

IRIC 2023



**Interdisciplinary solutions for
sustainable buildings**

BOOK OF ABSTRACTS

13–14 SEPTEMBER 2023
IZOLA, SLOVENIA



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The conference is organized by the InnoRenew CoE and the University of Primorska in the framework of the project Green, Digital & Inclusive University of Primorska (GDI UP).

The project Green, Digital & Inclusive University of Primorska (GDI UP) is co-financed by the Republic of Slovenia, the Ministry of Higher Education, Science and Innovation and the European Union – NextGenerationEU. The project is implemented in accordance with the Recovery and Resilience Plan (RRP) under the development area Smart, Sustainable and Inclusive Growth, component Strengthening competencies, in particular digital competencies and those required by the new professions and the green transition (C3 K5), for the investment measure Investment F. Implementation of pilot projects, the results of which will serve as a basis for the preparation of a roadmap for the reform of higher education for a green and resilient transition to a Society 5.0: project Pilot Projects for the Reform of Higher Education for a Green and Resilient Transition.



Keynote speaker



Alan Organschi

Alan Organschi is a principal and partner at Gray Organschi Architecture, an architectural practice in New Haven, Connecticut, USA, recognized internationally for its integration of design, construction, and environmental research.

In April 2021, Mr. Organschi was appointed Director of the Innovation Labs at the Bauhaus Earth, a global interdisciplinary initiative that seeks to transform the building sector from a major source of anthropogenic environmental and social impact into a regenerative and ecologically sensitive means to meet the housing and infrastructural needs of an urbanizing global population. Mr. Organschi continues as a Senior member of the faculty at the Yale School of Architecture where he has taught architectural design and building technology for two decades.

Mr. Organschi has written and lectured extensively on the carbon storage benefits of biogenic material substitution in urban building. He is a co-author of the recently published book *Carbon: A Field Manual For Building Designers* and the scientific paper "Buildings as a Global Carbon Sink" published in the journal *Nature Sustainability* in January 2020.

In 2012, Mr. Organschi and his partner Elizabeth Gray were honored for their work with an Arts and Letters Award in Architecture by the American Academy of Arts and Letters. t J4-1767.

Cross-Laminated Timber furniture as Earthquake Shelter: updates on the Lifeshell concept

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Lifeshell is a wooden furniture acting as safe shelter during earthquakes, thereby saving lives. The concept presented at IRIC2020 (Fellin et al., 2020) has been further developed into a 2.0 version. To improve this design, it is essential to understand the forces, actions, and direction of a building collapse during an earthquake. Reports on building typologies and vulnerability indicate that rubble stone, adobe, unreinforced brick or masonry, reinforced concrete frames with inadequate earthquake-resistance buildings, and poorly constructed timber structures are most prone to collapse. Earthquake image databases were also used to approximate the typical dimensions of collapse, and 14 case studies of seismic countries were analyzed in detail.

For each scenario, the mass ranges of floor and wall collapse over a desk were estimated, with vertical loads ranging from 300 to 2100 kg and lateral loads ranging from 75 to 3600 kg. These data were used to simulate a collapse over a desk, testing several software for both finite element analysis and static/dynamic simulation. Results show most of the software have significant challenges in defining wood as an orthotropic material and defining cross-laminated timber panels as a sum of multi-layered glued boards: nevertheless, one of the finite element-based software was successful.

Preliminary models of the Lifeshell desk indicated no further strengthening of the structure is needed. In fact, a lightened structure can safely carry the applied load resulting in more efficient and cost-effective solutions. Further validation of the design is planned using both finite element analysis and real-life tests to assess each desk variation's suitability for different building typologies and risk of collapse.

The Lifeshell 2.0 is a non-structural revision of the original design for aspects such as aesthetics, geometries, wheels, handles, safety, millings, and accessories. The Lifeshell 2.0 design is freely available under the Creative Commons 4.0 license.

Keywords: anti-seismic, furniture, cross-laminated timber, shelter, creative commons

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Fellin, M., Polidori, M., Ceccotti A., 2022. Application of Cross-Laminated Timber furniture as Earthquake Shelter: A public domain release of the Lifeshell concept. *Interdisciplinary Perspectives on the Built Environment*. 2(2022) doi: 10.37947/ipbe.2022.vol2.2

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