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IgCC

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SYNOPSIS

INTERNATIONAL GREEN CONSTRUCTION CODE™

PUBLIC VERSION 1.0, MARCH 2010

- ASHRAE/USGBC/IES STANDARD 189.1-2009
  STANDARD FOR THE DESIGN OF HIGH-PERFORMANCE GREEN BUILDINGS -
  A JURISDICTIONAL COMPLIANCE OPTION OF THE IGCC
- ICC® 700-2008 NATIONAL GREEN BUILDING STANDARD™ -
  FOR RESIDENTIAL OCCUPANCIES *(by reference)*

THE AMERICAN INSTITUTE OF ARCHITECTS

INTERNATIONAL GREEN CONSTRUCTION CODE® (IGCC®)

SYNOPSIS

(Based on Public Version 1.0 of the IGCC)

OVERVIEW/BACKGROUND

The International Green Construction Code (IGCC) provides a comprehensive set of requirements intended to reduce the negative impact of buildings on the natural environment. It is a document which can be readily used by manufacturers, design professionals and contractors; but what sets it apart in the world of green building is that it was created with the intent to be administered by code officials and adopted by governmental units at any level as a tool to drive green building beyond the market segment that has been transformed by *voluntary* rating systems. It has been developed by the International Code Council (ICC) in association with cooperating sponsors ASTM International (ASTM) and the American Institute of Architects (AIA). Other organizations indicating their support include the U.S. Green Building Council (USGBC), producers of the LEED green building rating systems, and The Green Building Initiative (The GBI), producers of the Green Globes green building rating system.

The IGCC was developed with the intent to be consistent and coordinated with the ICC family of Codes & Standards: the I-Codes. It is applicable to the construction of high performance commercial buildings, structures, and systems, including existing buildings subject to alterations and additions, utilizing both traditional and innovative construction practices. Residential occupancies are covered by reference to the ICC 700 National Green Building Standard (NGBS). High-rise residential buildings, however, may conform to either the IGCC or ICC 700. The IGCC also allows jurisdictions to choose ANSI/ASHRAE/USGBC IES Standard 189.1 as jurisdictional compliance option . ASHRAE Standard 189.1, Standard for High-Performance Green Buildings Except Low-Rise Residential Buildings, is an American National Standards Institute (ANSI) standard developed by the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) in association with the Illuminating Engineering Society (IES) and the U.S. Green Building Council (USGBC).

Because it was written in *mandatory* language, the IGCC is poised to produce environmental benefits on a massive scale: a scale 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 is not a rating system; however, it incorporates an innovative new concept, that of *project electives*, which is designed to encourage and drive the construction of buildings which exceed the already stringent minimum requirements of the code, much like rating systems do. In addition, it contains other innovative features which allow jurisdictions to customize and tailor the code to address environmental concerns of a local nature and to respond to environmentally related political agendas.

Often, even at their higher performance thresholds, most green and sustainable building rating systems offer many choices to the owner and designer, but do not *require* increased performance in those specific areas which the jurisdiction may feel are critical. The IGCC, however, provides 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. Rather than 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, as is typical of most green building rating systems, the IGCC takes the opposite approach: the IGCC is composed primarily of mandatory requirements, a number of which the jurisdiction selects for local enforcement, including specific requirements in each environmental category, and a relatively small number of owner/designer choices. The IGCC regulates owner/designer choices as *project electives*. A minimum number of *project electives*, as determined by the jurisdiction for all projects, 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 jurisdictions 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 IGCC:

- Is applicable to new construction, as well as alterations and additions to existing buildings
- 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
- *S*ets stringent minimum mandatory requirements and performance thresholds in many specific areas, some of which are determined by the jurisdiction
- Is intended to be useable by manufacturers, design professionals and contractors
- Is intended to be adopted by governmental units and administered by building departments
- Is applicable to all commercial occupancies
- 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:
    - Encourage practices which are difficult to mandate; and
    - Encourage higher performance buildings (buildings with lower environmental impact which exceed the minimum requirements of the IGCC)
- Is *not* a rating system and is *not* intended to provide a single metric indicative of overall building performance
- In a single code or volume, is applicable to new construction, existing construction, building shells, multiple occupancy classifications, building shells and community development, etc.

CONTEXT

The IGCC is founded on principles consistent with other codes produced by ICC (I-Codes): to adequately protect public health, safety and welfare; to provide requirements that do not unnecessarily increase construction costs; and to provide requirements that do not restrict the use of new materials, products or methods of construction and do not give preferential treatment to particular types or classes of materials, products or methods of construction, except where environmental impact or sustainability considerations require so.

The IGCC is an overlay code which relies on the foundation provided by other International Codes to provide communities with buildings that are safe and sustainable. Rather than the past approach of creating buildings which are capable of resisting environmental forces, consideration is given to the impacts on the natural environment from forces imposed by the built environment. The IGCC, much like the International Energy Conservation Code (IECC), is a code which regulates buildings primarily from a public welfare perspective. The IGCC is uniquely formatted not only to require the implementation of environmentally related best practices, but to encourage practices which are difficult to mandate, as well as to offer customization to jurisdictions, all in the name of reducing the negative impact of the built environment on the natural environment.

The benefits of the IGCC are not only environmental. Because the IGCC approaches conservation from many perspectives, and conservation inherently means *less* materials, water and energy, etc.., in most scenarios, over the useful life of buildings and structures which conform to the IGCC, owners are likely to realize cost savings. There will also be less strain placed on infrastructure (such as roadways, public sewer and water, electric and gas utilities, etc.) and, therefore, jurisdictions and public service companies will benefit financially, which means additional savings are likely to be passed on to consumers. In certain cases, even higher initial costs will be more than offset: where projects are financed, reduced monthly utility charges may more than offset the increased monthly finance charges attributed to green and sustainable practices.

IGCC DEVELOPMENT AND AVAILABILITY

Subsequent development of the IGCC is tentatively scheduled as follows:

- Public Version 1.0 of the IGCC posted for public comment between March 15 and May 14, 2010. IGCC public comments will be posted July 2, 2010.
- Public hearings to review the public comments will be conducted between August 14 and 22, 2010. Public Version 1.0 will then be updated to the Public Version 2.0 based on approved comments.
- Public Version 2.0 will be posted for code change submittals November 2, 2010, with comments due by January 3, 2011.
- An IGCC Code Development Hearing will be held May 16 through 22 in Dallas, Texas.
- The Final Action Hearing will be held November 3 through 6 in Phoenix, Arizona, in conjunction with the 2011 ICC Annual Conference. The Final Action Hearing vote is restricted to ICC governmental members as they will be charged with enforcing the code.

- The 2012 Edition of the IGCC will be available in early 2012.

This process is the same as used to track the development of other I-Codes. Once a final code is created, it will be updated every three years along with the other I-Codes, through ICC's Code Development Process.

