PREPARING FOR THE IGCC

OVERVIEW AND RISK MANAGEMENT RECOMMENDATIONS

FOR THE 2012 INTERNATIONAL GREEN CONSTRUCTION CODE

Sustainable Design Subcommittee, ACEC Risk Management Committee

Subcommittee Co-Chairs

P. Douglas Folk, Attorney
Clark Hill PLC

Timothy J. Corbett, President
SmartRisk

Subcommittee Members

Christopher D. Hawkins, Attorney
Nelson, Kinder, Mosseau & Saturley, P.C.

Janice Marsters, Senior Environmental Engineer
Kennedy/Jenks Consultants

James P. Messmore, Sr. Vice President
Hanson Professional Services Inc.

Albert Rabasca, Director of Industry Relations
XL Specialty Insurance Company

Lois Roberts, Principal
Lois Roberts, Consulting Engineers

Introduction

Members of the Sustainable Design Subcommittee evaluated the International Green Construction Code (IgCC) to determine how it will affect professional practices and the standard of care for design, engineering, construction administration, commissioning, and facility management. The IgCC, where adopted, will serve as an overlay of other I-Codes. It applies to construction of high performance commercial buildings, including alterations or additions to existing buildings, and it utilizes both traditional and innovative construction practices. Detached single family or low-rise residential occupancies are initially exempt from the IgCC[1], but each jurisdiction may opt to require residential projects to comply with the ICC 700 National Green Building Standard. High-rise residential projects may comply with either IgCC or ICC 700.

Local jurisdictions may choose to allow designers to comply with the performance standards of ANSI/ASHRAE Standard 189.1, Standard for High-Performance Green Buildings Except Low-Rise Residential Buildings as an alternative path for satisfying the IgCC's energy conservation requirements. The IgCC is a mix of performance-based and prescriptive design standards. The 2012 International Energy Conservation Code will serve as the baseline for energy conservation standards in IgCC, with the option for local jurisdictions to mandate even higher efficiency standards if they so desire.

IgCC will set minimum requirements and performance thresholds, some of which can be adapted by the jurisdiction to suit local conditions. Project electives, a minimum number of which must be selected by the project owner or design professional, are used to encourage innovative practices that are difficult to mandate, and encourage design and construction of higher performance buildings. The International Code Council has positioned IgCC as the baseline for sustainable design practices with the capability of accomplishing more significant public benefits than voluntary standards such as LEED.[2] The open question is whether building developers, users, and members of the public will forego the cost and documentation requirements of LEED certification in favor of this public baseline standard for sustainable design.

Adoption and Incorporation In Local Building Codes

The IgCC is a model code for sustainable design and land development published by the International Code Council in March 2012.[3] It must be adopted by state or local building authorities before it will take effect in any jurisdiction. As with other I-Codes, the IgCC also includes a model ordinance for adoption and enforcement, but that model ordinance does not mention the additional electives in Appendix A and they do not become part of the building code for a jurisdiction unless expressly adopted, according to Section 101.4[4]. As of December 2012, ICC reports that some version of the IgCC had been adopted at the state level in Maryland, North Carolina, Oregon, and Rhode Island, but some of these jurisdictions have allowed voluntary compliance with Public Versions 1.0 or 2.0 of the model code while it was under development. Scattered local jurisdictions in Arizona, Florida, New Hampshire, Texas and Washington have also adopted the IgCC.[5]

Major Elements of IgCC Implementing Sustainable Design Principles

Chapter 3 of the IgCC is the heart of the Code's organizational structure, requiring the adopting jurisdiction to determine which requirements of the Code will be mandatory, what compliance paths and minimum standards are applicable, and providing for elective sustainable design features that are unique to the locale and individual project. Table 302.1 – Requirements Determined by Jurisdiction, embodies the Code's flexible approach to sustainable design and performance with optional controls for:

- Site development restrictions (Chapter 4)

- Minimum waste diversion requirements ranging from 50-75% of waste material generated during construction (Section 503.1)
- Energy conservation – relative to a baseline standard – demonstrated by a zEPI of 46 or less for designated occupancies (Sections 302.1, 302.1.1, and 602.1)
- Automated demand response infrastructure (Section 604.1)
- Use of municipal reclaimed water, where accessible (Section 702.7)
- Post-Construction, Pre-Occupancy Baseline IAQ Testing (Section 804.2)
- Pre-Occupancy Testing of Sound Transmission Levels (Section 807.1)
- Conditions for applying IgCC requirements to modifications, additions, or renovations of existing buildings (Sections 1007.2 and 1007.3)
- Adoption of minimum required project electives from Appendix A.

