

**ACEI Design Excellence Awards 2017  
Nomination Form**

**Category (1) Mechanical & Electrical (M & E) Project**  
**Category (2) Innovation Project (all disciplines)**  
**Category (3) Overseas Project (all disciplines)**

**Company Details**

**Contact Name:** Gerry Cullen, Director Mechanical & Electrical  
**Firm:** RPS  
**Address:** First Floor, Motor City, Kylemore Road, Dublin 12  
**Tel:** 01 420 3100 **Email:** gerry.cullen@rpsgroup.com

**Categories/Groups:**

**Project Category:** M & E  Innovation  Overseas

**Project Group:**

**Small project** (under €2.5m)  **Medium project** (€2.5m - €10m)  **Large project** (over €10m)

**Project Information:**

**Name of Project:** Cardiac Catheterisation Laboratory & Orthopaedic Theatre at Our Lady's Children's Hospital, Crumlin

**Location:** Crumlin, Dublin 12

**Commencement date:** February 2015 **Completion Date:** April 2016

**Client:** Our Lady's Children's Hospital Crumlin

*Contact:* John Kavanagh Tel: 01-4282888

**Design Team:**

**Architect** MÓLA Architecture - Sinéad Hughes

*Contact* Email: shughes@molaarchitecture.com **Tel:** 01-218 3900

**Contractor** Clancy - Gary Curley

*Contact* Email: gcurley@clancy.ie **Tel:** 052 9152166

**Authorisation to contact above:** Yes  No

**Project Details:**

- (1) Provide a brief outline of the project (Max 200 words):
- (2) Provide a statement regarding why this project might be considered award winning: (Max 300 words):
- (3) Provide further details of the project such as: design elements / procedures; complexities involved; innovation aspects; site management and supervision; health & safety issues; project cost controls and any other relevant information (Max 500 words):

Entries should highlight where possible the particular influence or benefit the project engineering design has on society and the wider environment.

Please confirm by electronic or written signature that:

- (a) The supplied text may be used in any marketing material issued in connection with the awards.
- (b) Agreement has been received from the client and other stakeholders that the project can be inspected by the adjudicator and provide contact details as requested above for the relevant person to be contacted in this regard.

Signed: \_\_\_\_\_



Firm: \_\_\_\_\_



**Entry details:**

**Note: Applicants are encouraged to review the Awards Regulations and Procedures before submitting nominations.**

Send the completed entry form and supporting photos / images altogether in **one PDF document** (one pdf document per project nomination) by email to: [info@acei.ie](mailto:info@acei.ie) with a subject line: ACEI Design Awards 2017.

**Note: Closing date for receipt of nomination forms: 17:00, Monday 16<sup>th</sup> January 2017**

**Enquiries:** ACEI office [info@acei.ie](mailto:info@acei.ie) 01 6425588

RPS

# Cardiac Catheterisation Laboratory & Orthopaedic Theatre at Our Lady's Children's Hospital, Crumlin



18<sup>th</sup> January 2017

# 1 Project Outline

The new Hybrid Cardiac Catheterisation Laboratory at Crumlin Children's Hospital is the only fully equipped paediatric cardiology service on the island of Ireland to treat young children with heart defects.

It is a new design build project delivered on time and within budget in 2016 through the use of Building Information Modelling (BIM) by an interdisciplinary project team including RPS as Mechanical and Electrical Consulting Engineers.

The new laboratory performs cardiac catheterisation to help diagnose heart problems in children as well as correcting heart problems that once required open-heart surgery. The core equipment that the cardiologists and the team use is the specialist imaging equipment that allows for real time imaging of the heart and its blood vessels.

The laboratory is a new build at first floor level with a direct connection to the operating theatres by way of a link bridge. Equipment will be transferable to the new National Children's Hospital. The technology employed will facilitate open heart surgery and uses both open heart and keyhole techniques in the same procedure to improve outcomes. It also allows immediate post-surgical cardiac catheter / angiography to confirm a satisfactory result.



