



Using Building Information Modeling to Create More Sustainable Buildings

By Jen Creighton, Sarah Dreger, & Marty Turner

Have you heard a lot of buzz about Building Information Modeling (BIM) but are not sure what it all really means to a Construction Manager? You're not alone. Once considered "emerging" or "cutting-edge" topics within the industry, both BIM and sustainability are fast becoming the norm for the modern construction projects. Today's complex projects and sophisticated clients are looking for ways to innovate, reduce cost and save time while still creating lasting and sustainable buildings and systems.

BIM software facilitates an improved way of working collaboratively, using a model created from coordinated and consistent design information. This process enables earlier decision-making, better documentation, and the evaluation of alternatives for sustainable design or improvements using analysis before construction begins.

BIM data can be used to quickly analyze the various performance aspects of a facility including massing, DOE2 energy modeling, envelope analysis, and a number of other key performance areas, all to optimize energy efficiency. Two products currently on the market are Autodesk® Green Building Studio® and Autodesk Project Vasari. Green Building Studio® is a web based analysis engine allows the user to analyze the energy performance and carbon footprint of a design and to generate a number of design alternatives without ever modifying the original model. Project Vasari combines a BIM "eggshell" modeler with Green Building Studio and key Ecotect functionality all in one modeling product.

Daylighting is another form of analysis that is made possible and even streamlined in the BIM process. Daylighting is a means of utilizing natural light to illuminate buildings and reduce light, heating, and energy loads. This analysis, once a costly or difficult venture for design firms given software availability, the complexity of calculations, or the added expense of hiring a consultant, is growing in popularity and application given current BIM software usability. With the emerging role of technological improvements in BIM software to enhance the design process, the role of Construction Manager (CM) must therefore change with the times.

So how does one go from average CM to a "process leader" capable of wielding the power of BIM to achieve a sustainable delivery? One of the best ways to gain an understanding of any topic is to identify successful projects and CMs (industry leaders) and model your techniques after their success. The National Oceanic and Atmospheric Administration (NOAA) Research Building in San Diego is a perfect example of how the successful integration of BIM can streamline the design and construction process resulting in a sustainable building.

In 2007 the National Oceanic and Atmospheric Administration (NOAA) initiated the La Jolla Laboratory Replacement Project. NOAA selected a proven team of more than a dozen consultants working around the country. The architectural firm Gould Evans served as the architect of record and was responsible for coordinating the team's efforts. To help maximize coordination amongst consultants, the team used Autodesk® Revit® Architecture, Structure®, Navisworks® and 3D Max® Design Software.

The project team used BIM to solve a variety of complex owner issues. For instance, the end users had to understand if they would be able to move large pieces of marine equipment—such as ocean buoys or small submersible devices, through the facility and into the ocean tank. The

designers used BIM to model the flow of the equipment through the building to discover any unanticipated barriers and corrected them on the computer before they had to deal with problems in the field.

The design team also faced very challenging site conditions with an extreme slope on one side and a tight hairpin turn to contend with on the other. BIM modeling made it easier to accurately design the building and understand how the slope affected the building. The team felt that using the modeling tools not only helped the design process but also streamlined the construction process in the field, minimized mistakes, and ultimately reduced waste from construction.

CM's can also use BIM software to streamline the process of obtaining LEED® certification. For example at NOAA the team used Revit Architecture to perform area and volume calculations and speed up the quantity take-off process. They also used BIM to perform many of the calculations needed to include in the LEED certification submittal.

After construction is complete, the CM and the owner will be left with an accurate as-built record where the O&M database, which includes technical and warranty information, can be linked to the model. This record can be an invaluable tool in maintaining all of the green features incorporated into the building and yielding the anticipated performance.

It is critical that the modern CM understands and develops skills for managing, leading and constructing that incorporate a solid foundation in BIM to create more sustainable outcomes for clients. While the composition of a project team may vary based on Owner needs, local laws and project requirements, the CM has a central role to play in the successful outcome of a project. To be effective, the modern CM needs to be aware of the tools and trends that will save time, reduce cost, mitigate risk and provide for a better end product. Moreover, the CM industry and organizations such as CMAA must promote the development and mastery of the skills required to manage the BIM modeling process through the development of standards, guidelines and practical learning opportunities. Equipping today's CM with these essential skills is the key to creating real value for the customer, client and Owner which will translate to repeat business, greater profitability and a more sustainable building. **CM**

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