Novak

Invited Lecture **Classification of Residential Building Stock in Serbia**
Svetlana Brzev

Disaster Risk Reduction in the Municipality of Lezhë. Seismic Risk as Part of a Multi-Risk Analysis

Merita Guri, Endri Duro

Seismic Risk in the District/Municipality of Durrës

Markel Baballëku, Klajdi Shaholli, Rikard Luka, Genti Qirjazi, Renti Haziraj

Application of Analytic Hierarchy Process (Ahp) In Earthquake Risk Assessment

Anita Cerić, Ivona Ivić

On the Influence of Road and Rail Traffic on Seismic Vulnerability of Historic Masonry Buildings

Ivo Haladin, Krešimir Burnać, Katarina Vranešić

16:00–16:30 Coffee break**16:30–18:00 Session: Preparedness and Emergency Management**

Chairing: Zvonko Sigmund & Josip Atalić

Invited Lecture **Extended Reality Technologies and Metaverse to Enhance Emergency Preparedness**
Massimo Migliorini

DRR workshop

09:00–09:45 **Post-earthquake Retrofit of the Zagreb Cathedral**
Keynote Lecture
 Petra Gidak and Damir Lazarević

09:45–10:30 **Session: Historical Structures**
 Chairing: Petra Gidak & Marija Demšić

Retrofitting of Sacral Buildings after the Recent Earthquakes in Croatia

David Andić, Maja Baniček, Tamara Horvat, Borna Doračić, Juraj Pojatina, Mislav Stepinac, Ana Baričević

Lessons Learned from a Prediction and Postdiction of a Shake Table Test on an Unreinforced Masonry Aggregate
 Igor Tomić, Katrin Beyer

Marketing Spegra

10:30–11:00 Coffee break

11:00–13:00 **Session: Historical Structures & Repair and Strengthening of Structures**
 Chairing: Boris Trogrlić & Mario Uroš

Invited Lecture **Seismic Assessment of a Typical Stone Building in the Old Town of Dubrovnik and Retrofitting Measures**
 Mario Uroš

Experimental and Numerical In-Plane Seismic Behaviour of an Innovative Steel Reinforcement System for URM Walls

Luca Albanesi, Nicolò Damiani, Carlo Filippo Manzini, Paolo Morandi

Seismic Retrofitting of post-World War II Mid-Rise Unreinforced Masonry Residential Buildings in the Balkans

Svetlana Brzev, Predrag Blagojević, Radovan Cvetković

Repair and Strengthening of Old First Category Building In Skopje, N. Macedonia in Accordance with IZIS Methodology

Aleksandra Bogdanovic, Vlatko Sheshov, Zivko Bozhinovski, Kemal Edip, Julijana Bojadjeva, Elena Delova, Aleksandar Zurovski, Antonio Shoklarovski

Seismic Behaviour of Beam-Column Joint in R/C Frames and Strengthening with FRP

Naser Kabashi, Enes Krasniqi, Milot Muhaxheri, Florentinë Latifi, Ylli Murati

Retrofit of Masonry Buildings with CRM –Composite Reinforced Mortar – System: Practical Design Considerations about Seismic Capacity

Allen Dudine, Alessia Bez, Mihel Bosankić, Pierpaolo Turri

Marketing Rofix/Fibrenet

13:00–14:00 Lunch

14:00–14:45 **IZIS – 57 Years of Research Excellence and Buildout of European Seismic Resilience**
Keynote Lecture
 Vlatko Sesov

14:45–15:45 **Session: Seismic Performance of Structures & Repair and Strengthening of Structures**
 Chairing: Anđelko Vlašić & Marija Demšić

Invited Lecture **On-Site Observations of Performance of Buildings after the 2023 Turkey-Syria Earthquake during MUSAR Operations**
 Ante Pilipović & Karlo Jandrić

The Building Code SIA 269/8 for a Risk-Based Seismic Safety Assessment and Retrofit of Structures in Switzerland

Blaise Duvernay

Seismic Performance Assessment of RC Industrial Building after Retrofitting Beams and Columns

Niharika Peddaprolu, Pradeep Ramancharla, Aishwarya Gupta

Seismic Retrofit of Strategic Masonry Structures with Base Isolation Technique: The Case Study of "Giacomo Matteotti" School Building In Gubbio, Italy

Stefano Barone, Riccardo Vetturini

15:45–16:15 Coffee break

16:15–16:30 Closing Ceremony

17:00–19:00 Technical visit: the Zagreb Cathedral and the Archbishop's Palace

09:45–10:30 Session: Experimental Techniques for Characterization of Materials and Structures