## 2 Award Winning Engineering Project

Excellence in the design of mechanical and electrical (M&E) systems can be demonstrated by delivering a project that:

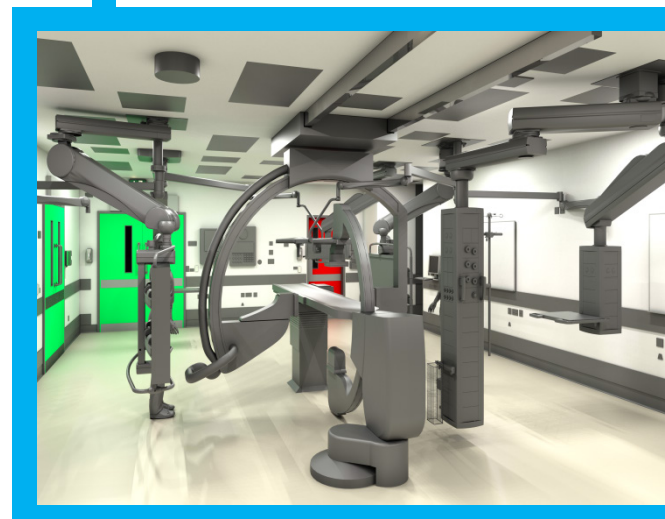
1. Incorporates fully the requirements of the end user's brief and is confirmed by the prompt and unqualified acceptance of the finished project.
2. Adheres fully to the project timelines and budget and is confirmed by the absence of programme or cost over-runs.
3. Avoids re-work on site due to unforeseen events and is confirmed by the absence of any compromise in order to achieve an acceptable outcome.

This project achieved all of the above through an innovative, highly efficient and collaborative approach by the design team.

The key challenge on this project was the co-ordination of the M&E services with the building and the end user equipment.

To meet this challenge, the M&E design was carried out in a Federated BIM Level 2 model using Autodesk Revit. The project team created a digital prototype of the building and thereby facilitated simultaneous rather than sequential integration of engineered systems (M&E), structural and architectural disciplines resulting in great precision and efficiency and achieving successful compression of the construction window. BIM workshops convened at the outset of the design led to a project-specific BIM Protocol that aligns to the PAS 1192:2 Standard. Key members of the design and construction teams came together early in order to understand how each discipline intended to use 3D modelling on the project and to share experiences of BIM on past projects.

Key complexities arose from undertaking a construction contract within a live operational hospital where all the activities are patient centric. The site management team were uncompromising in implementing all the required health and safety protocols.



# 3 Design | Innovation | Safety | Cost Control

The project consisted of a three-storey development measuring 545 sq m. The construction value was €4M and the design/construction programme was 65 weeks.

The building was designed with an undercroft area for car parking and incorporated a hybrid catheterisation laboratory and orthopaedic theatre including an ultra-clean ventilation system. The third floor is an internal plantroom containing the M&E equipment necessary to serve the building. Both the laboratory and the orthopaedic theatre are served by individual air handling units complete with high efficiency particulate air (HEPA) filtration and heat recovery to provide ultra-clean air and energy efficiency for areas with high air change rates. All life critical electrical systems are backed up with UPS and IPS as required for medically used rooms.

A link bridge was constructed to join the new facility with the existing theatre block. Careful planning and consultation was required to achieve the tie-ins to the existing M&E systems. This ensured any interruption of life critical systems was minimised. Back-up systems were put in place to ensure continuity of service in critical patient care areas during construction.

The complexity and volume of medical equipment to be installed in the catheterisation laboratory necessitated 3D modelling of all equipment. This ensured that the scanner rails, lighting and medical pendant positions, both in use and parked, would not interfere with the air distribution patterns, which were critical to the hospital and their infection control department.

Air velocity at the operating table could not exceed 0.5 m/s. RPS demonstrated compliance with this requirement by producing data and test results for the proposed diffuser which had been factory-tested for a previous project. Using the graphical representation of the velocities at measured distances from the centre of the diffuser, RPS was able to prove that the velocity in the operating zone would not exceed the requirements of the relevant Health Technical Memorandum (HTM 03-01) and the Infection Control Department (graphical representation of the test results overleaf).



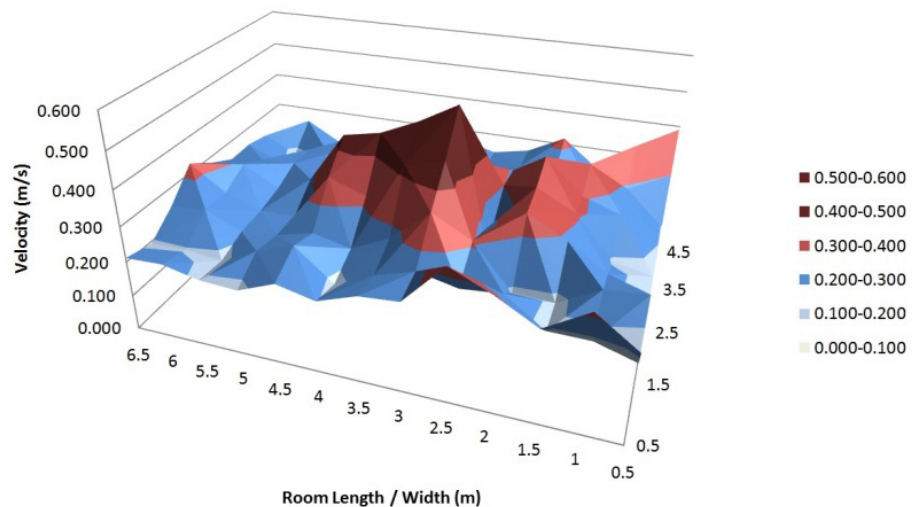
The ultra-clean environment in the theatre does not allow the re-use of room air through air re-circulation. In order to achieve a level of sustainability, the design of the air conditioning system provided for indirect heat recovery from air being discharged.

