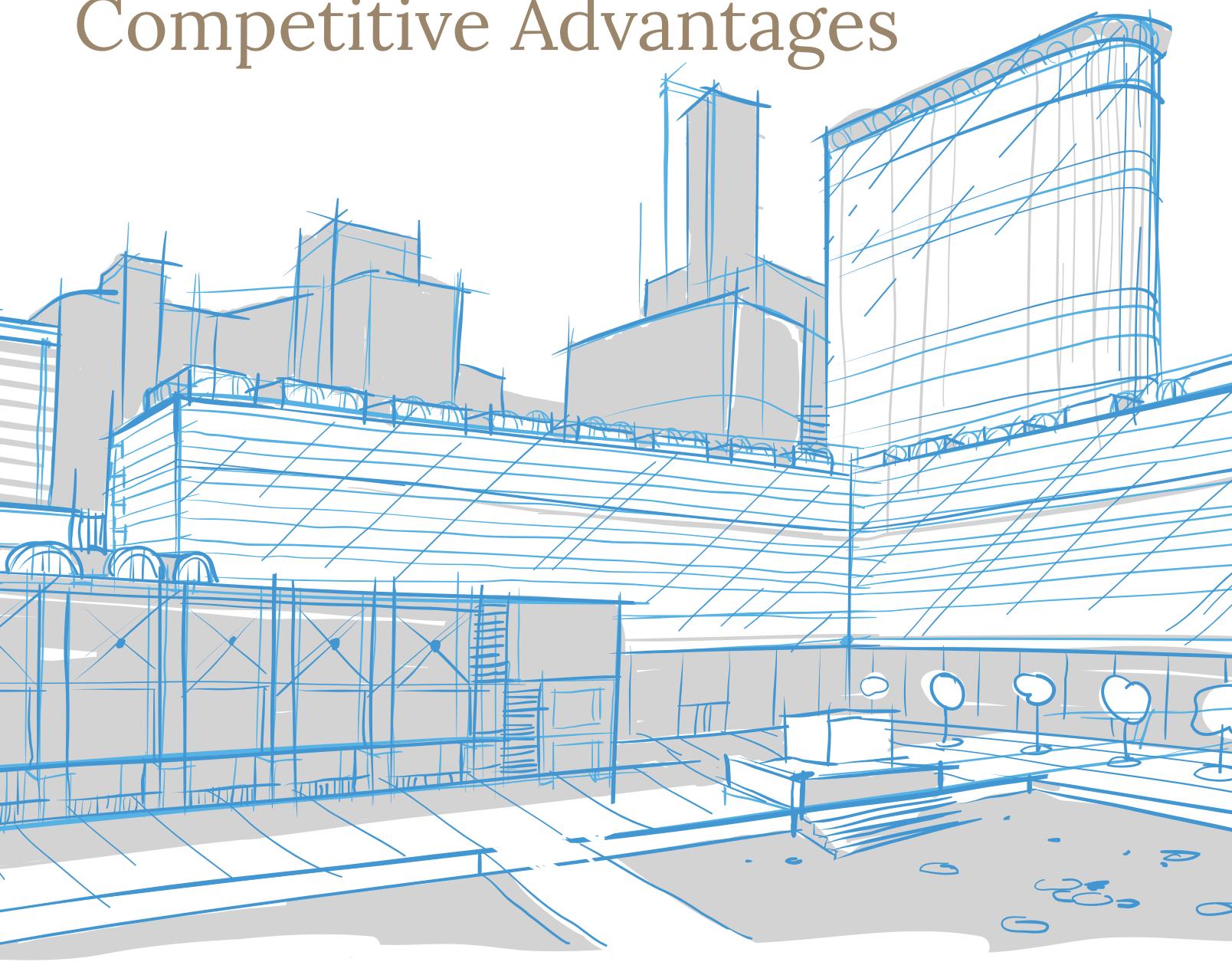




# P-H-C CONTRACTOR

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## BIM Competency Delivers Competitive Advantages



