

# BIM Me Up, Scotty – Navigating Risk in Digital Practice

by James B. Atkins, FAIA & Andrew D. Mendelson, FAIA

## 2021 Update

Since we first BIM'd up a few years back, 3D modeling technology has held its own. Usage continues to move steadily forward, and several states have initiated BIM mandates for public work. The 2020 AIA Firm Survey Report indicates that BIM software is now in use in 100% of large firms, 88% of medium sized firms, and 37% of small firms, measurably up since the initial publication. Global BIM market size is projected to grow from \$4.5 billion in 2020 to \$8.8 billion by 2024. So, our suggestion still holds that if you plan to practice architecture these days, it's time to get with your IT Group and start building your BIM transporter, if you haven't already.

BIM has many benefits in the design and construction process including enhanced visualization and building performance analysis (energy, lighting) to promote better understanding and thus informed decision-making by owners and users, improved coordination amongst design disciplines to enhance document quality, enable virtual design and construction to guide logistics and constructability, reduce changes and improve efficiency in construction, and even facilitate strategies for prefabrication and rapid prototyping. BIM is most successful when planned and implemented in a collaborative manner across the project team.

But what about the risks? The AIA Trust measures the market each year at the Professional Liability Insurance carrier fall interviews, and thus far there has been no proliferation of BIM claims or lawsuits. But risk management is about preemptive actions, so now is the time to look at how potential BIM risks can be managed.

This paper will address BIM practice and quality management standards that can be beneficial in managing risks in your approach to digital practice as you pursue the business of BIM. Discussions will key off the 2013 AIA Digital Practice Documents as well as others.

## What is BIM?

The National Institute of Building Sciences (NIBS) defines BIM as, “a digital representation of physical and functional characteristics of a facility. As such it serves as a shared knowledge resource for information about a facility forming a reliable basis for decisions during its lifecycle from inception onward.”

Accordingly, this digital database contains much more information than text and lines. Rather, it can render intelligent data which includes product data and other specification information, 2D drawings, 3D images, image animation, and elements of time/scheduling (known as 4D) and cost elements (known as 5D).

The data for 4D and 5D are typically produced by the contractor. For the purpose of this white paper we will address BIM only as it relates to the products of service produced by architects and their consultants (3D) whose responsibilities do not include time/scheduling or cost data.

Since we call building information modeling BIM, the term “BIM model” may appear redundant to some. However, for clarity we will refer to the “BIM model” when we address the 3D model in this paper.

## **BIM Planning**

Since it is more efficient for all members of the project team to be working on the same BIM model, it makes sense to first get everyone on the same page. This can be managed with a planning document referred to as a *BIM Execution Plan* or a *BIM Protocol Manual*.

The intent of the BIM Execution Plan (BIMEXP) or BIM Protocol Manual is to provide a framework that will allow the owner, architect, engineers and contractors to undertake BIM technology in a collaborative manner to enable faster and more cost-effective project delivery. Naturally, when this can be accomplished, management of risks are improved as well. Many organizations who have subscribed to BIM project delivery have developed their own internal management document. A BIM Protocol Manual prepared by the firm Ayres Saint Gross is available with this paper (<https://bit.ly/3nkfgqP>).

The plan establishes a baseline of services and expectations of those involved in development of BIM for a project. It addresses the intended and allowable use of the model and establishes guidelines and protocols for file sharing and other elements of work flow within the project team. The plan can include collaborative process mapping in the form of a narrative matrix that describes the activities of the owner, architect, engineers, contractors and even the commissioning agent from Conceptualization/Program of Requirements through design, agency coordination/buyout, construction and facility management as applicable to the project.

The plan typically includes a Model Element Table – Level of Development (LOD) which addresses the level of development of BIM components and deliverables and the points which design consultants and contractors will be engaged.

An excellent example of a document used to develop the Model Element Table is the *Level of Development Specification* (see <http://bimforum.org/lof/>). This specification, which is updated on an annual basis, utilizes the basic LOD definitions developed by the AIA for AIA Document G202-2013, Building Information Modeling Protocol Form, and it is organized in CSI Unifomat 2010.