Chairing: Ivan Duvnjak & Marko Marinković

Experimental and Numerical Analysis of Damaged Masonry Building

Ivan Duvnjak, Marina Frančić Smrkić, Domagoj Damjanović, Karla Grgić

Comparison of Non-destructive and Semi-destructive Methods for the Post-earthquake Assessment of Existing Masonry

Luka Lulić, Mislav Stepinac, Karlo Ožić, Javier Ortega, Marieta Nunez Garcia, Savvas Saloustros

Marketing Samoborka**10:30–11:00** Coffee break**11:00–13:00 Session: Seismic Performance of Structures**

Chairing: Marina Frančić Smrkić & Gordana Hrelja Kovačević

Nonlinear Static and Dynamic Analysis of a Typical Masonry Building In Palmotićeve Street in Zagreb

Vanessa Jusufbašić, Mario Uros, Senad Medic

Nonlinear Seismic Assessment of Coupled Walls Designed in Accordance with Eurocode 8

Ivan Mrdak, Marina Rakočević

Seismic Performance Evaluation of Existing RC High-Rise Building In Montenegro

Nikola Popović, Jelena Pejović

Selection and Replacement of Bridge Expansion Joints in Seismic Prone Areas

Klara Krišto, Mladen Srbić, Ana Mandić Ivanković

Pushover Analysis of Confined Masonry Walls Using Equivalent Diagonal Strut Models

Nemanja Krtinić, Matija Gams, Marko Marinković

Study of Simultaneous Inter-Storey Drift Ip and Oop Loads on RC Frames with and without Infill Walls and Openings by a Varying Angle

Filip Anić, Davorin Penava, Vasilis Sarhosis, Lars Abrahamczyk

Comparison of Ductility Class Requirements for Seismic Design of Reinforced Concrete Walls in a Tall Building

Luka Čičak, Anđelko Vlašić, Dominik Skokandić

13:00–14:00 Lunch**14:45–15:45 Session: Historical Structures**

Chairing: Marija Vitanova & Mislav Stepinac

Application of Wood-Based Seismic Retrofitting Techniques on Existing Timber and Masonry Structures: Design Strategies, Modelling Approaches and Practical Benefits for Two Case-Study Buildings

Michele Mirra, Andrea Gerardini, Geert Ravenshorst, Jan-Willem van de Kuilen

The Case Study of Prince Rudolf Infantry Barracks –Assessment, Modelling and Reconstruction

Boja Čačić Šipoš, Nataša Ivanišević, Mija Klasić, Luka Lulić, Ivan Matorić, Mislav Stepinac

Preliminary Earthquake Survey of Buildings – Case Study of Senj

Josipa Mihaljević, Davor Grandić, Paulo Šćulac

Earthquake Performance of a Cultural Heritage Building: The Jesuit College in Dubrovnik, Croatia

Anis Uzair, Lars Abrahamczyk, Dagoberto Gómez, Kinda Elias, Ante Vrbanić, Davorin Penava, Snježana Markušić

15:45–16:15 Coffee break**16:15–16:30** Closing Ceremony**17:00–19:00** Technical visit: the Zagreb Cathedral and the Archbishop's Palace