IGCC FORMAT/CONTENT

Building codes and standards are often thought of as establishing minimum requirements for construction practice. In reality, however, they are more accurately characterized as providing thresholds and limitations which are designed to trigger various requirements. The IGCC uses a new twist on that concept, utilizing *project electives*, to achieve the intent of various provisions while preserving flexibility and choice. Without flexibility and choice, mandatory enforcement of some of the code's provisions would become unreasonable or infeasible, effectively diminishing the applicability of the code, as well as its potential adoption, use and enforcement. For example, given current technologies, *mandating* that all buildings be *net-zero energy* designs (designed and constructed so that they generate all of the energy they use on-site by renewable means) might be quite onerous in many scenarios. However, *encouraging* the *voluntary* implementation of practices which move toward *net-aero energy* buildings is a reasonable approach, and is the one incorporated in the IGCC. The IGCC uses the concept of *project electives* to encourage the consideration and implementation of various environmentally effective practices which may not be suitable for every building and, therefore, may not be suitable as strictly mandatory requirements. The IGCC does not require that all *project electives* be complied with, it requires that a minimum number of *project electives* be complied with on each project, and allows the owner or design professional to select which ones are to be implemented on each project. *Project electives* enable the IGCC to drive the construction of buildings which may far exceed its minimum requirements. Such buildings will come much closer to fulfilling the ideal goals of sustainability. The IGCC uses the concept of *Total Annual Net Energy Use (TANEU),* in combination with *project electives*, to encourage the construction of *net-zero energy* buildings. (See the Chapter 6 overview for more on *TANEU.)*

The IGCC contains:

- Requirements which are chosen by the jurisdiction and become applicable to all buildings constructed in the jurisdiction (Chapter 3 - Table 302.1)
- Project specific electives (*project electives*) which are chosen by the owner/designer (Chapter 3 - Table 303.1)
- Many other unique and powerful tools in Chapter 3 which sets the roadmap for the entire code
- Requirements for Existing Buildings (Chapter 10)
- Chapters which address the fundamental aspects of green and sustainable building, including:
    - Site development and land use(Chapter 4)
    - Material resource conservation and efficiency (Chapter 5)
    - Energy conservation, efficiency and earth atmospheric quality (Chapter 6)

- Water resource conservation and efficiency (Chapter 7)
- Indoor environmental quality (Chapter 8)
- Building operation, maintenance and owner education (Chapter 9)

IGCC CHAPTER 1 OVERVIEW: ADMINISTRATION

Section 101.2 - Scope:

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

- Design and construction
- Additions , alterations and demolition
- Change of use or occupancy
- Equipment
- Location
- Maintenance

The IGCC is applicable to all occupancies, with the following twist for residential occupancies:

- Group R (Residential) occupancies, including the residential portions of mixed occupancies, must comply with ICC 700 at the performance level chosen by the jurisdiction, except that high rise residential buildings are permitted to comply with the ICC 700 or the IGCC. (See additional details in the discussion of Section 102.4.12 later in this document.)

The IGCC is *not* applicable to equipment or systems used primarily for industrial or manufacturing processes, except as provided (some energy provisions address limited aspects of process energy).

Section 101.3 – Intent:

- To safeguard the environment, public health, safety and general welfare through the establishment of requirements related to sustainability
- To reduce the negative potential impacts and increase the positive potential impacts of the built environment on the natural environment and building occupants, by means of minimum requirements related to:
    - Conservation of natural resources, materials and energy;
    - The employment of renewable energy technologies;
    - Improved indoor environmental quality;
    - Improved air quality; and
    - Building operations, building maintenance and owner responsibility".

Section 102.1 – General:

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* and the *International Fire Code*.

Section 102.4 - Referenced codes and standards

The codes and standards referenced in Section 102.4 and elsewhere in the code are considered as part of the requirements of the code to the extent prescribed in each reference. The following codes and standards are referenced in Sections 102.4.1 through 102.4.12:

- International Building Code
- International Fuel Gas Code
- International Mechanical Code
- International Plumbing Code
- International Property Maintenance Code
- International Fire Code
- International Energy Conservation Code
- International Wildland-Urban Interface Code
- International Code Council Performance Code
- International Existing Buildings Code
- International Zoning Code
- ICC 700 National Green Building Standard

Numerous standards are referenced throughout the code and a comprehensive list is contained in Chapter 12. The following is a small sampling of the ASTM standards referenced in the IGCC, for which the code will reference the latest available versions:

- *D3960 - Standard Practice of Determining Volatile Organic Compound (VOC) Content of Paints & Related Coatings*
- *D5093 - Standard Test Method for Field Measurement of Infiltration Rate Using Double-Ring Infiltrometer With Sealed-Inner Ring*
- *E1903 - Standard Guide for Environmental Site Assessments: Phase II Environmental Site Assessment Process*
- *E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal And Low-Sloped Opaque Surfaces*
- *E2397 - Standard Practice for Determination of Dead Loads and Live Loads associated with Green Roof Systems*

Section 102.4.12 - Residential occupancies:

The provisions of ICC 700 are incorporated by reference and are applicable to residential occupancies, including the residential portions of mixed occupancies, except that high rise buildings are permitted to comply with the provisions of the IGCC.

Residential occupancies regulated by ICC 700 must achieve the minimum environmental performance level identified by the jurisdiction in Table 302.1 of the IGCC.

When using ICC 700, the IGCC requires that baseline minimum performance exceed the 2006 IECC by 30 percent and that a minimum of two practices from ICC 700 Section 704 be implemented. The jurisdiction may indicate increased minimum performance requirements in ICC 700 Table 303.

IGCC CHAPTER 2 OVERVIEW: DEFINITIONS

Although the IGCC shares some definitions which are common to other International codes, most are unique to the IGCC. The following is a small sampling of those definitions:

BIO-BASED MATERIAL. A commercial or industrial material or product, other than food or feed, which is composed of, or derived from, in whole or in significant part, biological products or renewable domestic agricultural materials (including plant, animal, and marine materials) or forestry materials.

COMMISSIONING. A process that verifies and documents that the selected *building* and site systems have been designed, installed, and function according to the owner's project requirements and *construction documents*, and to minimum code requirements.

CONSERVATION AREA. Land designated by the jurisdiction, as a result of a community planning process, as appropriate for conservation from development due to the land possessing natural values important to the community including, but not limited to wildlife habitat, forest or other significant vegetation, steep slopes, ground water recharge area, riparian corridor or wetland.

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.

DEMAND RESPONSE, AUTOMATED (AUTO-DR). Fully Automated Demand Response initiated by a signal from a utility or other appropriate entity, providing fully-automated connectivity to customer energy end-use control strategies.

LIFE CYCLE ASSESSMENT (LCA). A technique to evaluate the relevant energy and material consumed and environmental emissions associated with the entire life of a *building*, product, process, activity or service.

LOW EMISSION, HYBRID AND ELECTRIC VEHICLE. Vehicles that achieve ratings of EPA Tier 2, California LEV-II, or a minimum of EPA LEV standards, whether by means of hybrid, alternative fuel, or electric power.

MUNICIPAL RECLAIMED WATER. Wastewater that has been reclaimed, recycled, reused or treated by a municipality for specific non-potable uses.

POST-CONSUMER RECYCLED CONTENT. Proportion of recycled material in a product generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product that can no longer be used for its intended purpose. This includes returns of material from the distribution chain.

PRE-CONSUMER (POST-INDUSTRIAL) RECYCLED CONTENT. Proportion of recycled material in a product diverted from the waste stream during the manufacturing process. Pre-consumer recycled content does not include reutilization of material such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

PROJECT ELECTIVE. Provisions contained in Sections 407, 507, 613, 710, 809 and 905 for which compliance is not mandatory unless selected under Section 303.1 for a specific *building* design. The minimum aggregate total number of compliance electives which must be selected and complied with is indicated in Table 302.1.

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 6-2.

VOLATILE ORGANIC COMPOUND (VOC). A chemical compound based on carbon chains or rings with vapor pressures greater than 0.1 millimeters of mercury at room temperature which typically contains hydrogen and sometimes contains oxygen, nitrogen and other elements.

IGCC CHAPTER 3 OVERVIEW: JURISDICTIONAL REQUIREMENTS AND PROJECT ELECTIVES

Chapter 3 is formatted to:

- Facilitate the customization of the code to address local agendas;,
- Encourage construction which exceeds the minimum requirements of the code and
- Encourage the implementation of best practices which are difficult, if not impossible, to mandate.

Table 302.1, which addresses *requirements determined by the jurisdiction*, and Table 303.1, which introduces the concept of *project electives*, are contained in Chapter 3 and are fundamental to the understanding and use of the IGCC.