The LOD Specification “...defines and illustrates characteristics of model elements of different building systems at different Levels of Development. This clear articulation allows model authors

to **define what their models can be relied on for**, and allows downstream users to clearly understand the usability and the limitations of models they are receiving.”<sup>1</sup>[Bold added]

Levels of development are defined in the LOD Specification to establish a clear limitation on the complexity of the completed model. An abbreviated narrative description of the “Fundamental LOD Definitions” are:

LOD 100 – Massing, including location and orientation
LOD 200 – Generalized systems or assemblies, approximately quantified and located
LOD 300 – Specific assemblies, accurately modeled
LOD 350 – 300 combined with other building systems
LOD 400 – Specific assemblies, accurately modeled and detailed so as to be suitable for fabrication
LOD 500 – Accurate, as-constructed actual assemblies

The LOD Specification may also provide graphic depiction of the Model Element definitions. A more precise level of detail is established through images representative of the level of intended completion of the details in the model.

The objective of establishing a clear definition of the Model Elements is to allow for independently generated details from the various design disciplines (and from trade contractors if they are involved in pre-construction) that have the same level of completion and complexity and will effectively work together as a unified Building Information Model. From a risk management standpoint, the definition establishes finite service deliverables and responsibilities as well as a consistent expectation among the team players.

The BIM Execution Plan should also include a File Naming Structure for each individual model file, narrative descriptions of Analysis Models, and a description of the Clash Detection Process. The more that can be defined and described in the BIM Execution Plan, the less likely for a misunderstanding or a failed expectation.

Numerous guides and descriptions are available such as that offered by Penn State University, available at <https://bim.psu.edu/>.

### **AIA Digital Practice Documents – 2013**

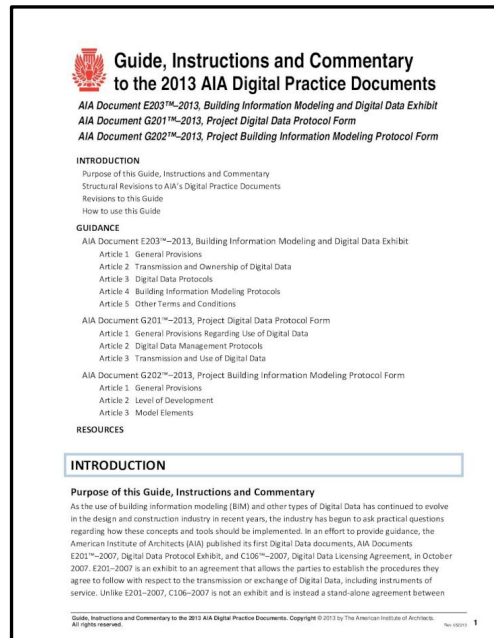
The documents developed by the AIA for digital practice are the result of an evolving practice model that was initially launched with documents published in October 2007. The AIA closely monitored digital practice initiatives, and in 2013 it published updated digital practice documents more representative of current practices. The 2013 Digital Practice Documents are:

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<sup>1</sup> 2020 LEVEL OF DEVELOPMENT SPECIFICATION, BIMFORUM, December 2020.

*AIA Document E203-2013, Building Information Modeling and Digital Data Exhibit*  
*AIA Document G201-2013, Project Digital Data Protocol Form*  
*AIA Document G202-2013, Project Building Information Modeling Protocol Form*  
*AIA Document C106-2013, Digital Data Licensing Agreement*

In addition to the contract documents, the AIA Documents Committee published the *Guide, Instructions and Commentary to the 2013 AIA Digital Practice Documents*. The Guide is free to everyone and available for download at <http://acdpages.aia.org/DigitalDocuments.html>, OR <http://www.aia.org/groups/aia/documents/pdf/aiab095711.pdf>. At 63 pages, the Guide is very comprehensive and explains background, commentary and document instructions. It is a good resource for learning about BIM and the AIA digital documents, and it is suggested that you download it on your laptop, tablet or PDA and treat it like your favorite novel.



If you are just becoming acquainted with digital practice, be cautioned that it is a detailed and complicated process because it is new and developing design technology. There are numerous avenues of approach, and no one specific project delivery approach has been established nor known cases tested in the courts. Nonetheless, it has been forecast that BIM will soon become the central platform for design, construction and building operation in our industry.

