Iscarsah
http://iscarsah.icomos.org
International Scientific Committee on the Analysis and Restoration of Structures of Architectural Heritage

ICOMOS
International Council on Monuments and Sites
Conseil International des Monuments et des Sites

BULLETIN

September 2025

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Message form the President

This is the last bulletin before the Annual General Meeting (AGM) of ISCARSAH in Lausanne, September 14, on the occasion of the conference SAHC 2025 (sahc2025.epfl.ch). I am looking forward to meeting many of our members, as well as old and new friends in Switzerland.

In the Bulletin you will find a note on the recent earthquake in Myanmar, information about recent activities in Dubrovnik to make our built environment less seismic vulnerable, and seismic isolation applications in Romania. We are happy to have two colleagues writing in the bulletin that are not our members, as the objective of the bulletin is to share information from a wider community. We hope this may foster interest from our members in sending a note or a short article and may foster interest from non-ISCARSAH members of the wider community in heritage structures in joining our ISC.

Thanks also to Tim Michiels (together with Steve Kelley, Nicoletta Bianchini and Evan Speer) for the great work regarding the webinars. We consistently have a wide attendance of participants, with a lively follow-up. Our YouTube Channel has over 2600 visualizations. Do check it at https://www.youtube.com/@iscarsahvideo!

The Bureau also started an initiative to recognize special contributions from our members, and you will hear more about this in Lausanne. Finally, we started an inquiry over a possible change of name in our committee, making it shorter and to the point. The Bureau will discuss and share the results once the response period is completed. In that respect, it is interesting to understand how key words in our field may be complex in English across the globe and in different languages. Conservation and restoration are likely to mean different things in different languages. Conservation vs preservation is, to some extent, an issue between e.g. US English and Euro English. As we just celebrated the 60 years of the Venice Charter, preserv* is used there 7 times with no definition. Conserv* and restor* are used 12 and 13 times, mostly together. There is a section on conservation (articles 4-8) and one on restoration (articles 9-13).

Different people may have valid different opinions, and languages also evolve in time. I remember “intervention” being a strange word in some native English-speaking countries a few decades ago, not to say “constructions” that we use in the SAHC conference series as Lausanne and, seemingly, does not exist. In the book “Historic Construction and Conservation” from 2019, the authors wrote: “Regarding conservation, a general and structure-oriented definition are, respectively, according to: Nara Charter, all efforts designed to understand cultural heritage, know its history and meaning, ensure its material safeguard and, as required, its presentation, restoration and enhancement (ICOMOS, 1994); and International Organization for Standardization, all actions or processes that are aimed at safeguarding the character-defining elements of a cultural resource so as to retain its heritage value and extend its physical life (ISO 13822:2010, Annex I on Heritage Structures.

For the sake of clarity, two other definitions are given. Preservation as the action or process of protecting, maintaining and/or stabilizing the existing materials, form and integrity of a cultural resource or of an individual component, while protecting its heritage value. Note that preservation is much used in American English, while conservation is much used in European English for the same concept. In Europe, preservation is used more in the context of materials or conservators (such as stone, paper, textiles, paintings, sculptures and alike), whereas conservation is almost exclusively used for the built cultural heritage. Restoration may be defined as the action or process of accurately revealing, recovering or representing the state of a cultural resource or of an individual component, as it appeared in a particular period of its history, while protecting its heritage value.

Note that restoration of a cultural heritage building is a controversial concept. It encompasses, in fact, many different interpretations, ranging between reconstruction and full "re-establishment" (i.e. full recovery of an ancient building to its highest splendor, even involving the reconstruction of parts historically collapsed or possibly never built), to minimal intervention oriented to strict conservation. In this regard, it is worth noticing that a certain understanding of restoration (especially those connected to reconstruction and re-establishment) are out-of-fashion and in contradiction with modern conservation principles. Even if the word has a common root in Latin (restauro or to 'restore, rebuild, re-establish, renew'), its adaptation to different languages entails also different perceptions. As an example, restauro in Italian, per the Italian Dictionary from Corriere della Sera, one of Italy's oldest newspapers, reads 'Operazione e procedimento tecnico che ha lo scopo di riportare in uno stato di buona conservazione e leggibilità un bene culturale e artistico' or 'Operations and technical procedure that aims to bring back a cultural and artistic asset to a state of good conservation and understanding', for which the best European English translation would be conservation."