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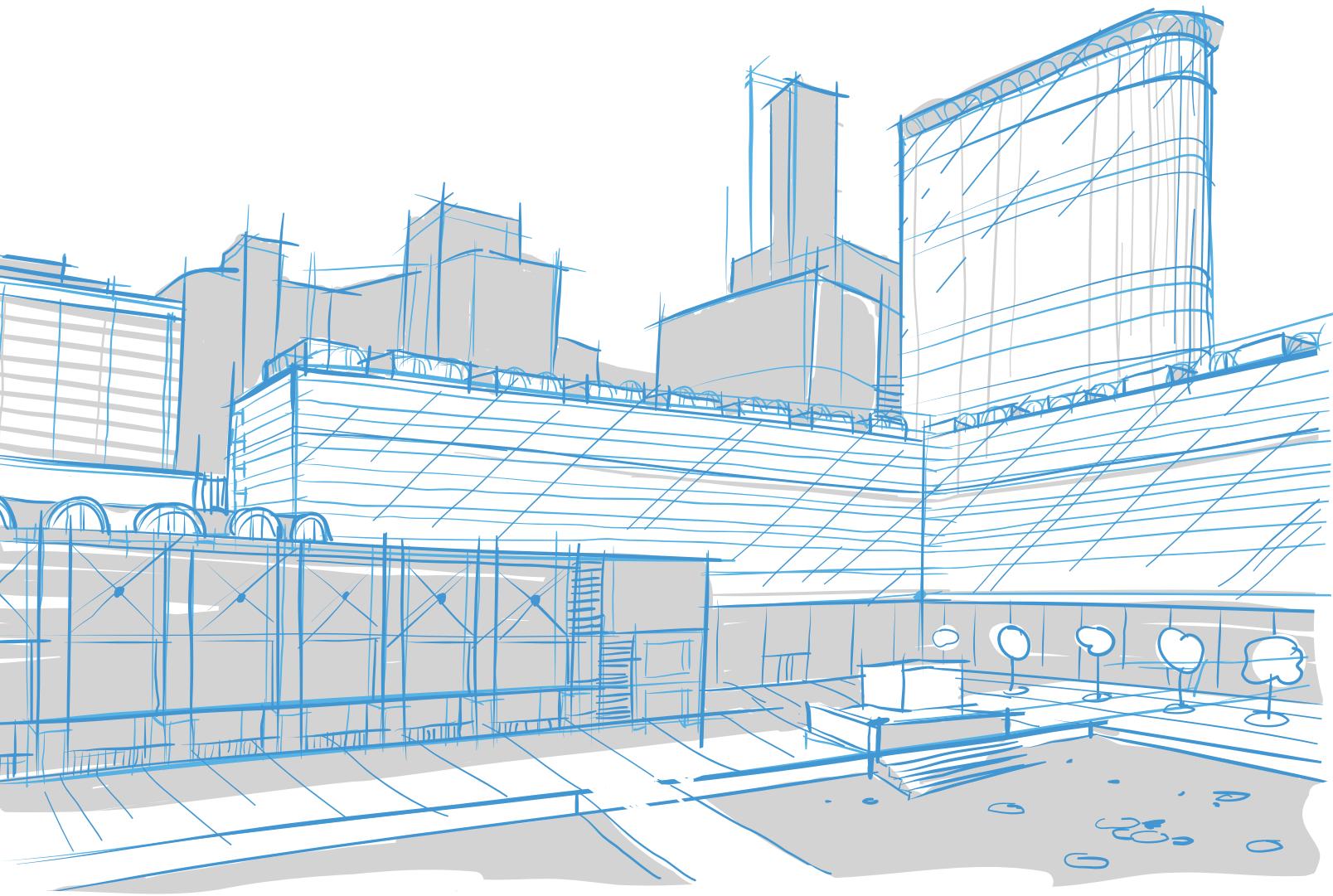
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# BIM Competency Delivers Competitive Advantages

BY DANIEL HUGHES | BIM STRATEGIST, BRADLEY CORPORATION



The Design Build  
Institute of America  
(DBIA) reports:

- + THE DESIGN-BUILD PROCESS REPRESENTS 40% OF THE U.S. CONSTRUCTION MARKET, UP 10% FROM 2005.
- + 50% OF DESIGN-BUILD PROJECTS ARE VALUED AT OVER \$10 MILLION.
- + DESIGN-BUILD PROJECTS ARE INCREASINGLY DEPENDENT ON USING BIM TO DRIVE HVAC AND PLUMBING PREFABRICATION; TO MEET PROJECT DEADLINES AND BUDGET.



