American Bar Association
Forum on the Construction Industry

Another Perfect Storm

Successfully Navigating Your Way Through the
Electronically-Managed Project:

Legal Challenges Presented by the Increased Use of Electronic Design Tools, Building Modeling Systems and Electronic Workrooms

BUILDING INFORMATION MODELING
SAILING ON UNCHARTED WATERS

Timothy M. O'Brien, Esq.
Faegre & Benson LLP
Minneapolis, Minnesota

October 25-26, 2007
Hyatt Regency Newport Hotel & Spa
Newport, Rhode Island

I. INTRODUCTION

"A sea change is gripping the U.S. building industry."[1]

Building Information Modeling is nearly upon us and will over time engulf the building industry. Whether the attendant ramifications will be slow and incremental or swift and abrupt remain to be seen. This paper will address issues of anticipated significance in the transition to the collaborative design process embodied within Building Information Modeling.

A. Building Information Modeling: Mere Sailcloth or More

While the jury remains out as to whether Building Information Modeling ("BIM") will, in due course, fundamentally transform the AEC industry, the outcome is all but ordained. Inexorable forces are in play, compelling the use of intelligent digital design, including market place pressures imposed by large institutional owners, private and public alike, who wish to reap the benefit of BIM. As the American Institute of Architects ("AIA") notes:

> Because the true benefit of BIM is to the project owner, the push to use BIM will most likely be a client-driven development. The value is in the significant building efficiencies and initial cost savings and extends to the operations and maintenance of the facility.[2]

General Motors, for its part, and in a well-publicized fashion, has imposed a requirement that all of its construction and renovation projects utilize BIM technology. Similarly, a Wal-Mart representative explains the surge to BIM in this fashion:

> I see this push towards BIM being driven by four factors:
> 1. Open communication channels due [to] the Internet.
> 2. Mature and affordable hardware that anyone can afford.
> 3. A need for greater collaboration across teams more instantly.
> 4. Increase in relational database technology.[3]

---

[1] Jeff Yoders, "The Merry Road to BIM," *Building Design and Construction*, August 11, 2006, http://www.bdcnetwork.com/index.asp?layout=articlePrint&articleID=CA6354606.

[2] "Preparing for Building Information Modeling," *AIA Practice Management Digest*, Summer 2007, http://www.aia.org/nwsltr_pm.cfm?pagename=pm_a_20050722_bim.

[3] Mark Aycock, Wal-Mart Store Planning/Design Department, IABC - Virtual Conference, *BIM Panel Discussion*, http://www.sigmadesign.com/IABC2006/virtual_conference/bim.html.

In like fashion, Intel, an owner historically spending $2 billion to $4 billion annually on construction, opines that "Owners need to adopt a 'BIM culture,' a day-to-day business mindset that demands that every facility includes a complete intelligent model."[4] Both the United States Corps of Engineers and the United States General Services Administration are likewise not only promoting but also mandating that BIM be employed and that 3-D models be deliverables.[5] Unlike the unfulfilled expectations of past semi-grand ideas, such as partnering and dispute review boards, aimed at influencing, if not transforming, aspects of the design/construction process, Building Information Modeling reaches to the core of design and construction, and its predicate of design and construction collaboration ". . . is neither a novelty nor a passing fad" but, instead, ". . . is the way in which the design and construction community will conduct everyday business in the very near future."[6]

It is certainly within the realm of reasonable contemplation that future generations, by then fully conversant with the collaborative digital design process and only too aware of the enrichment of project design by its passage through the prism of construction expertise, will simply shake their heads in wonderment at present day practices of generation and regeneration

[4] Vicki Speed, "The Virtual Construction Summit," *Engineering News Record*, September 3, 2007, quoting Art Stout, Director, Capital Development Group, Intel Corp.
[5] "Building Information Modeling (BIM): A Road Map for Implementation to Support MILCON Transformation and Civil Works Projects Within the U.S. Army Corps of Engineers (ERDCTR-06-10)," *U.S. Army Corps of Engineers, Engineer Research and Development Center*, October 2006, U.S. General Services Administration, *GSA Building Information Modeling Guide*, Series 01 (November 1, 2006). See, Joann Gonchar, "Transformative Tools Start to Take Hold," *Engineering News Record*, April 23, 2007; see also, Tom Sawyer, "Early Adopters Find the Best Models are Digital Virtuosos," *Engineering News Record*, October 2, 2006 ("GSA, manages a portfolio of 342 million sq. ft. of owned or leased space in 8900 buildings worth $500 billion for the federal government . . . GSA requires spatial BIM to be the minimum requirement for final concept approvals for all GSA projects receiving design funding beginning in FY 2007.")
[6] Quoting Judith Kunoff, Chair of the Emerging Technologies Committee of the Construction Management Association of America, *Engineering New Record*, June 11, 2007, www.enr.construction.com/resources/special.

of design and construction documents in a duplicative, redundant and error-prone 2-D paper-bound format.[7]

B. Definition of Building Information Modeling

There is somewhat of an aura of uncertainty and even mystery attendant to BIM. This stems, in part, from its rapidly evolving nature but is due, in larger part, to the distinction between its present day application and its yet to be fulfilled expectations. This is compounded by the fact that it is common to see BIM defined and described by reference not to what it presently is but, rather, to what it will become.

Definitions and descriptions of BIM abound:

(a) The Building Information Model (BIM) is a new tool used by the architecture, engineering and construction (AEC) industry."[8]

(b) Building Information Modeling is the development and use of a multi-faceted computer software data model to not only document a building design, but to simulate the construction and operation of a new capital facility. The resulting Building Information Model is a data-rich, object-based intelligent and parametric digital representation of the facility, from which views appropriate to various users' needs can be extracted and analyzed to generate feedback and improvement of the facility design.[9]

(c) Essentially, a building information model is a materialized 3-D model, meaning that everything in the building is drawn with its true properties.[10]

Each of these definitions of BIM is, in its own way, accurate and together they provide a formative description of BIM in both its existent and future capacities.

---

[7] It is further within the realm of contemplation, but beyond the scope of this paper, to theorize that utilization of BIM may well have the companion effect of hastening the demise of the well engrained design-bid-build process (already being undercut by the growing acceptance and use of design-build construction and, it must be anticipated, to be also undercut by future use of project alliance and integrated project delivery agreements), since design-bid-build, by its chronological isolation of design from construction, inhibits the very aspects of cooperation and collaboration between designers and contractors upon which the foundations of BIM are premised.
[8] Wikipedia, the Free Encyclopedia, http://en-wikipedia.org/wiki/Building_Information_Modeling.
[9] *GSA BIM Guide Overview*, *supra* note 5.
[10] Jason McFadden, "Streamlining the Structural Steel Design and Construction," *Penn State Ballpark: Final Thesis Report* (Spring 2006).

C. Value of Building Information Modeling

The benefits of BIM are readily apparent and widely lauded. Fully 77 percent of structural engineers surveyed in 2006 reported significant overall benefits from use of BIM in their practice.[11] A growing number of project owners, design professionals and contractors are beginning to vie with one another to herald and promote BIM, recognizing the value of digital generation and analyzation of design information.

> At the minimum, the drawings are better coordinated, the process is faster and the design team can iterate more. There is a definitely achievable reduction of errors. But BIM offer many other benefits, including the general sense that the team knows more about the project, to a higher level of detail and in a more clearly visualizable way, earlier in the process before critical commitments are made. . . . Silly errors get caught in 3-D during the design process that otherwise, with two-dimensional construction documents, may not become apparent until a condition is being constructed in the field.[12]

D. Implications to the Construction Lawyer of Building Information Modeling

Building Information Modeling, in its present genre, is proceeding apace, albeit, more often than not, cobbled together after-the-fact on a belt-and-suspender basis and engrafted upon traditional contracts already in place, by resort to riders and protocols, all leading to a parallel universe of 2-D hard copy construction documents and 3-D digital databases. This is hardly ideal. As BIM evolves and matures, such practices will inevitably yield to a future state where BIM will formally dominate and 2-D documents, if created at all, will be simply a secondary manifestation of design. In the coming world of BIM, the design product of the architect will encapsulate the detailed shop drawings of subcontractors, the drawings which set out sufficient detail to actually construct the project. Construction law principles and practices will inevitably

---

[11] C. C. Sullivan, "Integrated BIM and Design Review for Safer, Better Buildings," *Architectural Record*, June 2007.

[12] "Interview with Dennis Shelden, Chief Information Officer, Gehry Technologies," *Quarterly Review*, Zetlin & DeChiara, 2006, Volume 11, Number 4.

have to come to grips with these implications of BIM. The dimensions of this sea-change are addressed herein.

