
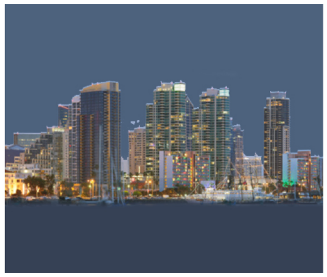

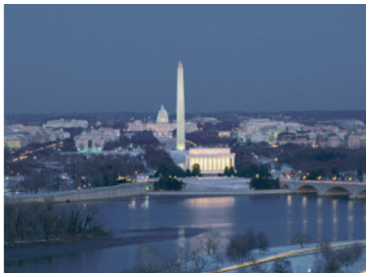

THE BROAD DIMENSION

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tbd consultants

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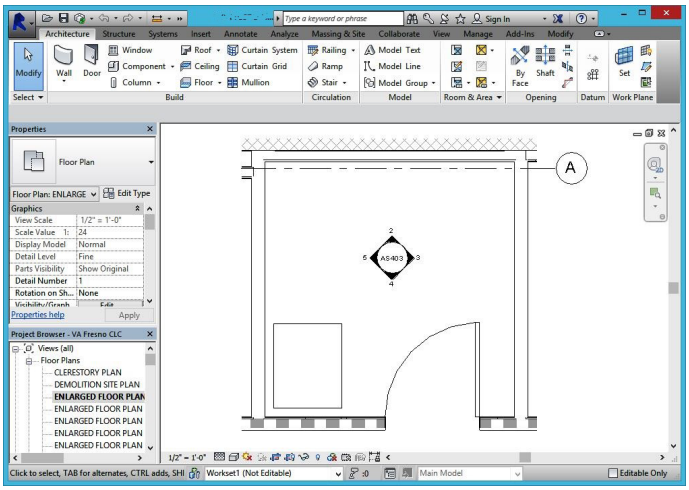
In this Edition:

Pluses and Minuses of BIM

BIM can stand for the Building Information Model itself, and for the process that produces it, Building Information Modeling, and BIM is a new way of creating designs. It maintains the information not as lines on a sheet, but as records in a database, and plans, elevations, perspectives, etc., are simply views of that data. The information in the model is not just digital, it is computable, meaning that the objects carry information about what they represent, and that information can be utilized elsewhere. Consequently, changing anything in any view will change the same and associated objects in another view, and the information remains coordinated and consistent.

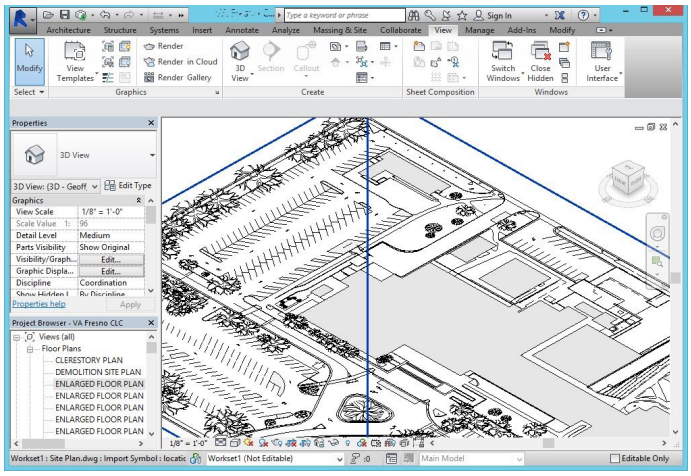


Being a new process, it impacts the way you work, not just the tools you use. It also affects the way you interact with other members of the design and construction team outside of your company. The results of early collaboration between

design disciplines are seen as one of the major benefits of the process. BIM also enables swift comparisons between design options, and the scheduling of material quantities helps speed the assessment of cost for different options.

BIM can mean additional work at early design stages, but it can save considerable amounts of time later in the design process, and results in fewer RFIs and change orders. But if you do a lot of early conceptual design work that doesn't progress to construction, you may not see much benefit in it – unless the visualization and presentation opportunities of BIM help you move the projects forward into design.

The BIM data allows the software to produce schedules, 3D renderings of the interior and exterior, and even walk-throughs of a project, as well as the traditional plans, sections, and elevations. As such, the design work can be more economical because there is no need for a team producing large construction document sets, when those can be generated automatically from the BIM. So we have faster drafting, and faster delivery. It also allows the building owner to better see what is being proposed, and to decide whether the design really meets his or her needs. This can save time and money by avoiding costly changes later in design or even when the project is in construction.