To begin, we will review the purpose and use of the AIA digital documents.

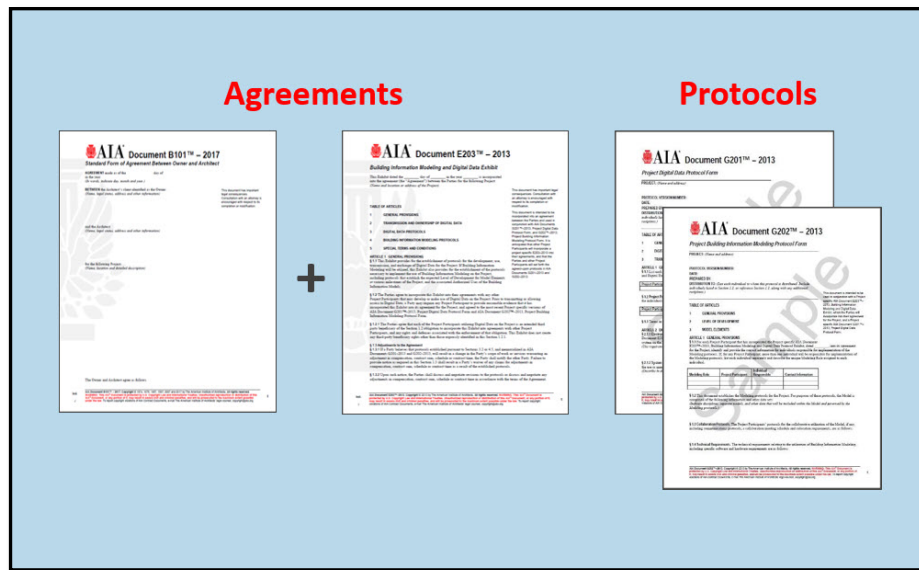
### ***AIA Document E203-2013, Building Information Modeling and Digital Data Exhibit***

This is an exhibit to be attached to an existing or new professional services agreement such as B101 and C401 referenced above or a properly drafted non-AIA owner-architect or consulting

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agreement. It is not tied to the AIA documents, and it is not a stand-alone contract. This document is intended to accomplish the following:

- Establish parties' expectations for use of digital data and BIM modeling on the project
- Provide a process for developing detailed protocols and procedures for data use
- Requires implementation of document *G201-2013, Project Digital Data Protocol Form*
- Requires implementation of document *G202-2013, Project Building Information Modeling Protocol Form*



While it is intended to be utilized as an exhibit to the professional services agreement at project inception, it can also be incorporated into an existing AIA agreement using *AIA Document G701-2001, Change Order*, *AIA Document G802-2007, Amendment to the Professional Services Agreement*, or *AIA Document G803-2007, Amendment to the Consultant Services Agreement*.

It is important to remember that documents G201-2013 and G202-2013 are not agreements and are not signed by the participating parties. They are only project forms used to document the digital data and BIM protocols once they have been agreed upon. Accordingly, it is important that they be monitored and managed the same as, for example, an updated specification section would be, to be sure that the participants have accepted and agreed to the latest version.

### ***AIA Document G201-2013, Project Digital Data Protocol Form***

This document is intended to accomplish the following:

- To be used with AIA Document E203-2013, Building Information Modeling and Digital Data Protocol Exhibit
- Documents the agreed-upon protocols and procedures governing transfer and use of electronic communication and non-BIM data by all parties

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- Does not speak to issues addressed in G202-2013
- Intended to be updated as needed

#### AIA Document G201-2013, Article 3, Transmission and Use of Digital Data

The reality of the digital age is that virtually every project communication can be transmitted and used in digital form. Agreements, meeting agendas and minutes, requests for information and basic communications texts and emails, those things that used to spill out of our filing cabinets as paper documents, are now primarily in electronic form. They can be much more difficult to manage and control. Article 3 is intended to identify the digital data that will be transmitted and used on the project.

