

What's a Structural Engineer to Do?

The Collaborative World of Building Information Modeling and Integrated Project Delivery

By David J. Hatem, PC and Sue Yoakum, Esq., AIA

Building Information Modeling (BIM) and Integrated Project Delivery (IPD) are relatively new concepts that are generating a significant amount of interest with owners, designers, engineers and contractors. The implementation of these new concepts requires the members of the design and construction industry, including owners, to work together more than ever and establish common goals, risk allocation and insurance options.

At this time, almost everyone in the design and construction industry understands BIM is a drawing tool used by design professionals with structural engineers at the forefront, and contractors to draw/model the project prior to construction. BIM has been defined as "a digital representation of physical and functional characteristics of a facility," by the National Institute of Building Sciences *Model Standard 22* (2007). BIM may be used in a variety of applications, including:

- 1) design visualization and comprehension,
- 2) structural analysis,
- 3) energy analysis,
- 4) preparation of design drawings,
- 5) systems coordination,
- 6) constructability reviews,
- 7) "4D" scheduling and sequencing, and
- 8) layout and field coordination.

IPD is an approach to project delivery in which major project participants (minimally, the owner, design professional and constructor, and potentially, lower-tier design and construction participants) execute a single contract under which they agree to collaborate in the design development process and, to a degree, share economic risk associated with design and construction. For projects where the structural design is complicated and the structure is a substantial portion of construction costs, the structural engineer should have a "seat" at the table to assist in the critical decisions.

Advantages Associated With the Use of BIM and IPD

The use of BIM on a project allows for simultaneous collaboration, interaction and integration among project participants in the planning, design, fabrication, construction, operations

and maintenance processes. Among other things, the use of BIM allows the contractors and subcontractors to understand and make early decisions relating to means and methods, and accurately report to the owner and designers ease of construction and construction costs. Certain designs are more expansive and complicated than others and an early understanding of this during design will assist in making informative design decisions.

Potential advantages associated with the use of BIM include:

- Improved spatial program validation
- Enhanced ability to visualize and comprehend designs, complicated details and sequences
- Better coordination and timely detection of conflicts and clashes
- Improved design details
- Compression of the design period
- Real-time identification and resolution of potential fabrication and constructability issues prior to start of construction
- Identification and resolution of design questions prior to start of construction
- Greater communication and collaboration among owners, designers, constructors, suppliers and other lower-tier project participants

Potential advantages associated with the use of IPD include many of the BIM advantages listed above, plus potential alignment of project interests and sharing of profits and risks.

Standard Form of Agreements for Use on BIM and IPD Projects

Today, there are standard forms of agreements available from the American Institute of Architects (AIA) and ConsensusDOCS® for use on IPD and BIM projects.

AIA Documents

Below is the list of AIA agreements available for use on IPD and BIM projects.

- C191-2009, *Standard Form Multi-Party Agreement for Integrated Project Delivery*
- C195-2008, *Standard Form Single Purpose Entity Agreement for Integrated Project Delivery* and companion agreements



- E202, 2008, *Building Information Modeling Protocol Exhibit*
- E201, 2007, *Digital Data Protocol Exhibit*

ConsensusDOCS

Below is the list of model ConsensusDOCS agreements available for use on IPD and BIM projects.

- ConsensusDOCS 300, *Standard Form of Tri-Party Agreement for Collaborative Project Delivery*
- ConsensusDOCS 301, *Building Information Modeling (BIM) Addendum*

For IPD projects, AIA has two forms of Agreements. In 2008, AIA released the C195-2008 and subsequent agreement for use in forming a single purpose entity to deliver an IPD project. In November 2009, AIA took another approach to IPD projects and released the C191-2009 *Standard Form Multi-Party Agreement for Integrated Project Delivery*. This multi-party approach is the more common approach for IPD projects. The C191-2009 agreement envisions the Owner, Design Professional(s) and Contractor(s) executing this agreement, a minimum, but additional parties can be added depending on project needs. For projects with a unique structural design, the structural engineer may prefer to be a party to the agreement.

C191-2009 is unique from other IPD agreements in that it allows the parties to enter into an agreement prior to defining all the project parameters. This is a good approach because in order to understand the project and risk allocations, the project parameters, design, schedule and costs needs to be understood at the basic level. There are four exhibits to this Agreement: Exhibit A, *General Conditions*; Exhibit B, *Legal Description of the Project*; Exhibit C, *Owner Criteria*; and Exhibit D, *Target Criteria Amendment*, the most important and

probably the Exhibit that will take the longest to complete is with an additional seven exhibits to complete. Exhibit D is anticipated to be completed over time and added to the Agreement by amendment.