II. CAPTAIN/FIRST MATE: WHOSE HAND IS ON THE RUDDER

There is potential for a not insignificant brouhaha to develop between the architectural and contractor professions as to who will be in control of the project when BIM emerges on a mature and large-scale basis. The outcome will likely depend upon the contract format which is determined to best facilitate the implementation of BIM. If BIM can somehow be successfully shoe-horned into a variation of the design-bid-build format, the architect will likely maintain her or his hand on the rudder. If, on the other hand, and as surmised herein, it is determined that BIM works best within the framework of design-build or if, in due course, project alliance or integrated practice agreements begin to flourish, the architect's traditional role at the project helm may well be usurped by the contractor.

A. Contractor or Architect

1. Architect

Architects, as a profession, have not, to date, been in the forefront of promoting and utilizing BIM in any significant sense.[13] While a survey conducted by a joint committee of the American Institute of Architects and the Associated General Contractors of America showed that three-quarters of U.S. architectural firms were using 3-D or BIM in some fashion, 98 percent of them were using the process for renderings and presentations related to conceptual design, with

[13] See Scott Simpson, "Architects are Belatedly Moving Towards the Light," *Engineering News Record*, March 5, 2007.

> Design is all about change, using new technologies, materials and better ways of think to solve problems and create value for clients. Ironically, while architects are experts on influencing change on others, they are traditionally reluctant to embrace fundamental changes in how they conduct their own practices.

only just over one-third using BIM as a construction resource, such as for clash detection.[14] Indeed, the American Institute of Architects has noted: "Building models embedded with detailed information about a construction project are far beyond the capabilities of most design firms at present."[15]

A number of factors are at work in the reluctance of architects to embrace BIM. These factors include issues of fundamental fairness, that is to say, receipt of adequate compensation for their BIM investment and efforts, concerns arising out of perceived or real changes in underlying risk and unwillingness to depart from traditional norms of practice.[16]

BIM technology is only incrementally whetting the appetite, the ability and the corresponding willingness of architects to respond to its obvious merits. While the American Institute of Architects has recently issued two model digital practice documents setting forth conditions relating to digital data exchange among team members,[17] it has, as of yet, apparently due to lack of consensus,[18] failed to issue guidelines or standard agreements under which the architectural profession can structure a path forward using BIM.

---

[14] Joann Gonchar, "To Architects, Building Information Modeling Is Still Primarily a Visualization Tool, *Architectural Record, Tech Brief*, July 2006, http://archrecord.construction.com/features/digital/archives/0607 dignews-2.asp. See also, Joann Gonchar, "Transformative Tools Start to Take Hold," *Engineering News Record*, April 23, 2007, where it is noted: "According to the most recent American Institute of Architects' firms survey, The Business of Architecture, about 16 percent of firms have acquired BIM tools and roughly 10 percent are using them for billable work."

[15] "Preparing for Building Information Modeling," *AIA Practice Management*, Summer 2007, http://www.aia.org/nwsltr=pm.cfm?pagename=pm-_2_20050722_bim.

[16] See Gary J. Tulacz, "Top 500 Design Firms, Technology and Sustainability are Surging," *Engineering News Record*, June 25, 2007.

> There are some concerns [among architects and designers] about adopting BIM, such as how it will alter the decision-making process. Under the old process, architects and engineers could put off final decisions on critical issues as late as the delivery of construction documents. In the BIM environment, those decisions have to be made early in the process, requiring input from all the players at the outset. Designers also are questioning how to allocate risk in the design. But for many, BIM represents the future.

[17] AIA Document C-806-2007, Digital Data Licensing Agreement, and AIA Document E-201-2007, Digital Protocol Exhibit.

[18] See, "Model Contracts to Aid E-Building," *Engineering News Record*, May 14, 2007, quoting Ric Stewart, AIA 2007 President: "This is uncharted territory. We don't want to commit to having something done before we know exactly what it is." .

Traditionally, architects have been loathe to assume risk which, while perhaps a good practice in the short term, is likely a not-so-good, long-term plan.[19] Risks are, in fact, perceived in certain quarters:

> It is likely therefore that by coordinating the model and access to the model, design firms are assuming significant risks. . . . Design firms may end up with new exposures to contractor claims as well as vicarious liability because of their assumed "responsible charge" of the design elements provided by independent consultants and unlicensed designers, such as specialty subcontractors, manufacturers and others.[20]

Risk could also flow under BIM towards the architect if its design models are inaccurate, if its design models are late, if its design models do not incorporate relevant data and if its design models vary from contract drawings.[21] From the designer's point of view, it has further concern regarding subsequent use or misuse of its model, simply error or omission on the part of a subsequent user or the incorporation of "design" data by others into its design model could imply responsibility on its part, much as if its name was on the drawings in the 2-D world of construction documents. Summing up, one architectural C.I.O. succinctly observed: "We don't want our data manipulated by another consultant."[22]

Nevertheless, architects fret about the role of contractors in the BIM world and recognize that it is in their collective self interests to avoid further erosion of their role on the project of the future. Architects understandably fear that general contractors will take over the building and design industry: "The great fear on the part of architects is that general contractor will take 'a

---

[19] Branko Kolarevic, "Architecture in the Digital Age: Design and Manufacturing," Spon Press (Taylor and Francis), London, UK, 2003, p. 58, "This aversion to risk has, unsurprisingly, led to the further marginalization of architectural design, further contraction in services offered by the design firms, and further reduction in fees . . . Only by taking the lead in the inevitable digitally-driven restructuring of the building industry will architects avoid becoming irrelevant."

[20] "Building Information Modeling: Will Professionals Receive the Benefits?," *Guidelines for Improving Practices*, Victor O. Schinnerer & Company, Inc., May/June 2006.

[21] Of course, resultant liability for comparable errors or omissions would likewise flow in the 2-D world

[22] Joann Gonchar, "Transformative Tools Start to Take Hold," *Engineering News Record*, April 23, 2007, quoting John Marinello, Flack & Kurtz.

huge part' of the industry by 'owning the model'", and more specifically "Our biggest fear right now is the contractor selling the model to the client and just hiring the architect as a consultant that puts the design down . . . As for whether that can happen, it's hard to say right now because everything is in such a state of flux with BIM."[23] Warning sirens to that effect have been set off by the American Institute of Architects. Thus, the newsletter of the AIA Technology in Architectural Practice bluntly warns: "If the architecture firm is not willing to deliver the potential value of the digital building model, the owner will seek delivery methods, probably contractor led, that will deliver the value. The role of the architect will be diminished."[24] As an insurance representative admonished its architectural clients: "One thing is clear: Architecture firms should control the information model.[25]

2. Contractors

Nature abhors a vacuum and the slow pace of architects in adopting BIM has created just such a vacuum. Seizing the available opportunity, contractors, on an individual basis, and contractors, as a profession, have embraced BIM.[26] Contractors, recognizing the intrinsic value of digital models in the shop drawing process and use in attendant clash detection, are generating BIM models for their own purposes irrespective of whether the designer is issuing digital models or 2-D construction documents.

---

[23] Jeff Yoders, "The Merry Road to BIM," *supra*, quoting Scott Mackenzie, CAD manager for CUH2A, Princeton, NJ.
[24] "Intelligent Building Models and Downstream Use," *AIA Edges*, Summer 2007, http://www.aia.org/nwsltr_tap.cfm?pagename=tap_a_documents.
[25] "Building Information Modeling: Potential Legal Exposure," contributed to by Victor O. Schinnerer & Company, Inc., *AIA Best Practices*, October 2006.
[26] Major contractors, such as Mortenson Construction, Turner Construction, Alberici Group, Inc., The Weitz Company and Barlon-Malow Company, to name but a few, are active participants in the development, promotion and use of BIM on their projects.

The Associated General Contractors of America (AGC) has also demonstrated that the AGC, and its members, recognize the import of BIM by publishing an informative guide book on BIM, wherein it provides a comprehensive pathway to contractors "who recognize this future is coming and are looking for a way to start preparing themselves so that when the future arrives, they will be ready."[27] Moreover, the AGC has established a comprehensive BIM website[28] and recently conducted a Building Division BIM Forum to address multiple BIM issues.[29]

By all appearances, contractors have gotten out of the gate well in advance of the architecture profession. Having played a prominent role in bringing BIM into the mainstream of the building industry, it remains to be seen whether contractors will be satisfied with any lesser role in the BIM future. Based upon the recognition by contractors of the power and scope of BIM, it could well be envisioned that contractor-led BIM may reach fruition far in advance of architect-led BIM. In view of the collaborative nature of BIM, it is quite likely that architects and contractors will share the leadership role on a particular project with architects at the forefront during the design phase and contractors assuming that role during the construction phase.