Chapter 3's customizable menu of sustainable design code requirements is backed up by the other major innovation of this I-Code: Chapter 9's mandatory building commissioning. Table 903.1 outlines all major requirements of the commissioning plan, and the sequence for delivering required documentation to assure both code official and project owner that the completed project is capable of satisfying Code requirements for energy efficiency and water conservation, innovation in sustainable design, and waste reduction.[6]

Risk Factors and Recommendations

Chapter 1 – Administration

The ICC's other primary International building codes are considered part of the IgCC's requirements according to Section 102.4, although this section does not reference specific editions of those codes. Presumably a local building authority will modify this incorporation by reference or provide guidance as to the extent of the incorporation upon adoption. Section 102.4.1 also attempts to reconcile any inadvertent conflicts among the IgCC and other referenced codes or standards where they overlap, by stating that the "the provisions of this code or the International Codes listed in Section 102.4, as applicable, shall take precedence over the provisions in the referenced code or standard." This order of precedence clause is not a model of clarity, however, and may not fully account for the conflicts that may arise. Further consideration and action to resolve code conflicts may require local amendments by the adopting jurisdiction.[7]

Section 103 empowers the local code official to enforce the IgCC as it does other building codes, but does not otherwise specify detailed enforcement mechanisms or penalties for non-compliance. Presumably these features will also be implemented as part of local adoption.[8]

Chapter 2 – Definitions

The IgCC relies on nearly two hundred defined terms and incorporates by reference those definitions adopted in several other International Codes. Terms not defined by the IgCC or by reference to another I-Code "shall have ordinarily accepted meanings such as the context implies", according to Section 201.4.

Chapter 3 – Jurisdictional Requirements and Life Cycle Assessment

Section 303.1 is another performance-based standard, which enables a design team to demonstrate compliance with Section 505's mandatory requirements for recycled or renewable content building materials by performing a Whole Building Life Cycle Assessment. This assessment must conform to the requirements of ISO Standard 14044 – Environmental Management - Life Cycle Assessment. Using an assessment tool approved by the code official the design team must demonstrate that the building project—except for electrical, mechanical, plumbing, controls, elevators and conveying systems—achieves not less than a 20 percent improvement in environmental performance for global warming potential and at least two other impact measures as compared to the minimum energy requirements of this Code and the structural requirements of the IBC.

It is too early to say whether the Whole Building Lifecycle Assessment permitted by Section 303.1 presents a greater risk exposure than the prescriptive material selection requirements in Section 505, Either process will require the exercise of professional judgments by the project design team. The life cycle assessment is intended to assess "the full life cycle, from resource extraction to demolition and disposal, including but not limited to, onsite construction, maintenance and replacement, relocation and reconfiguration, and material and product embodied acquisition, process and transportation energy. (Section 303.1.7) As the project design team will have legal responsibility for this task to comply with permitting requirements, prudence dictates that the assessment be completed by a team member or qualified consultant experienced in use of ISO Standard 14044.

The alternative compliance path under Section 505 obligates the design team to assure that not less than 55 percent of total building components (excluding electrical, mechanical, plumbing, security, alarms, fire sprinklers, elevators and conveying systems) are

- Used materials and components
- Recycled content building materials
- Recyclable building materials and building components
- Bio-based materials (as verified by stated test methods or reference standards); or
- Indigenous materials (in general, those extracted harvested or manufactured within a 500 mile radius of the building site)

The hidden risk for the design professional in these two methods for assuring sustainable construction is that the model code does not specify the penalties or consequences of a failure to

comply. From a legal perspective, non-compliant building materials would still provide full value to the owner and user—assuming they performed as represented and there is no question of overcharging for the approved product—and they should not be removed. The cost of removal and replacement with compliant products could be prohibitive after those products are incorporated into the project.[9] If these compliance issues are not addressed by the jurisdiction in its adoption of the IgCC, it will be for the courts to determine an appropriate remedy (or penalty) for a project that fails to attain conservation and sustainability goals due to a faulty Whole Building Life Cycle Assessment or excessive use of non-qualifying materials.

Until more experience is gained with these requirements, designers and specifiers are advised to require the contractor and its suppliers to provide all necessary documentation verifying the lifecycle cost of building components, and that the approved or specified materials were supplied. By sharing this risk with the contractor, the project designer and specification writer can mitigate their risk exposure.

Chapter 4 – Site Development and Land Use

This element of the model code could have some of the most far-reaching consequences for project designers, including civil engineers responsible for site development. When enacting the IgCC, a local jurisdiction can adopt one or more optional features as mandatory requirements, including:

- Flood hazard area preservation
- Surface water protection
- Conservation areas
- Agricultural lands preservation
- Greenfield sites
- Preferred parking for high-occupancy, low emission, hybrid or electric vehicles
- Transportation impact mitigation through mandatory bicycle parking for buildings with a total building floor area greater than 10,000 square feet, with shower and changing facilities, and connections to existing or planned future bicycle paths
- Heat island mitigation through restrictions on hardscape and use of shading, vegetated, or reflective roofing materials
- Light pollution control

While many of these subjects—such as stormwater management and light pollution control—are regulated by existing codes, and some mitigation measures might otherwise be employed to obtain credits in LEED-certified projects, adoption of more stringent IgCC land use management provisions could render certain projects infeasible or create conflicts with other state and federal codes applicable to the project.[10] Care must be taken by a jurisdiction adopting the IgCC to

anticipate and resolve these potential conflicts in local land use regulation. A design professional assuming responsibility for entitlements or land-use planning must also confirm in advance whether the jurisdiction has enacted IgCC restrictions on developments in or adjacent to flood zones, conservation areas, greenfield sites, or agricultural land.

