



A Lasting Engagement

*Like Autumn And Turning Leaves, Spoons And Forks,
Or The Cubs And Fifth Place, BIM And LEED Just Go Together*

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One can almost liken the current state of how a Building Information Modeling (BIM) model compliments a sustainable design process to a couple's engagement. Out of undeniable compatibility and a shared desire to attain similar long-term goals, they form a partnership that promises future long-term commitment to one another.

The concept of BIM has been around for a few years now. But not until recent years have people realized the full potential of a database-driven virtual model, which cannot only reduce coordination errors and allow clash detection across different disciplines, but also capture vital information to help make better decisions for a more efficient building not in the later stages of design, as was done in the past, but in as early as the conceptual and schematic phases.

In order to determine whether a building qualifies as a "Green Building," they are subject to a wide range of Building Rating systems around the world. In the U.S., most buildings currently follow the Leadership in Energy and Environmental Design (LEED) rating system, which is the leading system for certifying sustainable

Design, Construction and Operation of a building. There are currently four levels of certification based on fulfillment of a number of requirements such as water efficiency and energy performance, among others.

There are six major requirements for obtaining LEED Building Design and Construction (BD+C) credits: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Material Reuse, Indoor and Environmental Quality and Innovative Design. Each is associated with a certain number of points that are awarded based on fulfillment of each credit requirement.

Today these requirements are married back to BIM technology, which provides smart databases that are linked dynamically to building objects and schedules, effectively providing the data derived from built-in formulas within 2D or 3D designs that informs of building performance.

To show you the extent of how a BIM model would interact with a LEED requirement such as Water Efficiency, imagine being able to start off your design with a BIM working template preset with schedules and parameters that derive values from formulas linked to your building components such as roofs, plumbing fixtures, etc. This template would

automatically fill in the building component values into a schedule upon placement.

In order to determine whether a building qualifies for rainwater harvesting credits, monthly rainwater collection values for roof areas can be automatically derived from the BIM model. Based on information from a weather resource, one can look up the average rainfall for a region and apply the formula $\text{Roof Area} \times \text{Monthly Rainfall} \times 0.8$ to determine this value. Or, by using the automated schedule in our working template, this value can be directly extracted from the BIM model.

Now imagine having a similar schedule template that contains built-in values for the number of water fixtures you have and whether they are for sinks, toilets or drinking fountains. Combine this with data such as fixture flow rate, number of building occupants, and number of days per month and hours per day the facility is occupied. We can then use this data to determine our building's overall water load, non-potable water needs, and graywater capture potential.

This can also tell us what the building's impact on our municipal water supply will be after using the harvested rainwater and graywater that will collect from the building fixtures. From there, we can figure out how

large of a cistern we will need in the building in order to properly store all the water collected.

And these are just a few examples of how a BIM model can inform building element and fixture sustainability without even getting into what it can tell us about water-related credits like Water Efficiency in Landscapes, for which you could track vegetation type by square footage for any given terrain and find out the amount of water needed for irrigation based on chosen plantings.

In all, there is the potential to track over 40 points within the BIM model itself, without even considering ventilation, thermal, energy, or other further analysis if the data is entered and managed properly.

New extensions and add-ons to current BIM technologies continue to reduce the time required to get and compare the necessary data to check for compliance, making it increasingly easier for architects and engineers to alter and change their designs to better achieve optimum building performance early on.

One recent extension tool for Autodesk® Revit, called the Revit Conceptual Energy Analysis Tool, enables users to compare energy consumption between early design concepts.

The add-on provides graphical reports that compare energy use, lifecycle costs, and breakdowns of consumption and loads, allowing designers to evaluate and compare design options side-by-side, as well as communicate and deliver easy-to-understand graphical and raw data results to project stakeholders.

They can also access Web-based climate data from more than 1.5 million weather data sets to more rapidly perform analysis through cloud computing technology without disturbing the design workflow.

This sort of analysis requires little knowledge about the building and could be done by pretty much anyone on the design team during the early stages of the design process. The tool also allows you to edit multiple configurations for the building construction

and perform tests on how building orientation, massing, optimized envelope, shading, and glazing will impact building performance.

Another great example of an add-on for Revit is the Roombook tool, just released in December 2010. The Roombook tool calculates the surfaces of walls, floors and ceilings as well as room circumference and furnishing elements on a per-room basis and in total.

The calculation of each surface is made transparent by a detailed listing of all sub-areas, which makes tracking total square footage a lot easier than having to tally each separate building element.

Roombook could really impact tracking compliance for credits like the Material Reuse Credit 1.2, which requires the use of existing interior nonstructural elements such as interior walls, doors, floor coverings and ceiling systems in at least 50% (by area) of the completed building, including additions.

Thanks to BIM, there is little excuse for not being green these days. And with the ongoing development of new technologies, add-ons and applications that integrate with sustainable design software solutions such as Green Building Studio and Ecotect, the future is bright for an even more streamlined Building Information Model that will automatically gather all the information vital to creating completely efficient and sustainable designs. When that time comes, the combination of BIM and LEED will go from a perfect engagement to a perfect marriage.

At Microdesk, Leo focuses primarily on training and consulting. He specializes in helping firms implement Revit Architecture and various visualization products, including Autodesk VIZ and 3ds Max. Leo is a Revit Architecture Certified User and is LEED certified. He holds a Bachelors degree in Architecture and an Associates degree in Computer Science from Universidad Católica Madre y Maestra in Santiago, Dominican Republic, where he is also a Registered Architect.

