O'Connor Sutton Cronin Consulting Engineers

OCSC

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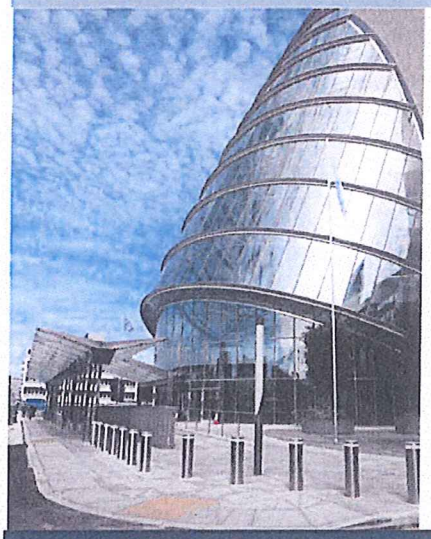
Multidisciplinary
Consulting Engineers

The Convention Centre Dublin

FIDIC Awards 2015



Introduction

The Team

Following a PPP type procurement competition awarded by The OPW O'Connor Sutton Cronin (OCSC), as part of a Design & Build consortium, was commissioned by CMP to undertake the Civil & Structural design of The Convention Centre Dublin (**The CCD**).

- Immediate Client – Treasury Holdings Limited
- D&B Contractors – CMP Limited
- Stakeholder Management – Bruce Shaw Project Management
- Architect – KRJDA
- **Structural/Civil Design – OCSC**
- M&E – MacArdle McSweeney Associates
- Theatre Consultant – Theatre Projects
- Acoustic Consultant – Sandy Brown

Description of the Site

The CCD site is located in Spencer Dock, Dublin 1, on the site of the former Iarnrod Eireann Rail Yard. The site measures 75m in width x 150m in length, and is bounded by the Royal Canal to the West, Mayor Street to the North, PWC Office Building to the East and North Wall Quay to the South.

The Brief

The brief from The OPW was to provide a 2000 seater 'world class' auditorium, an Exhibition space capable of catering for 2000 delegates and a banqueting space also capable of catering for 2000 guests, along with numerous dedicated conference meeting rooms ranging in capacity from 50-200 people. The exhibition halls are designed for an imposed loading of 12.5Kn/sq m, the auditorium 7.5Kn/sq m and the remaining floors 6.0Kn/sq m, all in accordance with the brief.

The PPP process

The OPW tender documents for the project were issued in late 2004. At this point the PPP consortium came together to prepare their bid for the project, which was submitted to the OPW in May 2005. From reaching preferred bidder status in December 2005, the formal appointment of the successful consortia was made on the 6th April 2007. Due to the nature of the contract (lump sum/fixed price contract with very high potential LAD's), the Brownfield nature of the site and the potential archaeological risks with the site, the Design and Build Consortium elected to commence work on site in November 2006, at their own risk.

Building Layout

From basement level there are two levels of car parking/double height service corridor and service yard; a 45m x 60m exhibition hall at ground level; a 35m x 47m exhibition hall at first floor level and the 2000 seat auditorium positioned on top with public access from three separate levels.

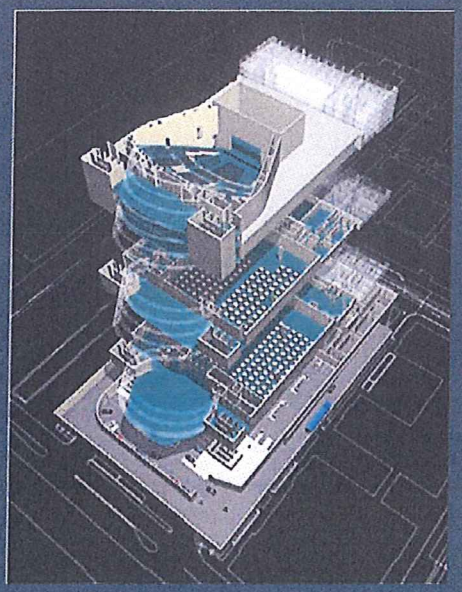
A 'Van and Truck' lift provides full access from the basement services yard to the Level Two Exhibition Hall and the Level three Auditorium Stage for a large rigid van and the trailer from a full articulated vehicle.

