Entering the Brave New World: An Introduction to Contracting for BIM[£]

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I. INTRODUCTION

Building information modeling (BIM), or as some refer to it, virtual design and construction,[4] is here,[5] and its benefits for the construction industry are many and varied. They include: improved spatial program validation; a greatly-enhanced ability to visualize and comprehend designs, complicated details, and sequences; more effective coordination and detection of system clashes; better quality design and design detailing; greater dimensional precision; improved productivity; better capability to optimize budget and schedule options; better tools for field teams; greatly-enhanced communication and collaboration among owners, designers, contractors, and suppliers; more efficient fabrication; an increased ability to modularize and prefabricate building components; improved quality and safety; reduced project delivery time; and improved as-built documentation.[6] BIM, competently applied, can also reduce the overall liability exposure of all of the players involved in a construction project.[7]

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[4] This article will refer to the process of using building information models as building information modeling (BIM), and to digital products of the process as building information models or simply as models. For a discussion of the varying aspects of building information modeling sometimes referred to as BIM, *see* NAT'L INST. OF BLDG. SCIENCES, NAT'L BLDG. INFO. MODELING STANDARD 22 (2007), http://www.facilityinformationcouncil.org/bim/pdfs/NBIMSv1_ConsolidatedBody_11Mar07_4.pdf [hereinafter NIBS].

[5] *See* The ASSOC. GEN. CONTRACTORS OF AM., THE CONTRACTORS' GUIDE TO BIM 2 (2006) [hereinafter AGC] ("The fact is that the construction industry is already beginning to go through what many predict will be a significant transformation.").

[6] *See id.* at 3–4, 13; JOHN KUNZ & BRIAN GILLIGAN, STANFORD UNIVERSITY CENTER FOR INTEGRATED FACILITY ENGINEERING, VALUE FROM VDC / BIM USE 43 (2007), http://cife.stanford.edu/ VDCSurvey.pdf; Glenn W. Birx, *Getting Started With Building Information Modeling*, AIA BEST PRACTICES, Sept. 2006, at 1–2, http://www.aia.org/SiteObjects/files/BP_13-01-02% 20Getting%20 Started%20with%20BIM.pdf; Derek Cunz & Dwight Larson, *Building Information Modeling*, UNDER CONSTRUCTION, Dec. 2006, at 1, http://www.abanet.org/forums/construction/publications/eunder_ construction_12_06.pdf; Dace A. Campbell, *Building Information Modeling: The Web3D Application for AEC*, *in* PROC. OF THE 12TH INT'L CONF. ON 3D WEB TECH. 173 (2007) ("BIM has enabled us to increase understanding, confidence, communication, quality, and safety, while decreasing cost, time, and rework in construction."); U.S. GEN. SERVS. ADMIN., GSA BLDG. INFO. MODELING GUIDE SERIES, 01 – GSA BIM GUIDE OVERVIEW 2, 6–7, 17 (2006), *available at* http://www.gsa.gov/gsa/cm_attachments /GSA_DOCUMENT/GSA_BIM_01_v05_R2C-a3-l_0Z5RDZ-i34K-pR.pdf [hereinafter GSA BIM GUIDE OVERVIEW] ("As a shared knowledge resource, BIM can reduce the need for re-gathering or re-formatting information. This can result in an increase in the speed and accuracy of transmitted information, reduction of costs associated with a lack of interoperability, automation of checking and analysis, and unprecedented support of operations and maintenance activities."); Howard W. Ashcraft, Jr., *Building Information Modeling: Electronic Collaboration in Conflict with Traditional Project Delivery*, 27 CONSTRUCTION LITIG. REP. 335, 335 (2006) ("The model can even be used to drive computer-controlled fabrication tools, leapfrogging the tedious and error-ridden shop drawing process."); Mike Neville, *3D Building Information Modeling – Not Your Ordinary Construction Tool*, OWNER'S PERSPECTIVE, Spring 2006, at 13, 13; Harry Goldstein, *Maestros of Design and Construction Render a Virtual Masterpiece*, CONSTRUCTION.COM, May 2, 2001, http://www.construction.com/NewsCenter/it/ archive/01-20010502pf.asp (discussing the use of BIM on the Disney Concert Hall); Nadine M. Post, *Sharing High-Tech Tools Creates Rocky Mountain High*, Engineering News Record, May 15, 2006, http://www.construction.com/NewsCenter/TechnologyCenter/Headlines/archive/2006/ENR_20060515.as

But what of the challenges? Leaving aside those of a technical nature (which are not insignificant considering the continuing evolution of available tools), the use of BIM raises a number of legal and contractual questions. Does it alter the traditional allocation of responsibility and liability exposure among owners, designers, contractors, and suppliers? What are the risks of sharing digital models with other parties? Does the party managing the modeling process assume any additional liability exposure? What risks arise from potential interoperability of the various BIM software platforms in use? How should intellectual property rights be addressed? What risks arise for the party taking responsibility for establishing and maintaining the networked file-sharing site used as a depository for models? How might BIM alter the set of post-construction deliverables on a project, and what are the implications of the changes? And, perhaps most importantly, how can the project contracts enhance rather than limit the benefits to be gained through the use of BIM?[8]

Despite the benefits and the range of issues it can bring, BIM for the most part has been treated lightly, if at all, in project agreements.[9] This is understandable, of course, given the relatively-recent emergence of BIM and its evolving capabilities and uses. Nevertheless, there is a general consensus that the industry must do better. In light of that need, the purpose of this article is threefold: (1) to address some of the legal issues raised by the use of BIM; (2) to generally discuss contract terms that can help the parties both manage the challenges and maximize the benefits of BIM; and (3) to discuss how BIM can be treated contractually as an integrated aspect of the delivery of a project.[10]

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p (discussing the use and benefits of BIM in the design and construction of the Denver Art Museum). For an excellent discussion of the productivity challenges facing the construction industry and the role the BIM could play in addressing the challenge, *see* Patrick J. O'Connor, Jr., *Productivity and Innovation in the Construction Industry: The Case for Building Information Modeling*, 1 J. AM. C. CONSTRUCTION L. 5, 135 (2007).

[7] *See* KUNZ & GILLIGAN, *supra* note 6, at 16 ("3/4 of respondents say VDC [virtual design and construction] reduces overall risk*!!*"); Michael Tardif, *BIM Me Up, Scotty*, AIARCHITECT THIS WEEK, Dec. 1, 2006, http://www.aia.org/aiarchitect/thisweek06/1201/1201rc_face.cfm ("The clarity of the information reported by model checkers and the relative ease with which it can be obtained fosters a collaborative climate for resolving design problems, with the added benefit of reducing both actual and perceived risk of professional liability errors and omissions.").

[8] For a description of other issues of interest to design professionals, such as the potential overlap between responsibility for software error and the professional responsibility of design professionals, the issue of whether "standards committees that develop interoperability protocols and object specifications become project 'designers,'" and the issue whether a design professional can be in responsible charge of such things as "changes to structural detailing that are performed by the software itself," *see* Ashcraft, *supra* note 6, at 344. As the authors are not practicing design professionals and do not advise design professionals, the discussion of these and similar issues is left to others.

[9] *See* O'Connor, *supra* note 6, at 176–77 ("One of the most pressing [challenges] is the fact that there currently exists no legal or contractual framework within which to encourage the full implementation of this technology.").

[10] The article is not intended to evaluate potential new delivery methods that might maximize the benefits of BIM, but rather to discuss issues that may arise with BIM in the context of any delivery method.. Similarly, although the capabilities and uses of BIM continue to evolve, the article is not intended to address future issues that may arise, but instead focuses on the here and now. Finally, while BIM will no

II. BIM AND ITS USES

BIM is not susceptible of easy definition. A building information model has separately and usefully been defined as "a digital representation of physical and functional characteristics of a facility"[11] and as "an intelligent simulation of architecture" in which the information contained within it is digital, spatial, measurable, comprehensive, accessible, and durable.[12] The qualities of BIM described in the second definition are enormously useful in the delivery of a construction project (and, as the use of BIM matures, in the entire life cycle of a facility[13]). These qualities allow BIM to be used in a variety of ways, including: design visualization and comprehension, structural analysis, energy analysis, preparation of design drawings, systems coordination, constructability reviews (including detection of physical clashes), communication, integration of models of various players, "4D" scheduling and sequencing, site planning and utilization, safety analysis and management, manufacturing control, cost estimating, layout and field work, prefabrication, emergency simulations, and operations and maintenance.[14]

One of the most important variables in the use of BIM that influences both the extent of project benefits to be gained and the range of issues that may require treatment in the project agreements is the degree to which BIM is integrated into the entire project-delivery process.[15]

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doubt be of enormous value during the entire life cycle of a facility, the article focuses primarily on the design and construction phases.

