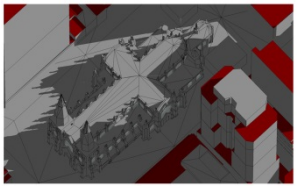
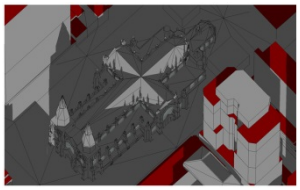
Saint Patrick's Cathedral: Solar Impact Study

New York, New York



Shadow graphics showing hourly change.



Total annual solar radiation emitted by each window on the Cathedral.

In order to determine which windows were receiving sunlight and for how long the Environmental Simulation Center (ESC) rendered a full set of shadow studies for the south side of St. Patrick's Cathedral. The ESC rendered shadows for the southerly 50th Street façade for one day (8AM-5PM) every two weeks from March 21st to September 21st. The rendered shadows were merged with an elevation drawing of the Cathedral to illustrate the windows that are shadowed at some point during the day by both context buildings and the Cathedral itself. The axonometric drawing of the Cathedral windows is rendered from the 3D Cathedral model used in shadow renderings.

The shadow graphics create an understanding of when the Cathedral windows are exposed to shadows from context buildings and the Cathedral itself. The above graphics show the impact of the shadows hourly and in a shadow sweep. Using the same method and zooming in on portions of the shadow renderings, the project team could better understand which windows would be receiving direct sunlight in the analysis periods.

The ESC also used a new tool to do a solar exposure analysis on this project. The analysis shows cumulative values of solar radiation throughout the analysis duration (365 days) and requires the use of a weather data. The New York weather data file for this analysis is created from National Weather Service's average yearly data.

The solar radiation analysis assists in understanding which windows would have the highest solar radiation throughout the year. Because solar radiation is a measure of energy, it is more precise than shadow sweeps. A surface under direct sunlight between 10AM to 11AM may receive less solar radiation compared to the same surface receiving direct sunlight between 12.30PM-1PM due to the sun angle. The solar radiation analysis takes this into account and uses a weather model to simulate sunlight energy levels for date and time of the day. The radiance analysis was able to determine the variation in energy on the windows, identifying those windows which experience extremes in temperature.

Client: Murphy, Burnham and Buttrich Architects

Co-Project Directors:
Michael Kwartler
Jean Parker Phifer

Completed:
2014