In order to define the *Target Criteria*, seven exhibits need to be completed: Exhibit AA, *Target Cost Breakdown*; Exhibit BB, *Project Definition*; Exhibit CC, *Project Goals*; Exhibit DD, *Integrated Scope of Services*; Exhibit EE, *Project Schedule*; Exhibit FF, *Digital Data Protocol Exhibit* based on the E201 2007 agreement; and Exhibit GG, *AIA E202 BIM Protocol Exhibit*.

The intent of both AIA IPD Agreements is to create a collaborative environment in which to deliver the project. These agreements include provisions that address, among other things; risk sharing, waivers of claims, waiver of consequential damages and subrogation claims, indemnifications shared project incentives and goals, and identifying a project neutral to assist with dispute.

AIA Document E202™ – 2008 *Building Information Modeling Protocol Exhibit* is the AIA's standard form of agreement for use on BIM projects. This document is an exhibit and is intended to be attached to any AIA agreement. E202 could be used as an exhibit with other agreements, after careful review and modification. This BIM exhibit primarily focuses on specific responsibility for the development of each BIM element; it assumes traditional project roles and responsibilities, and risk allocation.

ConsensusDOCS takes a different approach to their IPD agreement and does not require or promote the establishment of a Single Purpose Entity Agreement (SPE). ConsensusDOCS 300; *Standard Form of Tri-Party Agreement for Collaborative Project Delivery* is a tri-party approach which embraces the idea that, in order for all the parties to be on the same page, all parties sign one agreement. This agreement establishes a "Collaborative Project Delivery Team". Members include the owner, designer, and constructor collaboratively making decisions relating to design, costs and schedule. Other articles include:

- Article 3 allows the Parties "to release each other from any liability at law or in equity for any non-negligent act, omission, mistake or error in judgment, whether negligent or not, acting in good faith, in performing its obligations under this Agreement except to the extent such act or omission amounts to a willful default of an obligation under this Agreement."
- Article 3 *Traditional Risk Allocation* states each Party shall be fully liable for

its own negligence.

- Article 11 *Incentives and Risk Sharing* establishes both a financial incentive program for the sharing of project cost below the Project Target Cost Estimate (PTCE), as well as sharing of losses.
- Article 11.5 provides that, in the event that the actual cost of the Project exceeds the PTCE, excess will be borne by the Owner.
- Article 21 *Indemnity, Insurance, Waivers and Bonds*, under Article 21.1, owner, contractor and designer each agree to indemnify and hold each other harmless to the extent caused by the respective negligent acts.
- Article 21.3 requires the design professional maintain professional liability insurance for negligence.

The ConsensusDOCS 301 *Building Information Modeling (BIM) Addendum* defines roles and responsibilities, and risk allocation, in a fairly traditional manner. This BIM addendum addresses and focuses on the management of electronic information.

Insurance Coverage for IPD and BIM Projects

As a general matter, insurers underwrite the risk of insuring only *legal* conduct. Insurance concerns that should be discussed and addressed prior to entering into an IPD contract, including:

- A design professional's liability exposure may be increased if other project participants to whom design

responsibility is distributed do not maintain adequate, or any, insurance coverage for defective design.


- If design responsibility for permanent project work will be delegated to contractors and trade subcontractors, they should have adequate professional liability insurance.
- In instances in which insurance coverage for defective delegated design is not maintained by the constructor, trade subcontractor, or specialty designer, the design professional's professional liability insurance is often called upon to defend and indemnify.

Conclusion


Integrated Project Delivery may not be the right project delivery approach for every project. At a minimum, design professionals need to know associated risks, professional liability and insurability issues related to IPD projects. BIM continues as the appropriate drawing tool for every project, no matter how big or small. ■

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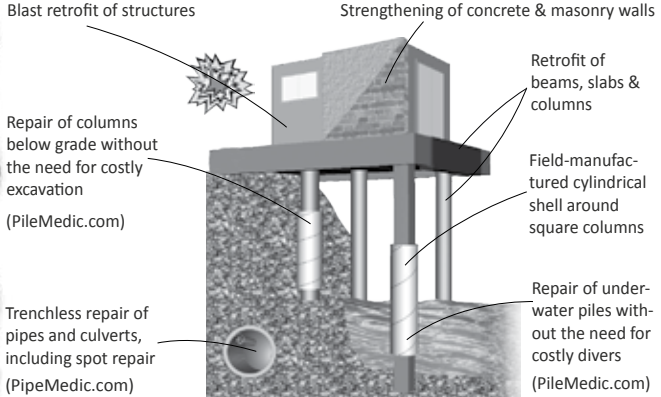
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