Restoration is defined per the California Historical Building Code, 2022 as the act or process of accurately depicting the form, features and character of a qualified building or property as it appeared at a particular period of time by the means of the removal of features from other periods in its history and reconstruction of missing features from the restoration period. The limited and sensitive upgrading of mechanical, electrical and plumbing systems and other code-required work to make properties functional is appropriate within a restoration project. This definition seems to ignore the fact that most historic buildings are a product of continuous changes and alterations throughout history, and the definition would be unreasonable across many parts of the world. In my view, structural or building restoration in European English or Portuguese is not an ideal concept. Again, I accept that the opinion may be questionable to many.

I am looking forward to meeting many of you in Lausanne for the ISCARSAH AGM and / or Nepal for the ICOMOS AGA, so that we keep friendship thriving and push heritage structures boundaries together.

Paulo B. Lourenço

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Thoughts from Afar on the Recent Myanmar Earthquake

Stephen JJ. Kelley, FAIA, SE, FAPT, FUSICOMOS

On 28 March 2025, a powerful earthquake struck the war - torn country of Myanmar causing widespread destruction. The Mw 7.7 7.9 strike - slip quake had an epicenter near Mandalay, the country's second largest city, was only 10 km deep, and had a Modified Mercalli intensity of X (Extreme). Myanmar is subjected to dramatic, ongoing tectonic processes controlled by shifting tectonic components as the Indian and other plates slide northward. Mandalay is set over these plate edges and is also located on the flat, expansive, alluvial flood plain of the Irrawaddy River. Recent geotechnic analysis revealed that the soil is a clay with high plasticity in the upper 1.5 meters and low plasticity below. Alluvial deposits of sand, silt and clay extend down more than 100 meters. Such soil can greatly amplify earthquake forces.

I have followed the aftermath of the earthquake because I was involved with the restoration of the mid - 19th century Shwenandaw Kyaung (Golden Palace Monastery) in Mandalay (Figure 1) for the World Monuments Fund starting in 2014 and ending with the 2021 coup d'etat. I spent enough time there to eventually rent my own motorcycle with an Aung San Suu Kyi sticker on the gas tank and ride to the site and around the region in a longyi and flip flops. Within blocks of my hotel were several Buddhist temples, a Hindu temple, a mosque, and two churches. What I experienced was a lovely indigenous culture deeply intertwined with Theravada Buddhism; combined with beliefs in astrology and spirits that intertwined with Buddhism; and these were an intrinsic part of everyday life.

The Shwenandaw Kyaung is a teak wood structure with its beams and joists connected to the posts by mortise and tenon with the beams being threaded through mortise holes in the poles and then shimmed to fit tightly and without the use of nails (Figure 2). This is a traditional timber framing method that was well developed by the 11th century in China. Known as chuan-dou, it creates a moment frame and was introduced to sinicized Asian countries from Mongolia to Japan. In my contextual research I visited numerous other teak monasteries, a unique building form in the region, including Maha Minthin Kyaung, Shwe in-Bin Kyaung, Thin-gaza Kyaung, and Bagaya Kyaung. What I noted at the time was termite infestations and the loss of teak post material where they were originally sunk in the ground and replacement by concrete (Figure 3). I was happy to see that none of the teak monasteries were reported to have been damaged in the recent seismic event, and this should not be surprising as they are wooden moment frame structures that would flex and sway to dissipate earthquake forces.

Figure 1: View from the northwest of the Shwenandaw Kyaung that is festooned with ornamental wood carvings on the eaves eaves and fascia of the three-tiered gable roof (S. Kelley photo).