Another mandatory component of Chapter 4, the pre-design site inventory and assessment (Section 401.2), requires the design team to prepare and submit "with the construction documents", an "inventory and assessment of the natural resources and baseline conditions of the building site", to include:

- A determination of whether any code-designated protection areas are located on or adjacent to the building site;
- A determination of whether, and the degree to which, native soils and hydrological conditions of the building site have been disturbed and altered by previous use or development;
- Identification of any "invasive plant species" for removal[11];
- Identification of any native plant species on the site.

This assessment should be started early in the entitlement process (at least as regards designated protection areas or hydrological or soils conditions) to identify issues that could prevent development or require unexpected mitigation measures. Conceivably, a jurisdiction could require some of this information with design review submittals.

Section 406.1 also requires development and implementation of a building site waste management plan that will divert not less than 75 percent of the land-clearing debris and excavated soils from landfills. Documentation confirming compliance with this requirement, as well as proper disposal of invasive plants or other contamination encountered during site clearing, must be maintained and presented to the code official on request. This is another requirement that must be passed through to the contractor, so that the general contractor and grading subcontractor (or other specialty trades needed for site preparation) will document and certify to the project design team compliance with the building site waste management plan and this code requirement.

Chapter 5 – Material Resource Conservation and Efficiency

In addition to the building material specification requirements discussed above, Chapter 5 of the IgCC requires for the inclusion of areas for building occupants to collect recyclable materials. The designer must also divert not less than 50% of nonhazardous construction waste from disposal (Section 503.1) and the jurisdiction may increase this diversion requirement in Table 302.1 to 60% or 75%. As with other mandatory aspects of this model code, the consequences of non-compliance with the conservation requirements are not specified, and it would be impractical to rectify some violations—such as sending too much construction waste to a

landfill—after the fact. This is another aspect of the IgCC that should be clarified and supplemented in the adoption process for any jurisdiction.

If penalties or remedies for non-compliance are not spelled out in the enacted version of this Code, the courts will have to decide on common law principles the appropriate measure of damages. In the short run, some unpredictable results could occur in cases involving more egregious failures to comply. If the design team is certifying to the owner or building department the compliance with these requirements, it could also be at risk for more serious fraud or false claim charges if it knowingly misrepresents the status of compliance. This is all the more reason to shift the responsibility for verifying compliance to the contractor, who is best equipped to document quantities and procedures.

Any construction waste management program will also require the contractor's participation and support, and care must be taken to avoid interfering with construction means, sequences, or methods.[12] One means to comply with this requirement is to include a performance specification for the diversion requirement, and require an early submission for the waste management plan, coupled with documentation of compliance at the completion of the project. For those who have not wrestled with such requirements in the past, it may be beneficial to engage the services of a qualified, experienced LEED consultant, because they have developed strategies and procedures for confirming compliance with similar requirements under the LEED credit structure.

Chapter 6 – Energy Conservation, Efficiency and CO_2e Emission Reduction

Chapter 6 of the IgCC presents some of the most significant challenges to design professionals. By offering a choice of performance or prescriptive compliance paths, the Code encourages design innovation. However, projects designed to meet the code performance standards for energy conservation and CO_2e reduction places the compliance burden fully on a designated design professional in responsible charge (602.1.3), who must, in turn, employ an energy modeler certified by an accredited agency approved by the building official. The project owner must also notify the building official if the registered design professional in responsible charge of the building energy simulation is changed or is unable to perform its duties.

Each compliance path has its own unique requirements. For performance-based designs, the design professional must also demonstrate compliance with the following requirements:

- Predictive energy simulation model demonstrating a reduction in power utilization as compared to a baseline standard (602)
- Plug-load controls for a variety of uses and office equipment (608.6)
- Energy efficiency requirements for specific types of permanent appliances and equipment such as elevators, escalators, conveyors, and food service equipment (609)
- Building renewable energy systems – photo-voltaic, wind energy, solar water heating equipment, or long-term renewable energy credits (610)

- The project mechanical, lighting, and electrical systems must be commissioned, as described below, after the completion of installation and before issuance of a certificate of occupancy (611)
- Proof of commissioning must be provided to the code official and owner within 60 days of completion.

Projects designed according to the prescriptive-based compliance path must comply with these requirements:

- Building thermal envelope, including insulation, fenestration, shading, and air leakage requirements, shall meet and, and in some cases exceed, requirements of Section C402 of the *International Energy Conservation Code* (605)
- Building mechanical systems shall meet the requirements of the *International Energy Conservation Code* and specific efficiency requirements of Section 606 for HVAC and exhaust systems.
- Building service water heating systems shall meet requirements of the *International Energy Conservation Code* and specific efficiency requirements of Section 607.
- Building electrical power and lighting systems shall comply with requirements of the *International Energy Conservation Code* and specific requirements of this section 608. The lamps, ballasts, and lighting controls must be inspected to confirm they are the type approved by the construction documents before the certificate of occupancy will issue. (608.10, .11)
- Energy efficient permanent equipment and building renewable energy systems as in the performance-basis design path (609, 610).