- The *jurisdiction*, upon its adoption of the IGCC, fills in the information required in Table 302.1, *Requirements Determined by the Jurisdiction*.
    - The jurisdiction identifies whether specific provisions are to be enforced in the jurisdiction in Table 302.1
    - These requirements are then applicable to all buildings constructed in the jurisdiction.
    - For some provisions, the jurisdiction must indicate the level of compliance required.
- The *owner or design professional* selects *project electives* and from Table 303.1, the *Project Electives Checklist*.
    - *Project electives* selected and indicated in the Project Electives Checklist are applicable to a specific project.
    - Different combinations of *project electives* can be selected for each project
    - The minimum number of project electives required to be implemented is the same for all projects in the jurisdiction, and that number is determined by *the jurisdiction* in Table 302.1.

Other than the *requirements determined by the jurisdiction* and *project electives*, which represent a relatively small portion of the codes requirements, all provisions of the IGCC are mandatory as applicable, just as is the case with all other I-Codes.

Table 302.1 –REQUIREMENTS DETERMINED BY THE JURISDICTION:

By means of Table 302.1, the IGCC facilitates customization of the code by jurisdictions such that their specific geographical and political priorities related to sustainability may be addressed, including, but not limited to, the potential to address:

- Urban sprawl,
- Heat island effects,
- Stormwater runoff and landscape irrigation, and
- Water and energy efficiency minimum thresholds.

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, whether enhanced energy performance or reduced plumbing fixture reduced flow rates will be required for compliance with the code, and to determine what minimum level of environmental performance will be required for residential buildings regulated by the ICC 700 National Green Building Standard (as referenced in Section 102.4.12).

Table 302.1 also requires that the local jurisdiction indicate a value between 0 and 14 as the minimum number of *project electives* which must satisfied in order to comply with this code. *Project electives* are the vehicles by which the IGCC encourages the consideration and implementation of environmentally beneficial practices which may not be appropriate as strict mandatory requirements in some scenarios. They are also used to encourage construction and performance which exceeds the minimum requirements of the code. However, if the jurisdiction is only interested in minimum performance thresholds, as used in other codes, they can "opt out" of the enforcement of project electives by indicating "0" in Table 302.1 as the minimum number of project electives that must be complied with.

TABLE 302.1
REQUIREMENTS DETERMINED BY THE JURISDICTION

Section	Section Title or Description and Directives	Jurisdictional Requirements	
CH 1. ADMINISTRATION			
102.4.12 302.1 (1)	ICC 700 Environmental Performance Level - Select one box.	☐ Bronze ☐ Silver ☐ Gold ☐ Emerald	
CH 3. JURISDICTIONAL REQUIREMENTS AND PROJECT ELECTIVES			
302.1 (2)	Optional compliance path – ASHRAE 189.1	☐ Yes	☐ No
302.1 (3)	Project Electives – The *jurisdiction* shall indicate a number between 0 and 14 to establish the minimum total number of *project electives* that must be satisfied.	_____	
CH 4. SITE DEVELOPMENT AND LAND USE			
402.2.1.2	Floodplain preservation	☐ Yes	☐ No
402.2.3	Conservation area	☐ Yes	☐ No
402.2.5	Agricultural land	☐ Yes	☐ No
402.2.6	Greenfields	☐ Yes	☐ No
403.4.1	High occupancy vehicle parking	☐ Yes	☐ No
403.4.2	Low emission, hybrid and electric vehicle parking	☐ Yes	☐ No
405.1	Light pollution control	☐ Yes	☐ No
CH 5. MATERIAL RESOURCE CONSERVATION AND EFFICIENCY			
502.1	Enhanced construction material and waste management	☐ Yes	☐ No
502.1	Minimum percentage of waste material diverted from landfills - Select a percentage only where “Yes” is selected in the previous row.	☐ 50% ☐ 65%	
CH 6. ENERGY CONSERVATION AND EARTH ATMOSPHERIC QUALITY			
602.1, 602.3, 602.3.2, 302.1.1	Enhanced energy performance - for buildings pursuing performance based compliance and buildings greater than 25,000 square feet in *total building floor area*	☐ Yes	☐ No
Table 602.1, 302.1, 302.1.1	*TANEU* of Jurisdictional Choice - Where “Yes” is selected in the previous row, the *jurisdiction* shall indicate a *TANEU* of 63 or less in Table 602.1 for each occupancy for which it intends to require enhanced energy performance.	See Table 602.1 and Section 302.1	

Section	Section Title or Description and Directives	Jurisdictional Requirements	
602.3.2.4	Reduced CO2e emissions calculations and reporting	☐ Yes	☐ No
613.2	Post C. of O. *TANEU*, energy demand, and *CO2e* emissions reporting	☐ Yes	☐ No
CH 7. WATER RESOURCE CONSERVATION AND EFFICIENCY			
702.1.2	Enhanced plumbing fixture and fitting flow rates	☐ Yes	☐ No
702.1.2	Enhanced plumbing fixture and fitting flow rate tier – Select a tier only where "Yes" is selected in the previous row.	☐ Tier 1 ☐ Tier 2	
702.7	Municipal reclaimed water.	☐ Yes	☐ No
CH 9. COMMISSIONING, OPERATION AND MAINTENANCE			
904.1.1.1	Periodic reporting	☐ Yes	☐ No
CH 10. EXISTING BUILDINGS			
1007.2	Demolition	☐ Yes	☐ No
1007.3	Sale of existing buildings and tenant spaces	☐ Yes	☐ No
1007.4	Evaluation of existing buildings	☐ Yes	☐ No
APPENDICES			
Appendix B	*Greenhouse gas* reduction in existing buildings	☐ Yes	☐ No
B103.1	Compliance level – The *jurisdiction* to select phases only where "Yes" is selected in the previous row.	☐ Phase 1 ☐ Phase 2 ☐ Phase 3 ☐ Phase 4	
B103.2	Where "Phase 1" is selected under Section B103.1 – *jurisdiction* to indicate the number of months to be used in association with Section B103.2.	_____ months	
B103.3	Where "Phase 2" is selected under Section B103.1 – *jurisdiction* to indicate the number of years and the percentage to be used in association with Section B103.3.	_____ years _____ %	
B103.4	Where "Phase 3" is selected under Section B103.1 – *jurisdiction* to indicate the number of years to be used in association with Section B103.4.	_____ years	
B103.5	Where " Phase 4" is selected above – *jurisdiction* to indicate the number of years and the percentage to be used in association with Section B103.5.	_____ years _____ %	
Appendix C	Sustainability measures	☐ Yes	☐ No
Appendix D	Enforcement procedures	☐ Yes	☐ No

ANSI/ASHRAE/USGBC/IES Standard 189.1 – Standard for High-Performance, Green Buildings Except Low-Rise Residential Buildings.

Of particular significance in Section 302.1 and Table 302.1 is the option which allows the jurisdiction to select ASHRAE Standard 189.1 as an alternate compliance path (see the row which references Section 302.1 at the left). 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).

Point of Entry and the Private Sector

Even where a jurisdiction selects "No" for each of the boxes in Table 302.1, does not select any of the enhanced performance options, and selects "0" as the number of project electives which must be complied with (meaning none of the project electives must be complied with), because the IGCC is intended to be adopted on a mandatory basis, it still has the potential to achieve significant results. Thus, where the jurisdiction does not feel they have the background or expertise to make all of the choices required by Table 302.1, they can take comfort in the fact that, even in is base minimum form, the IGCC will yield significant environmental benefits. Jurisdictions need no longer fear that mandatory green building requirements may be too restrictive for the private sector. They no longer need to limit the application of green and sustainable requirements to government buildings. The IGCC is not an elitist code intended only for large or high budget projects. It is intended for all projects and budgets. And in future years, as the jurisdiction, as well as the private sector, gain familiarity with it's application, the jurisdiction has the ability to ramp up the enhanced performance requirements at whatever level and pace they feel is appropriate. It is the mandatory application of the IGCC to the private sector which has the most potential to reduce the environmental impact of the built environment on the natural environment. The IGCC is a green code to begin with, and to grow with.