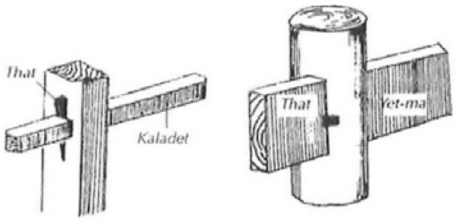

Figure 2: Drawing of typical mortise and tenon joint from the book, Splendour in Wood - the Buddhist Monasteries of Burma.

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Figure 3: The monastery of Thin-gaza has its teak posts replaced above grade with square concrete piers due to rot and termite damage (S. Kelley photo).

Figure 4: View of the Maha Aungmye Bonzan Kyaung from the south revealing the intricate ornamentation rendered in stucco over brick masonry (S. Kelley photo).

I was also asked to survey several unreinforced masonry structures that, not surprisingly, did not perform well during the earthquake. The obvious example is the Maha Aungmye Bonzan Kyaung (Figure 4). The Monastery is a fine example of early 19th century Burmese monastery architecture. As it was customary during this period for monasteries to be built of teak, this monastery was built in the same style with stucco ornamentation that looks like wood carving (Figure 4). The encircling hallways and chambers were covered with barrel vaults (Figure 5). At the time I observed the cracking within the vaults most likely from an 1838 earthquake and the outward spread of the encircling galleries. I am sorry to report the collapse of this monument (Figure 6).

These are rather obvious conclusions that can easily be concluded from afar, I know. I am happy to report that my Burmese colleagues seem to have weathered the recent tragic event. I hope that I can visit again some day and help with the recovery.

Figure 5: View of the lower gallery from the southwest showing the cracks along the apex of the vaults (S. Kelley photo).

Figure 6: The collapse of the Maha Aungmye Bonzan Kyaung following the earthquake (photo from the Associated Press)

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ISCARSAH Webinar Series

The committee continued its webinar series with two engaging sessions in the first half of 2025.

The first webinar, titled "**Structural Interventions in Heritage Case Studies Through the Lens of the Iscarsah Principles,"** was jointly organized with the Preservation Engineering Technical Committee of the Association for Preservation Technology (APT). This group of engineers, primarily based in Canada and the United States, shares a similar focus to Iscarsah and annually presents the prestigious David Fischetti Award for the best published paper on the engineering of historic structures.

In 2024, our board member **Arun Menon** (India), together with his co-author **Krishnachandran S.**, received this award for their outstanding work on the engineering analysis and adaptation of the Traditional Madras Terrace Slab System, highlighting key aspects of the Iscarsah Principles. They presented their award-winning research during the webinar.

Their presentation was complemented by **Iscarsah member Terrence Paret** from WJE, who discussed the application of the Iscarsah Principles in the seismic analysis and retrofitting of both the **Washington Monument** in Washington, D.C., and a **synagogue in San Francisco**.

Following the presentations, a discussion on the Iscarsah Principles was held with moderators **Rachel Will** (APT) and **Tim Michiels**. The webinar was well attended, and APT expressed strong interest in future collaborations with our committee.

The second webinar, titled **"Heritage in Times of Armed Conflict,"** was moderated by **Nicoletta Bianchini** and **Evan Speer.**

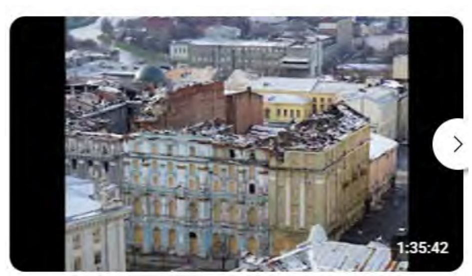
Architect **Muneer Elbaz** presented on the ongoing efforts and challenges in safeguarding historic buildings in the **Gaza Strip,** emphasizing that heritage preservation is not only about protecting structures but also about maintaining the connection between people and their cultural identity.