*Image by DPR Construction – Located on Buildipedia.com  
<http://buildipedia.com/sec-pros/design-news/contactors-look-to-bim-to-streamline-construction>*

Building Information Modeling (BIM) is an information-based process (vs. a drawing-based process) that builds long-term value and advances innovation. It's about integrating and streamlining design and construction processes, making them collaborative, and about the software tools needed to achieve that end. It's the "I" for information in BIM that sets the process apart from simple 3-D modeling.

#### EARLY BIM MANDATES – BIG PROJECTS AND PUBLIC OWNERS (2001-2006)

Public (federal, state) design and construction projects created many of the first BIM-mandated projects. Mandates stipulated that all project team members must use the same BIM software for designing and constructing the building. Upon completion of construction, the as-built BIM files would be turned over to the public facility owner's Facilities Management (FM) Department.

Public BIM-mandates began delivering these business values to the design/construction team:

- Basic benefits of better coordinated construction document sets;
- Time-saving benefits from a more collaborative, integrated design and construction team;
- Simulation and phasing of a project's construction resources & processes;
- Functional, as-built construction models that served the owners' FM Department's roles of facility management, operations, and maintenance.

#### BIM MANDATES MATURE – PROJECT FIRMS AND PRIVATE OWNERS (2007-PRESENT)

Design/construction project firms have both public and private facility owner clients. The BIM benefits achieved from their public projects could be adapted to their private projects. The BIM process and team members became a competitive force for improving overall design documentation, reducing construction time and cost over-runs while improving client satisfaction.

Project firms began building cost and time-saving BIM-based processes that made their design and construction processes more efficient. If the team wanted to achieve the benefits (financial, time, quality) of using BIM, all project members needed to be using BIM processes. Team members using CAD and/or paper processes clearly disrupted the efficiency of a BIM process.

Their BIM dependence began defining BIM mandates. All project participants, from design through construction, must demonstrate a proven record of BIM literacy, proficiency and competency.



*Skanska USA Building Inc., 2013 – MEP Systems Racks  
 Building Blocks: Offsite Prefabrication Saves  
 Time and Money  
<http://www.tradelineinc.com/reports/2013-11-building-blocks-offsite-prefabrication-saves-time-and-money>*

Here are just three ways a project firm may measure a contractor's BIM competency:

- A portfolio of past BIM-project deliverables.
- References. Who can vouch for the contractor's successful BIM-project team collaboration?
- Who are the contractor's BIM-qualified project leaders and what are their credentials?

More facility owners are contractually mandating BIM deliverables for their FM Department. Design and construction firms that lack BIM competency face the easy choice of being disqualified from the project team.

Global contractor Balfour Beatty issued a statement in December 2012: "We are trimming our supply chain companies from 15,000 to 10,000 over the next year. BIM proficiency will serve as the 'qualifier' to remain in Balfour Beatty supply chain."

How can contractors and subcontractors participate on these projects without BIM competency and proficiency? They can't.

*>> Continued on Page 12*

## <sup>▲</sup> BIM FOR CONSTRUCTION NOW EXCEEDS BIM FOR DESIGN

Based on McGraw-Hill's 2012 survey, "Business Value of BIM in North America," the construction market sector is the leader for using BIM processes. The survey reports that growth of BIM has created opportunities to integrate BIM with several other project delivery processes. Together, they're helping contractors to reduce construction time, improve project quality, provide labor savings, while increasing worker safety.