BIM leads to increased coordination and collaboration, and while collaborating is good and should make projects run smoother and be more predictably, seldom are all consultants working directly on the same model. They are often using different software and their own models, and then someone has to bring all the information together and coordinate it. Even within the architect's office, there will probably be several designers working on the model, and a change made by one has the potential of affecting work that has been done by others. A good system for monitoring changes and authorizing them needs to be in place. Who is responsible for any particular section of the building gets blurred when various parties, even materials vendors, may be supplying input to the model. States often require a licensed architect and/or engineer to take responsibility for a design by placing their seal on the drawings, but when those drawings are produced by BIM software that could have been manipulated by anyone on the team, licensed or not, is the ultimate responsibility really clear?

The cooperation required by BIM assists teams to engage in different contractual relationships, such as Integrated Project Delivery (IPD). Both BIM and IPD work best with early collaboration between the various disciplines, leading to better informed decisions on the project. Sharing information should result in reduced overall risk to the project, but might add to the risk carried by participants in the BIM process.

The person leading the BIM team needs to be able to communicate clearly with all members of the team, assigning appropriate roles and responsibilities. The coordinator must also be well acquainted with the capabilities the company's own BIM software, as well as those used by other consultants, since everything is going to be brought together. The idea of everyone using the same BIM system might sound good, but a system designed for one discipline is not necessarily ideal for another.

Sharing information between different BIM software can be achieved by using IFCs (Industry Foundation Classes) which uses an open format developed by buildingSMART and is designed to facilitate interoperability between AEC (architectural, engineering and construction) design software. COBie is another format for exchanging information, as is gbXML (Green Building XML), but any such exchange relies on how well the process is implemented in both the exporting and the importing software.

Traditionally, contractors have been protected from claims for faulty construction if they can show that they built it in accordance with the design documents (the Spearin Doctrine), but the BIM collaboration process could erode that protection. Individual rights and responsibilities can be hard to determine in an environment where everyone has their input.

The use that the information in the building model may be put to can range well beyond the bidding process, even to

being used to directly control aspects of construction, and on into the final use of the building. The legal responsibilities of the designers are not always clearly defined in these situations where design and fabrication are so closely intertwined. The era of the architect/builder seems to be returning by default.

The BIM data can also be used for tasks such as environmental/sustainable-design and energy analyses, structural analysis, construction simulations, and simulation of the building in use or in an emergency (such as a fire).

The model can let you step through the construction process (assuming you have schedule information incorporated), and check for conflicts between structure and MEP work, leading to less rework in the field. Clash detection is seen as one of the main benefits of BIM, and CIFE (Stanford University Center for Integrated Facilities Engineering) reports that up to 10% saving are achieved through clash detection, as well as up to 7% reduction in project time. Others have reported even larger savings. It often helps to have the construction team involved with building the model during the design stage, rather than bringing design to completion and then selecting the contractor through the bidding process, as the former can result in less constructability issues.

BIM data can be used for actual construction processes by controlling construction equipment, such as fabrication of components, or automating the site grading by using computer-controlled GPS-equipped excavators that are accessing the BIM grading information.

BIM data can contain information useful for facility management, such as specifications for replacement parts, maintenance information, and instructions for start-ups and shut-downs. Operational costs are quoted as being between four and ten times the original construction cost, so the potential for savings is significant.

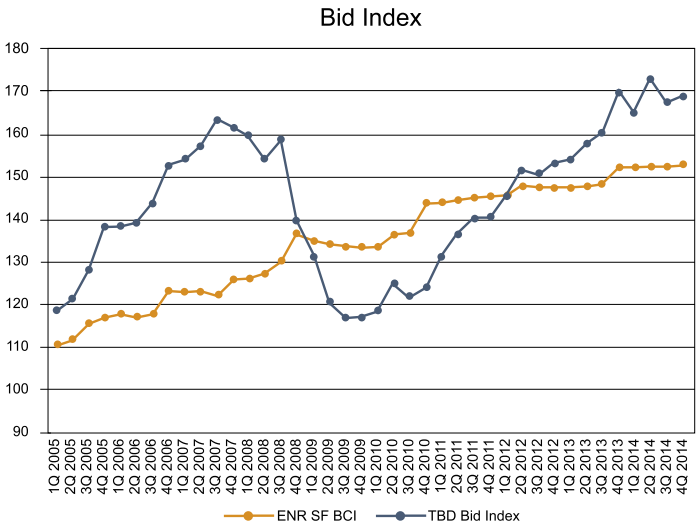
There are legal issues related to the ownership of the model and its data. The owner is paying for the model and they will have heard that it can be useful for facility management, but it may contain proprietary information related to one of more of the design team members. The design team were also probably only considering the bidding and construction of the project when preparing the model, so the question of the reliability of its use for other purposes needs to be considered, as well as any resulting potential liability.

