



NSERC CREATE Heritage Engineering Workshop on Structural Analysis of Historic Constructions: approaches and case studies

9 February 2018, 9:00am-4:00pm

Location: Carleton Immersive Media Studio, 4th floor, VSIM Building, Carleton University

Item	Speaker	Time
1. Welcome	Mario Santana	9:00 – 9:10am
2. Introduction to the Workshop	John Cooke	9:10 – 9:20am
3. International Case Studies	<p>Paulo Lourenco, University of Minho, Portugal</p> <p>Brief introduction to the problem of structural conservation</p> <p>Cloister of Monastery of Salzedas, Portugal</p> <p>Ica Cathedral, Peru</p> <p>Holy Cross Monastery, Coimbra, Portugal</p> <p>Reinforced concrete challenges</p> <p>Moderator: John Cooke</p>	9:20 – 12:05pm
4. Lunch break	Catered lunch at CIMS	12:05 – 1:15pm
5. ISCARSAH Principles	Tom Morrison	1:15 – 1:35
6. Canadian Case Studies	Government Conference Centre Rehabilitation, Lisa Nicol , John G. Cooke & Associates Ltd.	1:35 – 3:00

	<p>West Block rehabilitation project, Chris Vopni, John G. Cooke & Associates Ltd.</p> <p>Fort Rodd Hill Concrete Structure Rehabilitation, Doug Stephenson and Carol Kung, Heritage Conservation Directorate</p> <p>Conservation of Beinn Bhreagh, Tom Morrison, Heritage Standing</p> <p>Moderator: Mario Santana</p>	
7. Short break	Coffee & tea at CIMS	3:00 – 3:05pm
8. Correlating experiences and concluding remarks	Sujan Shrestha	3:05 – 4:00pm

Case Study: Issues to address

Each case study will address the following issues, this is based on the Standards and Guidelines:

- What are the key issues in the project/--building?
- How were these issues identified and investigated? What challenges were faced during the investigation?
- What were the main criteria considered during the design of intervention and how the design intervention is selected? How the design intervention respects the original material and construction technology?
- Was there any impact to the heritage significance due to the intervention? or How did the design intervention respect the heritage value, character defining elements of the structure?
- Has your solution been proved to work effectively? Or was there any post evaluation of the effectiveness of design intervention?
- If you were to undergo the same project today, would you approach the issues differently?

Case Studies

Government Conference Center Rehabilitation, Ottawa

The Government Conference Center was built in 1912, and for nearly 60 years was Ottawa’s train station. It underwent renovations in the early 1970s and was then used as a Government Conference Center for the next 40 years, with little to no public access. In 2014, the Rehabilitation of this Federal Heritage

Building began and is scheduled to be complete this summer. It will be the temporary home of the Senate of Canada for the next decade or two, with regular tours being provided to ensure public access. The structural mandate of the project was to 1) provide a seismic upgrade, 2) provide design for many new floor plates within the existing building, and 3) design a new addition along the east side of the existing building. With this ambitious mandate, there have been many interesting challenges along the way.

West Block Rehabilitation Project, Ottawa

The first phase of the West Block on Parliament Hill was constructed in 1865 with subsequent additions in 1978 and 1909. It underwent a major renovation in the 1960s, with much of the related structural information lost or found to be inaccurate. The current construction began in 2011 and is scheduled for completion later this year. The structural scope related to the existing building includes a seismic upgrade, upgraded floor systems to meet changing occupancy, and reinforcing to meet both modern M&E requirements and increased loading created by the new Courtyard Roof.

Fort Rodd Hill Concrete Structure Rehabilitation

Fort Rodd Hill is a coastal artillery fort residing in Victoria, British Columbia and is the only intact example of coastal fortifications from its time period remaining in Canada. Built to defend to Victoria and the Esquimalt Naval Base, the site was utilized as part of an elaborate network which together made up the Esquimalt-Victoria defences until it became decommissioned in 1956, and designated a National Historic Site in 1958. The concrete structures throughout exhibit extensive deterioration due to the site's coastal location subjecting it to salt-laden mist and extreme environmental conditions, and have been in desperate need of conservation; subsequently, as part of the Parks Canada Infrastructure Program, the site is currently undergoing a phased multi-year program of work to conserve the fortification. Work includes historic research, condition and structural assessments, undertaking pilot projects in advance of the major works, heritage recording and modelling, investigative openings, non-destructive testing (NDT), material testing, and executing a phased construction sequence.

Conservation of Beinn Bhreagh

Beinn Bhreagh was built by Mabel & Alexander Graham Bell in 1893 as a summer residence in Cape Breton, Nova Scotia. The wood frame building is still owned by the Bell's descendants, currently managed in a family trust. The Trust began the Conservation of the building in 2013, with the expressed desire that it's conservation be done following national and international conservation guidelines. This case study will discuss some of the unique issues encountered and how application of the ISCARSAH Principles guided the process for this remote site.