III. SETTING THE COURSE: YESTERDAY, TODAY AND TOMORROW

In the rapidly evolving world of BIM, it is next to impossible to parse hard distinctions between past, present and future practices. Nevertheless, a chronology review is helpful for an understanding of how BIM has evolved and will continue to evolve in the future.

---

[27] Associated General Contractors of America, *The Contractors Guide to BIM*, Edition No. 1 (2006). The AGC, formed in 1918, is the oldest and, at 33,000 members, is the largest association of construction contractors.
[28] http://bimforum.org/
[29] The forum held on June 21, 2007, in Pinehurst, NC, attracted and involved contractors, designers and owners.

A. Yesterday's News

The normal stages of yesterday's design practice, well engrained for eons, involved architectural development of design concept followed by design iterations leading to design development documents and subsequent generation of construction drawings reflecting the design intent of the architect. The contractor then submitted a low bid based upon these construction documents and upon award entered into subcontracts with multiple subcontractors who, in turn, prepared shop drawings which detailed their proposed means and methods of achieving the design intent of the architect. In effect, a building was designed by the architect and its consultants and then redesigned again through shop drawings to reflect how the structure would actually be built in the field.

As succinctly noted by scholar Branko Kolarevic: "It is debatable whether the drawings emerged in the building industry because of the need to separate design and construction or whether their introduction produced the present separation. The lasting legacy is the legal framework within which building industry professionals operate today, requiring drawings, often tens of thousands of them, for a project of medium size and complexity."[30]

In rendering its design, the architect of the past typically used tools such as a pencil, a compass, a straightedge and a T-square. Computer-aided-design (CAD),[31] and its present wide range of computer-based tools and technologies, has been in a continuous state of development since the 1970s, and has been embraced by designers as a method to enhance traditional design. CAD, however, in whatever iteration, should not be understood to be synonymous with BIM.

---

[30] Branko Kolarevic, "Architecture in the Digital Age: Design and Manufacturing," Spon Press (Taylor and Francis), London, UK (2003).
[31] The acronym CAD originally meant computer-aided-drafting and in its early stages CAD served simply to automate the drafting process.

While CAD continues in everyday use, it is separate and distinct from BIM. The distinction between CAD and BIM has been well articulated by the U.S. Army Corps of Engineers:

> Historically, a door shown in a CAD application is nothing more than lines, arcs, and a text descriptor. A door in a BIM has associated intelligence. It carries information about its fire rating, construction, and glazing. It also knows how to display itself -- one in a plan view, another in an elevation. In addition, it not only 'knows' it belongs to a wall, it also knows if the fire rating of the wall matches its fire rating. A complete BIM can be used to evaluate building code compliance, generate quantity takeoffs, and generate specification documentation. BIM offers true 'on-line collaboration' allowing offices across the country to design against a single model.[32]

Taking the distinction a step further, an officer of the Corps points out:

> One common misconception is that CAD is for 2D design and BIM is for 3D design. This is definitely not the case, since you can easily create 3D designs with CAD technology. The main difference between CAD and BIM all comes down to how an object perceives itself after it is placed. For instance, in CAD when you draw a wall, you may possibly draw one line then copy parallel that line a certain distance to achieve a wall with thickness. When you place windows or doors in that wall, you have to break the lines and do some clean up to create your openings. If the walls or doors have to be moved later in the design process, the wall lines have to be reconnected and a new opening has to be created. With BIM, you are dealing with objects that are simulations of building components. These objects know what they are and what their characteristics are. When you place a wall in BIM, it knows that it is a wall. It contains information about its materials, its fire rating and height (just to name a few). When you place a door object into a wall object, the opening is automatically created. If you have to move the door, the wall opening is filled in and an opening is created in the door's new location.[33]

Well-publicized efforts to break out of the 2-D cycle began in earnest in the 1990s. One project of much note was the Walt Disney Concert Hall, There, non-BIM 3-D applications were generated by the designer to serve as dimensional control for certain project elements, including exterior surfaces, cast-in-place concrete and glazing assemblies. 3-D models, in the form of 3-D

[32] "Building Information Modeling Training and Support," *U.S. Army Corps of Engineers, Engineer Research and Development Center*, April 2007, www.erdc.usace.army.mil.
[33] Stephen Spangler, "What Is BIM and Why Should I Care About It?," *U.S. Army Corps of Engineers, Engineer Research and Development Center*, http://www.axiomint.com/mst/200612-spangler-on-bim.htm.

line wire frames (no associated mass properties) were provided to the contractor as contract documents and the contractor, in turn, converted the 3-D wire frames into 3-D geometric models. In addition, the contractor, for its part, created a 4-D model integrating a time factor into the 3-D model for purposes of construction sequencing.

Other architects followed suit. As described by international architect and design firm NBBJ, "[its] foray into BIM started in 1998 with the U.S. Federal Courthouse project in Seattle. . . . NBBJ used it in the conceptual design phase for exploring different massing options, deriving the floor areas to verify them against the program requirements, and coordinating between the interior and exterior aspects of the design. Once the design was finalized, a comprehensive 3-D model was developed which was used for generating all the visualizations, as well as 2-D extractions for the construction documents. Many details, however, were shown only in 2-D sectional drawings to keep the model size within workable limits."[34]

In recent years, structural steel fabricators and erectors have been at the forefront in the use of 3-D modeling and the use of software systems to integrate the design and construction process.[35]

---

[34] Lachmi Khemlani, "Building the Future," *AECbytes*, February 15, 2006.

[35] Effective March 18, 2005, the American Institute of Steel Construction (AISC) issued Appendix A: Digital Building Product Models to its Code of Standard Procedure. Appendix A adapts the provisions of the Code to use in projects which will function through electronic exchange of design and construction information and is to apply when a 3-D digital BIM is to replace contract drawings and is to be the primary basis for the design and exchange of structural steel data. Appendix A provides, in part:

> A.3.1. Design Model
> The Design Model shall:
> . . . .
> (b) Contain Analysis Model data so as to include load calculations as specified in the Contract Documents.
> (c) Include entities that fully define each steel element and the extent of detailing of each element, as would be recorded on equivalent set of structural steel design drawings.
> (d) Include all steel elements identified in the Contract Documents as well as any other entities required for strength and stability of the completely erected structure.
> (e) Govern over all other forms of information, including drawings, sketches, etc.
> A.4.3 In addition to the requirements in Section 4.3, the following requirements shall apply:
> When the Design Model is used to develop the Manufacturing Model the fabricator shall accept the information under the following conditions:

> While most architects and other members of the building team are only beginning to apply BIM to projects, the structural steel industry is using 3-D modeling and interoperability -- the use of software systems that are able to communicate and exchange data and information through a neutral file format -- to integrate the design and construction process and speed the delivery of the structural steel package. Structural engineers are collaborating with steel detailers, fabricators, and erectors to share and exchange 3-D model information to create detailed designs for steel-framed buildings with tight tolerances. On numerous projects, this allowed mill orders to be placed earlier and steel to be delivered and erected on site more quickly, with few, if any field changes required. Fewer field changes enable the steel teams to provide a quality product, with less waste, and greater safety.[36]

Other specialty subcontractors and suppliers have also been early-on leaders in the adaptation of BIM to their professions. Mechanical and plumbing contractors have been using BIM on their systems for nearly a decade, receiving CAD files from members of the design team and redrawing them using 3-D software. The resultant 3-D drawings are then reviewed for conflicts between the architect and engineer drawings, which conflicts are resolved in the shop drawing phase, and thus prior to their shop fabrication of duct and piping runs.[37]

(a) When the design information is to be conveyed to the Fabricator by way of the Design Model, in the event of a conflict between the model and the Design Drawings, the Design Model will control.

(b) The ownership of the information added to the LPM [Logical Product Model, being the building model for the structural steel] in the Manufacturing Model should be defined in the Contract Documents. In the absence of terms of ownership regarding the information added by the Fabricator to the LPM in the Contract Documents, the ownership will belong to the Fabricator.

(c) During the development of the Manufacturing Model, as member locations are adjusted to convert the modeled parts from a Design Model, these relocations will only be done with the approval of the Owner's Designated Representative for Design.

(d) The Fabricator and Erector shall accept the use of the LPM and Design Model under the same conditions as set forth in Paragraph 4.3 with regard to CAD files, except as modified in A4.3 above.

[36] Larry Flynn, "Getting on Board with Building Information Modeling," *Architectural Record*, April 2006.

