PUNCH
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ACEI – Design Excellence Awards

Restoration of St Mel's Cathedral Longford:

<u>Category (1) Structures Project (Large project)</u>

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Introduction

In the early hours of Christmas Day 2009, fire broke out in the Sacristy of St Mel's Cathedral, located at the rear. The fire was caused by hot gases from the main boiler flue which escaped through an inspection hatch. The fire destroyed the interior and roof of the Cathedral, some damage was also caused to the external facing stonework.

St Mel's has been around since 1838, commenced construction in 1840 with the laying of the foundation stone, but was interrupted by the famine. It was completed in c.1890, with the consecration eventually taking place in 1893. It has numerous significant milestones along the way until the fire in 2009. Mass was once again celebrated on Christmas Day 2014 and it took five years of dedicated time and effort by a great many people to restore the Cathedral, a feat that appeared quite daunting given the massive scale of devastation facing those first entering the ruined shell.

Where to begin?

First and foremost, the project is a significant structural engineering project in itself (before all the remarkable decorative ceilings, plaster and stone work finishes the job!). The priority therefore was to retain and therefore stabilise the existing structure left in a precarious condition. Hegarty Demolition were tasked with the brave act of immediately stabilising the stone arches, a task made more dangerous by the vertical stone bed-laid columns being unstable, and also providing a temporary roof.

PUNCH Consulting Engineers (Ger Neville, Kevin Clancy & Kevin Mullery) are extremely fortunate and proud to play a significant role in the restoration of the Cathedral. Our focus has always been to first stabilise the existing structure, and when safe to do so, restore the building. These significant structural works include:

- Stabilisation of existing arch structures
- Replacement of 28 stone columns
- Replacement of floors throughout
- Design and replacement roof structure and ceiling structure
- Design of Sacristy, Altar and Organ structure

The incredibly difficult structural task of replacing 28 ornate blue limestone columns, moving 3 tonne stone drums without the use of an overhead crane, all while retaining the integrity of the arch structure overhead was quite an achievement.

Every structural element of the building has required intensive survey, investigation, and assessment of its condition. While PUNCH may have led the engineering charge, the success of a project like this comes from the effectiveness of a group of people working together, with respect for one another's abilities and a desire to achieve a common goal.

The late Richard Hurley with Fitzgerald Kavangh Architects' Colm Redmond and Interactive Project Manager's Niall Meagher, led the project and were ably assisted by the design team of Brendan Merry's Fintan Bennett, Peter Cox of Carrig Conservation, ARUP, not to mention Kevin Fay and Ronan Moore of GemPurcell Construction.

With nine separate building contracts, five Planning Applications and two trips to An Bord Pleanála, success is very much dependent on the long collaborative efforts of a dedicated team.

St Mel's Cathedral stands proudly restored today in the centre of Longford.

Executive Summary

A fire broke out in the Sacristy of St Mel's Cathedral on Christmas Day 2009, destroying the interior and roof of the Cathedral. PUNCH took on the challenging structural task of replacing 28 ornate blue limestone columns and replacing the timber roof structure in time for Mass to be celebrated on the 5 year commemoration of the fire, Christmas Day 2014. (61 words)

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- Replacement of 28 stone columns
- Replacement of floors throughout
- Replacement roof & ceiling structure
- Design of Sacristy & Organ structure

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1.0 Use of Sound Engineering Principles and Practices

St Mel's is a Protected Structure, which naturally influences the choice of materials towards those which have been used for the last 150 years!

Conservation

The principles of the client and design team are based on the International charters inscribed by the International Council of Monuments and Sites (ICOMOS) in the Venice and Burra Charters. Both these charters prescribe true conservation and retention of historic building fabric and the use of traditional construction materials and skills.

Of course, the conservation and restoration of monuments must have recourse to all the sciences and techniques which can contribute to the safeguarding of the architectural heritage.

Carrig Conservation's carried out detailed historical research into the materials used on the site (including research on original concrete, steelwork, 19th century quarries etc) helped greatly in sourcing appropriate matching stone for the replacement of 28 massive ionic grey limestone columns.

The early decision to place a temporary roof over the Cathedral, to protect it from the elements, gave direction to the design approach insofar as it eliminated the use of craneage. Modern pulley systems, rollers and jacks all contributed to the construction techniques in lifting heavy stone drums in and out of position.

Historical research into the original Queen Post Trusses, which were completely destroyed in the fire, in conjunction with An Bord Pleanála's decision to permit a glued–laminated bottom chord, allowed the design of traditional timber materials to compliment modern construction techniques from fabrication workshop to on site erection.