Speakers

Professor Paulo B. Lourenço, Department of Civil Engineering, University of Minho, Guimarães, Portugal and Co-Head of the Institute in Sustainability and Innovation in Structural Engineering. Leader of the

revision of the European Masonry code (EC6, Part 1-1). He is experienced in the fields of NDT, advanced experimental and numerical techniques, innovative strengthening techniques, novel masonry products and earthquake engineering. He is specialist in structural repair, conservation and strengthening, with works in more than 100 monuments. He has worked as consultant on innovative masonry structures using confined and reinforced masonry. He is Editor of the "International Journal of Architectural Heritage" and Coordinator of the European MSc on "Structural Analysis of Monuments and Historical Constructions" (www.msc-sahc.org), awarded the most prestigious cultural prize in Europe in 2017 (Europa Nostra). He has supervised 50 PhD students and has an h-index of 42.

Carol Kung graduated from the Civil Engineering program at Carleton University in 2012 and began her professional career in the Canadian federal government with the Heritage Conservation Services (HCS) PSPC shortly afterwards. Working with the multi-disciplinary HCS team she has been exposed to various types of heritage structures across Canada. In 2016, Carol successfully completed the Advanced Masters in Structural Analysis of Monuments and Historical Construction (SAHC), offered as a joint program between the University of Minho (Guimarães, Portugal) and the University of Padova (Padova, Italy). Upon completion of the SAHC program, Carol has returned to HCS to continue her career as a conservation structural engineer and has conducted condition assessments, structural analyses, seismic analyses and technical reviews on various heritage structures.

Tom Morrison, P.Eng., Ph.D., is principal engineer of Heritage Standing. He holds a Masters degree in Structural Analysis of Historic Constructions, and a Ph.D. looking at seismic evaluation and rehabilitation of existing structures. Past work experience includes private consulting and work with the Heritage Conservation Directorate in Public Works. In his current position with Heritage Standing Inc. he is working with a range of structural typologies, focusing on historic buildings, and enjoying the different engineering problems that come up.

Lisa Nicol, P.Eng, is a partner at John G. Cooke & Associates Ltd (JCAL). She completed Engineering studies at Acadia University and Dalhousie University, graduating from Dalhousie with a Bachelor in Civil Engineering in 2000. Lisa has worked at JCAL ever since, with the large majority of projects she's involved with being heritage masonry buildings, ranging in size from stone churches to Federal Heritage Buildings. The structural and conservation challenges one is faced with when working within an existing building always calls for creative and unique solutions – there's never a dull moment! The balance between pure structural engineering theory, and practical historic performance of masonry structures, is endlessly fascinating when determining the most appropriate rehabilitation solution. It is a great pleasure to be a part of rehabilitation projects, to help ensure that these landmark buildings can continue to be an important part of the community for years to come.

Sujan Shrestha studied Civil/Structural Engineering at Tribhuvan University, Institute of Engineering and graduated in 2011. In 2015 I completed my PhD from Sapienza University, Rome. After the Gorkha Earthquake in 2015, he was working with UNESCO Kathmandu Office as a consultant. Particularly, he was involved in damage assessment, mapping and emergency stabilization of the vulnerable heritage structures of Kathmandu Valley. In that period, he also conducted different damage assessment mission with the collaboration of different international experts and Department of Archaeology, to different

World Heritage Sites and tentative list of World Heritage Sites inside and outside of Kathmandu Valley. Since, September 2016, he is a 'NSERC CREATE Engineering Heritage' Post Doctoral Fellow and working on project "Recording, Documentation and Structural investigation of Heritage structures of Kathmandu Valley World Heritage Sites".

Doug Stephenson joined the federal governments PWGSC Heritage Conservation Services in 2001 after 17 years in the private sector. He is a graduate of Carleton University (B.Eng 1981, M.Eng 1988). Doug has extensive experience in structural investigation and assessments, rehabilitation design and construction, for both contemporary and historic structures. Since joining HCS Doug has worked and advised on Parliamentary Precinct Buildings, Parks Canada fortifications across Canada, National Capital Region and Atlantic Region Heritage buildings, Veterans Affairs Monuments, DND lighthouses. Doug also has specialized expertise in Structural Health Monitoring, Building Envelope and Historic Concrete. Doug has been the discipline manager of conservation structural engineering at HCS since 2012.

Chris Vopni, P.Eng, is an associate at John G. Cooke & Associates Ltd (JCAL). He completed his Engineering studies at the University of Ottawa, graduating with a Bachelor in Applied Science with a Structural Engineering focus. After some time working with a General Contractor, Chris started with JCAL and is now in his 10th year. Nearly all of those years, Chris has been working as Project Engineer for the West Block Rehabilitation Project with his focus on the conservation and upgrade of the existing Heritage Building. Chris has also been involved in a range of projects from localized interventions and large scale conservation projects.

References

- International Scientific Committee on the Analysis and Restoration of Structures of Architectural Heritage (ISCARSAH), The principles for the analysis, conservation and structural restoration of architectural restoration of architectural heritage (2003)
<https://iscarsah.files.wordpress.com/2014/11/iscarsah-principles-english.pdf>