[37] "Integrated Project Modeling, BIM and the Future of Collaborative Design and Construction," *Industry Design and Construction Alliance Journal*, December 31, 2006, where it is noted: "[ACCO Engineering Services, Inc.] ACCO has been using BIM on mechanical and plumbing systems for almost a decade with marked success. Similar to Webcor, they take the CAD files from the engineers and architects and redraw them using 3D software. Generally, they find conflicts between the architects and engineers drawings and by collaborating during the shop drawing phase or earlier, they resolve the conflicts prior to fabricating all their duct and piping runs in the shop. They also easily evaluate the staging, delivery and assembly sequencing in coordination with the other structural system installers. This process has almost eliminated RFI's and change orders after the start of construction.

B. **Present Course**

Today, BIM is utilized by any number of project entities to perform any number of functions. As previously noted, while architects and engineers utilize BIM in some capacity or another, they overwhelmingly, it would appear, use it for visualization purposes to promote project understanding and conveyance of design intent. In the design phase, it would not be untypical for the architect and its consultants to create separate 3-D design models and use them as the foundation for their respective 2-D drawings with the designers processing their 3-D models and 2-D drawings simultaneously.

A growing number of general contractors have likewise invested the time, funds and efforts to implement BIM programs. Contractors, for the most part, presently employ BIM for clash detection purposes[38] and for preparation and review of shop drawings. Such action are taken in concert with designers who either provide a digital model or models to the contractor or provide the normal 2-D documents subject to an understanding that the subcontractors will generate their own digital models for coordination and clarity purposes. Quite often, such an understanding between the designer and contractor is reflected in written protocols as to the permitted use of the design information. Whichever path is employed, 2-D construction drawings continue to reign and serve as the permit/approved drawings for contract documents with the digital models remaining contractually subordinate.

A typical protocol would include a contractor acknowledgment that there is no attendant warranty of accuracy of the digital models received from the architect and that the models are provided to the contractor for its convenience and at its risk. Upon receipt, the contractor, as a matter of practice, would check the 3-D models against the 2-D drawings, but would limit its

[38] Anecdotal accounts of the volume of clashes averted seemingly always are stated in three-figure increments. While laudable, it could well be presumed that a goodly number of those clashes would otherwise be also detected and addressed during the coordination process associated with traditional 2-D construction.

focus to that portion of the model that is germane to the work that the contractor will perform, and thereafter would use the design team's digital models for project planning and to provide input into the design.

As the project shifts to the construction phase, the contractor might well assume control over the models in order to facilitate discharge by its subcontractors of their means and methods obligations. In such a process, the contractor might well post the models to file transfer exchange site, require that designated subcontractors/suppliers individually model their work in 3-D format, require that the subcontractors' models be consistent with the contract documents and require that the subcontractors check their models for accuracy against the 2-D contract documents. Availability to the exchange site would be limited, with the site being made available only to those subcontractors/suppliers who provide a specific corresponding acknowledgment to the contractor that there is no warranty of accuracy and that their use is for their convenience only and at their risk. To facilitate performance of its shop drawing obligations, the subcontractor would typically import the design team's model into its modeling system and utilize that model as the basis for shop drawings. Coordination meetings between the contractor, subcontractors and architect would be held, with the subcontractors and the contractor utilizing the models to coordinate the work and with the architect resolving the physical conflicts which would have been identified. Decisions as to how the conflicts would be resolved would be made and approved by the architect Upon completion of the coordination process, the subcontractor would post its 3-D shop drawings on the contractor's website and deliver 2-D shop drawings to the contractor. The contractor would then review both the 2-D drawings and the 3-D models on a concurrent basis and then submit them to the architect. Upon approval of the shop drawings and from this point forward, the digital 3-D shop drawing model would comprise the working construction models.

C. <u>Future Course of BIM</u>

1. What is the Future Course?

The full measure of the impact of BIM upon the AEC professions and the building industry is yet to be realized. In the future state, the consensus vision is that there will be one digital model which will serve as the single source of design, capturing all information needed to construct the building, information which is presently diffused between the 3-D models of the architect, its various consultants, and the contractor and its multiple subcontractors. In order to create that unitary model, architects, engineers, contractors and fabricators will work in a collaborative fashion from the earliest stages of design through all phases of construction. Designers will enter information into a database using a variety of means and the computer will translate this information into whatever form is required by the user, be it 2-D drawings, graphics, tables, worksheets or text. Futurists project that in a not-so-distant time framework, the single master 3-D model will be considered as the document of record to which a seal will be affixed, that the 3-D model will be used for construction in lieu of 2-D drawings and that the 3-D model will take precedence over any other construction document. As expressed by scholar Kolarevic, the future state will be a master information model that provides for a "seamless digital collaborative environment among all parties to the building process."[39]

2. When Will the Future Be Upon Us?

While there are still pockets of resistance to the concept, most knowledgeable observers anticipate that the "tipping point" is upon us and that transfer of digital data will supersede distribution of paper documents with the only question being when.

---

[39] Branko Kolarevic, "Architecture in the Digital Age: Design and Manufacturing," *supra*.

The AIA Technology in Architectural Practice anticipates that within five years there will be widespread adoption of next-generation programs that will create an intelligent building model capable of producing accurate quantities for cost estimates and full 3-D models for constructability reviews and construction sequencing.[40]

3. What Will Be the Contract Vehicle?

The contract vehicle will likely be that contract made which is most compatible with the collaboration inherent to BIM. There are two contract mechanisms that appear to fit that criteria: design-build and project alliance agreements. In addition, the AIA is presently defining a vision of integrated practice intended to address the challenges of early collaboration and information sharing.[41]

(a) Design-Build

Design-build, even without application of BIM, is on the ascendancy.

The Design-Build Institute of America ("DBIA") has previously reported that design-build accounted for more than 40% of all non-residential construction projects in the United States in 2005[42] and has projected that design-build will exceed 50% of such projects by 2015.[43] The design-build process by its very nature addresses the weaknesses long recognized in the

---

[40] "Intelligent Building Models and Downstream Use," *AIA Edges*, Summer 2007. Others anticipate that implementation, while wholesale, will take somewhat longer. See, Matthew Brodsky, "Learning to Build from Scratch," *Risk and Insurance*, quoting Lorna Parsons, managing director of construction industry programs at Victor O. Schinnerer & Co.: "A lot of the insiders in the industry predict that in the next five to ten years BIM will be mandatory and the standard of the industry." http://www.riskandinsurance.com/printstory.jsp?storyId=13405624. Still others project that it will taken even longer: "E-Construction as the Norm is Still 10 to 15 Years Away," *Engineering News Record*, February 20, 2006.

[41] http://aia.org/ip_default.

[42] "Market Penetration of Major Project Delivery Systems," http://www.dbia-org/end_info/mkt-chrt.html.

[43] "Non-Residential Design and Construction in the United States," http://www.dbia-org.fr_industry.html and link to "Design-Build Market Share in the U.S." The DBIA further reports that 45 states and the District of Columbia have authorized, in some fashion, the use of design-build in the public sector.

traditional design-bid-build contracting method. These weaknesses were well summarized by a State of Washington Joint Legislative Audit and Review Committee:

> The most significant problem arises from the strict separation of design and construction. This separation deprives the owner of contractor skills during the design process, such as sensitivity to the labor and material markets and knowledge of construction techniques. It also provides little or no opportunity for a contractor to evaluate the coherence and completeness of the design or the cost of any proposed design changes.[44]

Each of the stated weaknesses of the design-bid-build process is explicitly addressed in the design-build setting.

Building Information Modeling is ideally suited for use in the design-build construction project delivery mode. As stated by the CEO of DBIA:

> Technology breakthroughs have helped us, but when you strip away all the rhetoric and hype to the kernel of what BIM means, it still comes down to communication and collaboration, which is at the heart of design-build."[45]

Integrating BIM into the design-build process would avoid many, if not all, of the legal uncertainties that surface in the context of BIM in the design-bid-build project delivery system.[46]

<u>Risk Inherent in Design-Build</u>

As concisely expressed:

[44] *An Assessment of General Contractor/Construction Manager Contracting Procedures, Report 05-9*, p. 5, June 22, 2005.
[45] Gary J.. Tulacz, "Design-Build -- Getting a Boost from New Building Systems Requirements," *Engineering News Record*, June 11, 2007.
[46] See, Jeffrey R. Appelbaum, "Insuring and Bonding the Design/Build Project," *American Bar Association, Forum on the Construction Industry/TIPS, Fidelity & Surety Law Committee*, January 25, 2007, where the author notes: "The preponderance of design/build projects being performed in the United States today utilize the 'contractor as design/builder' or 'contractor-led' approach." This is not an ideal situation from the point of view of the design professional and its insurer. See Interview with David J. Bresnahan, Senior Vice President and Casualty Division Executive, Lexington Insurance Company, *Quarterly Review*, Zetlin and DeChiara, 2006, volume 11, number 3. 'We consider design-build high risk . . . In design-build, the contractor comes between the owner and design professional . . . We've seen plenty of design-build projects result in serious exposure and loss to the A/E subcontractor . . . When the A/E is placed downstream from a design-build contractor, the design professional is out of the loop, in the dark on job progress and at an overall disadvantage.'"