Table 303.1 – PROJECT ELECTIVES CHECKLIST:

Although the section numbers listed in Table 302.1 become mandatory for all buildings in the jurisdiction only where the jurisdiction indicates so in Table 302.1, the *project electives* listed in Table 303.1, the Project Electives Checklist, are a different animal. They become mandatory only when they are selected or chosen by the owner or registered design professional to be applicable to a specific project, as indicated in the *Project Elective Checklist*.

The primary functions of the *Project Elective Checklist* are to:

- Give guidance to owners and design professionals as to what *project electives* are available to choose from,
- Inform the code official as to which *project electives* have been selected or chosen by the design professional and must, therefore, then be complied with and enforced as if they were mandatory requirements, and
- Encourage environmental performance which exceeds the minimum requirements of this code, including performance beyond the minimum levels determined by the jurisdiction in Table 302.1.

Provisions of the IGCC have typically been designated as *project electives* where mandatory compliance with that provision was determined to be unduly restrictive in certain cases, but where that provision was, nonetheless, important to encourage from an environmental perspective. For example, it would be unreasonable to mandate that all buildings be constructed on a brownfield site, as that would preclude the construction of buildings on all sites that were not brownfields. However, it is quite reasonable to encourage the practice. Therefore, Section 407.2.4, which regulates brownfield sites, is designated as a *project elective*.

Buildings with higher energy performance (lower TANEUs) or lower plumbing fixture flow rates (higher tiers) than required by the jurisdiction in Table 302.1, or buildings that incorporate best practices which are encouraged, but not required, by the IGCC, are also listed as *project electives* in Table 303.1. By this means *project electives* encourage the construction of higher performance buildings than would be produced by conformance with basic code minimum requirements, much like rating systems do.

Where a specific building project does not trigger the application of a particular mandatory provision, or where the jurisdiction has not selected a provision in Table 302.1 for enforcement in their jurisdiction, related *project electives* have been created to encourage, but not require, the implementation of the practice in those scenarios. For example, since Section 403.4.1, high occupancy vehicle parking, is only mandatory for buildings with an area which is *greater* than 10,000 square feet, a related *project elective*, Section 407.3.3, is written in an inverse manner: it *encourages* the application of the

provision to smaller structures by allowing, *but not requiring*, the design professional in responsible charge to select the provision as a *project elective* for buildings with an area of *less* than 10,000 square feet.

Provisions which are designated as *project electives* have been grouped in dedicated sections at the end of Chapters 4 through 9 so that they may be readily identified, and the Project Elective Checklist contained in Table 303.1 ties all *project elective* strategies from all chapters together in one location.

TABLE 303.1
PROJECT ELECTIVES CHECKLIST

Section	Description	Check the corresponding box to indicate each *project elective* selected.
CH 3. JURISDICTIONAL REQUIREMENTS AND PROJECT ELECTIVES		
304.1	Whole Building Life Cycle Assessment	☐
CH 4. SITE DEVELOPMENT AND LAND USE		
407.2.1	Flood hazard avoidance	☐
407.2.2	Agricultural land	☐
407.2.3	Infill site	☐
407.2.4	Brownfield site	☐
407.2.5	Greenfield development	☐
407.2.6	Greenfield proximity to development	☐
407.2.7	Greenfield proximity to diverse uses	☐
407.3.1	Changing and shower facilities	☐
407.3.2	Long term bicycle parking and storage	☐
407.3.3	Preferred parking	☐
407.4.1	Site hardscape 1	☐
407.4.2	Site hardscape 2	☐
407.4.3	Site hardscape 3	☐
407.4.4	Roof covering	☐
407.5	Light pollution	☐
CH 5. MATERIAL RESOURCE CONSERVATION AND EFFICIENCY		
507.2	Waste management (502.1 + 20%)	☐
507.3(1)	Reused, recycled content, recyclable, bio-based and indigenous materials (50%)	☐
507.3(2)	Reused, recycled content, recyclable, bio-based and indigenous materials (80%)	☐ (2 Electives)
507.4(1)	Multi-story building – footprint reduced by at least 45%	☐
507.4(2)	Multi-story buildings – footprint reduced by at least 70%	☐ (2 Electives)
507.5	Reduced building volume	☐
507.6.1	Service life – 100 year design service life category	☐
507.6.1	Service life – 200 year design service life category	☐ (2 Electives)
507.6.2	Interior adaptability	☐
507.7	Moisture control	☐

CH 6. ENERGY CONSERVATION, EFFICIENCY AND EARTH ATMOSPHERIC QUALITY		
613.3.1	Project *TANEU* is at least 7 points lower than required by Table 302.1.	☐
613.3.2	Project *TANEU* is at least 14 points lower than required by Table 302.1	☐ (2 Electives)
613.3.3	Project *TANEU* is at least 21 points lower than required by Table 302.1	☐ (3 Electives)
613.3.4	Project *TANEU* is at least 28 points lower than required by Table 302.1	☐ (4 Electives)
613.3.5	Project *TANEU* is at least 35 points lower than required by Table 302.1	☐ (5 Electives)
613.3.6	Project *TANEU* is at least 42 points lower than required by Table 302.1	☐ (6 Electives)
613.3.7	Project *TANEU* is at least 49 points lower than required by Table 302.1	☐ (7 Electives)
613.3.8	Project *TANEU* is at least 56 points lower than required by Table 302.1	☐ (8 Electives)
613.3.9	Project *TANEU* is at least 63 points lower than required by Table 302.1	☐ (9 Electives)
613.3.10	Project *TANEU* is at least 70 points lower than required by Table 302.1	☐ (10 Electives)
613.4	Building thermal envelope systems	☐
613.5	Mechanical systems	☐
613.6	Passive design	☐
CH 7. WATER RESOURCE CONSERVATION AND EFFICIENCY		
710.2.1	Fixture flow rates are one tier above that required by Table 302.1	☐
710.2.1	Fixture flow rates are two tiers above that required by Table 302.1.	☐ (2 Electives)
710.3	On-site wastewater treatment	☐
710.4	Non-potable outdoor water supply	☐
710.5	Non-potable water for plumbing fixture flushing	☐
710.6	Automatic fire sprinkler system	☐
710.7	Non-potable water supply to fire pumps	☐
710.8	Non-potable water for industrial process makeup water	☐
710.9	Efficient hot water distribution system	☐
710.10	Non-potable water for cooling tower makeup water	☐
710.11	Graywater collection	☐
CH 8 INDOOR ENVIRONMENTAL QUALITY AND COMFORT		
809.2.1	VOC emissions - flooring	☐
809.2.2	VOC emissions – ceiling systems	
809.2.3	VOC emissions- wall systems	☐
809.2.4	Total VOC limit	☐
809.3	Views to building exterior	☐

Section 304: Whole Building Life Cycle Assessment

Section 304.1 is a *project elective* which encourages, but does not require, whole building life cycle assessment. There was much in depth discussion of life cycle assessment by the Sustainable Building Technology Committee (SBTC - the committee responsible for drafting the IGCC). In the end, the committee decided that, because life cycle assessment is an extremely complex issue with roots in scientific and technical issues which we are only beginning to explore, it was not ready for inclusion as a mandatory provision in the IGCC at this time. Nonetheless, the committee also felt that there was great potential for life cycle assessment in the future and, therefore, decided to encourage its development by including a whole building life cycle assessment *project elective* in the code. To further incentivize whole building life cycle assessment, when Section 304.1 is satisfied, compliance with the material selection provisions of Section 503 is no longer required.

IGCC CHAPTER 4 OVERVIEW: SITE DEVELOPMENT AND LAND USE

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

Section 402 contains provisions designed to limit the impact of construction on site natural resources.