McGraw-Hill SmartMarket Reports compiled three (2013) BIM construction-integration reports:

**The Business Value of BIM for Construction | How Contractors are Driving Innovation with BIM**

<http://bradleybim.com/2014/01/10/download-mcgraw-hill-business-value-of-bim-for-construction-report>

**Lean Construction | Leveraging Collaboration & Advanced Practices (BIM) to Increase Project Efficiency**

<http://bradleybim.com/2013/11/24/download-mcgraw-hill-lean-construction-bim-report-2013>

**Information Mobility | Improving Team Collaboration through Mobile Project Information**

<http://bradleybim.com/2013/12/18/download-mcgraw-hill-smartmarket-report-information-mobility-bim>

McGraw-Hill's BIM reports are over 50 pages of easy reading. They incorporate project case study snippets, project managers' quotes and basic value statements of time savings, improved quality and reduced construction time.

"We are no longer discussing IF the BIM process is feasible for HVAC and plumbing contractors. Various contractors working on hundreds of projects have proven and continue to prove the multiple options for reaping the rewards of the BIM process"

- Daniel Hughes

## BUILDING BLOCKS: OFFSITE PREFABRICATION SAVES TIME AND MONEY

HVAC and plumbing subcontractors incorporate BIM components with their prefabrication software which spools the model data to sheet metal and piping fabrication equipment. MEP Systems Racks are prebuilt offsite and then trucked to the facility. Skanska defines this process as Multi-Trade Prefabrication (MTP); that is completed in Offsite Construction Facilities (OCF).

BIM software verifies there is enough room for all MEP systems to "fit" into a space; like a hallway ceiling. However, it may be impossible to efficiently "fit" all the required trades' people and equipment into the space to install the systems. MEP BIM components include

"clearance boxes" around MEP equipment service areas; to maintain "open space" around those areas for future access by the Operations & Maintenance Department.



## Turner Construction: Safer, Faster MEP Hanger Inserts Installation Process

Turner Construction is using a BIM-based construction process that delivers a dramatically faster process for installing MEP hanger insert, while providing a substantially safer work environment for construction workers.

The BIM process has enabled subcontractors to connect geographically-positioning (GPS) technology and BIM facility files to create a way-finding, installation system. Turner teams collect hanger point locations from the GPS coordinated BIM file (in the office) for layout in the field.

Traditionally, MEP hanger inserts were installed from the underside of the deck; after the concrete topping was poured. We used a ladder (less safe), drilling up into the underside of concrete. One worker could install approximately 20 holes a day.

The GPS\BIM-enabled process empowers a crew of three workers to install (from top of metal deck and walking with no ladder needed—safer) 750 hanger inserts\day.

Installation is much faster and safer – simply walk to a hanger insert location using the GPS device and screw in the threaded rods for pipe hanger racks, cable tray, electrical conduit racks, etc.

This is an excellent example of a time-saving, safer, and more efficient process to install 100,000-plus hanger inserts into metal deck before concrete topping is poured.

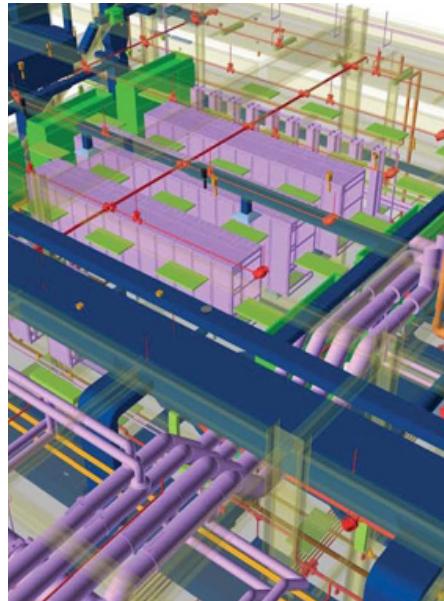
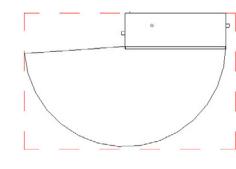
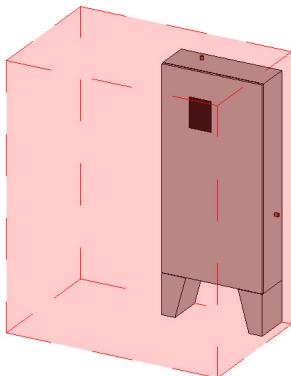


Image Courtesy of Skanska USA Building Inc., 2013

Image Courtesy of Turner Construction

This BIM file of a Tankless Water Heater has a clearance box that represents the clearance required to open the door to service the heater once it has been installed.



