CSI Webinar: Green Construction Codes are Here - Now What?

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Director - The Code Group, Inc. | BURNHAM Nationwide

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Learning Objectives

1. Understand how the Green Codes were developed.
2. Identify the main features of the Green Codes.
3. How Green Codes differ from LEED and from Energy Codes.
4. Where and how Green Codes are currently being enforced.
5. Learn the recommended steps in transitioning to Green Codes.
Introduction

• What is a “Green Building” code?

“Green building (also known as green construction or sustainable building) is the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building’s life-cycle: from site location to design, construction, operation, maintenance, renovation, and deconstruction.

This practice expands and complements the classical building design concerns of economy, utility, durability, and comfort.” [1]


Image Source: http://www.energycodes.gov/training/res_wbt/basics.stm

The Use of Regulatory Codes

• A building code is a collection of laws, regulations, ordinances, and other statutory requirements adopted by a state or local government for the wellbeing, health and safety of building occupants.

The Code of Hammurabi – 18th Century BCE
The Use of Model Building Codes

- A model building code is a 'consensus-developed,' mandatory minimum standard of care for protecting the life-safety, health and welfare of the public in the built environment.

What are Standards?
- Standards are regulatory supplements, often developed by public process. Standards fall into two categories:
  1. Those drafted by government agencies in response to statutes (often starting out as Guidelines) – such as the Americans with Disabilities Act Accessibility Guidelines (ADAAG)
  2. Those drafted by experts in the standards topic, who work for private organizations such as the American Society for Testing and Materials (ASTM) and the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE).
Codes v. Standards

- **Codes** have legal standing and are enforceable by States and Municipalities as law.
- **Standards** have no legal standing unless they have been incorporated into an adopted code (published in full or simply “referenced” as part of the text of the code).
- **Model Codes** are typically revised and republished every three years, while many standards may only be published every five years or more.

Introducing Green Construction Codes

**Voluntary Rating Systems**

- Aspirational, using elective criteria
- Defines achievement through (points-based) ratings
- Third-party or self-certified
- Encourages ‘doing better than minimum’
- Still subject to code review
Voluntary Rating Systems

- Independent of building codes, voluntary rating programs, remain ‘voluntary’ until state or local action mandates otherwise.
- Therefore, it is important not to call codes ‘standards’; not to call standards ‘codes’; or to refer to a voluntary green building rating program either as a ‘standard’ or a ‘code’.

Comparing Rating Systems, Standards and Model Codes
Comparing Codes, Standards, Ratings

Commercial Energy Codes and LEED Energy Requirements

Comparative Analysis Between LEED and Building Codes
The Development of Green Codes

- The current concept of sustainable development can be traced to the energy oil crisis and the environment pollution concern of the 1970s.
- The green building movement in the U.S. developed from the need and desire for more energy efficient and environmentally friendly construction practices.

Energy Standards

- ASHRAE first published Standard 90 in 1975
- Subsequent editions were published in 1980 (as 90A), 1989 and 1999 (as ASHRAE 90.1 Energy Standard for Buildings Except Low Rise Residential Buildings)
Energy Standards

- The 1998 International Energy Conservation Code (IECC) was the successor to the 1995 MEC.
- Starting in 2000, the IECC was placed on a three year code development cycle that is parallel to the other ICC codes.
- The IECC adopted ASHRAE 90.1 as a referenced standard.

The Development of LEED®

- **1993** - The U.S. Green Building Council (USGBC) is founded by as a non-profit trade organization that promotes sustainability in how buildings are designed, built and operated.

- The LEED® Green Building Rating System™
  - began its development in 1994.

- From 1994 to 2006, LEED® grew from one standard for new construction to a comprehensive system of six interrelated standards covering all aspects of the development and construction process.
THE DEVELOPMENT OF GREEN CONSTRUCTION CODES

Current LEED® Certifications

<table>
<thead>
<tr>
<th>BUILDING LIFE CYCLE</th>
<th>DESIGN</th>
<th>CONSTRUCTION</th>
<th>OPERATIONS</th>
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<tbody>
<tr>
<td>HOMES</td>
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<tr>
<td>NEIGHBORHOOD DEVELOPMENT</td>
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<td>COMMERCIAL INTERIORS</td>
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<td>CORE AND SHELL</td>
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<td>NEW CONSTRUCTION &amp; MAJOR RENOVATIONS</td>
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<td>SCHOOLS</td>
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<td>RETAIL</td>
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<td>HEALTHCARE</td>
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<td>EXISTING BUILDINGS</td>
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<tr>
<td>OPERATIONS &amp; MAINTENANCE</td>
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ASHRAE Standard 189

In 2006, ASHRAE proposes to write a Green Building construction standard 189, using the principals set forth in LEED®.

