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A Professional Corporation

Technical Bulletin

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Building Information Modeling (BIM) Part 1 - What is BIM?

Introduction

Many of our clients have or are learning about Building Information Modeling and how it will benefit their projects. In most cases, clients are now requiring BIM as part of their project requirements in their Requests for Proposals (RFPs). The purpose of this bulletin is to provide the reader a brief overview of BIM and its benefits whereas future technical bulletins will discuss productivity, scheduling, design and coordination considerations.

Vertical Force Resisting Elements

Over twenty years ago, computer technology allowed architects and engineers to develop construction documents electronically. At that time, the software of choice for the AE industry was AutoCAD which allowed us to create two dimensional (2D) plans, sections, and elevations. Today, many firms are adopting BIM to meet their client needs for integrated design and coordination, improved work quality, information sharing between disciplines including contractors, and integrating design and analysis. There are several software applications available to our industry. The software of choice has been Revit® by Autodesk whether it is architecture, structure, or MEP.

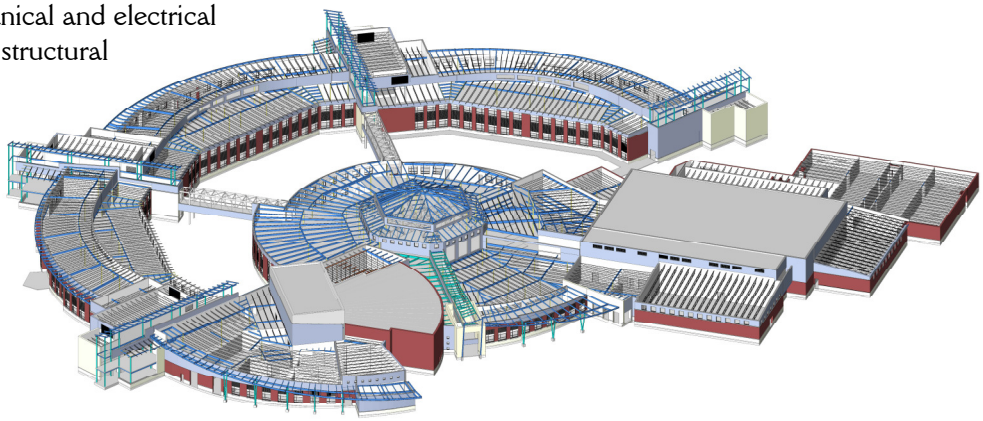
The key advantages of using BIM are:

- Single data source
- Improved coordination
- Design visualization
- Integration of design and analysis software
- Information sharing with design and construction partners

When we produced 2D plans, sections and elevations, we created separate files for each type of drawing whether it was a plan, detail, schedule, or notes. Thus for a typical large project, we could have 30 to 50 or even more independent files for each discipline. For a typical project, there are at least five disciplines; architect, structural, mechanical, electrical, and plumbing. If each discipline creates 50 drawings this could result in 250 separate computer files and/or drawings. Since these are separate and independent files, it can be extremely challenging to stay coordinated between discipline specific drawings or even between trades. Depending on the size of the project and limitations with computer hardware, Revit® allows us to create one model where we can develop 2D construction documents directly from a single source of data. The information shown on the documents comes directly from the model. In order to manage file size, each discipline will create their own model, thus reducing the computer data files from 250 to 5.

Since each discipline will create their own models, Revit® allows us to "link" these files into a single model to improve project coordination. This includes clash detection to identity and resolve conflicts prior to construction thus reducing errors and omissions.

In addition to project coordination, Revit® allows the user to visualize the building three dimensionally. This function lets the designer whether an architect or an engineer to see how the building comes together or how building components and/or systems interact with each other. These can include structural connections, building geometry, mechanical and electrical systems. For example, a structural engineer can immediately identify potential conflicts such as a deeper beam framing into a shallower beam before this is found during the construction process. Identifying these issues ahead of time can and will reduce potential construction costs and delays.



BIM Model of Kellam High School, Virginia Beach, VA
Current Speight, Marshall & Francis BIM project
Image courtesy of HBA Architecture & Interior Design

Another benefit of BIM in a structural engineering perspective is our ability to integrate our design and analysis software directly into the model. Software developers have written additional applications that allow us transfer our models bi-directionally from software to software. Thus we can revise our design and directly transfer information without the use of red lines while reducing potential errors when manually transferring information. However, this system of information transfer does have its limitations. Design software developers create software links after each release of a Revit® version which can take several weeks. Another limitation is dimensional precision. Design software typically works in decimal format while Revit® works in feet and inches. This can cause inaccuracies during the transfer of information and requires model adjustments after the information transfer. We anticipate that as BIM technology progresses, these limitations will eventually disappear in the future.

The last key advantage is information sharing with contractors. In our experience this has not yet been widely used since most AE design firms are still integrating BIM internally. As BIM technology becomes common practice, model information can be shared to contractors. This enables contractors to get a better visual understanding of the final product. It can also aid in determining project costs, material takeoff and be used for value engineering.

Coming Up...

Our next Technical Bulletin will discuss time management and productivity issues with BIM. We need to think and redefine our work flows and time management processes to fully utilize its strengths and provide a complete and coordinated set of construction documents which meets our clients' needs and expectations.

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