09:45–10:30	Session: Repair and Strengthening of Structures Chairing: Ana Baričević & Marko Bartolac
	Possibilities of Using UHPC as a Repair Material Antonija Ocelić, Ana Baričević, Marina Frančić Smrkić
	Seismic and Energy Upgrading of Existing RC Building Margareta Zidar, Dominik Skokandić, Matija Vajdić, Karlo Ožić, Mislav Stepinac
Marketing	Wienerberger
10:30–11:00	Coffee break
11:00–13:00	Session: Repair and Strengthening of Structures & Experimental Techniques for Characterization of Materials and Structures Chairing: Tomislav Kišiček & Tanja Kalman Šipoš
	Improvement of Building's Walls Bearing Capacity after an Earthquake Alush Shala, Jelena Bleiziffer
	Study of Thermal Performance of Prefabricated Large Panel Buildings Merita Guri, Flogerta Krosi, Klodjan Xhexhi
	Critical near Resonance Shaking Table Tests of Constructed Large-Scale Upgraded Isolated USI-V-MG Bridge Prototype Model Jelena Ristic, Ragip Behrami, Danilo Ristic
	Seismic Protection of Masonry and Infilled Frame Buildings Using Upgraded Sliding Isolation System with SF Devices Jelena Ristic, Valon Veseli, Labeat Misini, Danilo Ristic
	Testing of Models of Original and Upgraded Connection Between RC Floor-Beam and Column Used in Modern Precast Hall System Labeat Misini, Jelena Ristic, Viktor Hristovski, Danilo Ristic
	Ambient Vibration Measurement of the Building of the Institute for Materials and Structures in Sarajevo Enver Selimović, Hadžić Hanka, Simonović Goran, Churilov Sergey, Mustafa Hrasnica, Senad Medic
	Structural Monitoring Technology for Operational/Business Continuity and Resilience Mauricio Ciudad-Real Mauricio Ciudad-Real, Derek Skolnik, Khalid Saifullah
Marketing	MC-Building Chemicals
13:00–14:00	Lunch
14:45–15:45	Session: Italian Experience in Seismic Isolation of Buildings Chairing: Maria Gabriella Castellano & Ana Skender
	Behaviour of Seismic Isolated Building during Central Italy 2016 – 2017 Earthquakes Antonello Salvatori
	Large Scale Seismic Isolation for a Post-earthquake Reconstruction Preserving Identity of Sites Marco, Mezzi, Alessandro, Fulco, Stefano, Nodessi, Gianluca, Fagotti, Nicola, Alemanno, Maurizio, Rotondi
	Seismic Retrofit of RC Buildings in Use Through Seismic Isolation. Three Case Studies in L'Aquila, Italy Maria Gabriella Castellano, Riccardo Vetturini
	Seismic Isolation on Existing RC Buildings: Overview of Some Issues and Applications to Case Studies Gino Di Trocchio, Marco Zaccari, Michele D'Amato, Rosario Gigliotti
15:45–16:15	Coffee break
16:15–16:30	Closing Ceremony
17:00–19:00	Technical visit: the Zagreb Cathedral and the Archbishop's Palace

09:00–10:30 Round table 1: Seismologists and Engineers – are we satisfied with our collaboration?

Chairing: Iva Dasović & Marta Šavor Novak

Panelists: Laurentiu Danciu, Dario Albarello, Marijan Herak, Mario Bačić, Josip Atalić

10:30–11:00 Coffee break

11:00–13:00 Round table 2: Strategy of urban safety (in Croatian)

Chairing: Robert Mikac

Panelists: Josip Atalić, Kristijan Družeta, Ljubomir Miščević, Ivana Krišto, Kristina Martinović, Davorin Oršanić, Tomislav Tesla, Siniša Jembrih

13:00–14:00 Lunch

15:45–16:15 Coffee break

16:15–16:30 Closing Ceremony

17:00–19:00 Technical visit: the Zagreb Cathedral and the Archbishop's Palace

Saturday, 25 March

09:00–17:30 Technical visit Sisak-Moslavina County

Short Introduction to the Technical Visits

In 2020, central Croatia was hit by strong earthquakes. **The Mw5.4 Zagreb earthquake** occurred on March 22, while the **Petrinja earthquakes** struck at the end of December, with the mainshock of a Mw6.4 magnitude.

The Mw5.4 Zagreb earthquake occurred within the city limits at a depth of 10 km, and generated a peak ground acceleration of more than 0.2 g. The earthquake caused one fatality and damage to approximately 25,000 buildings, particularly extensive in the historic center of the city.

The Mw6.4 earthquake struck near the town of Petrinja, 50 km southeast from Zagreb, on December 29, 2020. It was preceded by the Mw4.9 foreshock the day before. The mainshock caused 7 fatalities and widespread damage. City centers with invaluable cultural heritage buildings were significantly affected as were the many residential buildings, mainly built of unreinforced masonry.

Three main technical visits to the earthquake-affected sites are planned:

- **Wednesday, March 22, 10.00–14.00:** we will walk through the historical core of Zagreb visiting interesting sites affected by the 2020 Zagreb earthquake, guided by engineers who participate in the retrofitting process
- **Friday, March 24, 17.00–19.00:** we will visit the Zagreb Cathedral and the nearby Archbishop's Palace, currently in the process of retrofitting
- **Saturday, March 25, 08.00–17.30:** we will visit Sisak-Moslavina County (by an organized bus); with the focus of the technical visit on the historical centre of the town Petrinja. We will also visit some churches outside of Petrinja that were heavily damaged, and have lunch in a nearby restaurant.

Meeting point for all technical visits is the lobby of the hotel Westin. Scan the QR code for Google Maps location.

