



## International Conference Civil Engineering and Cultural Heritage

### Introduction: speakers & presentations

*Kaarel Truu, MA, National Heritage Board, ESTONIA*

*Kaarel Truu is a PhD candidate in Estonian Academy of Arts, his academic research is focused on the restoration works carried out in Tallinn old town during the soviet period. Kaarel has worked on different levels and positions in the cultural heritage field since 2008. He has worked as a conservation specialist in Tallinn City Cultural Heritage Dept. and is currently an advisor at the Estonian National Heritage Board.*

#### **History and experience of renovation of Cultural Heritages in Estonia:**

##### **Restoration Works in Post-WWII Tallinn**

The scale of war damage to Tallinn Old Town can not be compared to that of Warsaw or many other European cities but was still remarkable. Dealing with war damage and problems caused by lack of maintenance offered endless challenges for heritage protection authorities. Heritage protection institutions started with marginal resources and position in early post-war years and ended up directing rather large scale projects in 1960s, 70s and 80s.

Works led by historians, architects and engineers greatly altered the look of the old town and how the general public even today perceives historic environment.



*Heiki Onton, PhD, Ramirent Baltic AS managing director, ESTONIA*

*Heiki Onton's main research areas are related to investigation the causes of damage to old reinforced concrete structures and restoration of reinforced concrete structures. In 2009 he worked out with professor Karl Õiger a renovation project for reinforced concrete structures of seaplane hangars.*

#### **Lessons learned. Renovation of Seaplane hangars**

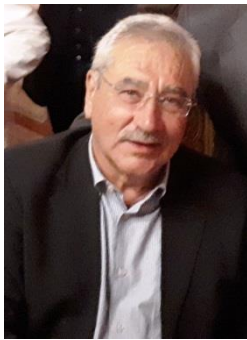
**Magazine The Builder, UK, 1920 (Charles Newson, M.S.A, M.C.I), „An example of Modern Dome Construction“** : The problem was to roof over a space measuring about 380 ft (115,8 m) by 165 ft (50,29 m), without any columns or intermediate supports whatever, a feat wich has probably never been attemptet before in any form of construction except steel.

**Prof H. Laul, 1961:** It is interesting to note the fact, that in Tallinn 1913-15 a. was built 3 doublekurved shallow shells every in plan 35 x 35 m. It was outstanding achievement of theory and practice of reinforced concrete technology of that time in whole world.



The hangars at the Tallinn Seaplane Harbour are the most important engineering landmark in the region. They are thought to be the first large-scale reinforced concrete shell structure in the world. When the hangars were first built, *The Builder*, a British architectural journal, compared them with Hagia Sophia in Istanbul. In the Soviet period, the seaplane harbour was in the hands of the military and the neglected hangars were decaying rapidly. By the time the restoration work began in 2009, the building was in terrible disrepair and on the verge of collapsing. Quick action carried out by an experienced team helped to save and refurbish the structure. In 2010- 2012, the seaplane harbour was renovated as a maritime museum which opened in May 2012.

Tallinn Seaplane Harbour was awarded Europa Nostra Grand Prix 2013, which is the European Union's highest cultural heritage award.



*Aris Chatzidakis, MSc Civil Engineer, ECCE Vice President, GREECE*

*Aris Chatzidakis is a Civil Engineer. He graduated, in 1974, from the National Technical University of Athens. During 1975-1976, he attended the post-graduate course (D.E.A.) "Aménagement du Territoire", at the Ecole Nationale Supérieure d'Hydraulique, at the University of Grenoble. Aris has been involved, as a structural and a geotechnical engineer, in many infrastructure projects. He has specialized in the structural analysis and design, for the restoration of traditional buildings and monuments such as:*

- *the "Ottoman" Mosque (1991) and the Venetian Castle "Kale" (1991), at Ierapetra, Crete*
- *the ottoman Water Mill, at "Kria", in Livadia (1992),*
- *"The Upgrading of the old town of Archanes" in Crete, in collaboration with professor P. Toulitatos (1992), which was part of a programme undertaken by the National Technical University of Athens,*
- *the Minaret at Agios Nikolaos Church, in the Splantzia area, in Chania, Crete (1998)*
- *the "Souleiman" Mosque and the Agia Kyriaki Church complex with the Minaret in Rhodes, (2002)*
- *the North Wing of the Arkadi Monastery, in Rethymno, Crete (2000)*

