

Getting to Know Your Green Building Code

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INTRODUCTION

The year 2010 represents an important milestone in the development of building codes in the United States with the publication of the new ANSI / ASHRAE / USGBC / IES *Standard 189.1-2009 for High-Performance Green Buildings*, the public commentary release of the ICC International Green Construction Code (IGCC), and the pending enforcement in 2011 of the California Building Standards Code (CAL Green). Any of these three documents, along with the previously published ICC 700-2008 *National Green Building Standard* for residential buildings, may be adopted by a municipality for use by building code officials in much the same manner that the ICC International Energy Conservation Code (IECC) is used today, with the ultimate goal of achieving sustainable solutions to the construction of the built environment.

These publications did not spring up out of thin air. They are the result of the widespread acceptance of energy codes and rating systems for 'green' buildings that has occurred during the past decade. For example, ten years ago few design professionals were proficient with the fundamentals of the ASHRAE 90.1 Energy Standard for Buildings, much less the IECC. Today, several thousand of architects, engineers, building code officials, and builders have been trained to use these documents as mandated by state, federal and local jurisdictions. In addition, with more than 20,000 member companies and organizations, and more than 131,000 Accredited Professionals, the basic concepts of the USGBC LEED rating system is familiar to most emerging professionals in the field.

Over the last few years, several communities throughout the country have struggled to use a combination of available codes, standards, and rating systems to compile their own homegrown policies for advancing 'green' buildings in their communities. With the advent of these new publications, it will be possible to adopt a 'green' building code that may be used in conjunction with other municipal codes and standards, that are more uniform and consistent, and therefore more predictable to developers, building owners, and the design community.

The purpose of this paper is to familiarize the reader with the basic concepts behind 'green' building codes, discuss the advantages to adopting a model code rather than adapting various rating systems and certain elements of published standards in a hybrid fashion, and to look at some specifics related to 'green' codes for commercial interiors.

BASIC CONCEPTS

The 'green' building codes include the California Building Standards Code (CAL Green), and the International Green Construction Code (IGCC). The California version is much more specific to that state and is currently only applicable to buildings which are state-regulated, although the format generally parallels that of the IGCC. Therefore, for simplicity sake, this paper will address only the IGCC when describing basic concepts.

The IGCC is an overlay code that relies on the structure provided by other International Codes. The IGCC, much like the International Energy Conservation Code (IECC), is a code that regulates buildings primarily from a public welfare perspective. The IGCC is formatted not only to require the implementation of environmentally related best practices, but also to encourage practices that are difficult to mandate, as well as to offer customization to jurisdictions.

The IGCC:

- Is written in mandatory language which is coordinated with the family of codes produced by the International Code Council
- Is intended to be adopted by jurisdictions on a *mandatory* basis
- Is intended to be administered primarily by building officials

- References ICC 700 for residential occupancies, except that high rise residential occupancies may be regulated by either ICC 700 or the IGCC
- Incorporates features which allow jurisdictions to customize requirements to suit local geographical conditions and environmental priorities and agendas
- Incorporates a relatively small number of “project electives”, a minimum number of which must be selected by the owner or design professional and implemented on each project, as a means to:
 - o Encourages practices which are otherwise difficult to mandate; and
 - o Encourages higher performance buildings (buildings with lower environmental impact which exceed the minimum requirements of the IGCC)

IGCC Chapter 1 Overview: Administration

The IGCC is applicable to the following aspects of buildings and building sites:

- New construction
- Additions, alterations and demolition
- Change of use or occupancy

The IGCC is *not* to be used as a stand-alone construction regulation document or to abridge or circumvent safety, health or environmental requirements under other codes, such as the *International Building Code (IBC)* and the *International Fire Code (IFC)*.

IGCC Chapter 2 Overview: (Sample) Definitions

- Daylight Saturation. The percentage of daytime hours throughout the year when 30 foot-candles (323 lux) of natural light is provided at a height of 30 inches (762 mm) above the floor. Partial credit is allowed for times when less than 30 foot-candles of natural light is provided. No credit is allowed for times when 450 foot-candles or more of natural light is provided.
- Project Elective. Provisions contained in Chapters 4, 5, 6, 7, 8, and 9 for which compliance is not mandatory unless selected for a specific *building* design.
- Total Annual Net Energy Use (TANEU). A ratio representing the energy performance of the proposed design compared to the energy performance of a standard reference design. It is determined in accordance with Equation 602.

IGCC Chapter 3 Overview: Jurisdictional Requirements and Project Electives

Table 302.1 allows the local jurisdiction to meet regional goals and priorities by determining whether certain provisions are to be enforced in the jurisdiction and to determine what minimum level of environmental performance will be required for residential buildings regulated by the ICC 700 National Green Building Standard. Table 302.1 also requires that the local jurisdiction indicate a value between 0 and 14 as the minimum number of *project electives* that must be satisfied in order to comply with this code.