- Limits construction in flood hazard areas. (Section 402.2.1.1)
- Prohibits construction in floodplains where indicated by the jurisdiction in Table 302.1. (Section 402.2.1.2)
- Prohibits building within 50 feet of bodies of water and wetlands, with exceptions. (Section 402.2.2)
- Prohibits construction within 50 feet of community designated "conservation areas" where indicated by the jurisdiction in Table 302.1. (Section 402.2.3)
- Prohibits construction on park land and agricultural land, with exceptions. (Section 402.2.4 and 402.2.5)
- Restricts construction on park land, agricultural land and greenfield sites where indicated by the jurisdiction in Table 302.1, with exceptions. (Sections 402.2.5 and 402.2.6)
- Requires an inventory of site natural resources. (Section 402.3.1)
- Contains requirements for stormwater management systems. (Section 403.3.2)
- Limits potable water use for landscape irrigation systems. (Section 402.3.3)
- Requires that municipally reclaimed water or collected rainwater be used for outdoor fountains and water features. (Section 402.3.4)
- Requires management of vegetation and soils and erosion control during construction. (Section 402.3.5)
- Requires that at least 75 percent of land-clearing debris and excavated soils be recycled or salvaged. (Section 402.3.6)

SECTION 403: TRANSPORTATION IMPACT

- Requires walkways and bicycle paths where vehicular access roads are constructed on a building site. (Section 403.1)
- Requires changing and shower facilities for buildings over 10,000 square feet in area where the building is also required to be provided with long term bicycle parking and storage, with exceptions. (Sections 403.2)
- Requires short term bicycle parking and long term bicycle parking and storage based on the use and occupancy of the building. (Section 403.3)
- Where indicated by the jurisdiction in Table 302.1, and where buildings have an aggregate area of over 10,000 square feet and an occupant load greater than 100, requires parking in preferred locations be provided for high occupancy, low emission, hybrid and electric vehicles. (Section 403.4)

SECTION 404: HEAT ISLAND MITIGATION

- Projects located in Climate Zones 1 through 6 must implement heat island mitigation practices for at least 50 percent of site hardscape. (Section 404.2)

- Projects located in Climate Zones 1 through 3 must implement heat island mitigation practices for at least 75 percent of roof surfaces.

SECTION 405: SITE LIGHTING

- Site light pollution control requirements must be implemented where indicated by the jurisdiction in Table 302.1, with exceptions.

SECTION 406: DETAILED SITE DEVELOPMENT REQUIREMENTS

Section 406 provides detailed requirements for practices which are triggered by other sections in this chapter. Detailed requirements are provided for:

- Subsurface graywater irrigation systems (Section 406.2),

- Vegetation and soil protection (Section 406.3),

- Soil use and restoration (Section 406.4),

- Landscape, soil and water quality protection (Section 406.5) and

- Vegetative roofs (Section 406.6).

SECTION 407: PROJECT ELECTIVES

See the portion of Table 303.1 under Chapter 4 for *project electives* related to site development and land use.

IGCC CHAPTER 5 OVERVIEW: MATERIAL RESOURCE CONSERVATION AND EFFICIENCY

Chapter 5 contains provisions which require and encourage building material conservation, resource efficiency and environmental performance.

SECTION 502: MATERIAL AND WASTE MANAGEMENT

- Requires that at least 35 percent of construction phase waste materials be diverted from landfills, and allows the jurisdiction to increase the materials required to be diverted to 50 percent or 65 percent in Table 302.1. (Section 502.1)

- Requires that areas be provided in buildings for the storage of recyclable post construction phase waste materials. (Section 502.2)

- Requires space be provided in buildings for the storage of discarded lamps, batteries, electronics and other items that require special disposal practices in the jurisdiction.

SECTION 503: MATERIAL SELECTION

- Where whole building *life cycle assessment* is provided in accordance with Section 304.1, compliance with Section 503 is not required. (Section 503.1)
- At least 55 percent of the total materials in each building project must be any combination of the following (Section 503.2):
    - 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).
- At least 75 percent of the total materials in each project must comply with requirements for the following items, for the country in which the project is located, or for the country in which the materials or products are harvested, extracted, processed and manufactured, whichever are more restrictive. For projects in the U.S., it is assumed that all materials or products harvested, extracted, process and manufactured in the U.S. meet these requirements. (Section 503.3)
    - Clean air
    - Clean water
    - Resource conservation
    - Noise control

SECTION 504: LAMPS

Section 504 sets maximum limits on the amount of mercury permitted in lamps, with exceptions.

SECTION 505: SERVICE LIFE

Section 505 requires that a Building Service Life Plan be included in the construction documents for the project and provides detailed requirements for the plan.

SECTION 506: CONSTRUCTION PHASE MATERIAL STORAGE, HANDLING AND MOISTURE CONTROL

Materials stored on site during the construction phase must comply with the manufactures recommendations for storage and handling. Porous and fibrous materials must be protected from moisture damage during the construction phase.

IGCC SECTION 507: PROJECT ELECTIVES

See the portion of Table 303.1 under Chapter 5 for *project electives* related to material resource conservation and efficiency.

IGCC CHAPTER 6 OVEVIEW: ENERGY CONSERVATION, EFFICIENCY AND ATMOSPHERIC QUALITY

Chapter 6 requires that buildings be designed, constructed and commissioned to reduce energy. (Section 601.1)

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 and is used in association with Tables 302.1 and 303.1. Section and Table 302.1 send the jurisdiction to Table 602.1 and instructs 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 which 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. In addition, Section 613.2 allows the jurisdiction to indicate in Table 302.1 whether TANEU, energy demand or *carbon dioxide equivalent* (CO_2e) emissions must be *reported* to the jurisdiction.

Though there are other factors that affect the value of *Total Annual Net Energy Use (TANEU),* it is essentially calculated in accordance with Equation 6-2 as follows:

TANEU = 77 x (PD - RE - WE) / RD (**Equation 6-2**)

Where:

PD = Total annual energy delivered to the *proposed design* and consumed on site, as determined in accordance with Section 603

RE = Total annual energy savings from renewable energy derived on site

RD = Total annual energy used by a *standard reference design*, determined in accordance with Section 603

WE= Total annual energy savings from *waste energy recovery*

PD, RE, RD and WE must be expressed in consistent units of energy in accordance with Section 603.1.1.

Buildings must be designed and constructed to deliver a TANEU which is not greater than 70, the Point of Entry values shown in Table 602.1, or those which the jurisdiction indicates in Table 302.1, whichever is less. Buildings which have a TANEU of 70 are 30 percent more energy efficient than buildings that are constructed in accordance with the *2006 IECC*. To help put TANEU further into perspective, note that buildings constructed in accordance with the minimum requirements of the *2006 IECC* are deemed to have TANEU of 100, and it is assumed that buildings designed in accordance with the 2012 IECC will have a TANEU of 77. (Sections 602.1 and 602.3.2.1)

Table 602.1 Total Annual Net Energy Use by Building Occupancy Type

Building Occupancy Types	**IGCC TANEU Point of Entry** IECC [a]	**TANEU** of Jurisdictional Choice [b]
Assembly: Groups A-1, A-2, A-3, A-4, A-5	70	--
Business: Group B	70	--
Educational: Group E	70	--
Factory and Industrial: Groups F-1, F-2	70	--
High Hazard: Groups H-1, H-2, H-3, H-4, H-5	70	--
Institutional: Groups I-1, I-2, I-3, I-4	70	--
Mercantile: Group M	70	--
Residential: Groups R-1, R-2, {R-3, R-4}	70	--
Storage: Groups S-1, S-2	70	--
Utility and Miscellaneous: Group U	70	--

a. Minimum acceptable performance for all *building* types and sizes.

b. Where the jurisdiction elects to adopt a greater threshold for energy efficiency, a '63' is ten (10) percent better than the IGCC 'Point of Entry'. 'TANEU of Jurisdictional Choice' shall only apply to *buildings* pursuing performance-based compliance in accordance with Section 602.3.2.