### **Challenges for the structural engineer on renovation of ancient buildings**

Our professional engagement with monuments and existing structures is rather recent. Our ideas, concepts, definitions, principles, analytical approach and Regulatory texts have evolved very rapidly the last 10 years. The particularities when dealing with monuments are of two kinds. Monuments constitute constructions which have been conceived and designed according to the so-called **rules of art**. They present a wide variety of **mechanical properties** in the same structural element which makes **mathematical simulation** very difficult. The restrictions imposed by the need to respect the **architectural form and the structural identity** of the monument, normally **contradicts** with the interventions which would be necessary to make the construction **conform to the current levels of safety**.



We have to compromise between the cultural integrity and the Regulations adopted according to the **current scientific knowledge** on the behavior structures and their expected seismic response. I will try to present these challenges, problems and particularities through the experience gained by my professional engagement in some restoration projects, of minarets and other monuments.



*Gediminas Rutkauskas, Dipl. Architect, ICOMOS international expert, Head of Vilnius Old Town Renewal Agency, LITHUANIA*

*Gediminas has studied at Vilnius Technical University and he holds MA degree in Architecture & Interior Design from Vilnius State Academy of Art. From Nov. 2011 - Dec. 2012 he worked as Vice Minister of Culture at the Ministry of Culture of the Republic of Lithuania. Gediminas is member of National Commission for ICOMOS since 2009 and 2011 - 2015 he was member of Bureau.*

### **History and experience of integrated renovation of Vilnius historic city centre**

The application to UNESCO World Heritage Centre was developed in 1989, - few years before the collapse of the USSR and recreation of Lithuania's Statehood. Inscription of Vilnius historic city centre into the UNESCO World Heritage List took place in Dec. 1994. Vilnius Old Town Regeneration Strategy was developed in 1997 and started in 1998. It commenced from an intensive physical upgrade of historic buildings and public spaces revitalising a general image of the city's historic core and attracting anxious private investors. The Old Town regeneration in early third Millennium featured by growing needs in developing PPP experience, improving restoration work's quality and extent, international and EU professional communication, also focusing on community awareness rising means and activities. Quality communication with local property owners, communities as well as developers is a current work focus aimed to improve coherence of the WH site regeneration.



*Johanna Liblik, MSc, Tallinn University of Technology, ESTONIA*

*Johanna has a background in civil engineering and is a PhD student at the Tallinn University of Technology. She has a special interest in historic timber buildings and has taken courses in cultural heritage and conservation in Estonian Academy of Arts and abroad.*



## Fire safety in historical wooden buildings

Johanna's current research is focusing on the fire design of timber structures protected by traditional plasters. The fire resistance of timber structures is one of the most important aspects when renewing an existing timber building. This presentation is introducing a design model for clay and lime plaster as fire protection materials for historic timber structures. The research is supported by a case study from Finland and contributes to the use of authentic materials and building methodologies in historic buildings.



*Janis Dripe, Expert, Ministry of Culture of Latvia, Head of RISEBA School of Architecture,*  
LATVIA

*Currently is working as a Director of the School of Architecture at RISEBA University and Expert at the Ministry of Culture on architecture and creative industries. He is a former City architect of Riga (2006 – 2011), Head of State Protocol (2002 – 2006), Ambassador of Latvia to the Kingdom of Sweden (1996 – 2001), Minister of Culture of Latvia (1993 – 1995) and President of Architects Association of Latvia (1993 – 1996).*

*Jānis Dripe is also an author of more than 300 articles on architecture and cultural issues. Author of the books „Architecture in Latvia 1991 – 2011” (Jumava, Riga, 320 p., 2012), „Gunnar Birkerts. National Library of Latvia. Riga” (Menges, Stuttgart – London, 72 p., 2015), „Latvian National Library. Architect Gunnar Birkerts” (LNB AB, Riga, 272 p., 2015).*

## Contemporary architecture & heritage – case of Latvia

Architectural scenery in Latvia after 1991 is the bright mixture of different trends and influences. Riga is hoping to position itself as the metropolis of the Baltic region – also in the area of architecture. After a long period of stagnation in the field of cultural buildings, during the last decade, Latvia managed to accomplish the programme of regional concert halls, to construct the new National Library, to extend and restore the National Art Museum and few other buildings of national significance. Competition process and constructed result form an important part of the national infrastructure and architectural culture of Latvia.