[11] NIBS, *supra* note 4, at 22.

[12] Campbell, *supra* note 6; *see also* AGC, *supra* note 5, at 3 ("Building Information Modeling is the development and use of a computer software model to simulate the construction and operation of a facility."). The General Services Administration's BIM Guide Overview further states:

> 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 or a recapitalized (modernized) 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. . . .
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> 3D geometric models contain almost no intelligence. BIM models are objects containing the most intelligence . . . . As a result, BIMs are multi-purposed and can be evaluated from many different points of view as required to optimize design, construction, and operation of a building.

GSA BIM GUIDE OVERVIEW, *supra* note 6, at 3–4.

[13] *See* GSA BIM GUIDE OVERVIEW, *supra* note 6, at iv ("Ultimately, [BIM] has the potential to enable the seamless transfer of knowledge from facility planning through design, construction, facility management and operation, and recapitalization or disposal. While all parties involved in design and construction stand to gain from the adoption of BIM, it is the owners who will potentially benefit the most, through the use of the facility model and its embedded knowledge throughout the 30 to 50 year facility lifecycle.").

[14] *See* KUNZ & GILLIGAN, *supra* note 6, at 19; TIMO HARTMANN, WILLIAM E. GOODRICH, MARTIN FISCHER & DOUG EBERHARD, STANFORD UNIV. CTR. FOR INTEGRATED FACILITY ENG'G, FULTON ST. TRANSIT CTR. PROJECT 9, 11–36 (2007), http://cife.stanford.edu/online.publications/TR170.pdf; Ashcraft, *supra* note 6, at 338–39; Cunz & Larson, *supra* note 6, at 3–4; Campbell, *supra* note 6.

[15] *See generally* AM. INST. OF ARCHITECTS CAL. COUNCIL, INTEGRATED PROJECT DELIVERY 1–4 (2007) http://www.aia.org/SiteObjects/files/IPD%20definition%20doc%20final%20with%20supplemental%20in

This includes the degree to which BIM is integrated into the design and construction (and potentially the operation and maintenance) activities of a project, the degree to which BIM is integrated into the collaboration of the various parties furnishing those services, and the degree to which the parties allow the use of BIM to increase the depth of that collaboration.[16] The degree and nature of the use of BIM for project collaboration is of particular importance to the contract drafter, because it affects the degree of change in the project-delivery processes[17] and thereby the range of potential legal issues requiring treatment in the project agreements.

In a relatively non-integrated use of BIM, the designers might use BIM to assist with design, then deliver completed 2D plans to the general contractor. From there, the contractor and its subcontractors and suppliers might create their own models for means-and-methods purposes from the 2D drawings.[18] Even this common, but relatively non-integrated use of BIM can bring significant value. The design team can use BIM to visualize the project and to achieve greater dimensional precision in the design, and contractors can use BIM for detailing and in their means-and-methods models can build the project virtually before they build it actually.[19] In the process, the parties can identify a great number of system conflicts and other issues that otherwise would not be discovered until the project is constructed and can address those issues far more efficiently and inexpensively than they could during construction.[20]

In a variation of this relatively non-integrated use of BIM, some designers might furnish copies of their digital models to the general contractor upon completion of the design for the contractors and fabricators to use as starting points for their means-and-methods models. However, because the sharing of models in this manner typically happens as an afterthought, rather than as the fulfillment of deliverables defined during the planning of the project and reflected in the project agreements (including the compensation provisions of the design agreements), the models are often shared only with broad disclaimers of the recipients' right to

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fo.pdf [hereinafter AIACC]; *see also* KUNZ & GILLIGAN, *supra* note 6, at 48 ("Use VDC/BIM at concept stage or as early as possible—Concept validation and automation take longer up front but save time and money overall . . .").

[16] *See* HARTMANN ET AL., *supra* note 14, at 6 ("By combining project scope and schedule information that would usually be represented in various different information sources, 3D/4D models serve as a construction planning, coordination and communication tool."); Tardif, *supra* note 7 ("There are benefits to implementing BIM within a single firm, but the greatest benefits are realized when BIM is implemented by all members of a project team.").

[17] *See* Ashcraft, *supra* note 6, at 335 ("At their core, [BIM tools] are platforms for collaboration that change the nature of the design and construction process."); Tardif, *supra* note 7 ("Building information modeling (BIM) is as much a business process as it is a technology.").

[18] *See* AGC, *supra* note 5, at 13 (referring to this relatively non-integrated use of BIM as "2D conversion").

[19] *Id.*

[20] *Id.* at 12–13. This approach nevertheless has drawbacks. Chief among them is the fact that contractors are required to create their means-and-methods models from scratch, andin the process give up potential project efficiencies. In addition, as the authors' colleague, Derek Cunz, has frequently described in public presentations, one of the lessons that Mortenson has learned in its use of BIM is that it is better to "model your own scope of work." This relatively non-integrated approach departs from that guidance in that it requires that contractors model information developed by designers and incorporated into the 2D contract documents.

rely on their accuracy.[21] The resulting collection of disclaimers then becomes a contractual "cloud" around the original set of agreements.

The use of BIM becomes more integrated when contractors begin their modeling work during the design phase. This brings important advantages, including allowing the means-and-methods work of the contractors to inform the design,[22] allowing the models to be used to a greater degree and earlier in the process as the primary tool for collaboration among the parties, and in some cases permitting a compression of the overall project delivery schedule.[23] Of course, the earlier that all of the key modeling parties are involved, the greater the integration and the greater the potential benefit. Even greater integration and greater project efficiencies can be achieved if the modeling parties agree on reasonable rights of the project team members to rely on the completeness and accuracy of shared models.[24]

The benefits (and challenges) resulting from the increased integration of BIM into the delivery of the project leads to one of the most important practical factors that can influence the ability of the parties to fully realize the benefits of BIM and at the same time manage the associated legal issues. That is the importance of the owner and the key modeling parties[25] meeting during the initial-planning phase of the project and making vital decisions about the use of BIM on the project, beginning with the desired outcomes of the owner and scope of the use of BIM.[26] This in turn allows the initial design and modeling activities to be executed in a manner consistent with the ultimate uses of BIM, and it allows the contract drafters to fully integrate the

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[21] *See* discussion *infra* Part III.B.

[22] This can bring enormous advantages. In one laboratory project, early coordination of design and means-and-methods detailing permitted the use of a shallower ceiling plenum space than expected and allowed an additional floor to be included in the height-restricted building. *See* AIA TECH. IN ARCHITECTURAL PRACTICE, 2007 BIM AWARDS (2007), http://www.mortenson.com/templates/img/Narrative.pdf.

[23] *See* Neville, *supra* note 6, at 14.

[24] *See* discussion *infra* Part III.B; *see also* William A. Lichtig, *The Integrated Agreement for Lean Project Delivery,* 26 CONSTRUCTION LAW. 25, 30 (2006); AIACC, *supra* note 15 (concerning the means of achieving broader and deeper integration of all aspects of project delivery than are addressed here).

[25] In Mortenson's experience, the key modeling parties generally include the architect, general contractor, and depending on the nature of the project, selected sub-consultants, subcontractors, and suppliers.

[26] *See* AIACC, *supra* note 15, at 3 ("Identify, at the earliest possible time, the participant roles that are most important to the project."); *id.* at 5 ("Involve all key stakeholders in the programming process."); KUNZ & GILLIGAN, *supra* note 6, at 48 ("Use VDC/BIM at concept stage or as early as possible—Concept validation and automation take longer up front but save time and money overall."); GSA BIM GUIDE OVERVIEW, *supra* note 6, at 15 ("GSA projects should first examine the business needs of the project and explore candidate 3D, 4D, and BIM technologies. This should be the basis for defining the scope of the 3D-4D BIM project."); NATIONAL INSTITUTE OF BUILDING SCIENCES, NATIONAL BUILDING INFORMATION MODELING STANDARD A/R 106 (2007), http://www.facilityinformationcouncil.org/bim/pdfs/NBIMSv1_ConsolidatedAppendixReferences_11Mar07_1.pdf [hereinafter NIBS A/R] ("Explicitly documenting the intended use of BIM models goes a long way in restricting their use and protecting the parties from unintended consequences.").

processes and deliverables agreed to by the owner and the modeling parties into the entire set of project agreements.[27]

III. LEGAL AND CONTRACTUAL CONSIDERATIONS

A. Design versus Means and Methods: Must the Egg be Scrambled?

Perhaps the greatest source of angst associated with BIM is the fear that its use will inevitably result in an unintended assumption of responsibility for design by contractors and of responsibility for means-and-methods by designers. The fear arises naturally from one of the central advantages of the use of BIM: the step-change in the degree of collaboration it enables among owners, designers, contractors, and suppliers. In its most extreme form, the fear apparently flows from a belief that the use of BIM results in the creation of a digital soup in which design, means-and-methods, and product information is irreversibly blended. In a less extreme form, it seems to derive from a fear that any new technology-enabled process that involves the widespread sharing of data-rich 3D models, the combining of design and means-and-methods models in common digital files for purposes of analysis and easy manipulation of the models cannot help but somehow result in some scrambling of the traditional roles and responsibilities of designers, contractors, and suppliers.