The proper handling of digital documents and data is a risk management reality for every architect's office regardless of the level of its use of 3D modeling or an advanced collaboration or alternative project delivery method. A firm's electronic document management protocol and methodology is an important practice standard; to disregard is to disengage.

#### ***AIA Document G202-2013, Project Building Information Modeling Protocol Form***

This document is intended to accomplish the following:

- To be used with AIA Document E203-2013, Building Information Modeling and Digital Data Protocol Exhibit
- Documents the agreed-upon protocols and procedures governing development, transfer and use of BIM models (consistent with the BIM Execution Plan)
- Establishes model development at the five levels addressed earlier in this white paper
- Authorizes use of model content at each level of development
- Assigns authorship and responsibility of each model element by project milestone
- Defines extent to which model users may rely on model content
- Clarifies model ownership
- Sets forth BIM standards and file formats.

#### ***AIA Document C106-2013, Digital Data Licensing Agreement***

If no AIA agreement such as B101 or C401 is being used or no alternate agreement that contains conditions for licensing, *AIA Document C106-2013, Project Digital Data Licensing Agreement* can be used. This document serves as an agreement between two parties for the licensed use and transmission of digital data, including instruments of service. If C106 is used, exercise care to define usage rights for the BIM or any other digital data.

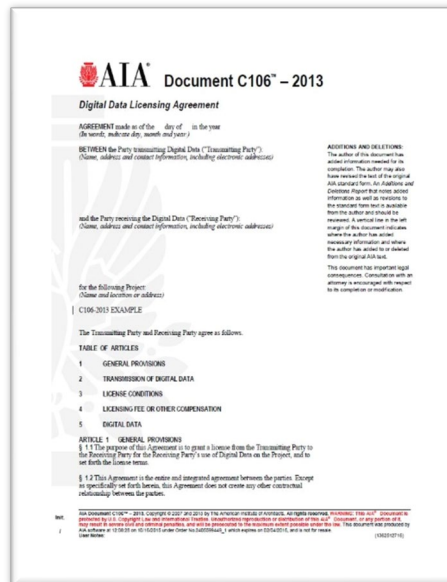
It is intended to accomplish the following:

- Grants a limited non-exclusive license to use the digital data
- Sets procedures for transmitting the data

- Places restrictions on the license granted
- Indemnifies the model author
- Allows for collection of a licensing fee

Use this document when you need to send digital data to someone where there is no existing agreement. *Take care to define the terms of use in this licensing agreement.* You do not need to use this document if you have entered into an AIA owner/architect or architect/consultant agreement such as B101 or C401, or an owner/contractor standard form agreement that incorporates AIA Document A201-2017, General Conditions of the Contract for Construction. These agreements already provide licensing terms.

However, to establish the protocols and procedures to govern the development, use transmission and exchange of the digital data, in short, to manage your risks when handing over something as important as a BIM model and control its use, you should incorporate *E203, Building Information Modeling and Digital Data Exhibit*, and *G202-2013, Project Building Information Modeling Protocol Form*, into your agreements to define the limits of the licensed granted.



## Mind the Model: An Architect – Contractor BIM Sharing Agreement

The level of development (LOD) of the BIM model determines how the model can be used. Architects should be careful in defining the terms and conditions of this use in E203 and G202, particularly when sharing the model outside the design team. The model has significant value as information for the contractor such as for estimating, logistics and trade coordination. However, in the current state of the industry, the model is not typically considered to be developed to the extent that it can be relied upon the same as signed and sealed construction documents.

In circumstances where the model is conveyed only as supplementary information and for convenience without reliance on the model content, Berkley Design Professional, a professional

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liability insurance carrier, has prepared a one page, plain language agreement ([click here for template](#)) that may be more efficient for these circumstances. Such a transaction is reminiscent of the electronic usage agreements architects drafted in times past for the contractor's use of the architect's 2D CAD documents for shop drawing backgrounds.

Please be aware, as with all agreements, that project requirements may vary, and the one-page agreement referenced here may not be appropriate for your project without revisions on advice of counsel. This agreement requires and/or includes the following:

- Consultation with counsel for preparation
- Specific use and limitations of the model by the contractor
- Retention of copyright and intellectual property rights by the design professional(s)
- Indemnity by contractor to owner and design professional(s)
- Prohibition of BIM files for construction use.