*Martin Vaga, MSc, YIT Infra Eesti AS, ESTONIA*

*Martin has graduated Tallinn University of Technology and holds master's degree in civil engineering. Currently he is working for YIT Infra Eesti AS as site and project manager and project engineer. He is certified road, bridge and ground engineer, EQF level 7.*

### **Lessons learned. Rotermann City, Tallinn**

Rotermann Quarter is an award-winning architectural pearl right in the heart of Tallinn, next to the Harbour and the wonders of Old Town. A busy-working factory area in the 19th century, then badly dilapidated during the Soviet Era, this quarter has emerged from its cocoon and become a bustling commercial and cultural centre, connecting old and brand new with good taste.

Modern times need modern buildings. That is the case in historical industrial quarter Rotermann, where old manufacture buildings and warehouses have been given new modern functions. Complex construction of underground parking house under old wheat mill and 54m high cattle house chimney will be presented.



*Dr. James Miles BA (hons), MSc, PhD, MCI(A), UK*

*James is a Director of Archaeovision and has an extensive background in the planning and management of heritage based projects. He has a PhD in computational archaeology from the University of Southampton, with his thesis focusing on the potential of structural analysis within archaeological simulation, using Winchester Cathedral and its precinct buildings as a case study. He is now a visiting fellow of the university and was recently appointed as the Digital Projects manager for the Church of England's Cathedral and Church Buildings division, overseeing all major digital projects connected to the 16,500 buildings that fall under the Church's jurisdiction. He is also the Chair of CAA-UK and an executive officer of CAA international, which are leading bodies in the use of computational archaeology, both within the UK and internationally. He is a noted expert in the field of geomatics in cultural heritage, with an experience of working and recording buildings and other objects of cultural significance in four continents, and was recently appointed as a Member of the Chartered Institute of Field Archaeologist in the UK.*

### **The possibility that technology offers: The potential of HeritageBIM**

Cultural Heritage surrounding historical architecture encompasses a multi-disciplinary relationship. The field has many experts and specialisms that contribute, discuss and interpret multifaceted information, providing an understanding and elucidation of standing and ruined structures. Within



the field of archaeology, 3D laser scanning and structure from motion now provide snapshots of buildings as they currently are, but within heritage practice, this data provides limited information as to the historical features of their architecture, which are required to fully understand their historical significance. When examining the current work completed in digital heritage, the field has begun to implement 3D CAD work into its day-to-day asset management, producing level 1 BIM models as a standard output, but focusing only on the visual quality of the buildings recorded. This methodological approach however provides the basis on which heritage specific BIM can greatly enhance our understanding of the past, providing greater possibilities within how we discern and manage our historic buildings, not only for their structural feasibility but also within their preservation and conservation.

Heritage requires a greater understanding of the individual parts that make up a building and the discipline already incorporates elements of planning, historic asset management, preventative maintenance, documentation, investigation and research. With the introduction of HeritageBIM and an enhanced asset management system, through the addition of 4D or 5D BIM models, qualitative and quantitative information can be further derived that characterise physical and functional features of these buildings. HeritageBIM not only provides a basis for enhanced collaborative work but the method provides the potential for a greater ability to share the datasets that are produced across the multi-disciplinary teams that define the different areas of expertise and specialisms. Discussing the historical background of heritage recording and the enhanced surface data that can be extracted, together with working examples of 3D recording, model production, and enhanced asset analysis and simulation through structural analysis, this paper will provide a snapshot of ongoing work that can be completed within the heritage field, focussing on the potential of HeritageBIM.