Of course, this concern is of great importance. It has been nearly ninety years since the United States Supreme Court decided *United States v. Spearin*,[28] which since that time has been the pole star in the allocation of responsibility for defective design and construction. Under the *Spearin* Doctrine, owners impliedly warrant the adequacy of plans and specifications they require contractors to follow.[29] Thus, the contractor is not legally responsible if an aspect of a constructed project is defective not because the contractor failed to build in accordance with plans and specifications furnished by the owner, but because those plans and specifications were inadequate.[30] Does the step-change in collaboration among designers, contractors, and suppliers enabled by BIM, much of which can occur during the design phase, deprive the contractor of protection from responsibility for design error provided by the *Spearin* Doctrine?

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[27] *See* O'Connor, *supra* note 6, at 177–78 ("It is important that the contractual arrangements regarding electronic media reflect the reality in the field."). Of course, many public owners are legally restricted in the extent to which they can select, let alone gather for planning purposes, the key modeling parties early in the project-delivery process. *See, e.g.,* GSA BIM GUIDE OVERVIEW, *supra* note 6 at 15 ("GSA projects have a unique set of constraints and opportunities. All projects are subject to federal requirements: design and construction phases must follow prescribed procedures for fair and open competition, specified federal project milestones must be met, and consultants must be selected based on design talent rather than other means or methods."). Nevertheless, the earlier they can do so, the better.
[28] United States v. Spearin, 248 U.S. 132 (1918).
[29] Spearin, 248 U.S. at 136; *see generally* 3 PHILIP L. BRUNER & PATRICK J. O'CONNOR, JR., BRUNER & O'CONNOR ON CONSTRUCTION LAW § 9:78 (2002).
[30] *See, e.g.,* Spearin, 248 U.S. at 136 ("But if the contractor is bound to build according to plans and specification prepared by the owner, the contractor will not be responsible for the consequences of defects in the plans and specifications."); Alaska Dep't of Natural Res. v. Transamerica Premier Ins. Co., 856 P.2d 766, 772 (Alaska 1993) ("If defective specifications cause the contractor to incur extra costs in performing the contract, then the contractor may recover those costs that result from breach of the implied warranty.").

For their part, designers have generally taken great care to avoid involvement in and responsibility for construction-means-and-methods decisions, for which contractors generally retain responsibility.[31] Does the collaboration enabled by BIM, in which the models prepared by contractors may inform the design and in which designers may make their models available to contractors for the preparation of means-and-methods models erode designers' traditional protection from responsibility for contractor means-and-methods?

As long as the parties' roles are appropriately defined and as long as appropriate control is exercised over the collaborative process the answer to those questions is generally no, with a potential exception. The use of BIM does not necessarily alter the traditional allocation of responsibility among designers, contractors, and suppliers. Instead, whether the allocation of responsibility is altered is purely a function of the roles and responsibilities assigned to the various parties, the collaborative process that is established, and the discipline of the parties as a matter of practice in maintaining their roles and following the established process.

It is Mortenson's experience that, with the possible exception of the role of the model manager,[32] the effective and collaborative use of BIM does not require that the project participants assume any roles other than their traditional roles. For example, the preconstruction duties of a construction manager under a commonly-used AIA contract form consist essentially of the following nine tasks: (1) "provide a preliminary evaluation of the Owner's program and Project budget requirements, each in terms of the other"; (2) "consult with the Owner and Architect regarding site use and improvements and the selection of materials, building systems and equipment"; (3) "provide recommendations on construction feasibility; actions designed to minimize adverse effects of labor or material shortages; time requirements for procurement, installation and construction completion; and factors related to construction cost, including estimates of alternative designs or materials, preliminary budgets and possible economies"; (4) "prepare, and periodically update, a preliminary Project schedule for the Architect's review and the Owner's approval"; (5) "make recommendations to the Owner and Architect regarding the phased issuance of Drawings and Specifications to facilitate phased construction of the Work . . . taking into consideration such factors as economies, time of performance, availability of labor and materials, and provisions for temporary facilities"; (6) "prepare, for the review of the Architect and approval of the Owner, a preliminary cost estimate utilizing area, volume or similar conceptual estimating techniques"; (7) recommend a course of action "if any estimate submitted to the Owner exceeds previously approved estimates or the Owner's budget"; (8) "seek to develop subcontractor interest in the Project and shall furnish to the Owner and Architect for their information a list of possible subcontractors, including suppliers who are to furnish materials or equipment fabricated to a special design, from whom proposals will be requested for each principal portion of the Work"; and (9) "recommend to the Owner and Architect a schedule

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[31] *See, e.g.,* AM. INST. OF ARCHITECTS, GEN. CONDITIONS OF THE CONTRACT FOR CONSTR., AIA DOCUMENT A201 - 1997 § 3.3.1, at 13 (2007), http://www.engin.umich.edu/class/cee431/AIA/05.04.05_A201_SAMPLE_encrypted.pdf ("The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters.")..

[32] *See* discussion *infra* Part III.D.

for procurement of long-lead-time items which will constitute part of the Work as required to meet the Project schedule."[33]

Contractors in collaborative BIM environments generally furnish essentially the same services during the preconstruction phase, along with other traditional services such as detailing to be ultimately incorporated into submittals, that historically were not furnished until after delivery of the contract documents. They merely furnish these services with more powerful tools that allow them to bring more value to their projects. Designers similarly play their traditional role, but they do so with better tools that allow them to provide more value.

Further, the collaborative processes associated with BIM can be designed to maintain the separation of the traditional roles. In this respect, collaborative BIM processes are no different than the myriad of traditional design and construction processes which, if mishandled, can result in unintended transfers of responsibility for design and means-and-methods.[34] These include processes for "value engineering," constructability reviews, fast-track design and construction, performance specifications, shop drawings, requests for information, and contract changes. The industry has not always handled these processes and others like them well and the result, even in the pre-BIM world, has often been a blurred line between design and means-and-methods responsibility. As the effective use of BIM demands process clarity, it may well bring more opportunity for clarifying the line between design and construction obligations than risk of blurring it further.

A basic understanding of models, model hosting sites, and typical collaborative processes associated with BIM is helpful at this point. The industry often refers to "the model," as if a single, unitary model contained all of the digital information produced by designers, contractors, and suppliers. But that is rarely the case; instead, there are normally many models.[35] Each design discipline, each contractor, and each supplier involved in the modeling process creates its own model(s).[36] Further, with a modicum of process control, each of these parties maintains complete control over its own model.[37] Thus, the architect creates and maintains control over the architectural model, the structural engineer creates and maintains control over the structural engineering model, the structural steel fabricator creates and maintains control over the

[33] THE AM. INST. OF ARCHITECTS & THE ASSOC. GEN. CONTRACTORS OF AM., DRAFT AIA DOCUMENT A121 CMC – 2003 AND AGC DOCUMENT 565, STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONSTRUCTION MANAGER 3–4 (2003) [hereinafter DRAFT AIA].

[34] *See* Cunz & Larson, *supra* note 6, at 4.

[35] *See id.* at 3–4 ("One major misconception is that 'BIM' is one model in which all project data resides. While this may be a future state, the current and near term BIM world will include multiple models built for specific project use."); NIBS A/R, *supra* note 26, at A/R 118 ("Currently, many, if not all, BIM technologies/methodologies rely on a *federated* model, where the 'complete project BIM' model is actually comprised of linked but distinct component drawings, models, texts, and potentially other rich project data streams."); AGC, *supra* note 5, at 5 ("One of the earliest lessons learned is that there is rarely one model.").

[36] *See* NIBS A/R, *supra* note 26, at A/R 118 ("BIM information is still stored and distributed through (ever more interoperable) files whose internal information and state can be readily attributed to one or another party."); Cunz & Larson, *supra* note 6, at 4.