The project was delivered by an integrated team under a design build contract awarded to Clancy Construction. The adoption of BIM promoted ongoing value engineering of design solutions allowing the project to remain within cost limitations without impacting quality. This integration of design and construction encouraged a selfless team spirit that promoted collaboration, streamlined delivery and ultimately produced successful outcomes. The construction work was carried out in a live hospital campus adjacent to the existing operating theatres.

The successful completion of this project on time and within budget through the design build process was a very efficient use of capital investment to create essential health infrastructure for the nation's children.



Swirl Diffuser - Room Velocity @ 1.1m



## Project Design Team



Mechanical & Electrical

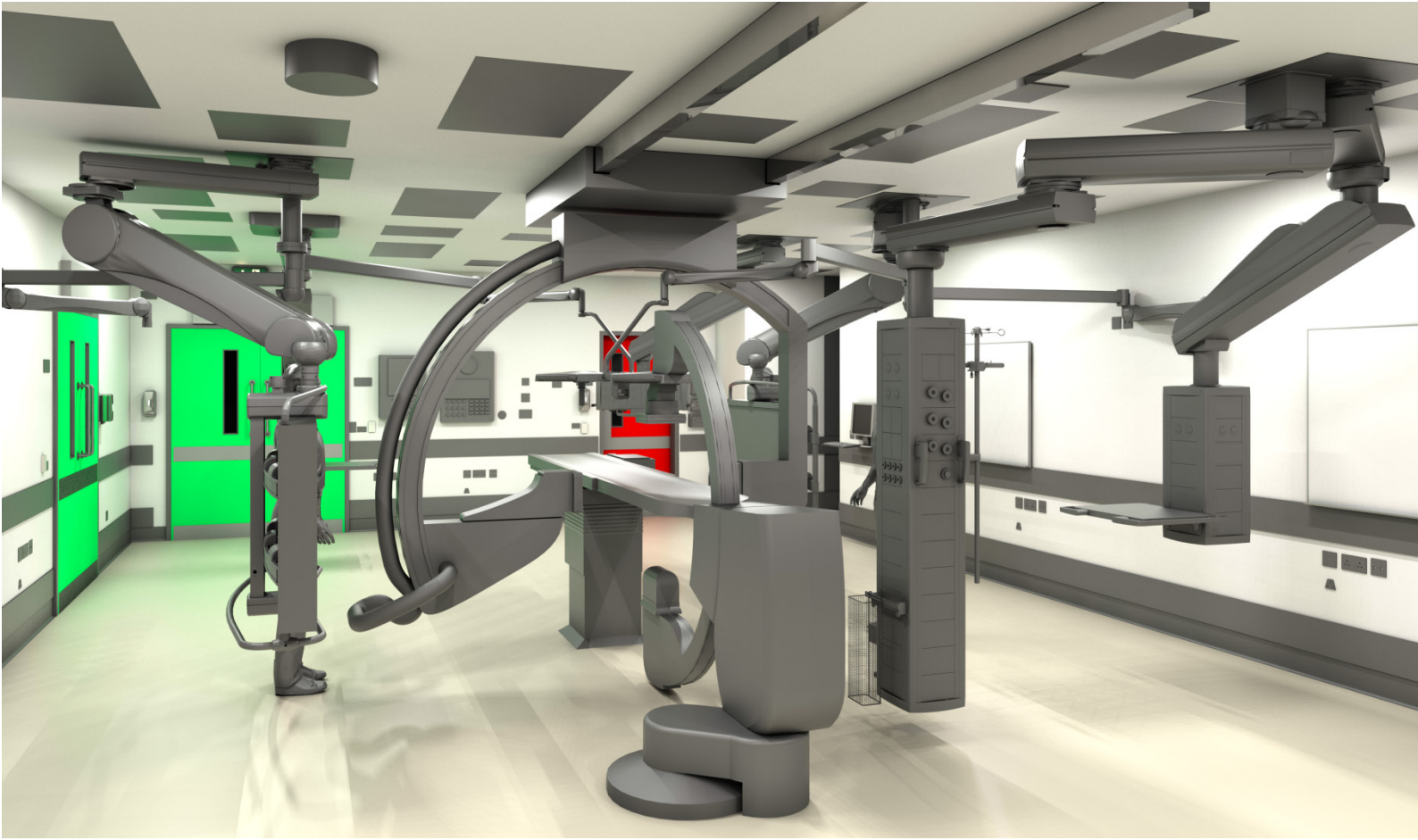


Architecture



Civil & Structural

# Project Images



Rendered BIM Image at Design Stage - Hybrid Catheterisation Laboratory



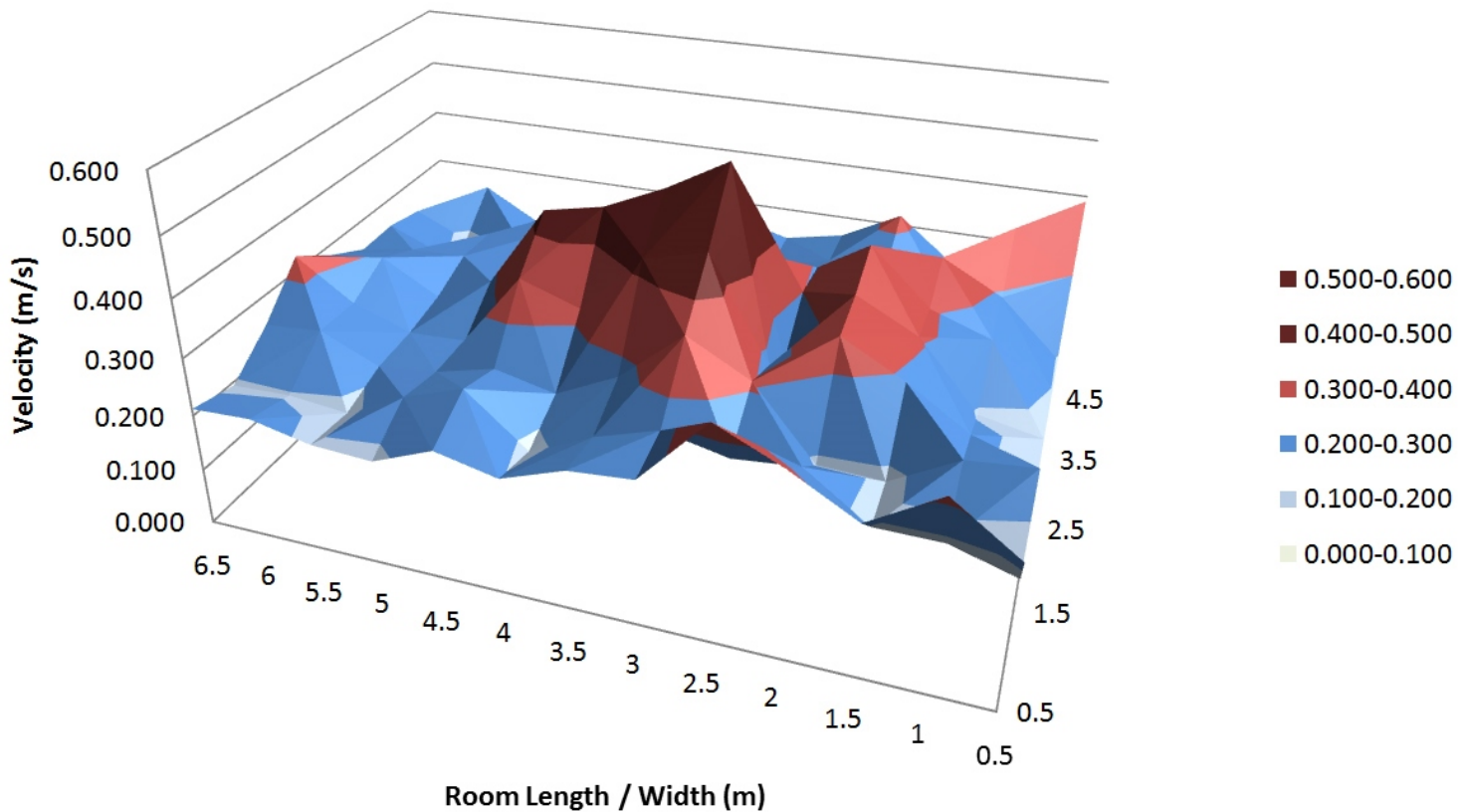
Completed Construction of Catheterisation Laboratory



