CASE STUDY
IES CONSULTING

INTEGRATED ENVIRONMENTAL SOLUTIONS

Office Of Public Works Headquarters

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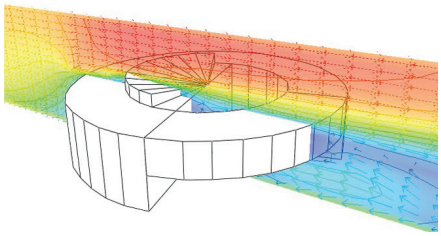

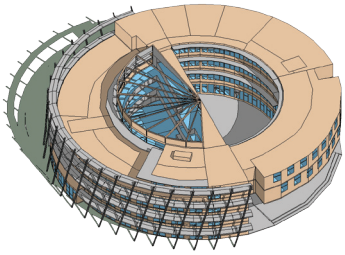

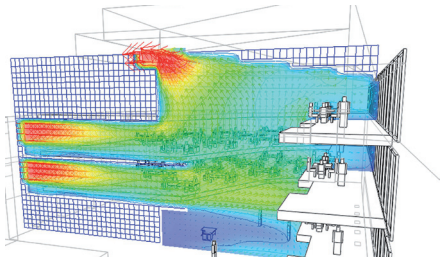

Acting as simulation consultants IES achieved a 50% reduction in energy consumption using its Virtual Environment software