[37] *See* NIBS A/R, *supra* note 26, at A/R 115 ("A federated BIM model allows individual parties to manage project data for which they are responsible . . . .").

fabrication model, the structural steel erector creates and maintains control over the steel erection model, and so on.

Moreover, the model sharing process is easily structured to preserve this individual control and to maintain separation between design and means-and-methods activities. In a typical process, each party develops, maintains, and modifies its own model on its own server, and downloads only a copy to the "in box" in the networked file-sharing site,[38] where only the party managing the modeling process has access to it. The model manager[39] can move models from various parties into a collaboration space where the models can be combined for viewing, conflict checking, analysis, and problem solving. However, data is neither altered nor created in this process. Instead, if the structural engineer, for example, determines in the collaborative process that its design should be modified, it makes any changes to its model on its information technology system. Other parties do the same, and updated models can then be downloaded to the sharing site for further collaborative review and analysis. The key modeling parties can and should jointly prepare a protocol to establish, in detail beyond than that set forth in the project agreements, the processes to be followed by the parties in order to ensure that design decisions are made by the appropriate designers and documented in their models, drawings and specifications, and that means-and-methods decisions are made by appropriate contractors and suppliers and documented in their models and shop drawings.

Similarly, the process for sharing models for the purpose of creating derivative models is easily designed to preserve the control of each party over its model. If the structural engineer is to create a derivative model from the architectural model, or if the steel fabricator is to create a derivative model from the structural steel model, the model manager can place the base model in an "out box" where only the intended receiving party can have access to it. The receiving party can make no changes to the base model on the sharing site, but instead can only upload the base model to its own IT system for preparation of the derivative model. The derivative model itself can then, with the permission of the model manager, be downloaded to the file-sharing site. The parties should decide in advance which parties will be entitled to make derivative models from which other parties' models and how and when record copies of models will be created and preserved.[40]

The potential exception to the view that the collaborative use of BIM need not alter the traditional allocation of responsibility for design and means-and-methods flows not from any change in role, but instead from a change in the timing of the fulfillment of a role. On traditional projects in the pre-BIM world, designers executed their designs and delivered contract documents to the contractor. It was only then that the contractors and suppliers prepared and delivered their shop drawings and other submittals based on the design information. There was little opportunity for the designers to rely on the details of the submittals in executing their

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[38] Models are generally shared either on an FTP (file transfer protocol or .ftp) web site or a hosted web site. FTP sites are commonly used, but hosted sites generally have more functionality.

[39] *See infra* Part III.D.

[40] Designers that allow contractors to make means-and-methods models that are derivative to their models are also naturally concerned about potential responsibility for means-and-methods content added by contractors. This concern is addressed in detail below. *See infra* Part III.B.

designs. There is greater opportunity for such reliance in the collaborative BIM world, in which contractors begin modeling in the design phase and share their models with designers.

By way of example, an architect could prepare a design based on input from the mechanical engineer that includes a specified plenum depth. If the mechanical contractor were then to prepare (and share) an MEP coordination model that showed that the depth of the plenum space could be reduced, and the architect were to rely on that model and reduce the depth of the plenum space (and the height of the building) in the final design, what would be the result if the mechanical contractor's model were to contain an error and the depth of the plenum space were to prove to be inadequate? It seems likely that the architect would also rely on input from the mechanical engineer and other designers in making such a design change, but assume for the moment that the architect relies solely on the mechanical contractor's model. Would the contractor lose the protection of the *Spearin* Doctrine? Would it otherwise bear responsibility for the design error?

Courts have considered similar circumstances not involving BIM, and their decisions offer some guidance here. With respect to the question of *Spearin* protection, the Federal Court of Claims has held that "[t]he warranty of specifications can be vitiated by the involvement of industry or the contractor's participation in the drafting and development of the specification absent superior knowledge on the part of the Government."[41] With respect to contractor responsibility for the design error more generally, a Florida appeals court held that where a wall system recommended by the contractor and incorporated into the project design proved to be inconsistent with building code requirements, the contractor was not liable to the owner's lender for the failure, which the court deemed to be within the purview of the architect.[42] Whether the contractor would lose the protection of the *Spearin* Doctrine and assume general design liability in this hypothetical would likely turn on a variety of factors, including the agreed-to roles and responsibilities of the parties, the required content of the various models at the various stages of development, and the agreed-to rights of reliance on the models of others.[43]

It is important to emphasize that there is no new legal issue here. Instead, the hypothetical merely involves the application of long-standing legal principles to a new context. Further, particularly with reasonable process controls in place, the preparation and sharing of models by contractors during the design phase is far more likely to bring benefit than cause mischief.

Another matter that should be carefully managed to preserve the separation between design and construction obligations arises out of the current reality that a project team using BIM for collaborative purposes operates in "parallel universes." The team's collaborative efforts are based primarily on digital models, while the contract documents legally governing the

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[41] Haehn Mgmt. Co. v. United States, 15 Cl. Ct. 50, 56 (1988), *aff'd*, 878 F.2d 1445 (1989); *see also* Aleutian Constructors v. United States, 24 Cl. Ct. 372, 378 (1991) (stating in dicta that "[w]hen defendant has provided design specifications and drawings, and plaintiff persuades defendant to change them in accordance with plaintiff's ideas, plaintiff assumes the risk that performance under its proposed specifications may be impossible.").
[42] Atl. Nat'l Bank of Jacksonville v. Modular Age, Inc., 363 So.2d 1152, 1155 (Fla. Dist. Ct. App. 1978).
[43] With respect to the matter of reliance, see *infra* Part III.B.

contractors' work continue, for the most part, to be two-dimensional plans and specifications.[44] The parties must keep the contract documents firmly in mind and ensure that decisions made in the modeling process are properly reflected in the contract documents. It can be particularly tempting during the construction phase to resolve issues using the model, to assume that changes to the appropriate model(s) provide sufficient documentation of agreed-to changes, and then fail to document changes to the work in a change order or other appropriate document pursuant to the contract change process.[45] This temptation must be avoided, and the modeling protocol should refer to contract change requirements.

As for the process itself, following is a non-exhaustive list of topics that might be covered in the contract or the modeling protocol to help ensure that responsibility for design remains with the intended designers and responsibility for means-and-methods remains with contractors and suppliers:

- The models to be developed for the collaborative use of the team, the parties (designers, contractors, and fabricators) responsible for preparing the models, and the required content of the models. Depending on the agreed-to purposes of a model, the required content might be greater or less than the content required for the model creator's own purposes, and it might be greater or less than the content of the 2D drawings prepared by the model creator.[46]
- The milestones at which the models are to be available, and the required degree of completion at each milestone. A possible starting point for consideration, at least for model content that will also be included in the 2D documents, is the corresponding degree of completion of the 2D documents at the same milestone, a relatively-familiar frame of reference. For instance, if the required content of an architectural model includes door hardware, the door hardware would appear in the model at the same time as it would appear in the development of the 2D drawings. Such a standard could of course be varied as deemed appropriate by the team based on the needs of the project.
- Clear descriptions of those aspects of the work to be designed by contractors and suppliers, whether through design-build scopes or performance specifications.
- A description of the specific collaborative responsibilities of the parties that include only design-related responsibilities for the designers and only means-and-methods-related

[44] *See* NIBS A/R, *supra* note 26, at A/R 110 ("In virtually all instances, the model will coexist with traditional printed construction documents.") and 107 ("BIM models may be used as contract documents, but generally in conjunction with (or in order to generate), not replacing, conventional contract documents including two dimensional paper and digital drawings and specification texts."); Cunz & Larson, *supra* note 6, at 4 ("Projects using BIM today typically employ a 'dual' process where the contract documents follow the traditional process including 2D information but the project team is using the BIM data to reap its benefits."); *but see* GSA BIM GUIDE OVERVIEW, *supra* note 6, at 11 ("GSA would like to move from a document-based to model-based delivery of designs."). The issues related to the existence of these "parallel universes" will likely diminish over time as models become increasingly accepted as contract and record documents.

[45] This is not a conceptually-new issue, but rather an extension of the issues involved in properly managing the request-for-information and contract change processes into a new context.

[46] In today's BIM world, some information (such as quality requirements and assembly of internal components) can still be better described in 2D documents. Certain other characteristics, such as size, quantity, and location, can and generally should be included in models.

responsibilities for the contractors and suppliers. (When design responsibilities are assigned to contractors and suppliers, the description should address those clearly-defined design responsibilities as well.)

