STRUCTURES & CONSTRUCTION DIVISION OF ENGINEERS IRELAND

Hidden Defects in Bridges guidance for detection and management – CIRIA Guide C764; The Boyne Viaduct – Structural Health Monitoring and Probabilistic Analysis; The Engineering and construction challenges of Number 26 York Street RCSI; Challenges faced during design and construction of the newly renovated Páirc Uí Chaoimh

Thursday 10th of May 2018 - 1345hrs to 1800hrs

Engineers Ireland

22 Clyde Road, Dublin 4

Admission – Free Entry

Programme

1345hrs Registration

1400hrs Welcome – Fergal Cahill – Chairman Structures and Construction Division

1405hrs **Hidden Defects in Bridges, guidance for detection and management – CIRIA Guide C764**

David Ashurst - Associate Director Bridges and Civil Structures Arup West Midlands UK

John Webb – Regional Director at Aecom Birmingham UK

1455hrs Questions and Answers

1500hrs **The Boyne Viaduct – Structural Health Monitoring and Probabilistic Analysis**

Lorcan Connolly, Research Engineer Roughan & O'Donovan Innovative Solutions

1550hrs **Questions and Answers**

1555hrs **Coffee Break**

1605hrs **The Engineering and construction challenges of Number 26 York Street RCSI**

Eddie Lyons – Associate at O'Connor Sutton Cronin Consulting Engineers

Paul Devine – Associate at O' Connor Sutton Cronin Consulting Engineers

1655hrs Questions and Answers

1700hrs **Challenges faced during design and construction of the newly renovated Páirc Uí Chaoimh**

Seán Breen - Senior Project Engineer with Malachy Walsh & Partners

1750hrs Questions and Answers

1755hrs **Seminar Close** – Fergal Cahill – Chairman Structures and Construction Division. Highlighting proposed October 2018 Structures and Construction Seminar

Lecture Details

Hidden Defects in Bridges, guidance for detection and management – CIRIA Guide C764

David Ashurst - Associate Director, Bridges and Civil Structures, Arup, West Midlands, UK

John Webb – Regional Director, UK, AECOM

The UK and Ireland's bridges play a critical role in support of their countries' economies and societies. As evidenced by the rarity of bridge failure or closure, they are generally well managed and fulfil their operational requirements. The new CIRIA guidance on hidden defects in bridges, published in June 2017, collates a group of case studies demonstrating that hidden defects do exist in critical bridge components. In some cases they have threatened safety to the travelling public and in extreme cases they have resulted in the collapse of bridges without warning. If the risk posed by hidden defects is not managed appropriately then the likelihood of encountering such failures will increase. This presentation will cover the following aspects of the study:

- Why the need for guidance?
- A selection of case studies;
- The content and layout of the guide;
- How to use it;
- Further research.

Figure 1: Bridge deck collapse without warning; due to hidden defects.

David Ashurst is a Bridge Engineer with over 30 years' extensive civil engineering experience in major infrastructure projects in UK and internationally. An Associate Director in Arup's Bridge and Civil Structures group Dave is based in the Arup Campus at Solihull, near Birmingham. He and his team collaborate worldwide, providing specialist technical advice to UK and international clients and investors on the management, remediation and forensic investigation of existing bridges and structures. On this subject David represented the UK as a member of the World Road Association (PIARC) Road Bridges Technical Committee from 2012 to 2016. Recently, David jointly authored CIRIA Guide C764; Hidden Defects in Bridges, guidance for detection and management; the subject of this presentation. David brings international experience to the design and renovation of bridges and civil structures on a range of ongoing infrastructure projects**.**

John Webb has worked on a wide range of construction, repair and maintenance projects over many years – the last 30 with AECOM (formerly Maunsell). He was a co-author of *Hidden defects in bridges. Guidance on detection and management* (CIRIA, C764) and Guidance *on the design, assessment and strengthening of masonry parapets on highway structures* (DfT, 2012b).