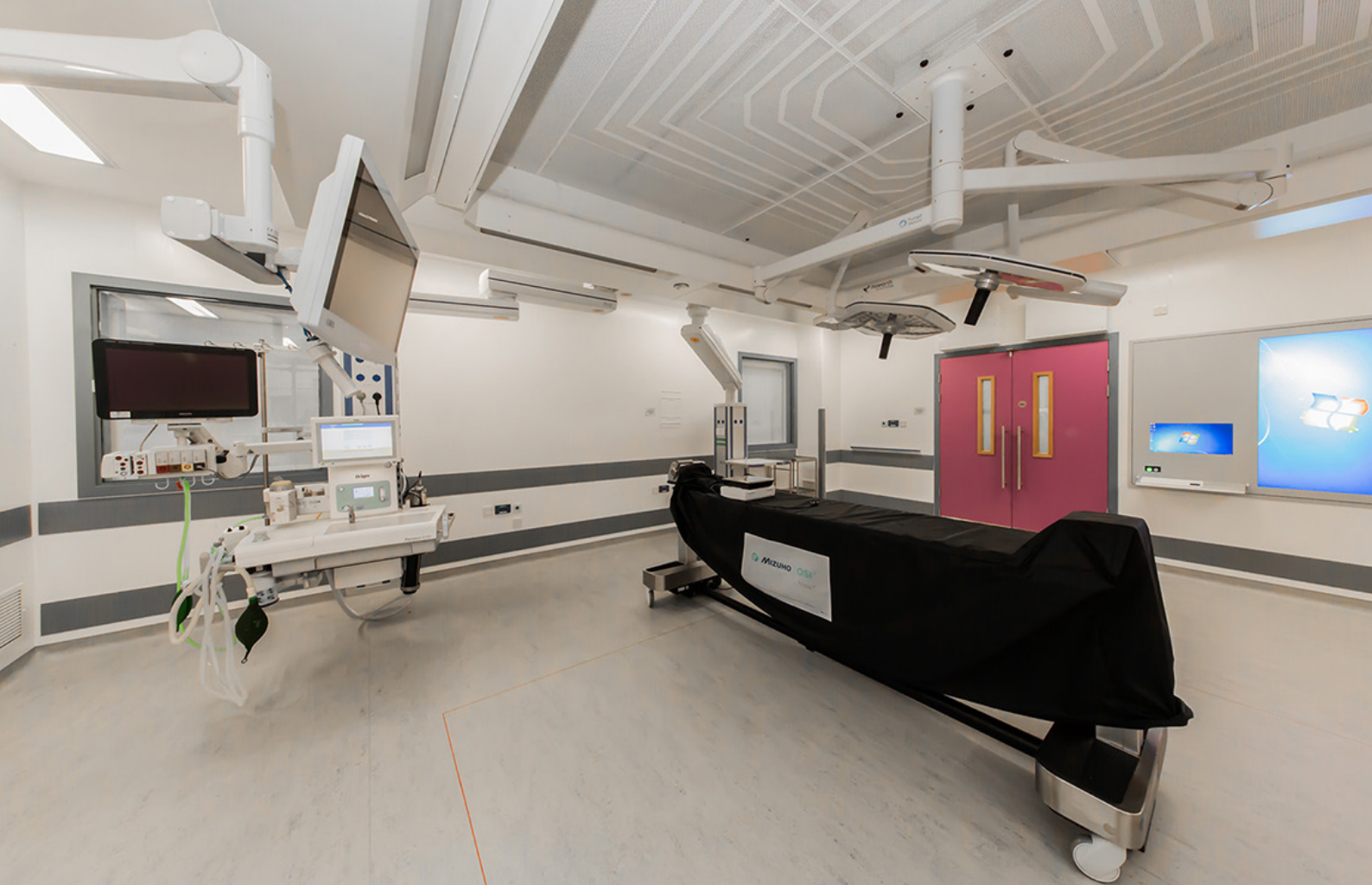


Hybrid Catheterisation Laboratory

## Swirl Diffuser - Room Velocity @ 1.1m



Graphical representation of test results - Swirl Diffuser (Room Velocity @ 1.1m above floor)



Orthopaedic Theatre



Anaesthetic Room