Of particular significance in this chapter is the option that allows the jurisdiction to select ASHRAE Standard 189.1 as an alternate compliance path. When this path is selected, the remainder of the code is replaced by ASHRAE Standard 189.1. The administrative chapters of the IGCC, however, remain applicable. Thus ICC 700 becomes applicable only to those residential occupancies for which ASHRAE Standard 189.1 is not applicable (i.e., all residential occupancies 3 stories or less in height).

IGCC Chapter 4 Overview: Site Development And Land Use

Chapter 4 contains requirements for the development and maintenance of buildings and building sites that are intended to promote natural resource conservation and environmentally responsible land use and development.

IGCC Chapter 5 Overview: Material Resource Conservation and Efficiency

Section 503: Material Selection

- At least 55 percent of the total materials in each building project must be any combination of the following:
 - Used materials,
 - Recycled content materials (must contain at least 25 percent combined post-consumer and pre-consumer recovered material, and must be recyclable),
 - Recyclable materials (with a minimum recovery rate of 30 percent),
 - Bio-based materials (with at least 50 percent bio-based content), or
 - Indigenous materials (materials recovered, harvested, extracted and manufactured within 500 miles of the site, with special provisions for materials transported by water or rail).

IGCC Chapter 6 Overview: Energy Conservation, Efficiency and Atmospheric Quality

Chapter 6 requires that buildings be designed, constructed and commissioned to reduce energy.

Table 602.1, Total Annual Net Energy Use (TANEU) by Building Occupancy Type, is central to the use, enforcement and adoption of the energy provisions of the IGCC. Table 602.1 directs them to determine minimum energy performance requirements. The jurisdiction can choose to leave the values for energy performance at the default TANEU Point of Entry values of 70 in Table 602.1, or can specify lower TANEU values (higher energy performance) for any of the occupancies listed in the table. TANEU is a ratio that represents the energy performance of a proposed design as compared to that of a standard reference design. In an innovative move, the calculation of TANEU in the IGCC gives credit for, and thereby encourages, waste energy recovery (cogeneration) and the on-site generation of renewable energy.

The IGCC allows building energy systems to be designed using *prescriptive* or *performance*-based compliance paths. Buildings with an aggregate area of over 25,000 square feet, other than existing buildings, are required to use the IGCC's *performance*-based energy compliance path. Buildings with an aggregate area of less than 25,000 square feet may use either the *prescriptive* or the *performance* based compliance path of the IGCC. Buildings with an aggregate area of less than 25,000 square feet which use the IGCC's *prescriptive* compliance path are deemed to, and are permitted to, have a TANEU of 70, meaning that they are exempt from the lower TANEUs (higher energy performance thresholds) which may be required by the jurisdiction. In accordance with Section 602.2, all buildings which follow the *prescriptive* or *performance*-based compliance paths must comply with the requirements of the IECC for the following:

- Building envelope air leakage
- Mandatory requirements for building mechanical systems
- Mandatory requirements for service water heating equipment and piping insulation.

IGCC Chapter 7 Overview: Water Resource Conservation and Efficiency

Chapter 7 requires and encourages the conservation of water used indoors, outdoors and in wastewater conveyance. It begins by providing *prescriptive* maximum flow rates for fittings and fixtures in Table 702.1, some of which are reduced as compared to those in the International Plumbing Code (IPC). It then requires compliance with a two-step *performance*-based method for determining fixture and fitting flow rates.

IGCC Chapter 8 Overview: Indoor Environmental Quality and Comfort

The provisions of Chapter 8 are intended to reduce the quantity of building indoor air contaminants and other pollutants, including those that are odorous, irritating, or harmful, and to provide an interior environment that is healthy and conducive to the well-being of building occupants, neighbors and construction personnel. This chapter, along with Chapter 5, has the most relevance for commercial interiors.

Section 808 contains requirements for the daylighting of interior spaces, including both prescriptive and performance based methods.

IGCC Chapter 9 Overview: Commissioning, Operation and Maintenance

Chapter 9 requires that building operations and maintenance documents, consisting of manufacturer's specifications and recommendations, programming procedures and data points, narratives, and other means of illustrating to the owner how the building, site and systems are intended to be maintained and operated, be included in the construction documents for the project. In addition, a copy must also be in the possession of the owner or occupant, and a copy must remain in the building throughout its life.

IGCC Chapter 10 Overview: Existing Buildings

The provisions for existing buildings in the IGCC are loosely based on the provisions of the *International Building Code* (IBC). In essence, whatever you change, you fix; and whatever you fix, you fix in accordance with the requirements of the current code, as applicable to that component, assembly or system. Whatever you add is treated much like new construction: you must meet the applicable requirements of the code.