The IGCC allows building energy systems to be designed using *prescriptiv*e- 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 Table 302.1. (Tables 302.1 and 602.1 and Sections 302.1.1, 602.3, 602.3.1 and 602.3.2)

In accordance with Section 602.2, all buildings which follow the *prescriptive*- or p*erformance*-based compliance paths must comply with the requirements of the IECC for the following:

- Building envelope air leakage (Section 502.4)
- Mandatory requirements for building mechanical systems (Section 503.2)
- Mandatory requirements for service water heating equipment and piping insulation (Section 504)

In addition to the requirements of the IECC noted above, buildings intended to comply on a *prescriptive* basis must comply with Sections 604 through 612 of the IGCC. Buildings designed in accordance with the IGCC's *prescriptive*-based compliance path are deemed to have a TANEU of 70. (Section 602.3.1)

In addition to the requirements of the IECC noted above, buildings intended to comply on a *performance* basis must determine peak energy demand in accordance with Section 603.1.2 and must comply with Sections 604, 605, 609.6, 610, 611 and 612. *Performance*-based designs must limit peak energy demand to no greater than 90 percent of the peak energy demand for the reference design. (Sections 602.3.2 and 602.3.2.2)

Where the jurisdiction indicates that reduced CO_2e emissions *reporting* is required in Table 302.1, emissions for *performance*-based designs must be determined and reported in accordance with Sections 602.3.2.3, 603.1.3 and 603.1.4. The IGCC's CO_2e

emissions criterion makes use of the U.S. EPA's *eGRID* regional grid loss factors. Emissions reporting is *not* required for *prescriptive*-based designs.

In addition to using the *prescriptive*- or *performance*-based compliance paths, *alterations* to *existing* buildings are permitted to document and verify energy performance using comparisons of actual *pre*- and *post–retrofit* energy use, third-party certification or by other measurement-based means in accordance with Section 602.4 through 602.4.3. Existing buildings, by default, are never required to have a building TANEU of less than 70, even for occupancies for which the jurisdiction has indicated so in Table 602.1. (Exception to Section 602.3 and Sections 602.3, 602.3.1, 602.3.2 and 602.4-602.4.3)

Section 604 requires that all buildings which consume energy, whether designed on a prescriptive- or performance-basis, have capabilities for *energy measuring, monitoring and reporting*, or incorporate features which readily facilitate those capabilities in the future. The intent is to provide building owners and operation and maintenance staff with information which they can use to verify that buildings perform, and continue to perform, properly.

Section 604 also requires:

- Energy distribution design and load type isolation, with exceptions (Section 604.3)
- Energy metering for traditional, renewable and waste energy sources (Section 604.4)
- Energy sub-metering for buildings greater than 25,000 square feet in gross floor area
- Buildings less than 25,000 square feet in gross floor area must provide for future energy sub-metering
- All required meters and sub-meters must be capable of being connected to a data acquisition system
- An energy display must be provided that is capable of showing the current energy demand for the whole building, updated for each fuel type at specified intervals, and the total energy use for the previous 12 months

Section 605 contains requirements for *automated demand response (Auto-DR)* infrastructure. It applies to all buildings that contain HVAC or lighting systems. It requires that *building energy, HVAC and lighting systems and specific building energy-using components* be provided with controls which facilitate a response to changes in energy demand by means of automated preprogrammed strategies. Software clients must be provided with the capability to communicate with a *demand response automation server (DRAS).*

In addition to building energy, HVAC and lighting systems, building component-specific *Auto-DR* strategies are required to be implemented for:

- Ornamental fountain pumps,
- Supermarket refrigerated and freezer display cases,
- Electric vehicle chargers,
- Commercial, manufacturing and industrial process loads,
- Elevator and escalator cycling and
- Irrigation water pumps.

Section 606 provides prescriptive requirements for the design of *building envelope systems*. It applies to the *prescriptive*-based compliance path only. Section 606 includes prescriptive building thermal envelope requirements related to the following:

- Insulation R-values and U-, C- and F-factor alternatives
- Fenestration
- Air barrier leakage, openings, sealing and testing
- Fireplaces
- Vestibules

Section 607 provides prescriptive-based requirements for the design of *building mechanical systems*. Compliance with Section 607 is required for the *prescriptive*-based compliance path only. It includes detailed requirements related to the following:

- HVAC equipment performance
- Ventilation
- Duct and plenum insulation, sealing and testing
- HVAC piping insulation
- Economizers
- Variable air volume (VAV) fan control
- Kitchen exhaust systems
- Laboratory exhaust systems
- Control of HVAC in hotel/motel guest rooms

Section 608 provides prescriptive requirements for the design of *building service water heating systems*. Compliance with Section 608 is required for the *prescriptive*-based compliance path only. It includes detailed requirements related to the following:

- Service water heating equipment performance
- Pools, hot tubs and spas
- Snowmelt systems
- Rough-ins for future solar hot water pre-heat (required)
- Drain water energy recovery
- Service water heating piping insulation
- Circulation hot water systems

Section 609 provides prescriptive-based requirements for the design of *building electrical power and lighting systems*. Section 609 is applicable to all buildings using the *prescriptive*-based compliance path. Buildings using the *performance* based path, however, are required to comply with Section 609.6 only. Section 609 includes detailed requirements for the following:

- Sleeping unit controls
- Interior light reduction controls
- Exterior light reduction controls
- Automatic daylight controls
- Plug load controls
- Fuel gas lighting systems
- Electrical system efficiency
- Exterior lighting
- Verification of lamps and ballast installation

Section 610 contains requirements for the efficiency of *specific appliances and equipment* which are installed in the building or on the building site. It applies to all buildings, whether designed using the *prescriptive*- or *performance*-based compliance path. It includes detailed requirements related to the following:

- Elevators
- Escalators and moving walkways
- Interior light reduction controls
- Commercial food service equipment
- Conveyors
- ENERGY STAR appliances and equipment

Section 611 contains requirements for *building renewable energy systems*. It is applicable to all buildings which consume energy, whether designed using the *prescriptive*-based or the *performance*-based compliance path. It requires that buildings use renewable energy sources to provide at least 2 percent of total calculated annual energy use, with exceptions. The following types of renewable energy systems are specifically addressed:

- Photovoltaic
- Wind
- Solar water heating
- Solar thermal
- Other systems designed in accordance with Section 611

Renewable energy systems must be monitored and metered in accordance with Sections 611.7 and 604.

Section 612 contains requirements for *energy systems commissioning and completion*. It is applicable to all buildings which consume energy, whether designed using the *prescriptive*-based or the *performance*-based compliance path. Section 612 requires the following:

- Mechanical systems commissioning and completion (Section 612.1)
    - Commissioning plan
    - Systems adjusting and balancing
    - Functional performance testing
    - Preliminary commissioning report
    - Completion requirements must be included in the construction documents
- Lighting and electrical systems commissioning and completion (Section 612.2)
    - Lighting pre-construction documentation
    - Verification of installation
    - Commissioning
    - Post-commissioning documentation
    - Post occupancy commissioning
- Building envelope systems commissioning and completion requirements (Section 612.3)
    - Pre-construction documentation, building thermal envelope
    - Verification of installation

Section 613.2 contains *requirements determined by the jurisdiction* and *project electives*. It contains provisions for the reporting of TANEU, energy demand and CO_2e emissions. Reporting is required where the jurisdiction has indicated in Table 302.1 that the codes requirements for reduced TANEU, energy demand or CO_2e emissions will be enforced in the jurisdiction. The remainder of Section 613 contains project electives related to energy conservation, efficiency and atmospheric quality. See the portion of Table 303.1 under Chapter 6 for a list and description of these *project electives*.