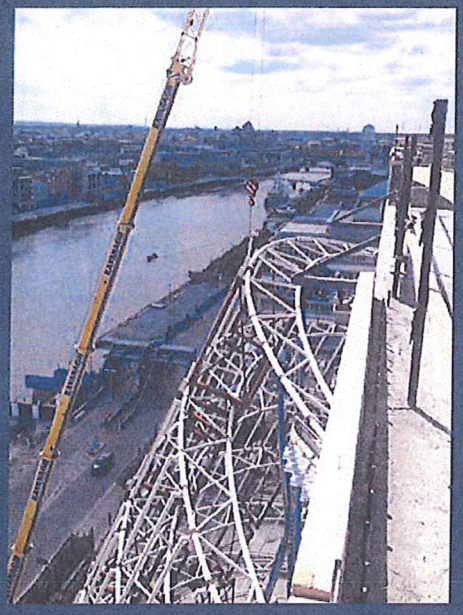
Structural Solution

A structural steel solution was chosen primarily because of the long span/shallow structural depth imposed on the project by virtue of meeting the Client brief and also keeping within planning constraints for building height, but also for programme reasons insofar as all of the elements were prefabricated off site and brought to site in a well managed and controlled sequence.

The structure's steelwork is based around eight internal 800mm x 800mm fabricated plate columns (carrying a maximum load of 40,000Kn) with steel trusses (2.3m deep) spanning 22m between columns. Six of these columns extend up through the two exposition halls and top out at the roof level of the auditorium. Due to the location of the auditorium at the top of the building and the requirement for 'column free' spaces in the two exhibition halls, a substantial number of the columns supporting the auditorium seating frames were transferred at the level three floor, through multiple transfer beams and trusses.

The biggest challenge was to determine the dynamic response of the structure to imposed loading, because of the long span/shallow structural depth imposed on the project by virtue of the brief, the planning constraints and the site constraints.





Conclusion

The Convention Centre Dublin is the first state-owned, public-access building to be constructed since the foundation of the Irish State. It officially opened to the public on 7th September 2010.

It is a benchmark in Irish Structural Engineering, not only as a result of overcoming the technical challenges presented as a result of placing a full 2000 seater auditorium over two large exhibition halls, but also as a result of the (PPP) contract the construction of the building was executed under and the (electronic) methods used to tender the substantial steel frame package.

The CCD Building is a unique iconic design, with high technical specifications and provision of services to give flexibility for multiple changes of use for the Main Rental Spaces for Meetings, Conferences, Exhibitions, Banqueting, Events and Concerts.

The Building is designed not only to be visually impressive but also for the ultimate delegate experience. The design solutions implemented have resulted in the Venue marketing itself as being one of the most technologically sophisticated venues of this type in the world, with state of the art equipment installed in every room, advanced communications, lighting, sound, rigging and electrical, mechanical and I.T. solutions and systems, to enhance every type of Event.

The design includes a fully Integrated Building Automation System (IBAS) which monitors and controls all the Mechanical and Electrical Systems within the Building and encompasses the Integration of the Fire Alarm System, BMS, Security, Lighting, Lift/Escalators Control, Energy Management Systems and Metering. The IBAS System results in a Building that is readily adaptable to changes, while continuing to run efficiently. The Integration of Systems provide functions and services that are broader than which would be achieved from the same technologies operating in isolation and results in more efficient system operation, as the integration between packages is fast and decisive. The System not only reduces running costs but also enhances the productivity, safety, flexibility and sustainability of the Building and its Occupants.

- Auditorium displacement ventilation strategy maximises free cooling and provides superior comfort conditions.
- Air handling units are equipped with adsorption thermal wheels which act as climate modifiers.
- Ice bank storage reducing peak daytime electrical load and reducing chilling plant size is provided.
- Future proofing to facilitate connection to District Heating Energy is included.
- The installation of variable speed/duty drives on all pumps and AHU fans allows for the profiling of actual demand to plant output. All ventilation system supply air volumes are controlled using algorithms based upon the occupancy density as measured by series of CO_2 sensors, thus, significant energy savings and CO_2 emissions are possible. The system monitors CO_2 levels in public areas and varies the plant performance in accordance with occupancy.
- The CCD includes a large proportion of sub-metering (approx. 260 meters) on all mechanical and electrical systems which monitor the Quality, Reliability and Cost of Energy and collect and collate operating data for comparison against pre-determined energy targets. The systems give early warning if the actual energy consumed is approaching unacceptable energy targets and enable monitoring and targeting of energy use to be carried out. The Metering Systems are capable of gathering load profiles to show energy requirements by the event and create usage profiles. Data can be assembled to enable external comparison and bench marking which will assist in raising the BREEAM Rating of the Building and assist in reducing Electrical Energy Costs.
- An automatic Lighting Control System is provided in The CCD to provide flexibility of operation, minimise running costs and maximise the usage of daylight. The system is also used to operate the emergency test function of the emergency luminaires with a fully addressable automatic testing and fault reporting system provided.
- Lifts and escalators include energy saving features. The escalators are reactive to actual traffic demand. The lifts are responsive to idle time status reducing to minimum power. A Graphics System is installed which displays and reports traffic of the transportation systems and provides a view of transportation demand, traffic performance and lift system capacity.