
Symbol of hope crowns Belfast Cathedral

Monday, 15 Jun, 2009

St Anne's Cathedral, the Anglican cathedral of Belfast, Northern Ireland, has a new, strikingly unconventional feature that it has been awaiting for over one hundred years. The Spire of Hope, which won the 2008 Royal Institute of British Architects award, soars 39 meters (almost 128 feet) above the cathedral. The exterior is constructed of Type 316 stainless steel and is designed to be maintenance-free for 100 years.

Belfast Cathedral is widely regarded as the centre of Anglican worship in Northern Ireland. The cathedral is built on the site of the parish church of St Anne, consecrated in 1776. The current cathedral has been evolving as a structure, built in stages as funds have allowed, since its foundation stone was laid in 1899. With the completion of the Spire of Hope in 2007, another chapter is written in the history and evolution of this icon of Anglican worship.

The cathedral had long lacked a crowning feature reaching heavenward. The notion of completing such a crown gained a new urgency as the cathedral approached its centenary. A stately spire had been included in the cathedral's original design but it remained just an idea on paper throughout the cathedral's life. With a new wave of prosperity coming to Belfast, and new development springing up around the cathedral, the cathedral community was concerned that this stately Romanesque building might be nudged into the background. The Cathedral Board formed a panel in 2003 to prepare a request for designs and undertake a design competition among architects under 40 years old from across the Emerald Isle. In the summer of 2004, the panel convened to review 23 submittals for the opening round of the competition. From this group, the panel selected three finalists and came to a consensus on the design that was to become the Spire of Hope. The winning design came from Box Architects of Belfast.

Now that the panel had agreed on a concept, the next two years brought the hard work of bringing the spire to life: detailed design of the structural support, computer modeling of the spire's behavior in the wind, and selecting a fabricator with the skills and the dedication necessary to turn a bold vision into a luminous reality. The project became a wonderful collaboration between the cathedral, the designers and the fabricators. The design is a long "spike" reaching 39 meters (almost 128 feet) skyward above the church and extending downward through a large glass skylight 15 meters (almost 50 feet) into the church above the choir. The spike is round in cross-section, tapering from 1.2 meters (almost 4 feet) in diameter at its widest point to 4 mm (0.15 in) at the tips of the spike.

The original design was for a carbon steel skeleton covered with titanium plates. This design raised some concerns for the selection panel. Among the concerns, there was a worry about electrolytic action between the titanium skin and the carbon steel skeleton not being able to meet the 100-year maintenance-free design criterion, and a concern that the design, with openings between the titanium plates, might "sing" when the wind blew across it, much like a flute. The stainless steel solution addressed both of these concerns. Moly-grade Type 316 stainless was selected for the outdoor portion of the spire to withstand corrosion in the coastal, urban environment and the fully welded skin eliminated the gaps that might cause the "singing". It also eliminated the need for an internal skeleton. The spire is hollow and self-supporting.

The round cross-section of the spire gave the design team some concerns about the dynamic response when subjected to wind.

The Spire of Hope: facts and figures

Length	54 meters (c. 177 feet)
Maximum width	1.2 meters (almost 4 feet)
Weight	40 tonnes
Material	Stainless steel Type 316 (exterior); stainless steel
	Type 304 (Interior). About 600 kg of molybdenum
	were used In the outdoor part of the spire
Glass	7.5 tonnes of triple-layered glass spanning 6.7 meters

	(about 21 feet) across the opening through which the
	spire enters the building
Designers	Colin Conn Architects; Robert Jamleson Architects
	(Belfast)
Structural engineers	Ramboll Whltbyblrd (London); Taylor and Boyd (Belfast)
Fabricators	Tuchschmld (Frauenfeld, Switzerland)
Project manager	WH Stephens (Belfast)

These concerns led them to engage the School of Aeronautical Engineering at Queens University in Belfast to develop computer modeling of its behavior. This modeling resulted in some redesign to "tune" the plates of the structure and provide enough structural damping to prevent the spire from moving excessively, even when subjected to hurricane-force winds. The modeling also revealed that the fins anchoring the spire into the building required some additional stiffening. The structure is still quite dynamic, nearly always vibrating mildly. This led the designers to specify replacement of over 500 structural bolts in the building framing to guard against any possible loosening due to this mild vibration.

Every generation of designers makes its mark on the world bringing new ideas, new sensibilities, new materials to the craft. This project represents a realization of striving to produce new architecture that complements the existing structure without copying it, of juxtaposing the old and the new to create a new and unique whole. The spire is illuminated by 12 outdoor lights and eight interior lights. Rising over 70 meters (almost 230 feet) above the ground, and visible throughout the city, this triumph of design and construction has secured the cathedral's place in the skyline of Belfast for many years to come.

(Sourced from International Molybdenum Association Moly review January 2009)

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