> The design-builder is liable for defective project-related conditions irrespective of whether the project was designed in accordance with industry standards or whether the work was performed in accordance with the plans and specifications. Liability is imposed by extending theories of express warranty, as measured by the design-builder's contractual undertaking.[47]

(b) Project Alliance Agreements/Integrated Practice

Efforts are ongoing to develop and promote the use of project alliance agreements and to fully develop the concept of integrated practice.

(i) Project Alliance Agreements

A task force of the AIA California Council has captured a working definition of the concept of project alliance.

> In a Project Alliance, the key participants collectively assume responsibility for agreed project performance. The profit (or loss) to each participant is determined by the team's success in meeting project goals, not individual performance. The shared opportunities and responsibilities align the parties' interests and provide an incentive for collaborative and blame-free performance. To further enhance the collaborative process, all decisions must be unanimous, disputes must be resolved without litigation and within the Alliance, and compensation is determined on an open-book basis.[48]

Project alliance agreements have been utilized on thirty to forty large complex projects in Australia and it is reported that most of the projects came in below the estimated costs and considerably ahead of schedule.[49]

(ii) Integrated Practice

The American Institute of Architects has established a work group to analyze an integrated practice business model that would involve contractors.[50] It is predicted that

---

[47] Mark V. Niemeyer, "Managing Risk on Design-Build Projects, the Surety's Perspective" (1998), http://www.roughnotes.com/rnmag/March98/03p.56.htm.
[48] "Integrated Project Delivery, A Working Definition," *AIA California Council*, May 2007.
[49] Lachmi Khemlani, "Building the Future," *AECbytes*, June 21, 2006, http://www.aecbytes.com/buildingthefuture/2006/AIA_IntegratedPractice.html.

"Integrated practice will drive changes to contracts in order to facilitate working in teams, sharing information and fairly allocating liability risk, compensation, and responsibility."[51]

(c) Design-Bid-Build

It is virtually impossible to envision how full-fledged BIM can flourish in a straight-forward design-bid-build environment. Design-bid-build, by definition, is a linear process. BIM, on the other hand, is intended to be highly collaborative, melding the abilities of the designers and the contractors from the earliest stage of the project.

D. Requisite Contract/Subcontract Provisions

1. No Standard Form Agreements Exist

The design and construction industries each promote utilization of standard form agreements. Such agreements have traditionally been viewed as even-handed and, more importantly, such agreements, or their historical predecessors, have been subject to judicial construction, thus setting a benchmark for legitimate expectations.

To date, no standard form documents have been issued which comprehensively deal with design or construction in the BIM world.[52] In the presence then of a non-BIM standard contract

---

[50] Nadine M. Post, Collaborative Construction," *Engineering News Record*, June 5, 2006.

[51] "Integrated Practice in Perspective: A New Model for the Architectural Profession," *Architectural Record*, May 2007, http://archrecord.construction.com/practic/projDelivery/0705proj-2.asp.

[52] See, "Integrated Project Delivery, BIM, and the Future of Collaborative Design," *Integrated Design and Construction Industry Alliance*, December 31, 2006, for panel discussion:

Q: How will contracts catch up with this new process?

A: Unfortunately, the 2007 issue of the AIA contract documents have not kept pace with the development of BIM or the need to capture the workings and relationships established within integrated project delivery. While there is a standard 10 year cycle between iterations of AIA contracts, it is likely that an interim contract document release will take place.

Q: What about the Architect as "Head Dog"?

A: Ultimately, the Architect will continue to be responsible for accuracy of the documents and the model. With strengthened contract language using relationships, and participant defined success through Project Alliance opportunities, Architects can be freer to design and bring about unique solutions that are cost effective with the use of mass customization . . . Someone needs to lead; it can be the architect, the owner, the contractor or a facilitator. It will be collaboration for success and Architects can make the process more efficient using 3D techniques with all participants.

and in the absence of a manuscripted contract addressing BIM, a contractor brought into the project after the owner/designer agreement is in place must either persuade the project owner to modify the owner/designer agreement to reflect basic BIM obligations and practices or strike a side-agreement with the designer as regards BIM.

2. Manuscript Agreements

Presuming the owner is amendable to incorporate BIM provisions into the design and prime contracts, the contractor would likely push for inclusion of language which would:

(a) Require the architect and its consultants to create copies of digital model files available to the contractor in digital form for purposes of:

(i) building area and volume computations;

(ii) determination of quantity of components and volumes of materials or assemblies necessary for completion of the work;

(iii) clash detection of architectural elements, building structural elements, mechanical and piping systems; and

(iv) determination of construction sequencing and logistics.

(b) Mandate that the design models be consistent with the hard copy plans and specifications.

(c) Recite that the contractor is entitled to rely on the information in the digital model.

If the contractor is unable to persuade the owner to modify the contracts to accomplish these ends, the contractor may still be able to persuade the designer that it is in the best interest of the project that BIM practices be employed. In such circumstances, negotiation will likely lead to an agreement between the designer and the contractor which results in the issuance of design models to the contractor for its use with the explicit understanding that: (a) the design models are not construction documents or contract documents; (b) the design models are to be used for coordination purposes and (c) there is no representation as to accuracy in the design models.

It must be anticipated that the contractor, in turn, will enter into close-to-identical agreements with subcontractors so as to replicate the rights and responsibilities imposed upon the contractor.[53]

IV. LEGAL ISSUES: AVOIDING THE SHOALS

There are a multitude of viewpoints as to whether BIM will shift, or possibly even increase the risk of AEC participants in a BIM project. On one end of the spectrum are those who anticipate a reduction in risk, particularly as it relates to claims arising out of lack of coordination. Thus, it has been said: "Architects, as well as their consultants, working with a building information model, reduce risk because the model makes the relation of design information explicit within the same virtual space."[54] This same rationale extends to clash detection where the designer, contractor and subcontractors check for 3-D clashes in advance of construction, where it has been similarly observed:

> Design reviews and clash-review meetings bring everyone into the same room, working to solve a problems. This significantly reduces everyone's risk.[55]

On the other end of the spectrum, there are those who subscribe to the belief that BIM will cause a fundamental reordering of liability, an opinion advanced during a panel discussion presented by the Building Futures Council at the 2006 mid-year meeting of the AGC: ". . . no one

---

[53] Certain of such manuscript forms utilized by contractors are posted at http://bimforum.org/
[54] C.C. Sullivan, "Integrated BIM and Design Review for Safer, Better Buildings," *Engineering News Record*, June 25, 2007, quoting Matthew Jogan, AIA.
[55] Richard H. Lowe, "Buckling Up Risks," *Constructor*, January/February 2007. See also, Dwight A. Larson, "Building Information Modeling," *ABA Fidelity and Surety Law Committee*, May 10, 2007, wherein the opinion is expressed that since BIM, by its nature, forces more preplanning and actually enables higher quality preplanning, that BIM properly executed will reduce overall liability for all parties.

implementing BIM first consults with their attorneys or insurance consultants. If they did, they wouldn't be implementing BIM."[56] The truth is likely somewhere in between.

A. Design v. Means and Methods

In order to properly focus on the liability which may flow from use of BIM, it is first necessary to define and distinguish between design for which the designer is responsible and means and methods which fall with the contractor's bailiwick.

1. Design

While definitions abound, the definition of design promulgated in the Federal Acquisition Regulations is straight-forward:

> 'Design' means defining the construction requirement (including the functional relationships and technical systems to be used, such as architectural, environmental, structural, electrical, mechanical and fire protection), producing the technical specifications and drawings, and preparing the construction cost estimate.

FAR § 36.102.

From the perspective of the architect, the construction documents which it issues express design intent and "do not contain sufficient information to construct the project, and much more information is required before the work can be done."[57] This point of view finds foundation in the following language from The Architects Handbook of Professional Practice[58]:

> It is important that all parties understand that construction documents are not intended to be a complete set of instructions on how to construct a building. Construction means, methods, techniques, sequences, procedures, and site safety precautions are customarily assigned as responsibilities of the contractor to give the contractor full latitude in preparing bids and carrying out the construction phase.