An example of this one-page agreement is included with this paper, but be advised that it is for general informational purposes only and finalization of an agreement for a specific project requires legal counsel involvement.

The one-page agreement is in plain language and its size and simplicity is less intimidating than the published documents. However, it should not be considered as a substitute for the documents needed to produce a BIM project.

If an agreement such as this is developed for use on a particular project, its use on subsequent projects will require a review of applicable laws and regulations as well as any other legal implications affecting the agreement under its use conditions. It is unsafe to assume that the agreement will be appropriate for any future project.

### **Practice Considerations**

Transitioning from a 2D CAD environment to BIM is more than purchasing new design technology software and learning how to use it. When implemented properly, BIM represents a significant evolution of design practice in a data-rich environment with an integrated team approach. The transformation to BIM involves significant investment by the design firm in the following areas:

- Design and production process
  - Extensive and collaborative project planning amongst the design disciplines to establish common goals, uses, and procedures including process mapping, model management, permissions, access, measurement, coordinates, accuracy and tolerances, data exchange, file transfer, file maintenance, document delivery and production, quality control and model integrity checks, support– all defined in the BIM Execution Plan or BIM Protocol Manual



- Training of staff is not only intensive initially but requires ongoing effort as the firm evolves in its capabilities in BIM use and delivery and adapts to annual software updates
- BIM managers and/or coordinators should be devoted to leadership of the process on projects
- Design and quality management content and systems
  - Creating a BIM content library of details, systems, families and components– the conversion of your well-established CAD libraries and procedures is time and planning intensive, requiring diligent engagement of QA/QC and design technology staff
  - Managing BIM content and procedures will evolve with project team experience. Communication amongst project teams to share lessons learned and best practices will facilitate consistent and efficient use of BIM across the firm in a manner consistent with your QA/QC policies and procedures
- IT Infrastructure to address higher data volume, computing speed and file sizes
  - Computer workstations with sufficient processing speed and RAM
  - Servers with enhanced storage capacity including potential dedicated system for BIM content library
  - Local area network (LAN)
  - Wide area network (WAN) especially for multi-office firms
  - Data backup and recovery procedures
  - Network security systems and procedures
  - Incremental cost of BIM subscriptions compared to CAD licenses

The architecture firm needs to be committed to fundamental change to the approach and thought process and make the necessary investment in important aspects of project delivery, design and technology systems and training to enable efficiency and success in the implementation of BIM.

### **Keep Good Company**

The rules for BIM apply as much they did for 2D CAD when it comes to the company that you keep. Experienced practitioners may remember the precautions taken with consultants when preparing for their first CAD delivered project.

- Consultants you know well and have worked with before
- Compatible software and approach
- Not their first time at the rodeo; experience with the process and equipment
- Reasonable expectations
- Willing and prepared to do what is needed
- Adequately insured

Similar rules of due diligence apply to the contractor.

- Contractors you know well and have worked with before
- Not their first time at the rodeo; experience with the process
- In-house BIM capability
- Reasonable expectations
- Willing and prepared to do what is needed
- Adequately bonded
- Acceptable claims history

And you cannot leave out the owner.

- Preferably an owner you have worked with before
- Preferably not their first time at the rodeo
- Fully aware of the risks
- Reasonable and realistic expectations of the role and impact of BIM for the project
- Acceptable claims history

Enough cannot be said about working with a team that is aware and is invested in the outcome. Most BIM projects are contracted traditionally, and the risk allocation is the same or similar to past traditional deliveries. However, your BIM model may generate more risks than your past 2D or hand-drawn drawings because of the extensive data embedded in the model and the potential that the contractor may gain possession and control of your work product or misuse or misinterpret your model. Although intentions may always be good, misuse of the data can potentially manifest into a claim. One cannot be too careful.

### **Professional Liability Insurance**

Current professional liability insurance policies cover the use of BIM in our professional services. Some insurance carriers have suggested that BIM and the clash detection process enhances the ability to coordinate between design disciplines, thus anticipating reduction of the incidence of claims for errors and omissions. Some professional liability insurance policies include coverage for certain elements of cyber liability emanating from professional services. Design professionals should review insurance policies carefully with their insurance brokers and determine appropriate coverage for the evolving cyber liability risks.