- A provision to the effect that the collaborative efforts do not make the designers responsible for means and methods nor the contractors and suppliers responsible for design, with exceptions for any clearly-defined design responsibilities of contractors and suppliers.
- The process for downloading models to and uploading models from the file-sharing site.
- A requirement that each model be modified only by the party that created the model on that parties' information technology system, with narrowly-defined exceptions if necessary (and appropriate process guidelines for any exceptions).
- A clear statement in the definition of contract documents as to whether any digital models will be deemed to be contract documents and, if so, for what purpose.
- Appropriate provisions in the shop-drawing and submittal terms as to whether submittals in the form of digital models will be acceptable (or required).
- Appropriate provisions in the terms concerning requests for information as to how contractor and supplier requests for information, along with designer responses, will be documented in the collaborative process.
- References in the protocol to the contract change provisions, and appropriate processes to ensure that changes in the contractors' work are properly documented in the contract documents.
- An appropriate process for incorporating construction-phase design changes into the working models.
- Provisions requiring that each party include identical BIM-related terms in subconsultant agreements and subcontracts.
- Assignment of responsibility to establish a 3D coordinate system for use by all modeling parties.

Project teams will no doubt identify other process-related issues to be addressed in the agreements and modeling protocol. All of these should be addressed with an eye toward maintaining the distinctions of the traditional roles of designers, contractors, and suppliers. Of course, the best processes are of no avail if they are not followed. Project teams should be advised of the potential consequences of not adhering to negotiated processes and counseled to be diligent in following them.

Because of the range of possible owner and project team goals for the use of BIM, the variety of BIM software platforms in use, the varying experience and expertise of the project participants in the use of BIM, and the evolving capabilities and uses of BIM, it will likely be difficult to address many of these BIM-specific terms in form agreements in a way that would be of practical use on individual projects.[47] Instead, for owners and project teams interested in integrating BIM into the entire delivery of the project, there appears at present to be no substitute to assembling the key modeling players and contract drafters during the preliminary project planning stages (or, if that is not feasible, as early as possible) to address these and other important BIM-related matters. Counsel can add considerable value to such an exercise by helping the participants define responsibilities and processes that preserve the traditional roles and liability exposures of the various parties or, if the parties choose to depart from their traditional roles, by advising as to the ensuing implications. In doing so, counsel should keep a close eye on the capabilities of the BIM tools being used and the BIM-related processes being applied, both of which are ever-evolving.[48]

B. Competing Concerns: The Right to Rely and Responsibility for Others' Use

As discussed in the preceding section, the integrated use of BIM inherently involves the exchange of digital models among various project players. The architectural model may be transferred to mechanical, electrical, and structural designers, which may then provide their electronic models back to the architect. Along with the architectural model, the mechanical, electrical, and structural models (and possibly others) may be transferred to contractors, subcontractors, and suppliers for the purpose of allowing the recipients to develop derivative models to further develop the design (in the case of engineers and some contractors and suppliers), or to develop the means and methods by which to construct the project. Not surprisingly then, recipients of digital models desire to *rely* on the models they have received. Recipients want to proceed with their work without the fear of liability for errors in the data furnished, and during the period in which the industry will continue to operate in the "parallel universes" of 2D contract documents and 3D models, they want to be able to assume that the models furnished by others match the 2D contract documents or shop drawings in their equivalent state of development.

However, the furnishers of models for use by others have a competing and equally compelling concern—to avoid liability exposure for changes made to the models after they leave the furnisher's control. This fear has led to the development of disclaimers and releases that significantly limit, or even eliminate, the right of recipients to rely on transferred models for any purpose. The tension between these competing concerns poses a significant obstacle to the full realization of BIM through the unfettered exchange of electronic data.[49]

[47] That said, the authors do not mean in any way to discourage industry efforts that may be underway to create standard contract language related to the use of BIM. These efforts are healthy for the industry. The more the industry can reach consensus on key BIM-related contract terms, the better.

[48] Capability and process changes that might alter the traditional allocation of liability between design professionals and contractors might include the integration into design models (as opposed to contractor or supplier models) of intelligent objects or other design information from subcontractors or suppliers, and the use of a single, unitary model incorporating the work of multiple designers, contractors, and fabricators. *See* Ashcraft, *supra* note 6, at 343–44.

[49] AM. INST. OF ARCHITECTS, 2007 AIA DIGITAL PRACTICE DOCUMENTS 1 (2007), http://www.aia.org/SiteObjects/files/ddd_article.pdf [hereinafter AIA DIGITAL PRACTICE].

Designers in particular have long been concerned with improper use, reuse, or alteration of their designs.[50] While the potential for improper copying or alteration of 2D designs is not a new risk, the ease with which electronic design data can be transferred, manipulated, and/or reused increases the potential risk.[51] The concern is not limited to alterations by others, whether inadvertently or intentionally, but also includes a fear of the potential for alterations to occur during the file transfer or conversion process.[52] The fear of liability for alterations to electronic data by others or during file transfer is further compounded by a concern that proving the original, unaltered, design condition of an electronic model years after the model's creation could prove difficult or impossible due to software and hardware changes, data degradation, viruses, or other issues.[53]

It is in response to these concerns that designers and other creators of electronic information have come to rely on disclaimers and releases, intended to either accompany or precede any transfer of the electronic data.[54] The theme of many disclaimers is that the electronic design data is for "informational purposes only" and is not to be relied upon.[55] Some disclaimers go further, expressly disclaiming any liability for the completeness or accuracy of any electronic data. Disclaimers or releases may also include broad indemnification language requiring the recipient of the electronic data to indemnify the party furnishing the data from all

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[50] *See id.*

[51] AM. INST. OF ARCHITECTS, TRANSFER OF DOCUMENTS & ELEC. INFO. (2005) http://www.aia.org/print_template.cfm?pagename=pm_a_transferdocs [hereinafter AIA TRANSFER OF DOCUMENTS]; *see also* Ashcraft, *supra* note 6, at 335.

[52] *See generally* AM. INST. OF ARCHITECTS BEST PRACTICES, ELECTRONIC DATA TRANSFER: SAMPLE DISCLAIMER NOTICE, BP 13.03.01, at 1 (2007), http://soloso.aia.org/eKnowledge/Resources/PDFS/AIAP016620?dvid=4294964454 [hereinafter AIA BEST PRACTICES]; AIA TRANSFER OF DOCUMENTS, *supra* note 51. In the authors' experience, this is not a significant concern; nonetheless, this reason is oft-cited as a source of potential liability.

[53] AIA BEST PRACTICES, *supra* note 52, at 1 ("Documents transmitted electronically for which no reliable means exists to verify their authenticity, authorship, and integrity are frequently regarded as having questionable legal standing.").

[54] AIA TRANSFER OF DOCUMENTS, *supra* note 51; AIA BEST PRACTICES, *supra* note 52.

[55] AIA BEST PRACTICES, *supra* note 52, at 1; AIA DIGITAL PRACTICE, *supra* note 49. One such suggested disclaimer states:

> NOTICE:
> XYZ Architects Inc. is providing, by agreement with certain parties, materials stored electronically. The parties recognize that data, plans, specifications, reports, documents, or other information recorded on or transmitted as electronic media (including but not necessarily limited to "CAD documents") are subject to undetectable alteration, either intentional or unintentional, due to, among other causes, transmission, conversion, media degradation, software error, or human alteration. Accordingly, all such documents are provided to the parties for informational purposes only and not as an end product or as a record document. Any reliance thereon is deemed to be unreasonable and unenforceable. The signed and/or stamped hard copies of the Architect's Instruments of Service are the only true contract documents of record.

AIA BEST PRACTICES, *supra* note 52, at 1. Although AIA BEST PRACTICES suggests the use of such language only as a notice or disclaimer to be included in any transmission of documents, often the release of any electronic data is conditioned upon execution by the party receiving the electronic data of such a disclaimer as well as a release from liability for errors in the electronic data.

claims, liabilities, losses, damages and costs in any way connected with the use—as well as the modification, misinterpretation, misuse, or reuse—of the data by others.