Limestone Columns

Why did the columns fail?

Limestone is a sedimentary stone with sediments generally laid down in successive layers called 'strata' or 'beds',' leading to the generation of horizontal bedding or lamination. Stone blocks are usually placed in buildings with the beds placed horizontally. The 28 stone columns were placed with the bedding vertically (face bedding). Stone should be laid on its natural bed so that its bedding and lamination are horizontal, perpendicular to the pressure exerted by the loading of the wall and the building itself.

The intense heat and subsequent freeze/thaw action caused significant delamination and all columns showed evidence of significant fracturing. The engineering priority of fully securing and strapping each column and determining their suitability for lifting became clear. These were sequentially removed and replaced with newly carved stone, each column weighing 13 tonnes, using a complex system of steelwork, scaffolding, pulley systems and rollers. And that was just the 'test column' enabling works contract with Kelly Builders Ltd!

Formulating the procedure during the main contract with Cregg Stone and Ronan Moore of GEMPurcell was a painstaking task, requiring the co-operation of the entire team.

New Roof

With the Nave walls not being parallel and varying in width, not to mention existing surviving slots in walls for truss haunches being misaligned, the integration of primary structure and decorative plaster support structure in a space that was out of level, out of line and out of plumb, was where the magic happened.

2.0 Benchmark of Irish Engineering

The project consisted of two main aims:

1. stabilise and conserve the badly fire damaged Cathedral
2. to create a Cathedral for the third millennium

The highly impressive original features of a double line of 28 massive ionic grey limestone columns and the ribbed barrel vaulted ceiling define the architectural space. The engineering challenge to accompany that design was a mammoth task. With the roof destroyed, and the limestone columns later discovered to be fractured through their core, retaining the masonry arched structure and walls

overhead while undergoing a comprehensive series of stone replacement, was a remarkable achievement.

Consider the impact of the fire on each surviving element.

Each and every stone at the very least was stained, which was the least of our issues. The face bedding noted in the columns was carried through to the stone pilasters, though not as widespread, and all required detailed analysis. The mass sandstone walls were somewhat protected by plaster, however the surface of the sandstone walls were badly damaged resulting in extensive loss of surface stone.

The challenge of faithfully restoring a building of this magnitude, when every original surviving feature was suspect structurally as well as architecturally, was a considerable feat of engineering.

3.0 Contribution of the Project to Society (Economy & Community)

To say the local community got behind the restoration works is an understatement.

The Client group consists of clerical and lay members, freely giving their time and commitment to the restoration works. Where possible, the client wished for the local community to contribute and show their support and pride in their near destruction Cathedral.

Ongoing and regular communications with the local community, steady relaying of messages of progress and production of a special publications, to keep the community involved were implemented early in the process. Local employment was given priority, including regeneration of traditional skills, and the local community responded in kind. For five years, the local economy was focussed on supporting St Mel's recovery.

Locally, GEM Construction formed a joint venture with Purcell Construction to create a locally based construction company capable of carrying out the daunting task ahead. Further, following An Bord Pleanála's decision to allow glued-laminated timber, the local GEM Joinery took responsibility for delivery of the Queen Post roof trusses within an exceptionally short time frame.

Regionally and nationally, the reinvestment in training of traditional skills such as detailed carpentry, ornate plastering from master plasterer George O'Malley, and the exceptional artistry involved in the works was significant.

St Mel's Cathedral is an integral part of Longford.

The Cathedral took over 60 years to be built initially and became the spiritual home of the people of Longford. The devastating fire of December 2009 struck at the very heart of that community. The initial impression of dismay and terrible loss was met head on by Bishop O'Reilly issuing his inspiring "we will rebuild" announcement on the day of the fire.

Every action since that day has been with the aim of restoring and returning the Cathedral to the people of Longford.

Creating a Cathedral for the third millennium required an architect with combined experience in conservation and liturgy and depth of understanding that St Mel's is not just a parish church for the community, but a Cathedral laid out in the plan of a basilica. With Richard Hurley and Colm Redmond as architects, their vision of faithful restoration has been achieved.

The people of Longford should be acknowledged for their tireless part in the restoration, in particular the investment of precious time by unpaid yet dedicated people in the steering committee, and the pride taken by the local workforce in playing their part in the works.

Jim Roche recently wrote "Renowned Irish write Frank O'Connor, infamously wrote of Longford and other midland towns that he 'had no idea what they were doing in the world at all'. If only he could visit Longford now".

Kevin Mullery
Director
PUNCH Consulting Engineers

Appendix A

(Pictorial Project History)