IGCC CHAPTER 7 OVEVIEW: 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.

Step 1 of the performance-based method requires that Table 702.1.1(1) be used to provide a rough approximation of daily water use in gallons per day, as calculated based on the occupant load of the building and using fixture flow rates which are identical to those in the IPC. Step 2 then requires a second table, Table 702.1.1(1) be used, with the water use in gallons per day entered from the first table, and that the fitting and fixture flow rates be reduced to provide a 20 percent reduction relative to the total water use in the first table, Table 702.1.1(1).

Section 702.1 requires conformance with both the *prescriptive*- and the *performance-based* methods, with exceptions.

Section 702.1.2 allows the jurisdiction to require additional fitting and fixture flow rate reductions to either 30 percent (Tier 1) or 40 percent (Tier 2), based on the performance based method described above, by indicating so in Table 302.1.

Section 702 also contains specific requirements for:

- Combination tub/shower valves
- Food establishment pre-rinse spray heads
- Drinking fountain controls
- Non-water urinal connections
- Appliances (clothes washers, ice makers, food steamers and dishwashers)
- Municipal-reclaimed water
- Efficient hot water distribution systems
- Makeup water supply
- Water powered pumps
- Food service handwashing faucets
- Dipper Wells
- Automated and self-service vehicle wash facilities
- Spa covers
- Swimming pool covers and splash troughs

Section 703 regulates water in:

- Hydronic closed systems
- Humidification systems
- Condensate coolers (tempering)
- Condensate drains (recovery)
- Heat exchangers
- Humidifier discharge

Section 704 regulates water softeners and reverse osmosis water treatment systems.

Section 705 contains specific requirements for indoor ornamental fountains, water features and water metering.

Section 706 contains signage and water quality requirements for non-potable water systems.

Sections 707, 708 and 709 contain detailed requirements for the construction of:

- Rainwater collection and distribution systems,
- Graywater systems and
- Reclaimed water systems, respectively.

Section 710 contains *project electives* related to water resource conservation and efficiency. See the portion of Table 303.1 under Chapter 7 for *project electives* related to water resource conservation and efficiency.

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.

Section 802, Building Construction Features, Operations and Maintenance Facilitation, contains requirements for the following:

- Air handling system access,
- Durability and cleanability of air handling surfaces,
- Air handling system filters and
- Insulation materials above suspended ceilings and in air plenums.

Section 803, HVAC Systems, contains requirements for:

- Construction phase duct openings, indoor air quality and ductless systems or filters;
- Temperature and humidity (must comply with ASHRAE 55);
- Environmental tobacco smoke control;
- Isolation of pollutant sources in print, copy and janitorial rooms and garages; and
- Ductless system filters.

Section 804 contains indoor air quality and pollutant control requirements for

- Fireplaces and appliances,
- Radon mitigation and
- Building flush out.

Section 805 prevents the use of asbestos in building construction.

Section 806 contains material emissions and pollutant control requirements for:

- Interior pressed wood (formaldehyde emissions limits)
- Adhesives and sealants
- Architectural paints and coatings
- Flooring
- Acoustical ceiling tiles and wall systems
- Insulation

Section 807 regulates the following in buildings and tenant spaces:

- Exterior sound transmission
- Interior sound transmission
- Mechanical and emergency generator equipment and systems sound transmission
- Special inspections for sound transmission

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

Section 809 contains *project electives* related to indoor air quality and environmental comfort. See the portion of Table 303.1 under Chapter 8 for a list these *project electives*.

IGCC CHAPTER 9 OVERVIEW: COMMISSIONING, OPERATION AND MAINTENTANCE

Chapter 9 is intended to facilitate the pre- and post- occupancy commissioning, operation and maintenance of buildings constructed in accordance with the IGCC. (Section 901.1)

Section 902, Approved Agency, and Section 903, Commissioning, are modeled after special inspections criteria in Chapter 17 of the IBC and commissioning criteria found in the IECC, respectively. Table 903.1 includes an extensive list of items for which commissioning is required. The table contains columns which distinguish between pre- and post-occupancy commissioning. IGCC commissioning requirements extend well beyond the energy realm and include, but are not limited to, requirements related to site, materials and water.

Table 903.1, Commissioning Plan, requires commissioning regarding various aspects of the following:

- Site/land use (Chapter 4):
    - Natural resources and baseline conditions of the building site (Section 402.3.1)
    - Landscape irrigation systems (Sections 402.3.1 and 406.5)
    - Topsoil and vegetation protection measures (Section 402.3)
    - Imported soils (Section 402.3.4.1)

- Soil restoration and reuse (Appendix B)
- Soil percolation test (Section 406.3)
- Stormwater management system operation (Section 402.3.2.1)
- Erosion and sediment control (Section 402.3.6)
- Hardscape and shading (Section 404.2)
- Vegetative roofs and terraces (Section 404.3.2)
- Site lighting (Section 405)

- Materials (Chapter 5):
  - Foundation sub-soil drainage system (Section 507.7)
  - Foundation damp-proofing and water-proofing (Section 507.7)
  - Flashing at windows, exterior doors, skylights, walls and drainage systems (Section 507.7)
  - Exterior wall coverings (Section 507.7)
  - Roof coverings (Section 507.7)

- Energy (Chapter 6):
  - Energy consumption, monitoring, targeting and reporting (Sections 604 and 611)
  - HVAC system balancing (Section 611.1.1)
  - Hydronic system balancing (Section 611.1.3)
  - Duct system testing (Section 611.1.3)
  - Mechanical system manuals (Section 611.1.4)
  - Mechanical system commissioning noted on plans, outcomes documented, prepared and available (Sections 611.2, 611.2.1)
  - Functional performance testing of HVAC equipment (Sections 611.2.3.1 and 611.2.3.2)
  - Preliminary commissioning report (Section 611.2.4)
  - Acceptance of HVAC systems and equipment/system verification report (Section 611.2.5)
  - Preparation and distribution of final HVAC completion documentation (Section 611.6)

- Lighting (Chapter 6):
  - Functional testing of lighting auto demand reduction system and plug load controls (Section 604.4 and 608.8.7)
  - Visual inspection of the connection of appliances to switched receptacles (Section 608.8.3)
  - Verification that transformer nameplate efficiency ratings are as specified (Section 608.10

- Verification of lamps and ballast (Section 608.11)
- Calculations revised to represent the building as constructed (Sections 602 and 603)
- Occupant sensor, automatic daylight, time switch, dimming systems and multi-level scene controls (Section 608.12)
- Captive key control devices (Section 608.12)

- Water (Chapter 7):
  - Water quality tests for rainwater and graywater systems (Sections 707.16.1 and 708.13.8)
- Sound transmission (Chapter 8):
  - Mechanical and emergency generator equipment located outside of buildings (807.5.1)
  - HVAC background sound (807.5.2)

Section 904.3 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. Operations and maintenance information related to Chapters 4, 5, 6, 7 and 8 is outlined and required to be included in the documents. In addition, Section 904.4 requires that a building owner education manual be created to inform the building owner and maintenance and operation staff as to the performance goals and reasoning behind the buildings features and systems design. A copy of the building owner education manual must also be in the possession of the owner and an additional copy of it must also remain in the building throughout its life.

Where the jurisdiction indicates so in Table 302.1, a periodic report confirming that the building is maintained and operated at the level of performance required by the approved construction documents is required.