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>1st public review (May-Jul)</td>
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<tr>
<td>2008</td>
<td>2nd public review (Feb)</td>
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<td></td>
<td>Committee reconstituted (Nov)</td>
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<tr>
<td>2009</td>
<td>3rd public review (May-Jun)</td>
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<td></td>
<td>4th public review of ISCs (Sep-Oct)</td>
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<td></td>
<td>Publication approval (Dec)</td>
</tr>
<tr>
<td>2010</td>
<td>Publication (Feb)</td>
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<td></td>
<td>Transition to SSPC</td>
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Residential Green Code

In 2004, the National Association of Home Builders (NAHB) began to independently develop the Model Green Home Building Guidelines, first published in 2005.

In 2006, NAHB notified the American National Standards Institute (ANSI) of their intent to develop a National Green Building Standard and started to work with ICC in 2007.

Residential Green Code

The ICC 700 National Green Building Standard was published in 2009. It defines green building for single and multifamily homes, residential remodeling projects and site development projects and allows the flexibility required for regionally-appropriate best green practices.
New York City Green Codes

75% of NYC’s carbon emissions come from energy used in buildings

Local Law 84/09: Energy and Water Use Benchmarking
Local Law 85/09: NYC Energy Conservation Code
Local Law 87/09: Energy Audits and Retro-Commissioning
Local Law 88/09: Lighting and Electrical Upgrades

The NYC Green Codes Task Force

• Set forth 111 proposals to “green” the NYC Building Code and other regulations related to zoning, health and environmental protection.

  - The proposals were broken down by category, including:
    • Overarching Code Issues;
    • Health & Toxicity;
    • Energy & Carbon Emissions – Fundamentals;
    • Energy & Carbon Emissions – Energy Efficiency;
    • Energy & Carbon Emissions – Operations & Maintenance; and
    • Water Efficiency.
The Development of CALGreen

In January 2010, California adopted the first statewide mandatory green building code in the country. In January 2011, the California Green Building Standards Code (or CALGreen) went into effect. The new code established minimum green building standards for most new construction projects.

CALGreen is part of the California Building Standards Code and is enforced by local jurisdictions and building officials.

How is CALGreen Structured?

- CALGreen is organized into chapters for both residential and non-residential buildings. Within each, there are mandatory measures that apply statewide, and voluntary measures, that can be adopted by local building departments.
- Mandatory measures, in Chapters 4 and 5, apply to everyone statewide
- Voluntary measures, located in the Appendices, have two tiers with prerequisite and elective measures
CALGreen Tiers

- **Tier 2**: All of Tier 1 + Prerequisites include all of Tier 1, plus some enhanced or additional measures.
- **Tier 1**: Mandatory + Prerequisites are a grouping of measures which set the base for that tier
- **Mandatory Measures**: in Chapters 4 and 5, apply to everyone statewide
- **Electives**: à la carte collection of additional measures not included elsewhere.

How CALGreen Works

- Some local jurisdictions will not have the staff resources necessary to perform **CALGreen inspections** on their own.
- In these instances the authority having jurisdiction may allow a **third party** to act as the owner’s agent in reviewing the building and project for compliance with CALGreen.
- This **third party** must demonstrate competence to the code official in being able to carry out the inspection services.
ICC decides to develop a Green Code

After the AIA Codes and Standards Committee held a Green Codes Summit in 2007, ICC became committed to developing their own Green code. CALGreen 2008 was used as a resource document and formed the basis for the first draft of the International Green Construction Code – IGCC, since ICC already owned the copyright.

THE DEVELOPMENT OF GREEN CONSTRUCTION CODES

<table>
<thead>
<tr>
<th>Event</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Meeting</td>
<td>July 28 – 30, 2009; Rosemont, IL</td>
</tr>
<tr>
<td>2nd Meeting</td>
<td>August 27 – 29, 2009; Denver, CO</td>
</tr>
<tr>
<td>3rd Meeting</td>
<td>October 8 – 10, 2009; Philadelphia, PA</td>
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<tr>
<td>4th Meeting</td>
<td>December 17 – 19, 2009; Fort Myers, FL</td>
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<tr>
<td>5th Meeting</td>
<td>January 28 – 30, 2010; Austin, TX</td>
</tr>
<tr>
<td>Working Group meetings</td>
<td>As needed during July – January (the day prior to a SBTC meeting)</td>
</tr>
<tr>
<td>First Draft posted for comments</td>
<td>March 15, 2010</td>
</tr>
<tr>
<td>Comments due</td>
<td>May 14, 2010</td>
</tr>
<tr>
<td>1st Comments Hearing</td>
<td>August 14 – 22, 2010</td>
</tr>
</tbody>
</table>
Main Features of Green Codes

- **ICC 700** – rating system
- **ASHRAE 189.1** – standard
- **IgCC** – “overlay” to building code

(all written in language suitable for mandatory adoption)
Main Features of Green Codes

ICC 700 National Green Building Standard

Chapter Headings

- Scope and Administration
- Definitions
- Compliance Method (point-system based)
- Site Design and Development
- Lot Design, Preparation and Development
- Resource Efficiency
- Energy Efficiency
- Indoor and Outdoor Water Use
- Indoor Environmental Quality
- Operation, Maintenance, and Building Owner Education

