Sustainable by Design

Perform whole building energy, water, and carbon analysis in minutes using 3D models.

Challenge: Implement sound, cost-effective building energy retrofits that enhance the nation's energy security and environmental stewardship while modernizing toward sustainable buildings.

Solution: Use 3D modeling and analysis tools to demonstrate energy savings, and help discover innovative, cost-effective alternatives for building energy retrofits.

Benefit: Faster delivery of critical energy and performance information accelerates the growth of energy-efficient, carbon-neutral, net-zero building inventories.

The U.S. Department of Energy concludes that buildings alone consume 70 percent of total electricity, 40 percent of raw materials, and 12 percent of fresh water supplies; account for 30 percent of greenhouse gas emissions; and annually generate 136 million tons of construction waste, amounting to approximately 2.8 pounds per person, per day.[1]

A key component of the economic recovery legislation is about making government buildings more energy efficient. This initiative offers the opportunity to create jobs, reduce energy dependence, and provide increasingly sustainable buildings for our future. Design technology can help with this effort by facilitating the creation of digital 3D building models, which can be used to quickly perform energy analysis and to calculate gains in energy efficiency that result from building modifications.

Today, the architecture, engineering, and construction industries have turned to a design process called building information modeling (BIM), which yields an intelligent 3D building model. This 3D model provides high-quality, accurate data that can be relied on for critical decision making and prioritization of energy performance options. Building models can be created from existing 2D drawings, 3D laser scans, or from manual observation and

[1] U.S. Department of Energy Efficiency and Renewable Energy Network (EREN) Center of Excellence for Sustainable Development

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measurement. Depending on the size and complexity of the building, a valid energy analysis model can be created in as quickly as a day.

Whole building energy analysis using 3D models enables more accurate predictions for overall energy performance and helps predict the success of energy improvements such as thermal insulation upgrades; solar voltaic and natural daylight usage; and heating and cooling system upgrades, including water conservation or reuse.

With this analysis, improvements can be prioritized and entire building inventories can be examined to balance resources between regions. Unlike other forms of data archiving, intelligent models can be more easily shared with professionals within or outside the agency to build on the models as projects proceed.

This technology also provides a platform to better evaluate and measure the effectiveness of allocated funds on energy projects today—and far into the future.