Images Courtesy of  
Bradley Corporation  
<http://bradleybim.com>

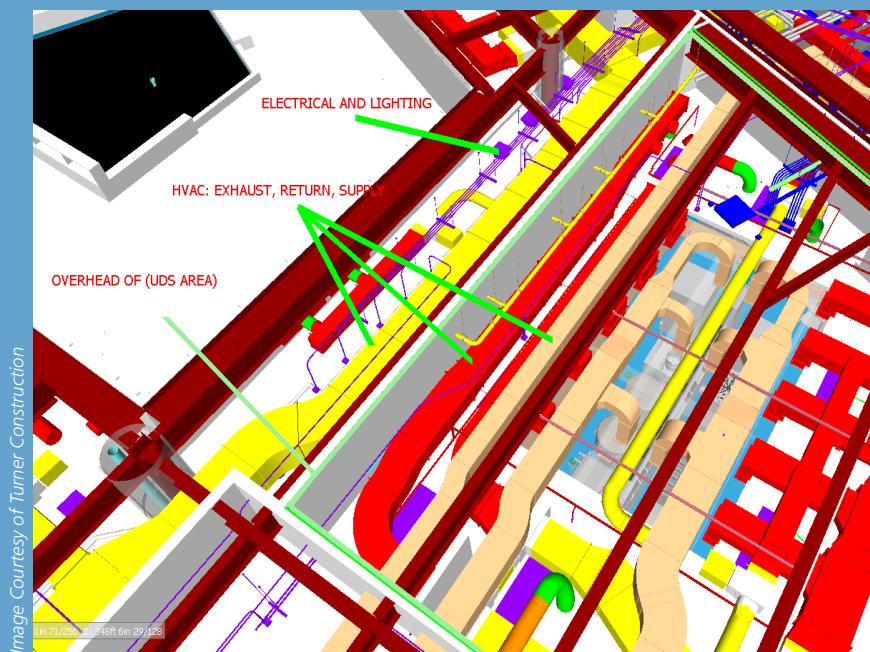
BIM helps create a Bill of Materials (BOM) of parts and fabricated components. The BOM with assembly drawings will be sent to the contractor's fabrication floor. There, the MEP Systems Racks are more easily and safely assembled on the ground using a manufacturing methodology. Trades' people are working in an environmentally-controlled building that uses Lean & Green Manufacturing processes. The systems are inspected, tested, labeled and tagged prior to being shipped to the construction site for final installation. □

*Daniel Hughes serves as Bradley Corporation's BIM Strategist. He manages the global Bradley BIM Initiative that provides 1,000 efficiently-modeled Revit families to architects, engineers, contractors & owners.*



*Portions of the library now include product in Vectorworks and Bentley model formats. Since 2002, Daniel has provided Revit training to 700 professionals, transitioned 130 firms to Revit with written implementations plans and served as Senior Revit Consultant on \$5 billion of global client projects.*

Image Courtesy of Skanska USA Building Inc.



#### Navisworks | File-Neutral BIM Viewer

MEP Contractors use BIM-authoring software to create BIM files for design, prefabrication and construction. Contractors also use a BIM file-viewing tool called Navisworks. It is a "file-neutral" BIM file viewer that allows contractors to view BIM model files from several BIM software packages.

Project BIM files may have been created in Autodesk Revit, Bentley Microstation, ArchiCAD, TEKLA, Vectorworks, AutoCAD 3D or Autodesk Civil 3D file formats. The MEP contractor links the various discipline specific BIM files together (HVAC, electrical, architectural, structural); to create a fully coordinated facility model.

Navisworks analyzes the coordinated facility model and verifies that MEP content is not interfering with other BIM building components.

For example, Navisworks verifies the sprinkler heads are not occupying the same space as a light fixture. It verifies the hot water pipe is not running through a column. Both of these examples help coordinate the plumbing design and construction process "in the computer" prior to onsite construction.

Navisworks' automated "interference detection" between the trades' models includes "3D mark-up" tools for enhanced communication between the designer & contractor.