Under either compliance path, the design must incorporate energy metering, monitoring and reporting capabilities for all energy and fuel stock use for the project (with submetering capability for buildings larger than 25,000 square feet), and a data acquisition and management system capable of storing and displaying not less than 36 months of data for:

- Current energy demand for the whole building level measurements, updated for each fuel type
- Average and peak demands for the prior day and same day of the prior year;
- Total energy usage for the prior 18 months.

Where elected in Table 302.1 by the local jurisdiction adopting the IgCC, the design must also incorporate an automated demand-response (Auto-DR) infrastructure to meter reduce peak demand, avoid rebound peak demands for heating, ventilation and air conditioning after periods of reduced usage; and reduce energy usage during normally unoccupied periods. (604).

To assure attainment of all energy reduction and operating efficiency requirements of the IgCC, the building owner must have the building formally commissioned by a registered design professional or an approved agency (Section 611). In contrast to the fundamental or enhanced

commissioning process conducted for LEED certification, there are no restrictions in the IgCC on who may serve as the commissioning agent beyond the basic qualification that it must a registered design professional or approved agency.[13]

Commissioning of the building mechanical system must be completed within 60 days of approval of the final mechanical inspection. A written plan must assure that building mechanical systems and equipment are tested to verify that they meet the requirements of the construction documents and are calibrated to perform to required capabilities. Air and water balance, and installation of all occupant sensors, daylight or programmable lighting controls for the lighting and electrical system must also be completed. A preliminary commissioning report must be furnished to the owner so that deficiencies can be corrected, and the final commissioning report is a requirement for issuance of the certificate of occupancy. More expensive post-commissioning documentation must be furnished to the owner to advise on required settings and sequence of operations for lighting and energy management controls, and annual inspection requirements. The project must also be re-commissioned 18-24 months post-occupancy to assure that building management systems are functional and in proper calibration.

One challenge to this process is the requirement in Section 611.4 for verification that the building thermal envelope has been installed in accordance with the construction documents. No specific method of compliance is prescribed. Some combination of documentation, special inspection or observation, and/or construction progress photos may be necessary to provide verification that the building thermal envelope has been installed in accordance with the approved construction documents. This documentation and verification requirement also presents an increased risk potential for design professionals and should be addressed with the contractor, installers, and fabricators as part of their responsibilities for submittals and record documents.

All projects designed according to the performance-basis path must have a zero energy performance index (zEPI) of no more than 51 (and less than that if the jurisdiction adopts a more stringent standard).[14] Energy efficiency improvements required by the IgCC will generally be 11%-15% higher than the 2009 IECC requirements, and 20% higher than the 2006 IECC. For jurisdictions updating from the 2006 IEEC, and those that previously had no energy conservation code, the adoption of IgCC will require a significant increase in energy efficient design requirements.[15]

It is the reliance on predictive energy modeling and targeted energy reduction and building efficiency requirements as a prerequisite for issuance of a certificate of occupancy, as well as continued code compliance, that pose the greatest threat to design professionals working under the IgCC.[16] Generally speaking, the better risk management strategy would include offering the full scope of services to assure that completed construction met design requirements and the design team managed the commissioning effort. Otherwise, in design-only projects, the designer will most likely discover unapproved deviations and substitutions only after construction is completed, when remediation would be far more costly.

Chapter 7 – Water Resource Conservation, Quality and Efficiency

Through a combination of requirements for reduced consumption, waste avoidance, and more stringent metering requirements, Chapter 7 seeks to reduce water consumption and provide for safe and efficient management of multiple water sources and uses, including:

- Fixtures, fittings, equipment and appliances (702)
- HVAC Systems and equipment (703)
- Water treatment devices and equipment (704)
- Rainwater collection and distribution systems (707)
- Gray water systems (708)
- Reclaimed water systems (709)
- Alternate onsite nonpotable water sources, such as stormwater, reverse osmosis reject water, foundation drain water and swimming pool backwash water with proper treatment(710)

The centerpiece of this water management section of the IgCC is the requirement for metering of water consumed from any source associated with the building or building site. (705.1). As required in Table 705.1.1, certain uses, and usage exceeding daily minimums, must be separately metered with the capability for remote monitoring of water consumption, data storage, and reporting capability for daily, monthly, and annual water consumption trends. While many of these requirements are found in existing codes, the consolidation of these requirements into a code that also permits and regulates the use of non-potable water sources for specified applications will undoubtedly lead to unanticipated possibilities for design errors or omissions.