Without a right to rely, the efficiencies afforded by BIM are limited. Each recipient is left with limited choices and considerable risks. These risks can only be mitigated by detailed comparisons of the electronic data to the 2D drawings or re-creation of electronic data from 2D drawings, which involves substantial duplication of effort and great cost to the project (and additional potential for error). The inefficiencies are compounded by the number of recipients and participants in BIM for a project. For example, an architectural model may be provided to the structural designer to develop the structural steel design model. This structural steel design model may then be transferred to the steel fabricator to develop a steel detailing model. The steel detailing model may then be provided to the erector to develop the steel erection model. Similar series of transfers may occur with respect to the design and construction of many other systems, including those for pre-cast concrete, enclosure, interiors, mechanical, plumbing, controls, and fire protection systems. If at each transfer of data the recipient must perform additional duplicative work to confirm the electronic data is without errors for which it will be held responsible and to confirm the electronic data matches the paper design documents, the efficiency and usefulness of BIM is significantly limited.[56]

Thus, any limitation on the right to rely on electronic data is a substantial hurdle to the full realization of the potential efficiencies enabled by BIM.[57] At the same time, the issues that have led to the growth and use of disclaimers limiting the right to rely must be addressed. Too often, the approach to electronic data transfer has involved demands on designers in particular to transfer electronic design data to others well after the design, or even the project, is completed. Typically there has been no discussion prior to or during the design process of the model requirements or future anticipated uses, let alone any treatment in the applicable agreements of models as deliverables or instruments of service. Likewise, processes have not been put in place to assure designers reasonable protection from responsibility for the use of their models by others, and designers have not been appropriately compensated for sharing their models.

The preparation of models for the purpose of allowing other parties to rely and to create derivative models creates great value. But it also requires additional effort and creates additional risk for the sharer of the model, particularly as compared with the traditional, 2D world of construction.[58] The risks can be diminished through reasonable process protections, but not completely eliminated. The value created and the risks borne should naturally be reflected in the compensation of the parties allowing others to rely on their models.[59]

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[56] *See* O'Connor, *supra* note 6, at 178–79 (The use of disclaimers of completeness or accuracy "is antithetical to the deployment of a BIM-driven collaborative process.").

[57] AIA DIGITAL PRACTICE, *supra* note 49 ("Architects and other design professionals often rely upon draconian disclaimer notices to ensure that drawings and other documents delivered in a digital format are not infringed upon or misused . . . . Clearly, such disclaimers are a significant barrier to the efficient design and construction of buildings in a digital age.").

[58] *See* Ashcraft, *supra* note 6, at 335.

[59] *See id.* ("Unless commercial and legal structures are modified to rebalance compensation, risk, and reward, BIM cannot achieve its potential.") A detailed discussion of changes in compensation arrangements that may be warranted in the BIM world is beyond the scope of this article. Regardless, the

Considering and addressing these issues in the earliest stages of a project, prior to agreement on the basic terms of the design agreement, reduces the likelihood that "right to rely" will be an issue. When addressed at project conception, models can be designated as design deliverables and even as contract documents themselves,[60] appropriate standards of reliance can be worked out, procedures can be established to protect the parties sharing their models (be they designers, contractors, or suppliers), parties can be appropriately compensated for sharing their models, and the range of issues associated with the right to rely can be addressed comprehensively and incorporated into the contract documents up or down the contract chains. Indeed, incorporating agreements on the right to rely and other issues within the traditional contract chain should avoid the need for multiple side agreements containing disclaimers or releases between entities not typically in contractual privity (e.g, designer and contractor, designer and subcontractors) and the creation of a "contract cloud" around the basic agreements.[61]

In addition, creators and recipients of electronic data alike will take comfort from processes that assure transferred models will be appropriately preserved and archived to ensure the existence of a "record" copy against which later-discovered errors or omissions can be compared to accurately assess responsibility.[62] These processes should be discussed in the preliminary project planning stages and incorporated into the contracts and the collaboration protocol.[63]

A related matter involves the use of "placeholders" in models by designers to designate an object, such as a window or door, that has yet to be selected and thus for which they do not have sufficient design detail. This could lead to confusion over certain electronic elements included in the model. The issue is magnified in fast-track delivery, when some scopes of work are well into means-and-methods modeling while other scopes are still being designed or specified. Such place-holders should be clearly defined as such in the models.

Addressing these issues in contracts or modeling protocol for a project, especially to ensure risk for error in the models is properly allocated to the party that caused it, is important to

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use of BIM raises a variety of compensation-related issues for owners to consider other than those related to a right of reliance. For example, under a traditional cost-reimbursable construction contract in which the contractor's fee is based on the cost of the work, for example, an earlier and less-expensive completion of a project achieved through the use of BIM would bring the economically-perverse result of the contractor earning less, not more, fee. The authors believe that owners should view appropriate compensation for the sharing of models not as an incremental project cost but as an investment in the efficiency of the project delivery—an investment that can pay great dividends. *See, e.g.,* AGC, *supra* note 5, at 4 (noting that benefits such as "improvements in productivity, lower warranty costs, fewer field errors and corrections" offset and may reduce the costs).

[60] *See* NIBS A/R, *supra* note 26, at A/R 112 ("A primary consideration in the adoption of BIM practices is the degree to which BIM documents serve as instruments of services in general, and construction documents in particular."). Currently, this is complicated by the practical reality that government reviewers may not have the technology or expertise to view and review 3D models.

[61] *See* AGC, *supra* note 5, at 30.

[62] *See infra* Part III.F.

[63] *See* AGC, *supra* note 5, at 10.

the success of a project using BIM. Topics that might be covered, in addition to those described in the previous section, include:[64]

- Identification of the aspects of shared models on which reliance is permitted. (Shared models may include more information than is required or desired by downstream users.)
- Identification of the parties entitled to create derivative models from the specified models of other parties and the permitted purposes of the derivative models.
- Appropriate compensation for parties sharing their models with a right of reliance and making their models available for the creation of derivative models by others.
- The agreed-to standards of reliance.[65] A useful starting point for consideration of this issue, at least for information that will reside in both the 2D documents and the models, is to require the information in the model be consistent with that in the 2D documents, be they design documents or shop drawings, at the equivalent milestone.[66] For model information over and above the information that may be contained in the 2D documents, other appropriate standards will have to be developed, depending on the nature of the information and the needs of the project.

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[64] The project participants may be tempted to create indemnities to allocate liability exposure arising out of the model sharing. This approach, however, tends to encumber the project agreements with unnecessary (and potentially contradictory) layers of liability allocation. *See* O'Connor, *supra* note 6, at 180 ("Infusing the creation, transfer, and receipt of electronic data with one or more indemnity obligations creates the potential for great mischief."). The better approach is to define the roles of the participants in a manner consistent with their traditional roles, establish processes to help maintain the traditional roles, create and maintain record copies of models shared with other parties to enable the accurate assessment of responsibility for later-discovered errors, and allow the *Spearin* Doctrine and the standards of care for design professionals to operate to allocate liability as they have done in the pre-BIM world.

[65] Rights of reliance should not be created outside of the contract chain such that a contractor in a traditional project delivery be accorded direct rights against a design professional on whose model it may need to rely. Rather, the contractor's rights with respect to a design model, like its traditional rights with respect to other aspects of the design, should pass through the contract chain. Those considering new delivery methods to maximize the benefits of BIM may want to consider alternate approaches, such as creating third-party beneficiary rights. But it would be counterproductive to provide a direct right by a contractor against a designer (or vice-versa) in applying BIM to current delivery methods, particularly at this early stage in the evolution of the use of BIM.

[66] At the completion of the construction documents or shop drawings, this standard would allow the user of the model to rely on it to the same degree the user would be entitled to rely on the construction documents or shop drawings. The standard at earlier stages of development may need to be varied from consistency with the then-current state of the 2D documents, depending on the needs of the project delivery as determined by the parties.

- The process for creating and retaining record copies of models (in "read-only" format[67]) downloaded to and uploaded from the sharing site. The process should include the party responsible for preserving the record copies (assuming that the hosting site does not do it automatically), the form in which the record copies will be preserved, how they are to be marked or titled, the minimum length of time for which the record copies will be preserved, and the method of access by the various parties if the sharing site itself will not be operational for the requisite period.
- A provision requiring users of models created by others to report any errors actually discovered in those models.[68]
- A process for clear identification of "placeholders" and "performance specifications."
- Allocation of the risk of degradation of data during transfer.
- A waiver of consequential damages.[69]

Counsel should watch for changes in capabilities and processes that might diminish the protections of the project participants that allow other parties to rely on their models. Such changes might include technological developments that prevent the parties from assessing responsibility for changes by subsequent users, including the use of single, unitary, project-wide models encompassing the work of various project participants.[70]

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[67] *See* NIBS A/R, *supra* note 26, at A/R 118–19 ("The electronic distribution technologies readily allow 'read only' copies of component models to be stored and documented, restrict changes to these submitted copies to the creating party, and track versions of the model. In short, the current state of federated BIM project databases, and corresponding tracking of data as documents, allows more or less conventional project controls to be applied to the distribution and tracking of BIM models."). *Id.* at A/R/119 (discussing possible future technological improvements and possible evolution in the use of BIM that may require the development of alternative approaches to creating record copies of models).