---

[56] Lachmi Khemlani, "Building the Future," *AECbytes*, October 11, 2006, http:/www.aecbytes.com/buildingthefuture/2006/AGC_BIM_pr.html

[57] "Best Practices in Risk Management Drawing the Line," James B. Atkins and Grant A. Simpson, *AIA Architect*, September 2005, http://www.aia.org/aiarchitect/thisweek05/tw0902bp._riskmgmt.cfm.

[58] Joseph A. Demkin, *Architects Handbook of Professional Practice*, 13th Ed., John Wiley and Sons, Section 13.4. (2001)

2. Means and Methods

It is a matter of common understanding that a contractor charged with implementing the design intent of an architect must detail the means and methods which it proposes to employ in the form of shop drawings, coordination drawings and various other submittals. This allocation of responsibility is customarily embodied in explicit contract language as follows:

> The Architect shall not have control of or charge of, and shall not be responsible for, construction means, methods, techniques or procedures, or for safety presentations and programs in connection with the Work (collectively Construction Methods) or for the failure of the Contractor or any subcontractor to carry out the Work in accordance with the Contract Documents.

BIM, in certain present day usages and certainly in the future state, blurs the design process with the shop drawing means and methods process.

B. Architect

It is difficult to conceptualize that a designer's participation in BIM extends its basic design liability measurably beyond its present basis. Traditionally, the designer's design liability to the owner has been measured by deviation from the prescribed standard of care. As aptly stated by the Minnesota Supreme Court:

> Architects, doctors, engineers, attorneys and other deal in somewhat inexact sciences and are continually called upon to exercise their skilled judgment in order to anticipate and provide for random factors which are incapable of precise measurement. The indeterminate nature of these factors makes it impossible for professional service people to gauge them with complete accuracy in every instance . . . Because of the inescapable possibility of error which inheres in these services, the law has traditionally required, not perfect results, but rather the exercise of that skill and judgment which can be reasonably expected from similarly situated professionals.[59]

[59] City of Mounds View v. Walijarvi, 263 N.W.2d 420, 424 (Minn. 1978).

The upshot of this universally accepted proposition is that a designer is not necessarily liable to its client simply because it issues a design which contains an error or omission, or even some modicum of error or omission. Nevertheless, implementation of BIM practices on a widespread basis by "similarly situated professionals" may, in due course, result in professional liability for the uncaught error or omission for the design professional who ignores BIM or who fails to properly implement BIM, but this is simply a logical consequence of being judged by the conduct of one's peers.

At present, the designer who contracts to provide overall design to an owner likely has derivative responsibility for the errors of a consultant. The case of Johnson v. Salem Title Co., 246 Or. 409, 425 P.2d 519 (1967) is instructive. There , an architect engaged an engineering consultant to design a masonry wall. As it turned out, the wall was not designed per applicable building code. Determining that the architect had a non-delegable duty to conform to code, the architect was found to be vicariously liable for the error. The case of Kerry v. Angus-Young Associates, Inc., 280 Wis.2d 418, 694 N.W.2d 407 (Ct. App. Wis.) is also of significance. There, an architect failed to adequately evaluate the engineering report of a consultant retained under separate contract by the owner. The court, in refusing to grant summary judgment to the architect, determined that a genuine issue of material fact existed as to whether the architect had a duty to question the adequacy of the report, a report subsequently shown to be erroneous. As such, in the BIM context it would seem to be a distinction without a difference from a liability point of view if the architect secured design documents from a design consultant or if the design consultant proceeded to incorporate its digital design into a master design model.

Similarly, an architect is not, unless performance specifications are involved, considered to be immune from liability as a consequence of error or omission in project shop drawings. The case of Duncan v. Missouri Board for Architects, 744 S.W.2d 524 (Mo. Ct. App. 1988), analyzed this issue in the context of the horrific collapse of the Kansas City Hyatt Regency walkway. The court considered and rejected the argument of the engineer that the structural steel fabricator by custom and practice was responsible to design certain structural steel connections, holding the engineer at fault and declaring that: "Custom, practice, or 'bottom-line' necessity cannot alter that responsibility."[60] Again, designers have responsibility for design aspects of shop drawings and should not be relieved of such responsibility because design information is digitalized by a third-party into a model.

C. Contractor

From the point of view of the contractor, participation in BIM will likely have two consequences: first, it may diminish its ability to invoke the defense of inaccurate or inadequate plans and specifications in a claim by the owner in the event that there is failure in one or more aspects of a project; and, second, it may reduce its ability to recover from the owner for damages it sustains as a consequence of inadequate design. Both potential consequences merit review of the Spearin Doctrine.

---

[60] *Bruner & O'Connor on Construction Law* § 17.61:

> The delegation of significant and substantial design responsibility to unlicensed professionals through the shop drawing process is inconsistent with the design professional licensing statutes of the various states. Contractual exculpatory language aside, the designer of record must remain responsible for the design of the completed structure. To the extent that critical aspects of the design are delegated to others to perform, the designer retains control and responsibility over the design through its review and approval of the delegated work.

See also, Atlantic Nat. Bank of Jacksonville v. Modular Age, Inc., 363 So.2d 1152, 1155 (Fla. Dist. Ct. App. 1st. Dist. 1978) ("Though he did not personally design the walls in question, he delegated that responsibility to others. This duty of the architect cannot be avoided by delegating the responsibility of ensuring that portions of this design comport with the applicable laws and regulations.")

D. Right to Rely: Will the Spearin Doctrine be Corroded or Even Deep-Sixed by Collaboration?

From the vantage point of contractors and their counsel, the seminal case of United States v. Spearin, under which the United States Supreme Court affirmed the doctrine that the Government impliedly warrants the adequacy of the plans and specifications, is properly perceived as the backbone of present day construction contract law.[61] Its preeminent status has been recognized repeatedly: "For over 80 years, the Spearin Doctrine has well served as the cornerstone of construction law. This doctrine enables contractors to assume that the plans and specifications provided to them are adequate and accurate. The doctrine reduces the overall cost of construction by relieving contractors of the cost of independently verifying the adequacy and accuracy of such specifications."[62]

In Spearin, a sewer line relocated by Spearin in full compliance with project plans and specifications broke as a consequence of internal pressure caused by sudden and heavy rainfall. The Government directed Spearin to repair the work at no cost and Spearin refused to do so contending that it had constructed the sewer in accordance with the plans and specifications provided by the Government, whereupon the Government annulled the contract and engaged other contractors to reconstruct the sewer line pursuant to modified requirements. Upon the Government's refusal to pay the contract balance, Spearin sued and recovered the amount owed under the contract, as well as lost profits. Writing for the Supreme Court, eminent jurist and legal scholar, Justice Louis Brandeis ruled four-square for Spearin and issued an opinion which resonates to this day: (1) "[I]f the contractor is bound to build according to plans and specifications prepared by the owner, the contractor will not be responsible for the consequences

---

[61] 248 U.S. 132, 39 S. Ct. 59, 63 L. Ed. 166 (1918).
[62] AGC's Comments On *EPA's Draft Federal Guide for Green Construction Specs*., Associated General Contractors of America, January 14, 2005.

of defects in the plans and specifications"; (2) "This responsibility of the owner is not overcome by the usual clauses requiring builders to visit the site, to check the plans and to inform themselves of the work"; (3) Contract provisions "prescribing the character, dimensions and location of the sewer imported a warranty that if the specifications were complied with, the sewer would be adequate"; (4) "This implied warranty is not overcome by the general clauses requiring the contractor to examine the site, to check up the plans and to assume responsibility for the work until completion and acceptance"; and (5) "The duty to check plans did not impose the obligation to pass upon their adequacy to accomplish the purpose in view." The Spearin Doctrine has subsequently been followed in virtually all jurisdictions and applied to public and private construction alike.[63]

Having created a shield for the contractor from liability arising out of defective plans and specifications, it was but a short step to transform that shield into a sword enabling the contractor to recover its damages arising out of defective plans and specifications.[64]

Over the years, exceptions to the Spearin Doctrine have judicially evolved and certain of these have application to the ability of the BIM contractor to invoke the Spearin Doctrine.[65]

---

[63] See, *Bruner & O'Connor on Construction Law*, Section 9.81.

[64] McCree & Co. v. State, 253 Minn. 295, 91 N.W.2d 713 (1958); see also Souza &McCue Const. v. Superior Court of San Benito, 20 Cal. Rpt. 634, 370 P.2d 338 (1962).