### **Assessing the Risks**

Although there are limited occurrences of BIM as a factor in claims and lawsuits, the potential for enhanced risk remains. Accordingly, we will examine some relevant issues.

### **CONTROLLING THE MODEL**

As addressed earlier, managing possession and control of the 3D model is critical for risk management of the integrity and content of the model. Loss of control can lead to unauthorized

use of the model. The key to protecting yourself is to maintain strict archive and documentation controls and always be able to prove up the authorship of model revisions with record copies. Properly archived BIM files will allow identification of changes by downstream users thus providing an effective defense should claims arise from misuse.

Additional risks associated with control of the model includes responsibility for maintaining the viability of the model and recognizing the importance of the integrity, confidentiality, and availability of BIM data for the project team. Model viability can be compromised by network failure, power interruption, improper file handling, cyber breach and malicious attack amongst other intentional or unintentional acts. Since design and project team members will likely be dependent on the consistent availability of the model and its robust data, the party responsible for model control may have significant exposure for delay claims if the BIM data is compromised or unavailable. Firms should establish strong network security measures and diligent and timely data backup and recovery procedures to minimize the impact of these potential data breach and cyber risks to their BIM and related project files.

#### DESIGN COORDINATION vs. CONSTRUCTION COORDINATION

When the construction documents were the sole domain of the architect, the capabilities and limitations of the documents were more black and white. However, the growing use of BIM by contractors is causing the difference between the architect's coordination of design and the contractor's coordination of construction to be increasingly difficult to differentiate. When control of the BIM model is shared with the contractor, expectations of what the data is intended to accomplish fall into more of a grey area.

The contractor, who must work out each minute detail before the work can be constructed, may unreasonably expect the design professional's model to contain details developed far beyond what was done with 2D CAD or manual drafting as required to express the design intent. Such unrealized expectations can lead to claims of incomplete or inaccurate documents. This places more importance on properly adapted AIA digital practice documents clarifying the architect's scope of services and effective management of expectations. BIM model detail and the degree of completion should be well documented and regularly clarified from the onset of the project.

#### CONSTRUCTION TOLERANCE CLAIMS

A potential result of the greater detail and scaling that is inherent in the BIM model are claims that construction tolerances should have been considered and more effectively accommodated. Again, the best antidote for failed expectations is clarity defined in the digital practice documents and ongoing discussions with the project team as the project evolves.

#### BIM SHOP DRAWINGS

Under typically current industry practices, the design professional's construction drawings are brought into constructible focus by the contractor's shop drawings. Since the BIM model is typically less complete than detailed contractor submittals, the more widespread use of the BIM model for shop drawings by the contractor could give rise to claims of adaptation difficulty or unusability. This reinforces the need for a well drafted digital licensing agreement with a completed

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Model Element Table. With the advent of vendors providing “shop drawing quality” details for the design professional to paste into the model, expectations and scrutiny become more acute. It is safe to predict that contractors will increasingly want more from the BIM model in terms of detail, and architects must be aware of this when they explain and define the scope of their basic services.

#### OLDER FORM AGREEMENTS

Our practice is changing at a more rapid pace than ever before, and older versions of standard form agreements are becoming “old technology” about as fast as our old computer did. Risks can be higher when these older agreements are used for digital practice, and careful modifications must be made to include the appropriate conditions and safeguards. The best recourse is to use the most current (2017 or later) AIA owner-architect agreements along with the 2013 AIA digital documents.

#### THE STANDARD OF CARE

Since the standard of care as defined by the AIA is, “...services consistent with that level of skill and care ordinarily provided by architects practicing under the same or similar circumstances,” there is concern that the technical advances and practice advantages of BIM may ultimately impose a higher standard of care as its usage becomes more widespread.