Where the local jurisdiction opts in Table 302.1 to require use of municipal reclaimed water, and a source of municipal reclaimed water is deemed "accessible"[17] to the project, it shall be used for water closets, water-supplied urinals, water-supplied trap primers and applicable industrial uses. IgCC's limits on pipe lengths for hot or tempered water, with or without a circulation loop or heat-traced line, will also require design innovation in the placement of boilers, mixing valves, and tankless heating systems. A learning curve should be expected for design teams to consider and coordinate the requirements of the tables and design formulas found in IgCC Chapter 7 in the location of equipment and routing of plumbing lines within the project.[18]

Chapter 8 – Indoor Environmental Quality and Comfort

Many of the requirements in IgCC Chapter 8 should seem familiar to design teams experienced in LEED-certified projects. An indoor air quality management plan is required by Section 801.2 and it must address air quality concerns in both design and construction practices to achieve desirable indoor environmental quality and comfort. Other commentators have noted that the IgCC is not clear on when or if the indoor air quality plan must be submitted to the code

official.[19] This is another planning and documentation requirement that would benefit from early participation by the contractor.

Adequate ventilation rates must be maintained during construction, and the duct openings for the building HVAC system must be protected against infiltration of dust and debris during the course of construction. Isolation of pollutant sources (print or copy rooms, janitorial rooms, garages and hangars), limits on permissible concentrations of pollutants or VOC-emitting building materials, and a total prohibition on indoor tobacco smoke indoors are intended to improve indoor air quality.

Of concern is a compliance option in Table 302.1 which, if adopted, requires a post-construction, pre-occupancy baseline Indoor Air Quality test before the structure will be considered complete. (Section 804.2) This section does not stipulate who shall oversee this baseline testing, or the credentials required of that consultant or agency. This Code section requires adherence to several ASTM and ISO testing protocols, but concludes with three significant exceptions that provide some protection against having a certificate of occupancy withheld for noncompliance:

- Group F, H, S and U occupancies are excluded from testing requirements
- Where a similarly designed and constructed building for the same owner or tenant has received an acceptable test result, subsequent buildings in the same project shall not require pre-occupancy IAQ testing.
- In the event VOC levels exceed the concentration limits in Table 804.2 and the owner or tenant does not mitigate the source of the violation, the project or building shall be deemed acceptable if it is flushed out by continuous ventilation with outdoor air for at least 14 days, with internal temperature of at least 60 degrees F. and relative humidity not exceeding 60 percent. Building occupancy may commence seven days after the start of the flush-out period.[20]

This flush-out procedure should mitigate the risk of a significant consequential damage claim resulting from IAQ violations, but the prudent design team should allow sufficient time in the project delivery schedule for baseline IAQ testing – where required by local option – and flush-out prior to commencement of occupancy.

Another optional requirement of Chapter 8 requires design and construction to achieve acceptable limits on sound transmission and sound levels within occupied units. Section 807 must be met if required by local option in Table 302.1. The compliance requirements and testing methods are familiar to those who have complied with existing building code or owner-requested requirements:

- Group A and F occupancies: ASTC 60 as designed, ASTC 55 as built
- Group B, I, M, or R occupancies: ASTC 50 as designed, ASTC 45 as built

- Group R condominium occupancy separated from Group R, B, I, M : ASTC 55 as designed, ASTC 50 as built.

Special inspection and sound transmission testing is required prior to occupancy, and the design professional and code official must be notified of these test results to confirm compliance or assure correction of prior deficiencies to obtain compliance. Field sound test reports are not required for approved assemblies with established STC ratings. (807.6, Exception). Since mitigation of sound transmission and sound level deficiencies can be extremely time-consuming and costly, this is one aspect of IgCC compliance burdens that deserves careful consideration. Employment of qualified, experienced, and appropriately insured acoustical consultants is essential to shift and underwrite the cost of this risk. Likewise, documentation of ASTC-rated assemblies and confirmation through observation or inspection that sound damping installations have been properly constructed are essential requirements for managing the risks of IgCC Chapter 8.

Daylighting standards and computational methods are the last component of indoor environmental quality addressed in Chapter 8. While compliance goals may differ, day lighting principles and computational methods are comparable to LEED criteria.

Since many of the IAQ compliance requirements also impact contractor means and methods, it would also be advisable to include the contractor in the development of the indoor air quality plan, or else provide a suitable framework or performance criteria for an IAQ plan in the bidding documents so that the contractors selected for the project has considered the cost impact in its pricing for the project. Some further clarification of the implementation requirements for Chapter 8 may occur in the adoption process for each jurisdiction enacting the IgCC as part of local building codes.[21]

Chapter 9 – Commissioning, Operation and Maintenance

IgCC Chapter 9 entrusts responsibility for post-construction, pre-occupancy building commissioning to the “registered design professional in responsible charge” or an “approved agency”. Both terms are defined in chapter 2 of the Code and allow considerable latitude as to who may perform this service. The first is defined in section 202 as:

> A *registered design professional* engaged by the owner to review and coordinate certain aspects of the project, as determined by the building official, for compatibility with the design of the building or structure, including submittal documents prepared by others, deferred submittal documents and phased submittal documents.

A professional registrant member of the owner’s design team could provide this service, but so could a suitably licensed construction manager advisor (but not the contractor who built the project) or independent commissioning agent.