BIM has arrived, and is only going to become more pervasive, but this new way of working does bring some practical and legal issues with it, that still need to be worked through.

Market at 2015

A decade ago, back in 2005, all sections of the construction industry were booming, and while growth slowed a bit during 2006 and 2007, things were still looking rosy. The sub-prime losses that emerged in 2007 might have been troubling, but if you weren't directly involved, they didn't seem worth worrying about. Things may not have been looking as good in 2008, but it wasn't really until the collapse of Leyman Brothers in September 2008 that everyone sat up and paid attention. Then 2009 saw the bottom fall out of the the construction market. The US National Bureau of Economic Research declared that the recession had begun in December 2007 and ended in June 2009, but different industries were affected at different times, and the recovery has been so slow that even now some still have difficulty believing it is really over.

But the reality is that here in the US confidence is back, and employment is picking up steadily, with the result that more money is flowing in the market. The construction industry has been benefitting, as indicated by the positive



trends showing up in the Architectural Billings Index. The potential dark clouds hovering on the horizon are almost exclusively from abroad, such as the turmoil in Ukraine and the Syria/Iraq region, and the disappointing economic situation remaining in Europe. But happily Europe just managed to avoid dropping back into recession.

The current labor and material escalation in the US construction market is around 3% to 4% based on projected labor rate increases and known material increases. This is anticipated to hold for the near future.

During the recession and its aftermath (2008 through 2011/2012) the construction industry lost a lot of its labor force to other professions. As the construction industry is picking up, skilled labor that was previously in the construction industry is not returning. As a result, the skilled labor shortage is anticipated to be a main driver for subcontractor profit margins over the next 5 years or so.

Some recent materials spikes have been in glass, lumber, and structural steel. Overall average increases in material prices have been in the 3% to 4% range (as with labor), but spikes in individual material prices are inevitable. China continues to consume large amounts of construction materials and affect the supply of materials, but that nation has been experiencing a slowdown recently, which should ease pressure on the material supply.

Profit margins have increased over the past 3 years at a steady rate. As skilled labor shortages become more prevalent, profit margins are going to increase more subsubstantially, and in some markets they are already doing so. Currently there is sufficient 'high profit' work available, with the result that less attractive work (such as complicated renovations) is likely to have problems getting bidders, and those that do bid the work can be expected to increase their profit margin above normal.

The largest risk item in the current market is this shortage of skilled labor. While this is already affecting the market to a noticeable degree, the level of construction work is not back to pre-recession levels yet, so the effect is not consistent across markets. However, any project that is seen as problematic in any way can be expected to attract high bids.

Geoff Canham & Michael Teggin, TBD Consultants

What is a ZEB?

ZEB stands for Zero Energy Building, but that can mean different things to different people.

What might be considered to be the ultimate ZEB is an off-the grid building. This generates enough energy to keep the building operational, and needs to incorporate some means of energy storage for periods of time when the solar or wind-powered sources are not available. Since one of the goals of having a ZEB is to be kinder to the environment, the use of diesel-powered generators would definitely be frowned on.

At the other end of the spectrum would be a ZEB that gets all its power from the electrical grid, but contracts to get the power from 100% renewable resources.

Others produce power from renewable sources on site, feeding power back into the grid during times when they are producing a surplus, and relying on power from the grid at other times. If they put at least as much power into the grid during times of surplus as they draw out at other times, they can say they are Net-Zero. How that calculation is made can vary, from straight wattage to making allowance for losses during production and transmission, and the question of the source of the power taken from the grid (whether it is renewable, non-polluting, or not) may or may not be considered.

Other assessments might take into account the cost of the energy, offsetting the cost of power taken from the grid with the cost of power drawn from it.

But whatever definition is used, and whatever political motivation is behind it, the end result is a more sustainable environment that is also friendlier to the planet and to the life on it, so we won't argue semantics too much.