

# Building Information Models (BIM)

## Envisioning a Future where BIM Brings Value to All Stages of the Design/Construction Process

By Mike Fenske, PE, DBIA, and Steve Cline, PE

Building information modeling (BIM) is moving from dream to reality and changing design and construction processes along the way. Although Burns & McDonnell has been modeling buildings and other facilities in 3D for decades, the term BIM has only recently been accepted by the industry.

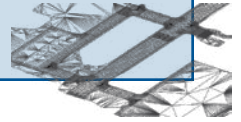
Standards such as the National Building Information Modeling Standard have defined BIM as a “representation of the physical and functional characteristics” of a building. Thus, a building information model is more than just an unintelligent 3D model. It includes data compiled from conceptual design through construction and commissioning.

While full implementation of all the possible functionality envisioned is still years away, the industry is moving with accelerating speed.

At Burns & McDonnell, our integrated delivery team is thinking out of the box. What if a design team had modeled the non-critical portions of your facility in advance, allowing the focus of the design to be on the main function of the building rather than the bathrooms? What if an as-built model was integrated with your building control system to allow building operators easy electronic access to information about the fixtures and equipment? What if construction managers could minimize job site personnel and create a cleaner and safer construction site?

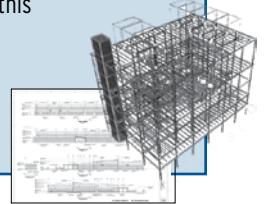
**Design Data** – Adaptable building component models of areas such as offices, control rooms and bathrooms are added to the schematic model.

Architects are able to easily evaluate space constraints while engineers create structural, mechanical and electrical analysis models within the BIM.



**Construction Documents** – Extraordinary visualization in the earlier stages of the project has allowed the facility's stakeholders to make layout and functional changes early in the design process, reducing the amount of time spent in this stage to complete the construction documents.

Two-dimensional construction documents are cut from the model and changes to the BIM result in live changes to the drawings.



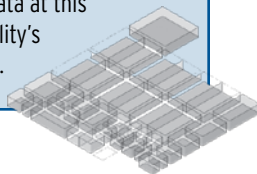
**Environmental Data** – LEED® points are actively tracked as the design progresses, allowing owners and designers to understand the environmental impact of their decisions. The resulting HVAC loads are used to determine if the facility's central plant can handle new loads.

Energy costs are automatically gathered from local utilities, providing stakeholders an accurate forecast of energy costs.



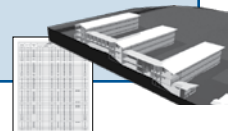
**Schematic Data** – Initiating the building information model (BIM) during schematic design of a facility enables superior space visualization allowing owners to make better-informed decisions.

At the schematic level, the model includes only the most critical components, such as space relationships and building form. The BIM may also be incorporated with GIS data at this early stage to illustrate the facility's relationship to its surroundings.



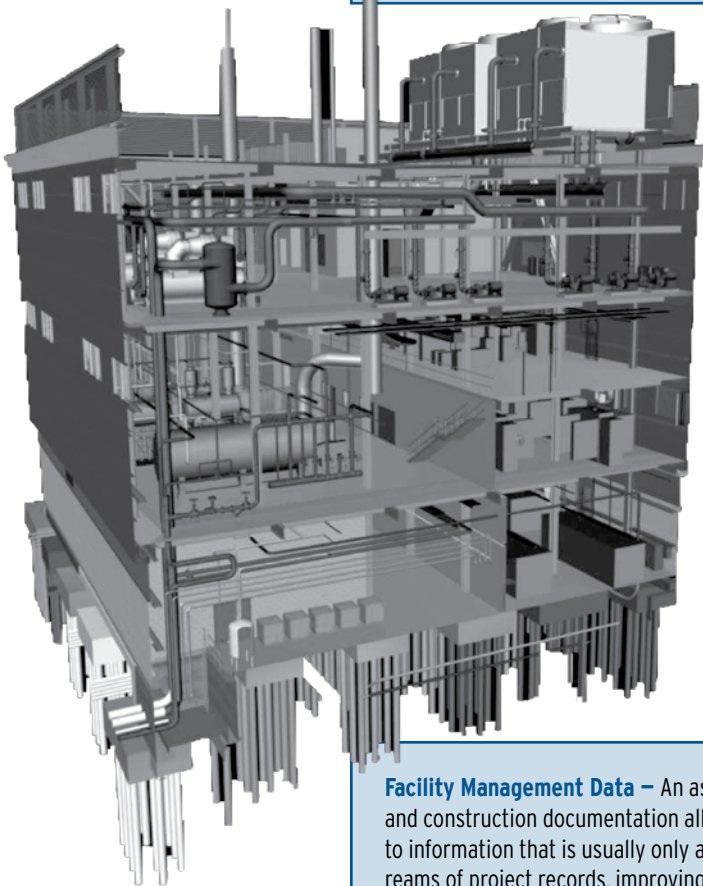
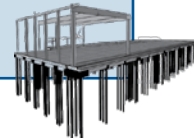
**Bidding and Negotiation Data** – Whether the facility is delivered through design-build or the more traditional design-bid-build, subcontractors are able to understand the 2D construction documents better when accompanied by a BIM.

Quantity takeoffs from the model allow for more accurate bids and visualization of the project gives a savvy contractor an understanding of the complexities of the job.



**Construction Management Data** – The facility model is tied to the construction schedule, creating a 4D representation of the building. Construction planners use the 4D model to evaluate construction positions and project sequencing to allow the existing facility to remain operational.

The design is adjusted for an optimal construction sequence fit, saving money and time. Subcontractors coordinate their fabrication models and are able to fabricate more elements off site, creating a safer and cleaner construction site.



**Facility Management Data** – An as-built BIM tied to actual design and construction documentation allows facility operators easy access to information that is usually only accessible by searching through reams of project records, improving maintenance responsiveness while reducing maintenance cost.

The BIM is tied to facility operation systems so that building engineers can virtually control the building systems while security personnel monitor access.



**Mike Fenske, PE, DBIA**, is an associate vice president and engineering manager in the Burns & McDonnell Aviation & Facilities Group. His experience includes project management for domestic and international aviation and aerospace facility design and construction. He has a bachelor's in electrical engineering from the University of Nebraska and a master's in engineering management from the University of Kansas.



**Steve Cline, PE**, is a structural engineer and BIM services director in the Aviation & Facilities Group. He has five years of structural design experience with institutional, military, transmission and distribution, industrial, environmental and aviation projects. He has a bachelor's in civil engineering from Purdue University and a master's in civil engineering with a structural emphasis from the University of Illinois at Champaign-Urbana.

For more information, please e-mail:  
mfenske@burnsmcd.com  
or sccline@burnsmcd.com