The “approved agency” is also defined in Section 202 as “an established and recognized agency regularly engaged in conducting tests or furnishing inspection services or commissioning services, where such agency has been *approved*.” The required approval must be obtained from the code official for the project, and, for this purpose, the approved agency must also be objective, competent, and independent of the contractor performing the work. (Section 902.1.1) Accordingly, an appropriately qualified and certified testing firm could also provide the commissioning services required by the IgCC.

Table 903.1’s Commissioning Plan provides a comprehensive tabulation of the IgCC’s many pre- and post-occupancy commissioning requirements, the frequency and method by which they must be satisfied, and the applicable code provision or standard. A completed pre-occupancy report must be supplied to the owner, registered design professional in responsible charge and, upon request, to the code official. Deficiencies noted in the report must be referred to the contractor for correction. Where not corrected, they must be brought to the attention of the owner, registered design professional in responsible charge, and code official prior to completion of that phase of the work.

The final commissioning report must be submitted to and accepted by the code official prior to issuance of the certificate of occupancy. (Section 903.1.1) Where additional post-occupancy commissioning is required by Table 302.1, the report must be provided to the owner, and made available on request by the code official within 30 months after the certificate of occupancy issues. (Section 903.1.2) The methods and details required in this commissioning report should be familiar to anyone who has participated in a LEED-certified or other commissioned project under prior code. Even so, the ongoing time commitment, contracting requirements, and post-occupancy costs associated with these additional commissioning requirements must be explained to the owner in advance, to set realistic expectations and assure compliance with code-mandated procedures. Given the complexity and highly technical nature of some IgCC requirements, the commissioning plan stands as the primary means to assure code compliance. Periodic inspections by the building department during construction will not be sufficient to confirm compliance with all requirements.

Chapter 9 also requires compilation and delivery to the owner of building operations and maintenance documents – consisting of the records and instructions required by Section 904.3 – and record documents prior to issuance of the certificate of occupancy. Section 904.1, .2. The Code optimistically requires that “at last one additional copy [of the BOM documents] shall remain with the building throughout the life of the structure.” For sites that were previously a brownfield, or the subject of requirement environmental corrective action, remediation, or restoration by governmental order, the owner shall also be provided with copies of engineering or institutional control information pertaining to this action. The owner is required to submit a letter to the building official certifying it has received these submittals. Section 904.1.

Chapter 10 – Existing Buildings and Chapter 11 – Existing Building Site Development

Both chapters provide transitional rules applicable to buildings and sites developed prior to adoption of the IgCC, and this new code does not automatically apply to existing structures. Unless an owner or user undertakes the alteration of an existing building or tenant space, or re-development of an existing site, that building or site will be evaluated according to requirements of the code in effect at the time of the improvements were built.

Cost, utility, and feasibility constraints are imposed on the application of IgCC requirements to building alterations (Section 1003.1) and the code official has the discretion to reconcile conflicts between different code editions or requirements, as applied to alterations or modifications of existing buildings and sites, and their application to historic buildings. (Sections 1005 and 1105.) There is a potential for conflict between the exemptions allowed by Chapters 10 and 11 for historic buildings and requirements for continued inclusion in the National Register for Historic Buildings, so additional research and consultation with all jurisdictions having authority over historic structures is necessary to assure their protected status will not be jeopardized.[22]

Chapter 12 – Referenced Standards

This Chapter compiles all other building codes or reference standards mentioned in the IgCC, listing their standard number and effective date. It also provides a convenience cross-reference to the IgCC section mentioning that standard. Design professionals must account for the impact of these reference standards where applicable. As demonstrated in many design errors or omissions cases, an astute expert witness can develop a plausible – if not necessarily winnable – theory of liability based on an alleged failure to comply with a reference standard. Where conflicting expert testimony concerning the standard of care must be resolved by a jury, claims are often resolved by settlement to avoid the risk of an adverse verdict.

Appendix A – Project Electives

The IgCC's "Project Electives" in Appendix A are provided for adoption by those jurisdictions who seek to exceed the IgCC's minimum conservation requirements. (Section A101.1) However, as noted elsewhere, the Code and the optional model ordinance in Appendix C fail to provide a ready means for adoption of these electives.[23] The preface to the IgCC states, "Appendices have the same force and effect as the first 12 chapters of the IgCC only when they are explicitly adopted by the jurisdiction."[24] Neither Table 302.1 of the model code nor the model ordinance and enforcement procedures in Appendices C and D to the Code itemize the Project Electives so that they may be adopted by the jurisdiction. Both state that these electives are not mandatory unless specifically referenced in the adopting ordinance.[25] The separate Radon Mitigation standard in IgCC Appendix B does not even state its relationship to the rest of the model code. Clearly, these issues with the text must be resolved before the Project Electives can be enforced as mandatory requirements in any jurisdiction adopting the IgCC.

Code-Related Insurance Considerations

In evaluating potential coverage issues in the IgCC, warranties and guarantees are a primary concern. The typical professional liability insurance (PLI) policy provides coverage for negligence in the performance of professional services. Negligence, for the design professional, is determined by reference to the standard of care or, more specifically, a breach of that standard of care. Consequently, and even though the PLI policy does not specifically say so, this insurance provides coverage for a breach of the standard of care. The standard of care is that degree of judgment, knowledge, skill and care that design professionals of ordinary ability, working in the same or similar communities, possess and exercise.