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. The following is a summary of these mandatory requirements:

- Non-functioning thermostats must be repaired or replaced
- Leaking accessible air supply and return ducts must be sealed with *approved* sealants
- Outside air dampers, damper controls and linkages controlled by HVAC units must be in good repair and adjustment

- Hot water and steam leaks, defective steam traps and radiator control, relief, and vent valves are not permitted in any accessible piping
- Leaking accessible chilled water lines and equipment must be repaired or replaced
- The temperature of the supply of hot water for domestic or commercial purposes other than comfort heating must be set and maintained to provide water at no higher than one hundred ten degrees Fahrenheit at point of use (except where water from a water heater must be higher than one hundred ten degrees Fahrenheit for regular use of a dishwasher or for running other justifiable equipment, including instantaneous demand water heaters).
- There must be no leaks in any accessible hot and cold water pipes.
- There must be no leaks in compressed air or pumped water systems.

In addition to the mandatory requirements, the IGCC uses a scenario similar to that used for accessibility in the IBC, requiring that 10 percent of the cost of alterations be allocated toward the preparation of an energy audit report and energy and mechanical system improvements. The energy and mechanical system improvements are selected from the extensive list provided Sections 1003.3.1 through 1003.3.9. Listed mechanical system improvements include the following (compliance is not required for everything listed, but at least 10% of the cost of the alteration must be allocated to any combination of these items):

- The installation of a metering device for at least one system or piece of equipment, as selected from a list of 11 types of equipment and systems
- Heating, ventilation and air conditioning systems and equipment must be in accordance with the following:
    - HVAC time clock and time switch controls required under certain conditions
    - Functional outside air economizers required on cooling systems over certain capacity thresholds
    - HVAC piping and ducts insulated to R-values in accordance with the IGCC
    - Furnace combustion units, boilers and chiller systems cleaned and tuned within one year prior to a change of occupancy
    - Chillers equipped with an outdoor air lockout thermostat and chilled water reset control
    - Phase out plan required for CFC refrigerants
    - Building automation system required under specific conditions
- Water heater and hot water storage tanks insulation upgraded to at least R-6.
- Hot and cold water supply and *distribution pipes* insulated to R-values as specified in the IGCC.
- Water heaters of thirty gallons capacity or greater equipped with a pressure-temperature safety-release valve.
- In Seismic Design Categories D, E and F, water heater and water storage tanks with a tank capacity of thirty gallons or greater strapped or otherwise secured to a wall, floor, ceiling, or other object that itself is adequately secured to a wall, floor, or ceiling.
- Water, gas and overflow pipes connected to water tanks must be secured similarly to above.
- Gas water heaters provided with a flexible gas line entering the appliance.

- Circulating pump systems for hot water supply purposes other than comfort heating under timeclock control.
- Showerhead, toilet, urinal and faucet flow rates in accordance with the IGCC, with consideration given for sanitary drainage requirements.
- Lighting systems and equipment upgraded in accordance with Sections 505.2.2.1 and 505.2.4 of the IECC
- Commercial refrigeration equipment cleaned and tuned for efficiency or equipped with doors, strip curtains or similar devices.
- Motor-driven equipment filters cleaned or replaced and belts and other coupling systems verified to be in good repair
- Swing pools and spas: equipped with covers; recirculation pumps under timeclock control; and heaters cleaned and tuned.
- Unconditioned attics insulated to the minimum R-value required by the IGCC.

Section 1004.1 requires that any change of occupancy, even to a less hazardous occupancy, comply with the mandatory provisions of Sections 1003.2.1, 1003.2.2 and 1003.2.3. Again, these are relatively basic, common sense provisions. Section 1007.3 is a similar requirement, except that it is triggered by the *sale* of existing buildings and tenant spaces, and it is enforceable only where identified by the jurisdiction in Table 302.1.

Section 1007.2 allows jurisdictions to indicate in Table 302 whether at least 50 percent of waste materials resulting from the demolition of existing buildings, or portions of existing buildings, must be diverted from landfills.

Section 1007.4 contains requirements and exceptions which are specifically designed to facilitate the evaluation of existing buildings in accordance with the requirements of the code in a comprehensive manner, similar to that which is applied new buildings, and allows the jurisdiction to certify those buildings. Rather than taking the “if you don’t touch it, you don’t have to fix it” approach alluded to earlier, Section 1007.4 contains unique provisions designed to encourage the owners of existing buildings to bring their buildings into full compliance with the code, demonstrate that compliance, and be recognized and certified for doing so. By indicating their intent to enforce Section 1007.4 in Table 302.1, jurisdictions agree to offer the option to owners of existing buildings to have their building evaluated in accordance with the requirements of the IGCC, just as if it were a new building. By means of this section owners are not forced to have their existing buildings evaluated, they are simply encouraged to voluntarily do so. While it may seem strange that anyone would want to voluntarily subject their existing building to the requirements of a new code, it is beneficial to owners of existing buildings who wish to use their building’s conformance with the green and sustainable requirements of the IGCC as a marketing tool. Wherever the IGCC is adopted, owners of existing buildings will often need to compete in the real estate marketplace against other recently constructed buildings which comply with the code and advertise that fact in their marketing materials.

Section 1002.1 prohibits the construction of additions to buildings which are located in flood hazard areas, except where all habitable space is located at least 1 foot above flood elevation.

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.

IGCC APPENDIX A OVERVIEW: OPTIONAL ORDINANCE

In addition to including key elements of a code adoption ordinance, including the information required for insertion into the code text, this optional ordinance is intended to open a dialogue among stakeholders and to give jurisdictions a place to start a fiscal and evidentiary-based adoption structure. It utilizes performance bonding requirements which are tied to the compliance verification process. The bonding requirement is designed to ensure that the project complies with the IGCC. Bond amounts are set as a percentage of total cost of the building, based on local economic and geo-centric requirements overseen by jurisdictional authorities, and the bond is held by the jurisdiction.

IGCC APPENDIX B OVERVIEW: GREENHOUSE GAS REDUCTIONS IN EXISTING BUILDINGS

Appendix B provides the basis and establishes targets which are intended to enable jurisdictions to reduce greenhouse gas (GHG) emissions in existing buildings. Note that, as is true of all appendices, Appendix B is enforceable only where specifically adopted.

The jurisdiction is directed to select Phase 1, 2, 3 or 4 as the required level of compliance. Where a higher phase is selected, all lower phases are also applicable.

Phase 1 requires that owners of existing buildings and tenant spaces greater than 5,000 square feet develop a greenhouse gas *inventory* to calculate the carbon footprint of the building or tenant space. This must be done within a specific time frame from the date of adoption of Appendix B, as specified by the jurisdiction. The carbon footprint must be calculated using the industry protocols listed, or other protocols approved by the code official.

Phase 2 requires that the owners of existing buildings *develop a plan* to reduce the carbon footprint of their buildings by an amount which the jurisdiction specifies. Note that there is no requirement to implement the plan, the requirement is simply to develop it.

Phase 3 requires that the owners of existing buildings actually implement the plan they developed in phase 2, and that semi-annual reports be filed by the owner to identify progress being made toward fulfillment of the plan.

Phase 4 requires that the owners of existing buildings continue to reduce GHG emissions each by an amount specified by the jurisdiction.

Section B104 lists GHG reduction methods, including energy efficiency measures and the use of renewable energy.

IGCC APPENDIX C OVERVIEW: SUSTAINABILITY MEASURES

Appendix C contains additional sustainability requirements for existing buildings. These requirements address water, energy and material conservation and indoor environmental quality. They are applicable only to non-residential buildings which exceed 5,000 square feet. (Appendices are enforceable only where specifically adopted.)

IGCC APPENDIX D OVERVIEW: ENFORCEMENT PROCEDURES

Appendix D supplements the provisions of Chapter 1. It contains enforcement procedures designed to ensure the continued compliance of *buildings*, structures and *building sites* constructed under the IGCC. It addresses public health, safety and welfare and protection of the environment insofar as they are affected by the continued occupancy and maintenance of *buildings* and *building sites.* Existing *buildings,* structures and *building site* improvements that do not comply with these provisions are required to be altered or repaired to restore compliance with the IGCC. (Appendices are enforceable only where specifically adopted.)