Victor Dvornikoff discussed ongoing efforts in **Kharkiv, Ukraine**, to stabilize and salvage elements from war-damaged buildings, while **Prof. Chiara Calderini** offered a historical perspective by sharing archival photographs of **Genoa, Italy,** documenting the destruction from bombing campaigns during World War II. Her presentation highlighted how historical damage documentation can enhance our understanding of historic damage which in turn supports current preservation and restoration efforts.

Both webinars, and all our past webinars, are available on theIscarsah Youtube channel.

Tim Michiels

Webinar 7: Structural Interventions in Heritage – Studies Through the Lens of ISCARSAH Principles



Webinar 8: Heritage in Time of Armed Conflict

N E W S

Seismic Analysis and Structural Assessment of Typical Stone Masonry Building in the Historic Core of Dubrovnik

The historic centre of Dubrovnik, a UNESCO World Heritage Site since 1979, is recognized for its exceptional cultural, historical and architectural value. However, it is located in a highly seismic region as tragically demonstrated by the devastating earthquake of 1667 and the significant damage during the 1979 earthquake in Montenegro. The latter prompted those involved to establish the Institute for the Restoration of Dubrovnik. Over the years, the Institute has carried out a number of projects for the structural retrofitting of historic buildings, some more impactful than others, but always focussing on the application of innovative methods and construction technologies which minimally disrupt the historical value of the building. As part of this endeavour, a project for seismic analysis of the representative block B17 was carried out by the University of agreb, Faculty of Civil Engineering, by Associate Professor Mario Uro and his team; Marija Dem i , Marta avor Novak, Josip Atali , Maja Bani ek, Ivan Duvnjak and Petra Gidak.

Based on the current state of scientific literature and engineering practice, the researchers summarised relevant experimental studies on the earthquake resistance of stone masonry buildings with flexible diaphragms and the various strengthening measures in order to reliably present the mechanical properties of the materials and the failure mechanisms. In addition, a critical review of strengthening methods was carried out and their applicability in relation to the building typology was assessed.

The research project employed advanced numerical modelling methodologies that were supported by extensive experimental data. Laboratory and in-situ investigations provided important information on the mechanical properties of the traditional three-leaf masonry walls as well as on the global dynamic behaviour determined by the OMA measurements of the existing structure. These findings served as the basis for the creation of numerical models and performing simulations to predict the structure's response.

Numerical models of varying complexity were developed for the analyses. The most sophisticated analyses involved non-linear dynamic simulations and advanced constitutive material model to predict the behaviour of the building under the set of real and artificial earthquakes specified for the site. Although these models are complex and rarely used in regular engineering practise, they were necessary to ensure a understanding of the performance of the historic structure. In addition, the global seismic response was assessed by applying an equivalent frame model with a macro-element constitutive law, representing masonry elements as pier and spandrel elements and using a pushover analysis. Finally, representative walls were analysed for possible out-of-plane failure and the corresponding safety factors were calculated.

Position and representation of analysed block B17 in the Old Town of Dubrovnik

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The analysis was thus conducted in two stages: the first comprising the evaluation of the existing condition of Block B17, that included model calibration based on measurement results and seismic performance assessment; the second involved the structural analysis of the building for different retrofit strategies applied to the structure, ie. considering proven engineering techniques commonly used, such as wall injections, post-tensioning of the wall, installation of ties etc. Results of both global models indicated the critical structural elements that exhibited significant seismic vulnerability. The analysis of potential out-of-plane mechanisms and non-structural elements also revealed structural vulnerabilities that require targeted intervention. Comparison with the upgraded models gave a valuable information on the effectiveness of specific strengthening measures.

To summarize, this study has provided a comprehensive assessment of the efficiency of a certain structural strengthening measures to the seismic resilience of heritage buildings in Old Town of Dubrovnik. Importantly, it identified critical weaknesses and provided recommendations for future measures to enhance further historic buildings in Dubrovnik. The project continues with a long-term monitoring initiative focusing on dynamic structural response using remote accelerometers, supported by the Croatian Centre for Earthquake Engineering at the Faculty of Civil Engineering, University of agreb. Furthermore, the project underscored the need for future activities to be strategically focused on mitigating earthquake risk, with particular emphasis on preserving built cultural heritage and enhancing its structural safety.

