IMAGINiT TECHNOLOGIES

WHITEPAPER

Building Information Modeling: The Key to More Sustainable Structures

Sustainability and energy efficiency are top of mind for building owners and facilities managers. A recent survey conducted by IMAGINiT Technologies revealed the following:

- Over three quarters of facilities managers (80.7%) reported that they are always, very often, or often looking to reduce energy costs on new projects.
- A similar number (77%) reported that they are seeking the same on renovations.
- Around half of all respondents (49.6%) indicated that energy analysis/sustainable design was an industry trend they expected to implement in the next year.

Using Building Information Modeling (BIM) during the design phase of a new building or renovation can provide important information that supports the construction of more environmentally friendly and sustainable structures. The goal of this white paper is to discuss the types of sustainability-related analyses that can be done through BIM which deliver cost savings to building owners.

Sustainability and the Bottom Line

With energy costs trending higher, it's not surprising that owners are interested in ways to improve the energy efficiency of their buildings. While lower energy expenses are always desirable, buildings with high efficiency systems or envelopes can also qualify for tax credits. For example:

- **Section 179d.** In the United States, building owners can take advantage of Section 179d, which is sometimes referred to as the "green building tax deduction." This offers new or existing building owners with up to $1.80 per square foot to install high efficiency interior lighting, efficient building envelopes, or HVAC or hot water systems. Qualifying systems must reduce the building's total energy and power cost by 50% or more in comparison to a building meeting minimum requirements set by ASHRAE Standard 90.1-2001.
- **The Business Energy Investment Tax Credit (ITC).** This was expanded by the American Recovery and Reinvestment Act of 2009 and provides dollar for dollar tax credits for eligible systems placed in service on or before December 31, 2016. These systems include solar, fuel cells, small wind turbines, geothermal systems, micro turbines, and combined heat and power systems.

Taking sustainability to the next level with certifications like LEED can also lead to state and local tax credits. For instance, Cincinnati, Ohio provides a 100% tax exemption for LEED certified buildings, not to exceed $500,000 over 15 years for new buildings and over 10 years for renovations. If a building receives LEED Platinum certification, there is no maximum exemption.

The Oregon Business Energy Tax Credit is designed to offset the cost to businesses that build sustainable commercial buildings that meet the LEED Silver rating. Another example is Chatham County, Georgia which offers an exemption that provides a five year full state and county property tax abatement for commercial buildings that receive LEED Gold certification. It also provides a reduced abatement for the next five years.

The What and Why of Sustainability Analyses Using BIM

One of the major benefits of using BIM during the design phase of a project is that it's easy to run "what if" scenarios to see if design adjustments can improve the environmental characteristics of a new building or a renovation. With a few minor tweaks in the BIM software, it's possible to iterate quickly on different designs and optimize for the best environmental performance. BIM is also a useful tool for discussing sustainability issues with non-technical stakeholders.

There are a wide variety of sustainability analyses that can be run using BIM, including:

- **Energy efficiency.** For a new building, it's possible to take rough design ideas and drop an initial building concept onto the prospective location. With this information, baseline energy efficiency data can be generated. It's easy to then rotate the building model 90 degrees and rerun the energy efficiency analysis. Multiple iterations can be generated to identify the best place to locate a building.
- **Photovoltaic potential.** If an owner is interested in installing solar panels, modeling the building and its environment to analyze the potential for solar power generation is essential. Whether you are talking about rooftop units or ground-based solar panels, BIM allows you to understand sun and shadow patterns throughout the course of a year to optimize solar power generation.
- **Illuminance levels.** During the design phase of a new building or renovation, the amount of daylight flowing into the building can be analyzed. As more natural light comes in, less energy must be spent on artificial lighting. With BIM, it's easy to model illuminance levels based on different times of the day and seasons of the year. Designs can be modified to add windows or skylights to carry light deeper into rooms. In addition, smart lighting systems can be incorporated that will turn off when a certain illuminance level is reached in a room.
- **Heat island effect.** For owners that are interested in LEED certification, it's important to find ways to reduce heat island effect. BIM can be used to select paving and building surface options that will reduce heat island effect.
- **Air flow modeling.** Computational Fluid Dynamics and air flow can be simulated and analyzed with BIM. Modeling air flow is important for thermal comfort in buildings, particularly those with large atria. In certain specialized building spaces, such as operating rooms or data centers, air flow simulation is especially important.

How to Obtain Sustainability Data as Part of BIM

During the design process for a new building or renovation, it's important to specify upfront that energy and other sustainability-related analyses should be done throughout the design process.

A deliverable at the end of construction should be a final detailed energy model. This accurately represents the performance that the building is expected to have. A final model will be based on data provided by the contractors and will contain actual cut-sheet data from the equipment installed in the building. This includes things like lighting fixtures, heating and cooling equipment, building shell materials, and more.

It is also useful to request energy analysis reports. These will provide a good reference for how the building is performing during operation, compared to how it was designed. This comparison can reveal potential areas for improvement.

Conclusion

Energy efficient structures continue to grow in importance as owners and operators try to conserve resources, as well as lower the energy costs associated with the lifecycle of buildings. At IMAGINiT, we help clients identify opportunities to enhance building sustainability through smart, effective, and efficient application of technology. The result is more environmentally friendly and more cost effective buildings. Contact us today and start improving your bottom line tomorrow.