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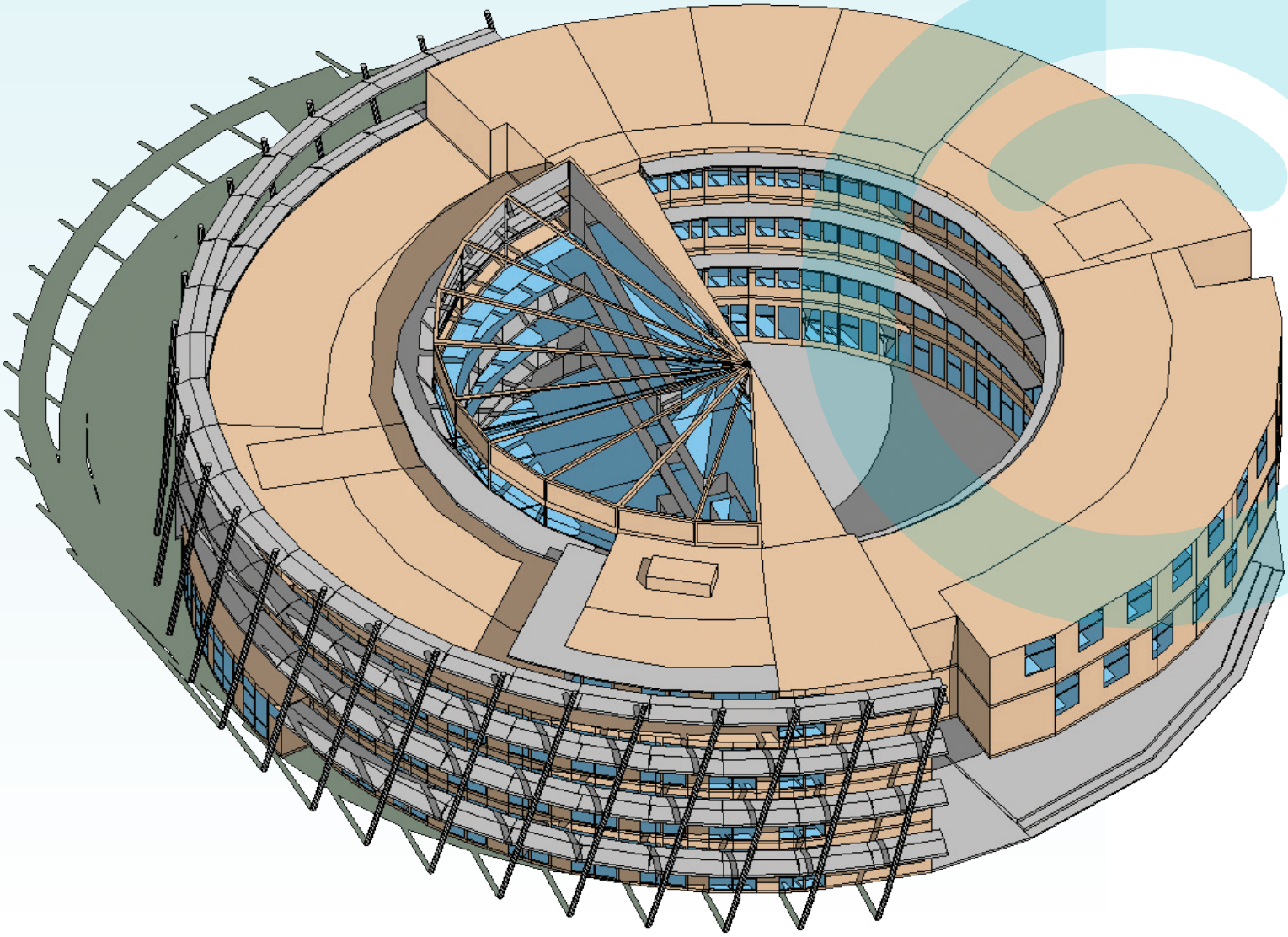
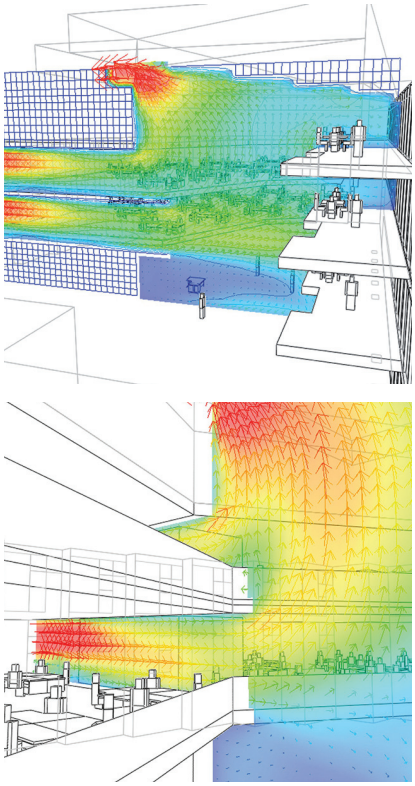
Brought in on a consultancy basis at the earliest stages of the design process IES worked closely with the Irish Office of Public Works (OPW) on the sustainable design of its new HQ building in Trim, Co. Meath, Republic of Ireland. IES also worked with the winning tender team, Messrs. Bennett (Construction) Ltd., during the later stages of the process and were involved throughout construction assessing the impact of last minute design changes.



The Project



CFD studies assessed airflow, thermal comfort and ventilation across the office floorplates and atrium.

The OPW is responsible for the development of a series of new central government buildings, which form part of the Irish Government's decentralisation strategy. Taking the opportunity to lead the way in the design of 'green' buildings in Ireland, the new OPW HQ is the flagship project and will house 275 staff.

Acting as simulation consultants, IES Limited has been involved right from the initial concept, using the building performance modelling capabilities of its **<Virtual Environment>** software to help in the development of the design. The software can compare and contrast how different design choices affect the performance of a wide range of elements affecting how sustainable and comfortable the building is; such as thermal, airflow and lighting performance, and energy/CO_2 consumption.

The involvement of IES from the earliest stages meant a structured simulation approach could be taken, encompassing all the latest cutting edge simulation techniques available within the IES **<Virtual Environment>**. For example, external wind studies, thermal, airflow and lighting studies.

As a flagship low energy building, OPW required a significant reduction in energy consumption when compared to a traditionally designed government headquarters. The structured simulation strategy allowed IES to use appropriate tools (external wind and thermal studies) at the early to mid design stages to help determine the optimum design solution for the building, whilst also ensuring exceptional comfort standards.

Ten key design features that significantly enhanced the thermal performance of the building were identified through work undertaken by IES.