However, certain obligations imposed on the design professional by the IgCC text might be interpreted as a warranty or guarantee. The PLI policy specifically excludes coverage for claims *based upon or arising out of express warranties and guarantees.* Members of the public may think it reasonable to require design professionals to assure that their construction documents meet code because, after all, a design that does not satisfy code requirements has not met the standard of care. But design professionals cannot *guarantee* that the built project will comply with building net energy performance standards, peak net energy demand or CO_2e emissions requirements. A design team that certifies to the owner or building department that the design or completed construction will comply with these specific IgCC standards, could well be interpreted as having guaranteed the actual performance of that project.

While performance standards are a significant component of IgCC compliance, the interaction of contractors, equipment manufacturers, building owners and facilities managers to complete construction and commissioning of a project designed to IgCC standards make it unwise and impractical for the design professional alone to guarantee code compliance. Such a guarantee would not be covered by the PLI policy. Accordingly, limiting the design professional's duty to the standard of care must be clearly defined in all contracts subject to the IgCC. Language expressly disclaiming any warranties or guarantees relating to professional services is strongly recommended.

Another coverage issue to consider is the potential for fines and penalties for non-compliance with the IgCC. As mentioned earlier, Section 103 empowers the local code official to enforce the IgCC as it does other building codes, but it does not specify detailed enforcement mechanisms or penalties for non-compliance. Presumably these features already exist in the local building code, or will be implemented upon adoption of the IgCC. If these compliance measures are not addressed by the local jurisdiction, it will be for the courts to decide on common law principles the appropriate measure of damages or other remedies (or penalties) to impose for violations of the IgCC.

Design professionals should note that the typical PLI policy agrees to pay on behalf of the Insured all sums in excess of the Deductible, subject to the Policy Limits of Liability, that the

Insured becomes legally obligated to pay as Damages. Damages are generally defined as a monetary judgment, award or settlement of *compensatory damages*, including associated pre-judgment and/or post-judgment interest *but do not include fines, taxes, statutory or administrative penalties*, injunctive or equitable relief. If left to the courts, damages based on common law principles will more than likely be compensatory and will not present a coverage issue. However, if left to the local jurisdiction, the consequences for non-compliance could more readily involve the imposition of fines or administrative penalties, which, if assessed against the design professional, are not covered by the PLI policy. This is yet another reason to shift responsibility for non-design compliance issues to the contractor or other party who is better suited to deal with those concerns.

Another insurance consideration, although more indirect, is the potential for the IgCC to establish a new, probably augmented, standard of care for the design professional. An increase in the standard of care does not necessarily present a risk to coverage since, as previously noted, the PLI policy provides coverage for breach of the then-prevailing standard of care. However, an A/E firm that does not increase its capabilities to meet the new standard could see the firm's bottom line hurt by increased frequency of claims, associated claims expenses, time and resources diverted from paying work to the defense of claims, damage to reputation, and disciplinary action by licensing authorities. A/E firms must also recoup in their fee income the investment in training and resources required by IgCC's higher standards. Failing to do so is not a sustainable business model.

The insurance industry will eventually re-assess the risk profile of A/E firms designing to IgCC standards and charge a premium rate commensurate with that risk regardless of whether the insured's fee income increased in response to the risk and new burdens of compliance. But therein lies the problem. It is somewhat easier to justify an increase in fee for services needed to comply with a voluntary sustainable design standard, such as LEED certification for example. The owner can take it or leave it. But when sustainable design becomes part of a mandatory code, the owner will want to know why it should pay more for a design that simply "meets code."

Therefore, the A/E firm must explain during negotiation of the scope and fee that the jurisdiction and code *demands a better design to comply with IgCC*, and so additional services and fees are needed to deliver that design. Basing the fee solely on a percentage of final construction cost—when that cost may not increase proportionally to the added complexity of sustainable design—will not adequately compensate for the added risk. Comparison of a work/task breakdown to a percentage of construction cost may aid in illustrating the justification for additional fees needed for IgCC-compliance.

Risk and Contract Management Considerations

Given the broad reach and technical rigor of the IgCC, design professionals should recognize that it can impose a higher standard of care for certain projects and certain professional disciplines. We propose the following risk management recommendations for design teams who assume responsibility for developing more sustainable designs under this new Code:

1. If the jurisdiction has enacted Appendix A Project Electives, determine whether their restrictions or incentives conflict with the owner's program or the requirements of other land use or historic building regulations that will apply to the project.

2. Avoid overselling the benefits and underestimating the burdens of compliance with the IgCC – especially the costs and training required to maintain the operational efficiencies of high performance HVAC systems and building conservation systems.

3. Qualify and select consultants based on their competence in designing for LEED or CalGreen certification requirements. Consultants who have not previously designed for LEED, CalGreen or similar sustainable design requirements should partner with more experienced architects, engineers, or simulation modeling consultants with a demonstrated record of success with such projects.