Lecture Details – Slot 2: 1500hrs – 1555hrs

The Boyne Viaduct – Structural Health Monitoring and Probabilistic Analysis

Lorcan Connolly, Research Engineer, Roughan & O'Donovan-Innovative Solutions (ROD-IS)

The central steel span of the Boyne Viaduct in Drogheda, Co. Louth, was constructed in 1932. The bridge is currently beyond its expected design life. It is therefore vital that the structure undergoes a robust maintenance strategy in order to verify the ongoing performance in terms of reliability with respect to both the Ultimate Limit State (ULS) and the Fatigue Limit State (FLS). A combination of Structural Health Monitoring (SHM) and advanced probabilistic methods of analysis were employed in order to address these issues for this landmark structure. This presentation will cover the following aspects of the assessment:

- History of the Boyne Viaduct;
- Finite Element (FE) Modelling and Identification of Hotspots;
- Probabilistic Assessment (ULS and FLS);
- SHM Strategy;
- Refinement of assessment:
    - Site-specific calculation of dynamic stress amplification;
    - FE model calibration;
    - Consideration of fatigue load history.

Figure 2: Arial view of the Boyne Viaduct

Lorcan is a Research Engineer with 5 years' experience in the areas of bridge modelling, design, and assessment. He specialises in probabilistic assessment of structures and global risk assessment of infrastructure. Lorcan has published extensively in these areas. He is a Chartered Member of Engineers Ireland and a graduate of the Master of Engineering programme of Structural Engineering with Architecture in University College Dublin, graduating with first class honours.

Since Joining Roughan & O'Donovan-Innovative Solutions (ROD-IS) in 2013, Lorcan has worked for clients such as Transport Infrastructure Ireland, Irish Rail, Network Rail and Rijkswaterstaat. Lorcan was the primary ROD-IS researcher on the FP7 funded SMARTrail and H2020 funded DESTination rail projects. Lorcan is also the primary researcher on the current GOSAFE Rail (Shift2Rail) and SAFE-10-T (H2020) projects.

Lecture Details – Slot 3: 1605hrs – 1700hrs

The Engineering and construction challenges of Number 26 York Street, Royal College of Surgeons, Dublin, Ireland

Eddie Lyons – Associate at O'Connor Sutton Cronin Consulting Engineers

Paul Devine – Associate at O' Connor Sutton Cronin Consulting Engineers

Henry J Lyons Architects and O'Connor Sutton Cronin Structural/Civil Engineers provided design services for the New Academic Educational Building at No. 26 York Street, built by Bennett Construction Limited, on behalf of the Royal College of Surgeons in Ireland. Design and construction of the project on a confined city centre site presented many challenges, including alterations and extensions to one of the deepest occupied basement structures in Ireland and the requirement for the superstructure to bridge over long span, column free auditorium and sports hall spaces. The building showcases exposed Concrete in various finishes throughout, revealing the structural anatomy of the building. Polished terrazzo, itself a concrete element, is common to circulation spaces tying the floors together and drawing light deep into the plan. The design solutions and execution of the works demonstrate excellence in concrete achievements and contribute to the built environment by showcasing many of the unique capabilities of concrete to meet the demanding challenges presented.

Figure 3: View of RCSI New Academic Educational Building at No. 26 York Street August 2017

Figure 4: Existing concrete box, with temporary support structures

Eddie Lyons is a Chartered Member of the Institution of Structural Engineers and of Engineers Ireland with over 20 years of experience in structural and civil engineering. His wide range of experience includes work on public buildings, retail, educational, commercial, residential, healthcare, site development, bridges and pipelines. Eddie was intimately involved in the structural design of the Dublin Convention Centre which is a major iconic building in Dublin City Centre. Eddie has recently worked on city centre sites involving complex deep basements including the award winning Royal College of Surgeons and redevelopment of the former Passport office on Molesworth St.

Paul is a senior associate engineer with over twenty years' experience in the industry, working on the design of building and civil engineering structures. He has authored two publications regarding the sensitivity of occupied floors to serviceability vibrations. He also authored the Irish National Annex to Eurocode 4. He served on the committee responsible for the development of the rules regarding acoustic design in hospitals and is the national representative for Ireland for Eurocode 4. Paul has worked on many iconic structure in Ireland including the Point Village, The National Convention Centre, The Royal College of Surgeons and the National Paediatric Hospital.