Mario Uros

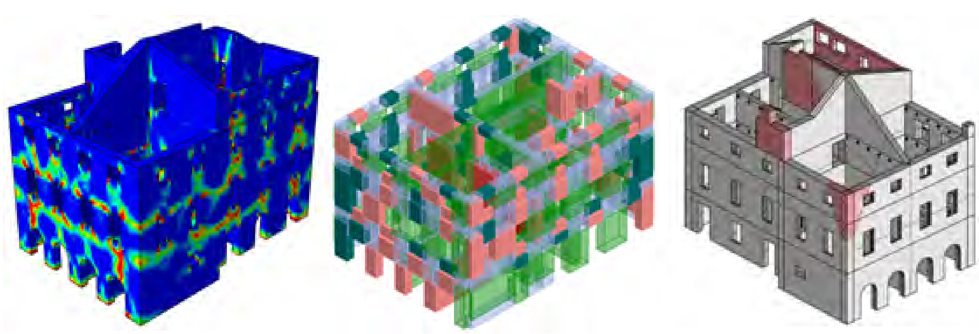

Illustration of Numerical Models

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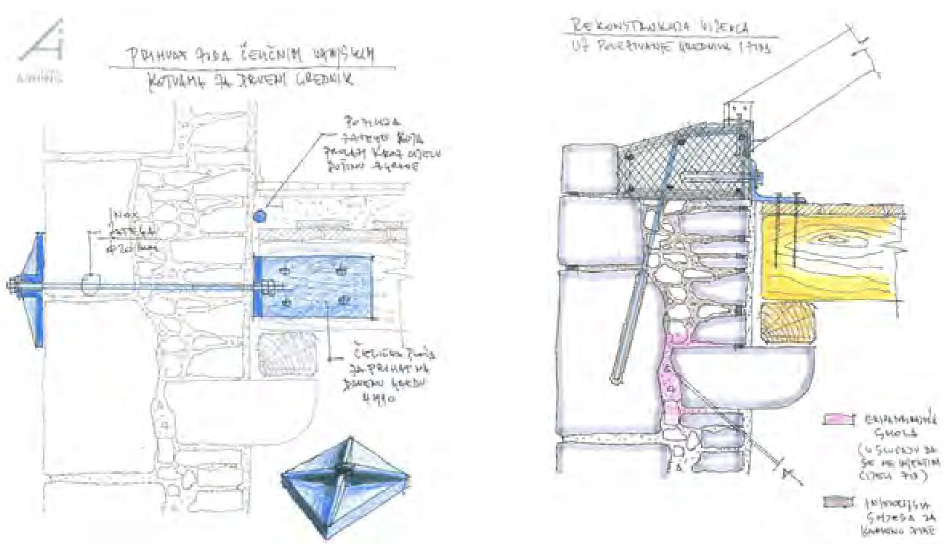
Extraction of wall structure and laboratory testing samples

Representative documented structural details



Proposed Strengthening Details Conceptual Sketches

N E W S

Seismic Isolation Applications in Romania on Heritage Buildings

Seismic isolation is a technology applicable everywhere in the world with the aim of protecting buildings from earthquakes or other vibrations, by decoupling the superstructure from the foundation with the introduction of an isolation interface, where two types of devices can be installed (isolators and dampers). In this way, the acceleration coming from the seismic motion which in a conventional building (fixed base) produces damages in the structural elements is significantly reduced for the su-perstructure, and the seismic energy is dissipated only in the isolation interface. This technology now-adays is not new, but in developing countries engineers are still getting familiar with the specific prac-tices corresponding to its application. An estimation of applications worldwide is shown on Figure 1.