[68] Terms that might imply a <u>duty</u> to discover errors in models created by others would be inconsistent with the need for and benefits of reliance in the BIM world.

[69] The AIA approach of including waivers of consequential damages in design and construction agreements is generally an appropriate means of balancing the risks and rewards of a construction project, but such waivers are particularly important in the context of the rights of reliance on model information. *See* NIBS A/R, *supra* note 26, at A/R 111 ("A project-wide agreement should be reached that appropriately limits or waives consequential damages due to errors in the model . . . . Otherwise, there will be no incentive to share the information in the model.").

[70] *See* NIBS A/R, *supra* note 26, at A/R 119.

> There are technological changes to this federated approach, both on the horizon and beyond, which will not so readily allow standard distribution tracking mechanisms to be imposed on BIM data. Presumably new tracking mechanisms will need to be defined and delivered in the technologies. Two significant trends include the development of parametric relationships between project geometries . . . , and the development of integrated, object level, project databases.
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> The anticipated eventual outcome of BIM—a fully integrated project-wide object database, is not yet a fully-functioning reality but is clearly in the foreseeable future. . . . [C]onventional mechanisms for [the] tracking of information control and distribution are likely to require substantial modification." *Id.*

C. Interoperability

The exchange of electronic models and data through BIM also requires some consideration of interoperability. Interoperability refers to the ability of various entities and different technology to share and exchange electronic information.[71] With a variety of software offerings in the marketplace for BIM use,[72] questions as to the extent of interoperability remain. Construction industry stakeholders, including owners, designers, contractors, and software developers, have formed a number of organizations, committees, and initiatives with the goal of identifying uniform standards to minimize interoperability issues.[73]

Until such uniform standards are implemented, interoperability concerns can be minimized through protocols developed during preliminary planning based on the systems generally used by the key modeling parties. These protocols can help assure that all of the entities involved in modeling on a project will be using technology consistent with agreed-to standards of interoperability so as to be able to exchange, access, and use generated electronic data, and to understand in advance interoperability challenges that may require management during the collaborative process. Contract terms or protocol documents might include guidance or requirements such as:

- Software and/or interoperability requirements for modeling parties.
- File format for exchanged files. In Mortenson's experience, interoperability has not generally been a problem and can be effectively managed.

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[71] *See* MICHAEL P. GALLAHER ETAL., NAT'L INST. OF STANDARDS AND TECH., TECH. ADMIN., U.S. DEP'T OF COMMERCE, COST ANALYSIS OF INADEQUATE INTEROPERABILITY IN THE U.S. CAPITAL FACILITIES INDUSTRY ES-1 (2004), http://www.bfrl.nist.gov/oae/publications/gcrs/04867.pdf ("Interoperability is defined as the ability to manage and communicate electronic product and project data between collaborating firms' and within individual companies' design, construction, maintenance, and business process systems."); *see also* NIBS, *supra* note 4, at 49 ("Software interoperability is seamless data exchange and sharing among diverse applications which each may have their own internal data structure.").

[72] To name a few: Autodesk Revit, Autodesk NavisWorks, and Autodesk Architecture (http://usa.autodesk.com/adsk/servlet/item?siteID=123112&id=8909451), Bentley Microstation/Triforma (http://selectservices.bentley.com/en-US/), Graphisoft Constructor (http://cif.org/nom2005/nom-2005-13.pdf), Archicad (http://www.graphisoft.com/products/archicad/?source=google_GSUS), and Tekla Structures (http://www.tekla.com/go/).

[73] *See generally* Stephen R. Hagan, *Out of BIM Chaos, the Road to Structured Data*, EDGES (AIA Tech. in Architectural Prac. Knowledge Cmty.), Summer 2007, http://www.aia.org/nwsltr_tap.cfm ?pagename=tap_a_20051230_classification. Along with the AIA's Technology in Architectural Practice Knowledge Community (www.aia.org/tap_default), other groups focusing efforts on interoperability issues include the International Alliance for Interoperability (www.iai-international.org and www.iai-na.org), the Virtual Builders Roundtable (www.virtualbuilders.org), FIATECH (www.fiatech.org), BIMForum (www.bimforum.org), the National Building Information Model Standard committee of National Institute for Building Sciences (http://www.facilityinformationcouncil.org/bim/index.php), and the Web3D Consortium (www.web3D.org).

Proper treatment of interoperability can help assure a relatively seamless flow of information and enhance efficiency of construction project participants from project concept to completion.[74]

D. Role of the Model Manager

The sharing and exchange of the vast amounts of electronic data associated with models by multiple parties also necessitates the identification of a person or entity to act as gatekeeper for the model.[75] Such a gatekeeping role is not new to construction projects. Indeed, architects and general contractors have routinely acted as information gatekeepers for the project designers and contractors, respectively, and those roles have never been (to the knowledge of the authors) the source of any particular liability concern. The increased collaboration among designers, contractors, and suppliers associated with BIM, however, broadens the role of this information gatekeeper, termed the "model manager," and makes the role a more important one.[76]

The obligations of the model manager are not uniformly established[77] and, indeed, they must necessarily vary depending upon the need of the project and the processes agreed-to by the modeling participants. The model manager may have the more limited duties of maintaining the file transfer site and overseeing access rights. The model manager might, however, also be responsible for "compiling the information from the smaller models of other project members and disseminating it in a useful form to all project stake-holders,"[78] or even checking the correctness of the full 3D model.[79] Such obligations may be accompanied by additional liability exposure.[80]

The role of model manager in managing the flow of information between the designer group and the contractor group, to the extent that it goes beyond the traditional roles of architects and general contractors in managing such information, appears to be most akin to the role of a construction manager.[81] That role likely carries some liability exposure with it. [82] However, it is

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[74] *See, e.g.,* National Building Information Model Standard, Frequently Asked Questions About the NBIMS, http://www.facilityinformationcouncil.org/bim/faq.php (last visited Sept. 9, 2007).
[75] See NIBS A/R, *supra* note 26, at A/R 114 ("Typically, a controlling or gatekeeping party is identified, and that party is responsible for the integration of project information from other parties.").
[76] Luke Faulkner, *Super Models*, MODERN STEEL CONSTRUCTION, Nov. 2006, http://www.coinsweb.nl/downloads/SuperModels.pdf.
[77] *See* Cunz & Larson, *supra* note 6, at 4.
[78] Falkner, *supra* note 76.
[79] Lachmi Khemlani, The Eureka Tower: A Case Study of Advanced BIM Implementation, AECbytes, (June 2, 2004), http://www.aecbytes.com/feature/2004/EurekaTower.html. Because checking models created by others for accuracy is not a typical role for the model manager in practice, this responsibility should not fall on the model manager.
[80] The model manager has naturally been one of the usual project participants (most often, the architect or general contractor). The role may even be held by different entities through the different project phases, with the architect acting as the model manager during design and the general contractor taking on that role during construction. Cunz & Larson, *supra* note 6, at 4. Alternatively, the model manager could be a third-party with specialized expertise in managing large amounts of electronic data or familiarity with the particular software selected for the project. *See* Faulkner, *supra* note 76, at 2.
[81] Faulkner, *supra* note 76, at 2.
[82] *See, e.g.,* DRAFT AIA, *supra* note 33.

also a role familiar to the industry, and one that is often combined with that of the contractor.[83] Assuming that the role of the model manager ultimately goes beyond the traditional gate-keeping role of architects and general contractors, the model manager's activities seem likely to be deemed to involve the rendering of professional services governed by a standard of care that requires the model manager to use the care and skill ordinarily used by members of the profession acting under similar circumstances for professional services.[84] Just what that care and skill might be deemed to be in this burgeoning area is somewhat uncertain.

Even so, the nature of the role assumed and the attendant obligations will likely inform any liability analysis. Setting forth clear expectations and obligations for the model manager through contract terms or protocol documents will help ensure that project participants are in agreement regarding the assigned roles and responsibilities. Such topics that might be covered include:

- The identity of the party or parties responsible for management of the modeling process at each phase of the project.
- The specific duties of the model manager, such as maintaining the shared site, overseeing or providing access rights, preserving record versions of the models, and/or managing collaborative sessions in the models.[85]
- A process for recording and displaying the versions of the models residing in the sharing site at any particular time and the extent to which such things as change orders, responses to requests for information (RFIs), and architect's supplemental instructions (ASIs) are incorporated into the relevant models.