For example, a BIM non-user may be confronted in a lawsuit by a plaintiff’s expert witness who maintains that the problems at issue could and would have been avoided with the use of BIM and its technical tools such as clash detection. Only time will tell if the standard of care evolves in this direction, and BIM non-users may someday have to consider having the owner formally agree to their approach to services delivery. Another concern is that the variations in the specified level of information among BIM projects may cause the standard of care to become a “moving target” that could be difficult to assess.

#### INTEGRATED PROJECT DELIVERY

The most complex use of the BIM model occurs with Integrated Project Delivery (IPD). While this topic is beyond the subject matter discussed in this paper, IPD is the frontier of our practice, and it provides a glimpse of the new horizons rapidly moving within the evolutionary reach of current standard practice.

#### **Plan Your Approach**

A good approach to managing your risks with BIM is to follow a checklist as the project develops. There may be a need to revise the checklist based on changing project requirements. One example of such a checklist is included below.

# BIM Execution Checklist

## **AIA Professional Services Agreement Executed**

- AIA Standard Form of Owner-Architect Agreement
- E203-2013 included by contract amendment
- G201-2013 included by contract amendment
- G202-2013 included by contract amendment

## **Owner Dialogue**

- Discuss BIM model content and detail to clarify scope of services
- Explain limitations of use of the BIM
- Understand owner's intended future use of BIM for facility operations, if any

## **Team**

- Consulting firms with acceptable BIM capabilities
- Experienced teams assigned
- Insurance certificates on file
- Architect-Consultant Agreements executed

## **Services**

- No AIA Professional Services Agreement Executed
- C106-2013 Licensing Agreement Executed
- Model Element Table added to clarify BIM use

## **BIM Execution Plan / BIM Protocol Manual**

- Conditions agreed upon
- BIM Execution Plan prepared
- BIM Execution Plan distributed

## **Conclusion**

BIM technology has not yet developed a track record on claims and the recent survey of professional liability insurance carriers by the AIA Trust has not indicated extensive evidence of claims thus far. However, concern continues to be expressed for the potential risks associated with multi-party use and manipulation of the architect's 3D model, and rightfully so. The AIA documents that have been developed attempt to address these concerns. Meanwhile, practitioners are eager to use BIM because of its positive attributes, potential for advancement of collaborative practice, and the simple fear of not residing on the leading edge of design technology.

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This is incentive for practitioners to remain on the frontier with BIM implementation and development while properly managing risk not only in the technical content of the model but the intended and allowable use of the model by other members of the project team. The good news is that you are not alone, and the resources, technology and strategies for BIM usage continue to grow. With the projections of increased U.S. and global BIM usage, it's a trip you will not want to miss.

Meanwhile, live long and prosper with your BIM endeavors, and be careful out there.

## **ACKNOWLEDGMENT**

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## **REFERENCES, For More Information:**

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2013 AIA Digital Practice Documents – Frequently Asked Questions, go to [www.aia.org/groups/aia/documents/pdf/aiab079942.pdf](http://www.aia.org/groups/aia/documents/pdf/aiab079942.pdf)

AIA Documents questions? Go to [docinfo@aia.org](mailto:docinfo@aia.org), call (202)626-7526; go to [info@aia.org/knowledgebase/](http://info@aia.org/knowledgebase/)

*BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers, and Contractors*, 2<sup>nd</sup> edition (Wiley 2011) by Chuck Eastman, Paul Teicholz, Rafael Sacks, and Kathleen Liston

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*The Architect’s Handbook of Professional Practice, 15<sup>th</sup> edition, Article 11.3, Small Firms, Small Projects, and Building Information Modeling* (Wiley 2014) by The American Institute of Architects

*Building Information Modeling (BIM): Trends, Benefits, Risks, and Challenges for the AEC Industry* (American Society of Civil Engineers 2011) by Salman Azhar, Ph.D., A.M. ASCE

## **RESOURCES:**

*AIA Firm Survey Report 2020*, (American Institute of Architects, 2020)

The BIMForum is an organization formed to facilitate and accelerate the adoption of building information modeling in the design and construction industry. Go to [www.bimforum.org](http://www.bimforum.org)

AIA Center for Integrated Practice (CIP). The AIA’s online clearinghouse that contains useful resources necessary to lead the industry toward collaborative design practices. Go to [www.aia.org](http://www.aia.org).

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