[65] See, Travelers Casualty and Surety of America v. the United States, CFCL No. 02-584C and 03-1548C (filed November 22, 2006), where the exceptions are well summarized as follows: "[T]he [Spearin] warranty does not extend to performance specifications which 'merely set forth an objective without specifying the method of obtaining the objective." White v. Edsall Construction Company, Inc., 296 F.3d 1081, 1084 (Fed. Cir. 2002); the contractor may recover only if design specifications are "so substantially deficient or unworkable as to constitute a breach of the contract." Wunderlich Contracting Co. v. United States, 173 Ct. Cl. 180, 191 (1965); a contractor must fully comply with and follow the design specifications, although faulty, to enjoy the protections of the implied warranty, unless the departure from the specifications is 'entirely irrelevant to the alleged defect.' Al Johnson Constr. Co. v. United States, 854 F.2d 467, 470 (Fed. Cir. 1988) (citing further authority); a contractor is subject to a "duty to investigate or inquire about a patent ambiguity, inconsistency, or mistake when the contractor recognized or should have recognized an error in the specifications or drawings." PBI Elec. Corp. v. United States;. White, 296 F.3d, *supra* at 1085; and as always, the contractor has the burden to prove the existence and breach of this implied warranty, and the harm that resulted. Hercules v. United States, 24 F.3d 188." These exceptions to the Spearin doctrine spring from common sense. Other deviations do not. See Dugan & Meyers Constr. Co., Inc. v. Ohio Dept. of Admin. Services, 113 Ohio St.3d 226, 2007 - Ohio 1687, where the Ohio Supreme Court narrowly construed the Spearin Doctrine so as to limit its application to accurate indications on the part of the Government of site

E. <u>Viability of Spearin</u>

Whether the Spearin Doctrine will continue to maintain viability in the BIM world will depend, in the first instance, upon whether BIM, as it evolves, will accelerate the trend to design-build. If it does, application of the Spearin Doctrine will diminish.

1. Design-Build

In the design-build setting, the design-builder's obligation to design is obviously directly akin to a performance specification, thus invoking the principal exception to the Spearin Doctrine, that the contractor was working to performance specifications. A case of distant vintage is directly on-point. In Barraque v. Neff, 202 La. 360, 11 So.2d 697 (1942), the Supreme Court of Louisiana, an owner sued its contractor (and its contractor's surety) arising out of defects in a building designed and constructed by the contractor. Stating the obvious, the court concluded that when plans and specifications were prepared by the contractor, the contractor could not escape responsibility for the defects by taking the position that the defect was in the specifications and not the work since the contractor was responsible for both. Rejecting the contention of the contractor that it was protected by the Spearin Doctrine, the court ordered judgment for the owner.

It is likely that the Spearin Doctrine may still be invoked in the BIM context when the information parameters provided to the design-builder by the owner, and upon which the design-builder's design is predicated, proves to be defective or deficient in some fashion. The case of Record Steel and Construction v. United States, 62 Fed. Cl. 508 (2004), is instructive. There, at issue was whether the government was within its rights to insist that its design-builder over-excavate for the building footings as recommended in the government's foundation analysis

---

conditions; the Court determining that the Spearin Doctrine did not apply to permit a damages award against the Government resulting from delays due to problematic plans and specifications.

report. Finding that the government's information to the builder was ambiguous, the design-builder was entitled to recover the cost of the over-excavation. Likewise, in the case of M. A. Mortenson Company, 93-3 BCA 26, 189 ASBCA No. 39,978, the design-builder was determined to be entitled to rely on information shown on the project drawings in its determination of the amount of concrete and reinforcing steel required. While the case did not specifically refer to an implied warranty of accuracy, the holding establishes that the design-builder had a right to rely upon the government information.

Despite the trend to design-build, and even if BIM accelerates that trend, as has been suggested, a substantial portion of building projects will undoubtedly continue for the foreseeable future to be designed and built in the design-bid-build mode.

2. Design-Bid-Build

Certainly, to the extent that design information provided to the contractor in a digital model is inaccurate, the contractor should be able to rely on such information and should have a corresponding Spearin Doctrine defense as well as a remedy in the event of design deficiencies. However, there are permutations from that principle. First, wholesale implementation of BIM methodology contemplates, if not demands, full participation by the contractor in reviewing the design model early-on in the design process.[66] In such event, the contractor may lose the benefit of the owner's implied warranty by application of the patent defect exception to the Spearin Doctrine which requires that patent errors be recognized. To point out the obvious, BIM participation by the contractor may and could well lead to timely (preconstruction) discovery and correction of certain design errors so as to abrogate any subsequent necessity to invoke the

[66] This participation undercuts the principle that the contractor is not normally under a duty to conduct an independent investigation of the adequacy of the specifications and the underlying rationalization that the contractor should not be obligated to search for hidden ambiguities since such an obligation would impose an unrealistic burden on a contractor who is a "busy prospective bidder attempting to prepare a responsive, timely and competitive bid." Foothill Engineering, 94-2 B.C.A., 1 B.C.A., 3119A, CCH 26, 732 (1993).

Spearin Doctrine. Nevertheless, it is a certainty that certain design errors in certain circumstances will not be detected. In such instances, the right of the contractor who participates in BIM to invoke the Spearin Doctrine involves an analysis of whether an error otherwise latent should be considered patent. In that regard, it is not unreasonable to project that the threshold for invocation of the Spearin Doctrine by a contractor and BIM participant in such a situation will be set quite high.

Apart from a heightened obligation to detect errors, a BIM contractor may also tread closely to an inability to invoke the Spearin Doctrine by its early-on addition of detail into the digital model. In such circumstance, a trier-of-fact would likely scrutinize whether the project owner was obligated to warrant such specific aspects of design. Of course, contribution, at any stage, to design, even design in its inception, should not necessitate a corresponding obligation on the part of the contractor to enmesh itself into unrelated aspects of design and should not preclude resort to the Spearin Doctrine as regards such other areas of design.

While it is naturally appropriate to focus on whether the contractor's right to recover from the owner for defective plans and specifications will be undermined by the contractor's participation in BIM, it needs to be recognized that there is another school of thought that BIM will lead to even a greater right on the part of the contractor to recover from the designer for errors in design. This possible expansion of right of recovery of the contractor BIM participant has been expressed as follows:

> With the electronic sharing of information, the ability of contractors to claim detrimental reliance on the design has increased. Case law seems to be moving from the Spearin doctrine in which the client [the Owner] provides an implied warranty of the suitability of the documents for construction but the design firm only has to meet a professional standard of care. Now, a new paradigm seems to be allowing contractors to claim [against the design firm] they are intended beneficiaries of the design information and therefore have an absolute right to rely on its accuracy. Much of this trend is tied to the use of electronic information, and BIM may accelerate this trend.[67]

F. Disclaimers

In present day application of BIM, disclaimers of responsibility of the accuracy of the 3-D model, while counter-intuitive, are commonplace.[68] Inasmuch as the architect typically disclaims the accuracy of its design-model and requires the contractor to acknowledge that disclaimer, so, too, does the contractor typically declaim the accuracy of the construction model which it makes available to its subcontractors. The architect's disclaimer has as its antecedent its antipathy to assumption of risk. The contractor's disclaimer, in turn, is grounded upon common sense since the contractor certainly has no reason to provide a warranty of a construction model derived from a disclaimed design model.

The astute recognize the right to rely is vital to the ability to extract the inherent values of BIM. Thus, it has been observed, "With BIM, there must be a free exchange of data and the ability to rely on such data when incorporated into the final model."[69] Moreover, it has also been suggested that disclaimers may be ineffective since reliance is implicit.[70] This antipathy to

[67] "Building Information Modeling: Will Professionals Receive the Benefits?," Schinnerer, *Guidelines for Improving Practice* (May/June 2006).
[68] Although it must be recognized that use of disclaimers has by no means been universal. In that regard, the contract documents for the Walt Disney Concert Hall specifically provided that: "3-D Computer Database Master Model. The Architect has prepared a 3 dimensional (3D) computer model (master model) which forms a part of the Contract Documents."
[69] Schinnerer, *Guidelines for Improving Practices,* May/June 2006, *supra.*
[70] Schinnerer, *Guidelines for Improving Practices,* May/June 2006, *supra.*

disclaimers is shared by the AGC. "Disclaimers of reliance that some have sought to apply to design documents in electronic format should be discarded."[71]

As a consequence, it can be predicted, with a relative degree of certainty, that the present day use of disclaimers of accuracy of BIM models within the AEC world will be short lived and will have no role in the future world of BIM. Certainly, with both public and private owners clamoring for BIM, they will demand the full measure of its power be available, marginalizing, if not eliminating, the application of disclaimers in the future world of BIM.

