DLR Group: Rockford Public Schools

Rockford, Illinois 2014

DLR Group use IES Virtual Environment tools to present performance issues in portfolio of school buildings to the 3rd largest school district in Illinois.

Key Facts

- 3rd largest school district in Illinois
- 45 schools
- $139 million budget for deferred maintenance
- $111 million budget for 21st century learning environment

DLR Group use IES Virtual Environment tools to present performance issues in portfolio of school buildings to the 3rd largest school district in Illinois, to help teach parents and school board members about the importance of Indoor Environmental Quality when providing 21st Century learning Environments.

DLR Group was tasked with validating an existing Masterplan at Rockford Public School District 205, which included 45 elementary schools built from the turn of the century to the 1960s and 1990s, with the aim of evaluating the performance of the existing buildings and deciding which was best: to build new or to renovate?

Due to the large variation of building age, condition and mechanical systems, DLR Group concluded that Energy Use Intensity (EUI) would not be a sufficient performance indicator for grading each school. Instead they challenged themselves, and the school district, to Think Differently - to Think Holistically. Not only did they need to evaluate the Energy Usage of each school, they needed to evaluate the quality of the Learning Environments provided for students in each building.

To achieve their goal of performing a Holistic Building Performance Assessment, they developed a range of High Performance Building Design Indicators; Energy Use Intensity, Thermal Comfort, Indoor Air Quality, Visual Comfort and Acoustical Comfort. A comprehensive data collection plan was developed to gather information on each of the high performance building design indicators, consisting of methodologies to gather objective and subjective data at each school with additional field measurements to validate conclusions.

A representative classroom was chosen for each school and sensing equipment was placed in these rooms to record Temperature, Humidity, CO2, Lighting Levels and Acoustics. With the help of school facility managers each school had data logging completed for at least one week of operation. DLR Group gave the building occupants a voice on their Indoor Environmental Quality by issuing a district-wide Occupant Thermal Environment Survey, based on ASHRAE Standard 55, with additional questions to identify occupant satisfaction with Indoor Air Quality, the Visual and Acoustical environment. Armed with field measurement equipment, DLR Group's commissioning experts conducted a building walk-through of each school to validate logged and survey data.

The objective and subjective data was gathered and used to grade each high performance indicator for each building as follows:

- Energy Usage: Utility Bill Analysis to rank each building based on its Energy Use Intensity
- Thermal Comfort: Predicted Percentage Dissatisfied using the ASHRAE 55 Occupant Thermal Environment Survey
- Indoor Air Quality: Proportion of occupied hours exceeding exceeding ASHRAE 62.1 standards
- Visual Comfort: Combination of Occupant Survey results that identified sources of occupant dissatisfaction with their visual environment and logged lighting levels.
- Acoustical Satisfaction: Combination of Occupant Survey results that identified sources of occupant dissatisfaction with their acoustical environment and logged Noise Criterion.

IESVE was used to tell the story of this analysis in a format that parents and school board members understood. First they were presented with the Good and Bad energy users.

Then DLR Group used two comparative schools, from an age and mechanical system standpoint, to show the district that energy cannot be the sole indicator of a building's performance. While Lewis Lemon consumed less energy than Ellis, twice as many people in Lewis Lemon were dissatisfied with their thermal environment than Ellis.

Similarly, even though the Energy Use Intensity was lower in Lewis Lemon, the CO2 levels recorded during data logging exceeded code maximums four times as frequently.

IES Virtual Environment allowed DLR Group to convey this complex grading strategy and results in a simplistic and visually appealing manner that all members of the school district board could understand. Conceptual energy modelling was also carried out using the VE and showed the proposed designs to use dramatically less energy than the existing buildings. Each school was imported into the VE to forecast the Energy Use Intensity for each school floor plan, if it also satisfied the other high performance indicators relating to Indoor Environmental Quality.

> *"As far as Building Performance & Energy tools go, IES are by far the industry leader. Not only is the tool great for visually presenting data, it proved to be a great way to present other metrics that compared the buildings performance and allowed us to make better informed decisions, rather than relying on the EUI which proved not always to be the best metric to use: a building could have a really good EUI but the Indoor Environmental Quality might not foster an adequate learning environment. As our industry progresses on our commitments to provide low energy and net-zero buildings, we must keep the Health, Well-Being and Productivity of Building Occupants at the forefront of every design decision."*
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> **Ruairi Barnwell, Energy Services Leader, DLR Group**