4. Since no standard forms of agreement address the specific challenges of the IgCC, your contracts must be modified to define those duties for Code compliance and documentation that must be satisfied by the owner, registered design professional in responsible charge (RDPIRC), contractors, and vendors. Where appropriate, contractors and vendors must be required to provide the required engineering, test data, and certifications to assure compliance with all performance and prescriptive obligations of the Code.

5. Educate clients about the assumptions and limitations of energy and water conservation modeling software, and counsel them to expect differing results if their utilization of the project does not match inputs and assumptions of the models.

6. Consider including in your contract a limitation of liability or other agreed remedy for IgCC code violations that cannot easily be remedied without causing economic waste.

7. For those consultants working with energy models, develop more accurate estimates of plug loads and operating hours as inputs to those models. Consider engaging a suitably-credentialed and insured energy modeling consultant.

8. Have the energy models and key elements or systems of the design peer-reviewed to detect errors, omissions, or unrealistic assumptions before the start of procurement and construction activities.

9. Utilize building information models (BIMs) and, where appropriate, existing conditions 3D Laser Scans to facilitate coordination of building systems within available plenum spaces.

10. Engage the construction team and design consultants in a constructability review to identify design deficiencies before the construction documents are released for fabrication and erection. Require contractors and suppliers to certify that supplied equipment and systems performs to IgCC standards

11. Avoid contractual warranties or guarantees of the model's predictions, compliance with the Code, and politely decline to speculate on or predict any anticipated economic benefits or intangible health, productivity, or wellbeing benefits.

12. Consider the risks of "design-only" scope of services and insist on participation in the commissioning process

13. Engage the contractor early in the course of the work to secure its assistance in developing the site assessment, the Whole Building Lifecycle Assessment, the waste management plan, and commissioning documentation needs. Make certain that the contractor and its vendors or subcontractors understand the efficiency and conservation targets for the project, and discuss how their work plan must be adjusted to reduce construction waste and protect IAQ.

14. Participate fully in the post-construction, pre-occupancy commissioning processes, and follow up with the contractor or owner to assure correction of deficiencies noted in Commissioning Report.

15. Include in your scope of services a post-occupancy warranty inspection and participation in the re-commissioning process. Document all deficiencies noted.

16. Conduct a lessons-learned evaluation of project outcomes to identify aspects of the design or design process that require improvement.

ENDNOTES

[1] See 2012 International Green Construction Code (IgCC) Section 101.3. Through local option, residential buildings that are one or two-family detached dwellings, townhomes not exceeding three stories, R-3 residential, and R-2 or R-4 residential buildings of four stories or less, may be required to comply with the National Association of Homebuilders ICC 700 National Green Building Standard. The ICC 700 code is currently adopted in only three jurisdictions.
[2] See LEED and Green Building Codes: Distinct & Complementary Policy Tools - http://bit.ly/T3IwBc
[3] For additional information, visit http://www.iccsafe.org .
[4] Unless the context indicates otherwise, all mentions of "Section *xxx.x*" in this paper refer to the applicable section of the 2012 International Green Construction Code.
[5] International Codes – Adoption by State (updated December 2012) - http://www.iccsafe.org/gr/pages/adoptions.aspx .
International Codes – Adoption By Jurisdiction (Updated December 2012) - http://www.iccsafe.org/gr/Documents/jurisdictionadoptions.pdf
[6] The commissioning requirement has long been considered a missing, but necessary, requirement of voluntary sustainable design standards. See "Some Buildings Not Living Up To Green Label", *The New York Times* (August 30, 2009) http://nyti.ms/RCesKP .
[7] See *The AIA Guide to the IgCC* (2012) published by the American Institute of Architects, pages 50-51. (Referred to hereafter as *"AIA Guide"*)
[8] *AIA Guide*, pages 53-54.
[9] *Id.*
[10] See *AIA Guide*, page 52.
[11] This term is defined in Section 202 to include those species on approved federal, state, or local noxious or invasive plant lists
[12] *AIA Guide*, page 53.
[13] Additional information regarding certification of commissioning agents may be obtained from ASHRAE at http://bit.ly/VoK0qA .
[14] *AIA Guide*, page 54.
[15] *Id.*
[16] See "Energy Modeling Isn't Very Accurate" *www.greenbuildingadvisor.com* March 30, 2012; "Some Buildings Not Living Up To Green Label" *New York Times*, August 31, 2009; "Big Usage Gaps Exist Between Energy Models and Performance" *ENR*, February 27, 2012.
[17] As stated in Section 702.7, a municipal reclaimed water source is deemed "accessible" when this "supply is not greater than 150 percent of the distance that the potable water supply is from the lot boundary or the supply is within 100 feet (30.5 m) of a potable water supply that serves the lot."
[18] *AIA Guide*, page 55.
[1919] *AIA Guide*, page 55.
[20] Section 804.2, Exceptions.
[21] *AIA Guide*, page 55.
[22] *AIA Guide*, page 56.
[23] *AIA Guide*, page 57.
[24] IgCC, Preface, page x.
[25] *AIA Guide*, page 57.