V. INSURANCE ISSUES

There is a not unreasonable perception that utilization of BIM will serve to reduce the overall risk profile of a project. Certainly, clash detection, while not 100% foolproof, will reduce claims arising from lack of coordination between design disciplines. Nevertheless, AEC participants in the BIM process are concerned that BIM may cause risk to be reallocated to their detriment. As such, principles of risk management dictate that BIM participants insure attendant risks to the greatest extent possible.

A. Contractors Professional Liability Policies

It is a fact of life that contractors who undertake projects as design-builders or contractors (or at-risk construction managers) and find themselves bound, in whole or in part, to discharge performance specifications, necessarily engage either directly or indirectly in the performance of design services. Whether the contractor contracts with others for performance of the design services, performs the design services itself, or passes the obligation to perform design services down to its subcontractors and suppliers, such as precast fabricators, curtainwall manufacturers, sheeting, shoring contractors and fire protection contractors and the like, the contractor exposes itself to claims for design error and, as, or more, importantly, the prospects of significant defense

[71] *The Contractors Guide to BIM, supra.*

costs in the event of such claims. Of course, such exposure is not confined with the contexts of design-build and performance specifications, as contractors, with or without the added element of BIM participants, may well subject themselves to liability for its performance of professional services in its discharge of contract responsibilities for construction management, value engineering, design assist, constructability reviews, pre-construction services and program management services to name but a few.[72] Performance of BIM services should properly be viewed as just another potential liability stemming from performance of professional services.

Contractors who engage in such work, including those who utilize BIM technology, are well served by purchasing professional liability insurance.[73] Such insurance will serve to protect contractors from professional liability claims,[74] whether predicated upon direct or derivative liability. Perception suggests that professional liability carriers, while understandably concerned about the new order being created by BIM, do not fully understand its implications, are not very far along in their analysis of liability and, as a consequence, will continue to make underwriting decisions upon the basis of their comfort with the financial and other capabilities of the contractor. It is within the realm of reason that underwriters may in fact be amendable to a contractor's stated position that utilization of BIM, all in all, makes it a better contractor and, thus, reduces the risk of professional liability claims.

---

[72] "Insuring Contractors' Professional Liabilities," David H. Collings and Gregg Bundschuh, *26 International Risk Management Institute Construction Risk Conference,* October 11, 2006.

[73] Professional liability is excluded from many commercial general liability policies, either directly or by reason of a professional liability exclusion endorsement typically attached by CGL insurers.

[74] According to Collings and Bundschuh: "Most underwriters believe that less than half of the contractors that need professional coverage buy it."

B. Architects Professional Liability Policies

Information is sketchy about the legal exposure posed to architects by BIM. As noted by Victor O. Schinnerer & Company, Inc., "Building Information Modeling (BIM) does not have enough of a case history as an architectural tool to determine risk."[75]

A survey of 14 leading A/E insurance companies conducted under the auspices of the National Society of Registered Engineers showed that the carriers have concerns regarding liability which could ensue from use of shared design over the Internet, such as BIM.[76] Part of such concern could well stem from false expectations on the part of owners who, in due course, will undoubtedly be called upon to pay its architect for the additional cost associated with use of BIM, that use of BIM will result in projects which are designed beyond reproach in all respects. It is relevant to note that the concerns of the A/E carriers, as respects an additional avenue of potential professional liability, had yet to surface. As reported in a 2006 survey of liability carriers, BIM has not shown up in claims as yet.[77]

C. Subcontractors Professional Liability Policies

If a subcontractor commits an error in its performance of an aspect of design, as for example, if the curtainwall subcontractor working under a performance specification fails to properly design a curtainwall facade, the owner will quite likely assert a claim against the prime contractor who, in turn, will assert a right of recovery against the subcontractor. In order to fully

---

[75] "Building Information Modeling: Potential Legal Exposures," *AIA Best Practices*, October 2006. Quoting Lorna Parson, Schinnerer "Integrated Practice in Perspective, A New Model for the Architecture Profession," *Architectural Record*, May 2007.

[76] "Insurance Rates are Trending Lower," *News Release*, National Society of Registered Engineers, October 31, 2006. The NSRE is a national society of licensed professional engineers and is comprised of more than 50,000 members. See also, *CNA Application for Architects & Engineers Professional Liability Coverage,* sub-heading Risk Management and Loss Prevention, which poses the questions: Does your firm design projects using a model-based technology linked to a database of project information such as Building Information Modeling(BIM). If yes, on what percentage of projects is it used.

[77] Maureen Conley, "The Goldilocks Effect," *Engineering, Inc*., 2006 Survey of Professional Liability Carriers, January/February 2007.

protect itself in such an eventuality, the contractor will have to assure that the subcontractor has obtained and maintained professional liability coverage. Of course, if the professional liability coverage of the subcontractor is non-existent, the contractor may find itself with an upstream liability and no downstream recovery. Moreover, if the professional liability coverage of the subcontractor is insufficient, the contractor is at risk for any resultant gap in coverage.[78]

D. Project Professional Liability Policies

Risks associated with all professional activities of an architect, its consultants, and the contractor (and its subcontractors) on a specific project were in the not-so-distant-past encompassed and insured through a project policy and relatively high levels of coverage were at one time available in the market. Unfortunately, the present insurance market no longer supports these policies as: ". . . adverse loss experiences have restricted availability of this type of coverage, with only a handful of markets writing them," and "when it is available, premiums are significant."[79]

E. Technology Errors and Omissions Liability Policies

Use of advances in technology is not without risk and consequent avenues of liability remain unexplored.[80] Certain of these risks, certainly inherent in BIM, could well be predicated upon failure to secure computer systems with resultant unauthorized access, security breach, theft, destruction, deletion or corruption of electronic data. The insurance industry has responded and developed insurance products to address this liability. Technology Errors and Omissions Liability Policies are now available to cover risks relating to data created and

[78] According to Collings and Bundschuh: "A few insurers, led by Zurich, offer protection for this exposure (for resultant gaps in coverage)."
[79] "Construction Risk Management," Chapter IX, *Wrap-Up/OCIP International Risk Management Institute, Inc.*, November 2006.
[80] Again, most Commercial General Liability policies do not provide coverage for professional liability issues and, in any event, such policies typically do not cover economic damages and consequential financial loss.

distributed. The policies are written to extend to liability risks related to programming errors, software performance, system crashes or destruction, deletion of the information created in a BIM model or on a website, risk of loss of intellectual property and risk associated with failure to prevent computer virus (malicious code) transmission between computer systems, any or all of which cause a claim on the part of a client or a third party.

V. BONDING

Inasmuch as there are no unique problems in BIM associated with payment bonds, focus will center exclusively on performance bonds.

It goes without saying that to the extent possible the performance bond surety does not want to provide a performance bond which incorporates design risks. Such risks, from the surety's perspective, are best addressed within liability insurance policies. To the extent that BIM causes the bonded contractor or its subcontractors/suppliers to engage in the performance of professional activities, as for illustrative purposes, if the contractor's input of information into the operational database of the BIM model is determined to constitute design, there are potential ramifications to the performance bond surety. In such a scenario, and presuming that the contractor and its subcontractors/suppliers are required to provide contractual warranties for their work, any work product that integrates design and construction issues (BIM) may result in unanticipated consequences to the performance bond surety.

Nevertheless, it is universally recognized that suretyship is a contractual relationship under which the performance bond surety is obligated to answer for the default of the contractor. As such, the performance bond surety's expectations to the contrary, liability for design deficiencies is to be envisioned.[81] As articulated by legal commentators: "The surety which issues a performance bond conditioned upon the principal (design-builder) performing the

[81] Barraque V. Neff, 202 La. 360, 11 So.2d 697 (1942).

contract, may effectively assume obligation not only for the construction but also for the design, thus substantially increasing the surety's exposure."[82]

The exposure to the performance bond surety in securing the performance of a contractor who undertakes BIM obligations is very much akin to the surety's risk in issuing a performance bond to a design-build contractor. In design-build, the design-builder, by the very nature of its contract with the owner, is responsible for the design and construction of the project. In the absence of specific performance bond language exculpating the performance bond surety for damages resulting from defective design, the performance bond surety will find it difficult indeed to argue that its liability is confined to the "build" end of the design-build equation.

VI. CONCLUSION

Maturation of BIM is on hand and project delivery systems must account for its presence. Construction law practitioners will be called upon to assist in its implementation and as friends of the project should embrace its applications.

---

[82] John H. Gregory and Michael Jay Rune II, "Liability of the Performance Bond Surety," *The Law of Performance Bonds, American Bar Association, Tort & Insurance Practice* (2000), citing therein Nicholson and Loup, Inc. v. Carl E. Woodward, Inc., 596 S.2d 374 (4th Cir. La. 1992)