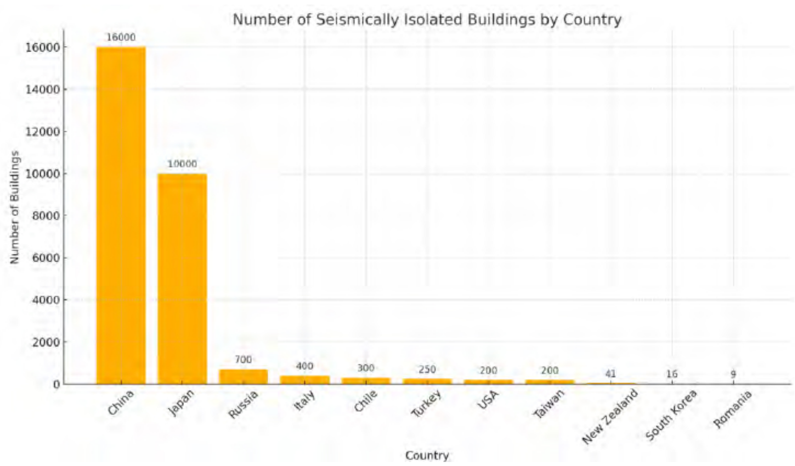


Figure 1: Number of isolated buildings per country

Romania is one of the countries in Europe with high seismic hazard, which is mainly coming from the Vrancea seismic source, a point source producing intermediate depth earthquakes, high peak ground accelerations, long predominant periods of the records (about 1.4-1.6 sec. in Bucharest), and undesirable side effects due to the soft soil conditions. Many strengthening interventions, if applied, are made using conventional methods such as shear walls or by jacketing of beams, columns and walls, and this is due to economic reasons. But in some situations, such methods may not offer enough addi-tional strength, or the functionality of the building is not allowed to be interrupted. So other solutions should be found, and recently authorities and engineers applied, even if in a few cases, seismic isolation for retrofitting existing heritage buildings and response control systems for new buildings.

Among the current 9 applications of seismic isolation in Romania, 6 of them are on heritage build-ings are shown after the retrofit in Figure 2. The structural systems consists for most of the cases of unreinforced masonry walls using of burned clay bricks, some of the having concrete floors, and in order to apply the seismic isolation, the upper structure also needed some interventions such as rein-forced concrete jacketing of walls, creating floor diaphragms by adding concrete covers on top of the existing slabs, or injections with epoxy resin and then application of laminated carbon fiber or steel plates (where the elements are strong enough to allow a strong connection).

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a) Victor Slavescu building of the ASE (Economics Studies Acad.) in Bucharest isolated with rubber bearings + viscous dampers

b) Bucharest City Hall isolated with rubber bearings + viscous dampers

c) Arch of triumph (Bucharest) isolated with rubber bearings + viscous dampers

d) Aroneanu Church (Iasi) isolated with friction pendulum sliding isolators

e) Fire Tower (Bucharest) isolated with rubber bearings + viscous dampers

f) Cantacuzino Institute (Bucharest) isolated with lead rubber bearings

Figure 2: Heritage buildings in Romania retrofitted with seismic isolation

The main principle for retrofit works are creating rigid elements beneath (inferior carrying frame visible in Figure 3 a) and above (superior carrying frame) the isolation interface to ensure that the defor-mation due to large earthquake will only occur there. In most of the applications flat jacks filled with epoxy resin (red color) were used to ensure the contact between the upper part (superior carrying frame) and isolators (Figure 3 b). The isolation gap (Figure 3 c) should be large enough to accommodate the isolators' displacement and also carefully designed to avoid pounding with the surrounding retain-ing wall.

a) Rubber bearings installed on steel tables with anchor bolts, which remain embedded into the inferior carrying frame

b) Testing the spread of the resin (red color) inside the flat jack

c) The isolation gap for which a concrete cover was made to protect people and objects from falling into the gap

Figure 3: Seismic isolation application details at existing buildings (photos from Mr. Dragos Mocanu)

Andreea Dutu