E. Who Owns the Model? Intellectual Property Considerations

The general legal principle applicable to the ownership of building information models is deceptively simple; absent contract language to the contrary, the party that creates the model owns it.[86] The reality in the BIM world is considerably more complex because nearly every model includes, or is derived from, information contributed by numerous other parties.[87] For example, if the architect shares its original model with the structural engineer and the structural engineer uses it to prepare its own model, the structural engineer's model is a derivative work of the architect's model. But then if the structural engineer shares its model with the architect and the architect incorporates aspects of the structural engineer's model into its own, the architect's model becomes (at least to a degree) a derivative work of the structural engineer's model, in which the structural engineer retains some ownership rights. Each model subsequently based on

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[83] *Id.*

[84] S*ee, e.g.,* Nelson v. Virginia, 368 S.E.2d 239, 243 (Va. 1988) (holding that the standard for architects is to "exercise the care of those ordinarily skilled in the business," and noting that this standard of care applies to the administration of project construction as well as to project design).

[85] *See generally*, Faulkner, *supra* note 76, at 2 (providing a prototype for model managers and proscribing their prospective duties).

[86] *See* MELVILLE B. NIMMER & DAVID NIMMER, NIMMER ON COPYRIGHT, § 5.01[A] (2007).

[87] 17 U.S.C. § 101 (2000) (defining a "derivative work" under copyright law as "a work based upon one or more preexisting works").

either of these models is similarly derivative.[88] Of course, this is not conceptually different from the intellectual property rights associated with the 2D pre-BIM world[89] (although the stakes are raised because of the usefulness of the models), and it illustrates the rationale for simply negotiating ownership rights and documenting them in the project contracts.

Rights to use some or all of the models may well be more important to the delivery of an integrated project than actual ownership because such rights are closely associated with the *raisones d'etre* of the models. Accordingly, an appropriate allocation of the legal rights to reproduce, use, make derivative works, distribute, and publicly display[90] the models, should be developed early in the process and incorporated into the project agreements. The allocation of the rights must be consistent with the desired use for the models. These should include, as appropriate, rights to download models from the sharing site and to create derivative works for specified purposes. Particular attention should be given to intended uses of the models by owners during the life of the facility. It also is appropriate that the various modeling parties should be accorded rights to use derivative models primarily intended to incorporate their work product for marketing and educational purposes.

F. Other Considerations

The sharing and exchange of design and construction models also gives rise to other issues. For example, the sharing and exchange of models typically involves large files that may be best suited to file transfer, or FTP, file-sharing sites.[91] Alternatively, sites hosted by third parties may be used.[92] One of the project participants must assume the responsibility to create and maintain the file-sharing site or arrange for a third party to furnish a site.[93] While the model manager might assume these obligations, it need not do so. Indeed, the facility owner, with a potential interest in preserving the file-sharing site and certain models for use after project completion, might appropriately assume this responsibility.

In addition, as with any computer system, project teams should assess the potential for electronic data loss or software error, whether due to worms or viruses, software corruption or failure,[94] hardware failures, or system destruction (such as by power surges, fire, or water damage). Total software failures or the complete loss of the file-sharing site seem unlikely.

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[88] *See id.*

[89] *See generally,* David A. Roberts, *There Goes My Baby: Buildings As Intellectual Property Under the Architectural Works Copyright Protection Act,* 21 CONSTRUCTION LAW. 22, 23 (2001) (outlining the history of intellectual property law as it relates to building design and construction law).

[90] The statutory rights afforded to a copyright owner include the rights to keep others from reproducing, making derivative works of, distributing, publicly performing and publicly displaying the copyrighted work. 17 U.S.C. § 106 (2000).

[91] ELIZABETH D. ZWICKY ET AL., BUILDING INTERNET FIREWALLS 44 (O'Reilly & Associates, Inc. 2d ed. 2000).

[92] *See* Paul Chin, *The Pros and Cons of Third-Party Intranet Hosting,* INTRANET JOURNAL, Dec. 1, 2004, *available at* http://www.intranetjournal.com/articles/200412/ij_12_01_04a.html (explaining the general benefits and detriments of third-party site hosting).

[93] *See* NIBS A/R, *supra* note 26, at A/R 111–12 ("[I]n a collaborative project, the project agreements should identify who is responsible for administering the model and providing the technical resources needed to enable connectivity, host the files, manage access, and assure security.").

[94] *See* NIBS A/R, *supra* note 26, at A/R 109 ("Although using BIM will likely increase the quality of construction documents the possibility of software error can not be eliminated.").

Appropriate precautions can be taken to minimize this risk such as periodically backing up the file-sharing site and/or the information exchanged in it, protecting such sites from unauthorized users, and developing protocols for project participants to minimize issues that might arise from incompatible software, viruses, or worms.

Yet what if the unlikely occurs and the "model" is damaged or rendered unavailable for further use? It seems likely that such an event would be deemed to be a *force majeure* event (and the applicable *force majeure* contract language should be the subject of consideration by the parties). But who would pay to recreate the model? Insurance might be an option, but only when endorsements or coverages to specifically address electronic data loss are procured.[95] For example, Commercial General Liability (CGL) insurance is unlikely to provide any protection.[96] The 2004 ISO form expressly excludes coverage for direct damage to electronic data,[97] and most courts interpreting pre-2004 forms have not found coverage for electronic data losses because there is no direct physical loss of tangible property.[98] In contrast, an "Additional Coverages—Electronic Data" endorsement that covers "the cost to replace or restore" electronic data destroyed by a covered cause of loss is currently available under the 2006 Business Owners Coverage Form (and earlier forms as well).[99] The procurement of such specialized coverage should be considered in the early planning stages of the project.

The process for preserving models for record keeping purposes (including any related post-project responsibilities), as well as the disposition of models at the end of the project, should also be addressed. As discussed earlier, participants will be interested in assuring that record models are preserved periodically to aid future investigations into the cause of errors or omissions in the event of an incident.[100] Given the progress of technology, and the concerns that software and hardware available today will be obsolete five or ten years in the future, the parties should consider whether any steps should be taken to ensure that an appropriate record is not only preserved but accessible in the future.[101]

Finally, while a detailed discussion of the use of building information models for the operation and maintenance of the facility is outside the scope of this article, the owner and the modeling parties should consider, preferably before any modeling is commenced, the intended post-construction uses of the models. In doing so, the parties will be able to adjust the modeling requirements and contract terms accordingly.

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[95] AGC, *supra* note 5, at 26–29.
[96] Kenneth S. Abraham, *The Rise and Fall of Commercial Liability Insurance,* 87 VA. L. REV. 85, 106 (2001).
[97] *See generally*, Mary E. Borja, *Catastrophic Computer Events—Data Loss and System Failures*, MEALEY'S LITIGATION REPORT: (Catastrophic Loss—Commentary), Vol. 2, no. 7, at 5 (April 2007).
[98] *See id.* at 2–5.
[99] *See id.*at 5.
[100] *Supra* Part III.B.
[101] Industry agreement and use of open and ISO-compliant file formats and standards (such as IFC and X3D) that will not change and will always be backwards compatible, even as their specifications evolve in the decades to come, will help to minimize this concern. *But see* NIBS A/R, *supra* note 26, at A/R 110 ("Archiving for the short term is relatively easy, but the rapid evolution of digital systems and media makes it difficult to be confident that today's digital formats and media will be readable in the future.").

IV. FINAL THOUGHTS

Project owners and their counsel are in a unique position to drive the use of BIM and to establish an environment that maximizes the resulting value.[102] They can do so by considering BIM from the earliest project planning stages and establishing goals for its use; by considering experience with and willingness to cooperatively use BIM in the selection process for the key project players; by gathering the key modeling parties as early as possible to consider how BIM should be integrated into the delivery of the project given the owner's goals and the varying technologies and experiences of the project participants; and by ensuring that the key project contracts are negotiated in a manner that is consistent with the agreed-to use of BIM and that addresses the legitimate concerns of the project participants.

Early, thorough, and integrated consideration of key BIM-related project issues and resulting contract terms will take time and will not be easy. This is true in large measure because, notwithstanding the efforts of the GSA and many other organizations, such a comprehensive exercise has never, to the authors' knowledge, truly been conducted. Nonetheless, such an effort made in a cooperative spirit should pay off many times over in a better project built with greater efficiency and reduced liability exposure for all concerned.

[102] *See* Faulkner, *supra* note 76 (discussing the "barrier" impeding the widespread implementation of BIM of "convincing owners and developers that the greater up-front costs [associated with the integrated use of BIM] is in their best interests, and is the first step in a more efficient process."); THE CONSTRUCTION USERS ROUNDTABLE, OPTIMIZING THE CONSTRUCTION PROCESS: AN IMPLEMENTATION STRATEGY 13 (July 2006), http://www.aia.org/SiteObjects/files/ip_optimizingconstructionprocess.pdf.