THESE WERE:

1. Triple opening facade strategy
2. Night cooling
3. Exposed mass
4. Improved glazing to façade ratio
5. Atrium
6. Enhanced shading system
7. Solar control glazing system
8. Intelligent placement of airflow obstructions such as cellular offices
9. Identification of localised cooling requirements
10. Atrium independent solution created for the minister's office

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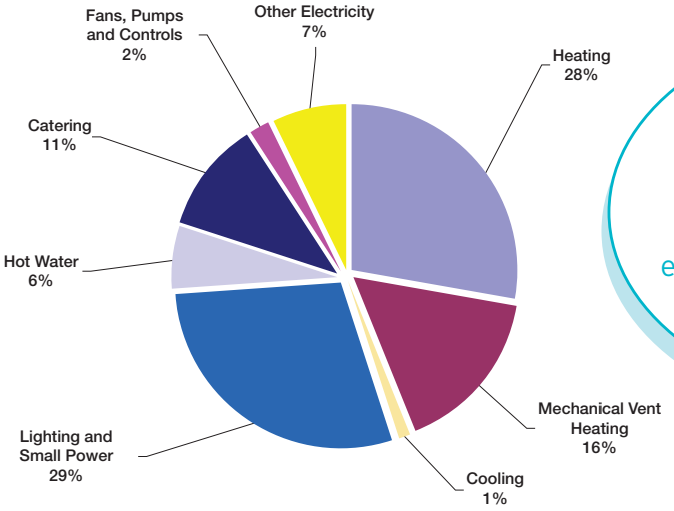

> The OPW really took on board the capabilities of our software. We worked with the design team right from the early stages to ensure maximum impact on energy consumption was achieved.

Vincent Murray
Lead IES Consultant

This configuration was then validated and further optimised using internal CFD studies to predict micro air movement and Radiance studies to predict daylight distribution within the atrium and open plan office areas.

The design was found to be effective during summer at moving air and therefore heat gains away from the perimeter of the building and into the atrium, achieving a typical uniform temperature distribution in the region 23/24ºC across the office floorplate. While during winter, underfloor heating in the atrium in conjunction with a high level extract system generated a positive flow, promoting uniform temperature distribution and minimising the influence of any drafts on occupants neighbouring the atrium.

The building was also shown to be successful at using all available natural daylight. With overcast conditions producing natural lighting levels with a daylight factor between 1-3 and a good distribution across the working plane, and sunny conditions producing natural daylighting levels in the region of 450-500 lux.

The early stage IES **<Virtual Environment>** analysis identified that the initial thermal configuration was unable to maintain comfort conditions in line with current CIBSE best practice guidelines:

- **CIBSE Guidance – Guide A 1999 – Section 1.3 Design Criteria:**
  An inside dry resultant temperature of 25ºC is not exceeded for more than 5% of the annual occupied period (typically 125 hours).
- **CIBSE Guidance – Guide A 2006 – Section 1.4.2.4:**
  Table 1.8: Office Overheating criterion:
  1% annual occupied hours over operative temperature of 28ºC.

The structured IES **<Virtual Environment>** model was invaluable in determining the optimum route from 'concept' configuration to 'final' configuration ensuring that inside dry resultant temperatures of 25ºC were only exceeded for 41 hours on average. The initial scheme exceeded this for an average of 416 hours.

Finally, a holistic analysis of energy performance was undertaken, taking thermal, lighting and airflow performance into consideration. The simulation calculated that the annual energy consumption for this building will be 185 kWh/m2/year, representing an annual energy saving of 59.4% over a type 4 ECON 19 building and 48.5% over an equivalent notational building.

Associated reductions in CO_2 emissions have also been estimated.

"The OPW has really taken on board the capabilities of our **<Virtual Environment>** software," said lead IES Consultant on the project Vincent Murray. "We have been able to work closely with the design team right from the early stages to ensure that maximum impact on energy consumption was achieved. All too often performance modelling is carried out after many key design decisions have been made, limiting the scope for performance enhancing alterations."

info

For Further Information
Contact us at **enquires@iesve.com,** or call **0141 945 8500**.

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