The IGCC, however, takes additional steps. First, the IGCC requires that any existing building which undergoes alterations or additions, even if they are of a minor nature, comply with the basic minimum energy and HVAC requirements listed in Sections 1003.2.1, 1003.2.2 and 1003.2.3, except where the code official determines that they are technically infeasible, materials or systems are concealed, or where a tenant does not have control over complete systems.

IGCC Chapter 11 Overview: Existing Building Site Development

Chapter 11 covers much of the information already covered in Chapter 10, except that it covers the material with respect to existing building *sites*, as opposed to existing *buildings*. Chapter 11 addresses existing building landscaping, site hardscape and surface vehicle parking, as well as other items related to Chapter 4, *Site Development and Land Use*.

IGCC Chapter 12 Overview: Referenced Standards

Chapter 12 lists the standards that are referenced in various sections of the IGCC, including the agency which promulgated it, the standard's identification, effective date, full title and the sections or sections of the IGCC which reference it. Latest editions of all standards will be referenced, consistent with referenced standards in other I-Codes.

COMMERCIAL INTERIORS

Indoor Environmental Quality (IEQ), Section 8, in Standard 189.1 addresses four major categories: indoor air quality (IAQ), thermal comfort, acoustical control and daylighting. Each of these four areas has been identified as a critical component in balancing "environmental responsibility, resource efficiency, occupant comfort and well-being and community sensitivity" in the design of high-performance, green buildings.

- **Indoor Air Quality** – The IAQ requirements in Standard 189.1 incorporate the three critical components to IAQ design: source control, air cleaning and dilution.
- **Thermal Comfort** – Standard 189.1 requires compliance with Standard 55-2004, *Thermal Environmental Conditions for Human Occupancy*. These sections provide the design and documentation criteria required to comply with Standard 55. Included are requirements to document design assumptions such as design conditions, occupant assumptions and conditions that may create local discomfort.
- **Acoustical Control** – The acoustical requirements for Standard 189.1 are designed to protect spaces from both indoor and outdoor noise sources. Buildings located near expressways, airports and other significant noise sources must follow envelope construction criteria designed to reduce transmitted noise. Walls between sensitive interior spaces such as classrooms, dwelling units and individual tenant spaces are required to meet similar requirements.

- **Daylighting** – Standard 189.1 includes measures intended to provide a minimum quality and quantity of daylighting. For large open spaces (>20,000 ft²) under a roof, skylights are required to daylight at least half of the space. For offices and classrooms, sidelight daylighting is required. Additionally, measures requiring window shading limit the amount of direct sun in these spaces, minimizing the potential for problematic daylighting conditions. The IEQ daylighting requirements are complemented by lighting controls requirements in Section 7, Energy Efficiency

ADVANTAGES

What sets 'green' building codes apart from the current trends in green building is that they have been created with the intent of being administered by code officials and adopted by governmental units as a mechanism to drive green building beyond the market segment that has otherwise been influenced by *voluntary* rating systems.

Written in *mandatory* language, these codes have the potential of producing environmental benefits on a massive scale, otherwise impossible to attain with purely *voluntary* green building programs and rating systems. *Voluntary* programs have pioneered the Green movement, and with the foundation they have laid, the IGCC is positioned to achieve significant market transformation in those segments that are not likely to react to voluntary programs.

The IGCC regulates owner/designer choices as *project electives*. A minimum number of *project electives*, as determined by the jurisdiction, must be chosen by the owner or design professional for implementation on each specific project. As a result of these features, the IGCC is able to produce more predictable results which are closely aligned with each jurisdiction's specific environmental goals. And even if a jurisdiction chooses to enforce only the minimum criteria in the IGCC, because the IGCC is intended to be adopted as a mandatory document, it is still poised to significantly reduce the impact of the built environment on the natural environment.

The incorporation of *project electives* are designed to encourage the construction of buildings that exceed the already stringent minimum requirements, much like rating systems do. In addition, they contain other innovative features that allow jurisdictions to customize and tailor the code to address environmental concerns of a local nature and to respond to environmentally related political agendas. Relying on an overall score attained by allowing owners and design professionals to choose from a wide array of choices in all environmental categories with few mandatory requirements is typical of most green building rating systems. 'Green' building codes provide jurisdictions with a document which allows them to specify enhanced building performance in many specific critical areas of concern, including energy, water, natural resource and material conservation, etc.

Note: Since official publication of the IGCC is not expected before 2012, be alert for jurisdictions considering the premature adoption of draft versions. As currently written, a jurisdiction that approves use of ASHRAE 189.1 for IGCC compliance is agreeing to rely solely on the 189.1 provisions – eliminating the ability of building designers to follow the IGCC's own criteria. This is a departure from the usual structure of alternative compliance options, and it is possible that adopting jurisdictions will not fully understand the implications of their selections.

About the Author

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