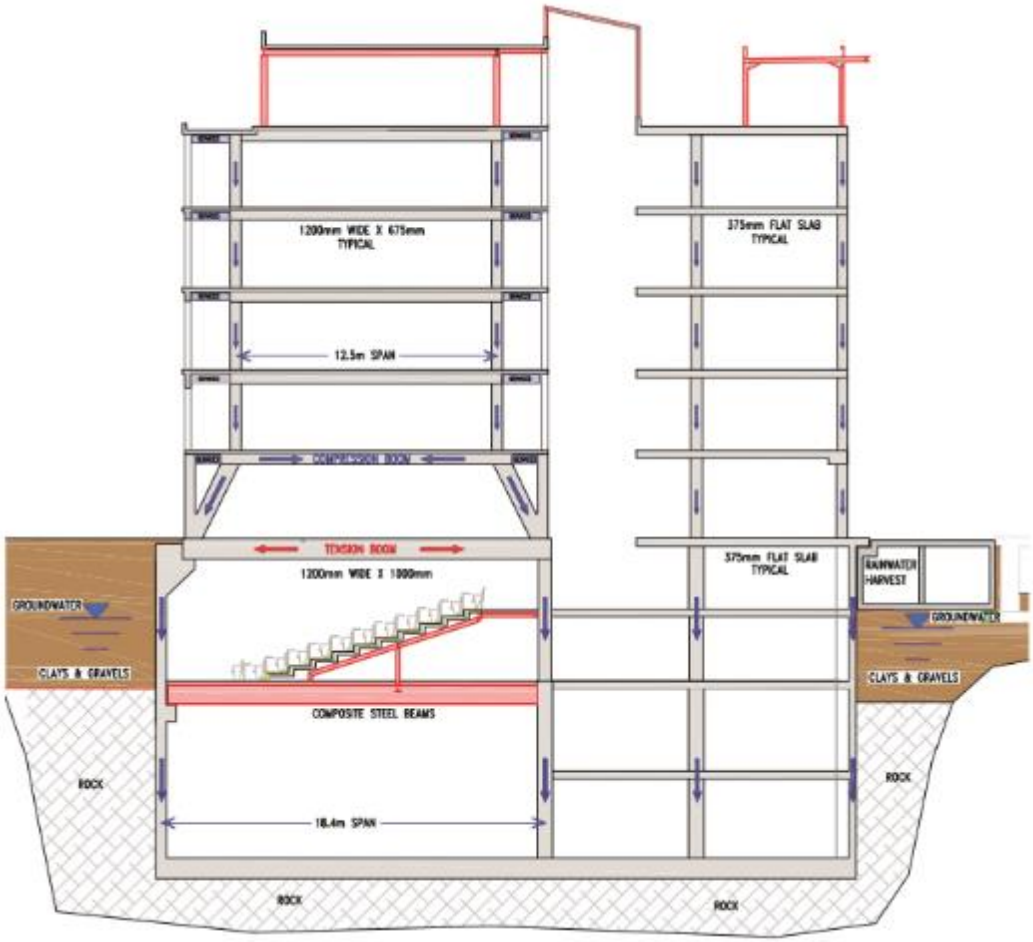

Figure 5: Load path diagram for structure

Lecture Details – Slot 4: 1700hrs – 1800hrs

Challenges faced during design and construction of the newly renovated Páirc Uí Chaoimh

Sean Breen – Malachy Walsh and Partners

This landmark project for Cork, a 45,000 capacity redevelopment of the iconic Páirc Uí Chaoimh in the heart of a municipal park, is the first stadium in Ireland designed to current spectator safety standards. The multi-functional design caters for large conferences/events while maintaining and building on the proud history of spectacular matches and concerts since the original stadium was opened in 1976. State of the art LED lighting, including the floodlighting system, rainwater harvesting, heat recovery and building management systems ensure the energy performance is in line with the stadium's modern facilities and design. The project won a number of prestigious awards including overall engineering project of the year award from Engineers Ireland and Irish Construction Excellence Awards. In this presentation, Sean Breen of Malachy Walsh and Partners, will outline the challenges faced by the design and construction teams in the delivery of this fantastic facility which hosted its first inter-county hurling and football championship games in the Summer of 2017.

Figure 6: The newly renovated Páirc Uí Chaoimh

Figure 7: Interior view of the newly renovated Páirc Uí Chaoimh

Mr Seán Breen is Senior Project Engineer with Malachy Walsh & Partners and is a Chartered Engineer with 14 years' post graduate experience in the design, delivery, management and construction of civil and structural projects in the marine and building engineering sectors. He has extensive experience in large scale civils, marine, sports and building structures from concept to completion with responsible for commercial planning, civil structural engineering design and project management.