**Palace Hotel Zagreb • Wednesday, 22 March 2023 • 10:15**

The palace in which Palace Hotel Zagreb is located was built in **1891** for Karl Schlesinger, and it was put into operation in 1907 as the **first organized hotel in Zagreb**.

With its appearance and architectural style, it represents one of the rare examples of the Neo-Rococo style. Since then, the hotel has been reconstructed and adapted several times. Palace Hotel Zagreb is located in the center of the city, next to the old city park Zrinjevac.

The hotel was heavily damaged in Zagreb 2020 earthquake and it is currently **in the process of retrofitting**.

13 min walk from hotel Westin • goo.gl/maps/fZokpr3YCeRBSKDW6



Church of St. Francis of Assisi • Wednesday, 22 March 2023 • 11:30

The complex of the church with the monastery was built in the **13th century**, but it is possible that the Franciscans already had their residence there before. The **Gothic structure** is considered one of the most mature Franciscan sacral buildings in the Central European region. The church and monastery were thoroughly **renovated after the Zagreb earthquake in 1880**, when an effort was put to achieve the original Gothic character of the building. The church got a new high bell tower closed with a pointed roof.

The complex was damaged in the Zagreb 2020 earthquake and it is **in the final phase of the retrofitting process**.
14 min walk from Palace hotel or 25 min from Westin • goo.gl/maps/EPmc7SGPfQ82Y2Tq6



The oldest part of the city: Upper Town • Wednesday, 22 March 2023 • 13:00

In the oldest part of Zagreb, several schools and churches are in the retrofitting process. Depending on the remaining time, a short tour of the construction site will be organized according to the expressed interest, and if necessary, the participants will be divided into several groups.

10 min walk from Church of St. Francis of Assisi • goo.gl/maps/KenvCCNuJRwFQUFc7



Zagreb Cathedral • Friday, 24 March 2023 • 17:00

Zagreb Cathedral, is a Roman Catholic cathedral-church. It is the second tallest building in Croatia and also the **most monumental sacral building** in Gothic style southeast of the Alps. Construction of the cathedral was completed in **1217**.

The cathedral was severely **damaged in the 1880 Zagreb earthquake**. The main nave collapsed and the single tower was damaged beyond repair. As part of that restoration, two spires 104 m (341 ft) high were raised on the western side.

Cathedral was seriously damaged in the Zagreb 2020 earthquake and it is **in the first phase of the retrofitting process**.

22 min walk from hotel Westin • goo.gl/maps/JjvfNYgaCk6DwBZK6



The Archbishop's Palace • Friday, 24 March 2023 • 18:00

The Archbishop's Palace in Zagreb runs parallel to the Zagreb Cathedral. The complex of the Archbishop's Palace was built within the ramparts that protected it from the Turkish conquests. The building is a protected cultural heritage, and the first records of the buildings inside today's Archbishop's Palace date back to the **13th century**. After two devastating **earthquakes in 2020**, the building suffered significant damage to the structure, facade, staircase and roof. The strengthening method is minimally invasive and enables the preservation of the original construction characteristics in the exterior and interior of the building.

22 min walk from hotel Westin • goo.gl/maps/JjvfNYgaCk6DwBZK6



Sisak-Moslavina County • Saturday, 25 March 2023 • 8:00 – 17:30

After the devastating **earthquakes in 2020** many buildings in Sisak-Moslavina County were damaged. Most of the damage was in the **historical centres** of the three largest cities: Petrinja, Glina and Sisak, but there was also considerable damage to **churches and in villages**, most of which were not reconstructed or retrofitted after the Homeland War.

1. Churches outside of the City of Petrinja

We will visit the churches of **Holy Mary Magdalene in Sela** (currently under reconstruction) and the Templar church of the **Assumption of the Blessed Virgin Mary in Gora** (reconstructed before the earthquake).

2. City of Petrinja historical area

The heaviest damage and the focal point of technical visit is **City of Petrinja historical centre**. Buildings date to **late 1700s** and **most of the buildings are from the 1800s** and belong in the baroque and classicism era.

Visit will include **a walk through inner historic centre** with the **opportunity to enter several significant buildings**, followed by lunch at a nearby restaurant.

50 min drive from hotel Westin • goo.gl/maps/W6zLBWQnGdNJsLDo6

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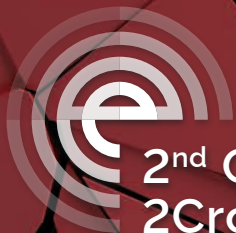
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