Many of the mandatory measures are consistent with the International Code Council's I-Codes. Third party verification is required.
Threshold Point Ratings for Green Buildings

<table>
<thead>
<tr>
<th>Green Building Categories</th>
<th>Performance Point Levels (1)(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BRONZE</td>
</tr>
<tr>
<td>1. Chapter 5 Lot Design, Preparation, and Development</td>
<td>39</td>
</tr>
<tr>
<td>2. Chapter 6 Resource Efficiency</td>
<td>45</td>
</tr>
<tr>
<td>3. Chapter 7 Energy Efficiency</td>
<td>30</td>
</tr>
<tr>
<td>4. Chapter 8 Water Efficiency</td>
<td>14</td>
</tr>
<tr>
<td>5. Chapter 9 Indoor Environmental Air Quality</td>
<td>36</td>
</tr>
<tr>
<td>6. Chapter 10 Operation, Maintenance, and Building Owner Education</td>
<td>8</td>
</tr>
<tr>
<td>7. Additional Points from any category</td>
<td>50</td>
</tr>
<tr>
<td>Total Points</td>
<td>222</td>
</tr>
</tbody>
</table>

(1) In addition to the threshold number of points in each category, all mandatory provisions in each category shall be implemented.

(2) For dwelling units greater than 4,000 square feet, the number of points in Category 7 shall be increased in accordance with Section 601.1.

The Green Scoring Tool allows scoring a building to the Standard (NAHB Model Green Home Building Guidelines has been discontinued), and includes decision support materials such as how to verify, intent, how to implement, resources, and Green Approved Products.

This tool is available free from www.NAHBGreen.org
ASHRAE 189.1 – standard

- **Standard 189.1 is:**
  - a standard (regulatory supplement, typically developed by public process such as ANSI)
  - applies to all buildings except low-rise residential buildings (same as ASHRAE Standard 90.1)
  - intended for adoption into model building codes

- **Standard 189.1 is not:**
  - a design guide
  - a rating system
  - a code

**Main Features of Green Codes**

**ASHRAE 189.1 – standard**

**Chapter Headings**

- Sustainable Sites
- Water Use Efficiency
- Energy Efficiency
- The Building’s Impact on the Atmosphere, Materials and Resources
- Indoor Environmental Quality (IEQ)
- Construction and Operation
- Normative References
ASHRAE 189.1 – standard

Chapter Structure

- x.2: Compliance
- x.3: **Mandatory**
  (required for all projects)
- x.4: **Prescriptive option**
  (simple option, very few calculations)
- x.5: **Performance option**
  (more sophisticated, but more effort)
  Annual Energy Cost; Physical or Computer Models; Life Cycle Assessments, etc.
- x.1: Scope

**NOTHING IS VOLUNTARY**

Main Features of Green Codes

**ASHRAE 189.1 – standard**

**Mandatory Provisions** (example)

**Heat Island Effect**

- **Site hardscape:**
  - to be shaded, be SRI 29, or porous pavers
- **Wall:**
  - to be shaded up to 20 feet above grade
- **Roofs:**
  - to be SRI 78 (low-slope)/29 (steep-slope)
  - or cool roof
ASHRAE 189.1 – standard

Energy - General:
Goal is 30% less than Standard 90.1-2007
INCLUDING PROCESS LOADS
Appendix G from Standard 90.1 is incorporated as a Normative Appendix
Metering for verification
Peak load reduction
Other areas increase stringency beyond Standard 90.1

BUILDING ENVELOPE
Example (Prescriptive):
Climate Zone 3 Roof

<table>
<thead>
<tr>
<th>Std. 90.1</th>
<th>Std. 189.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>R15</td>
<td>R-25</td>
</tr>
</tbody>
</table>

Example (Prescriptive):
Climate Zone 5 SHGC for 10-40% window area

<table>
<thead>
<tr>
<th>Std. 90.1</th>
<th>Std. 189.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.39</td>
<td>0.35</td>
</tr>
<tr>
<td>(0.49 north)</td>
<td>(all orientations)</td>
</tr>
</tbody>
</table>

Main Features of Green Codes

• Prescriptive Option (Lighting)
• Interior lighting power to be 10% less than ASHRAE Standard 90.1 (except retail)
• Occupancy sensor
• controls (§7.4.6 (b))
• Egress lighting control
• Auto-controls for daylight zones, outdoor lighting
Main Features of Green Codes

International Green Construction Code

Scope & Coverage
- Administration
- Site Development & Land Use
- Material Resource Conservation & Efficiency
- Energy Conservation, Efficiency & Atmospheric Quality
- Water Resource Conservation & Efficiency
- Indoor Environmental Quality and Comfort
- Commissioning, Operation & Maintenance
- Existing Buildings
International Green Construction Code

- 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.

- One and two family, townhouses, R-2, R-3, and R-4 occupancies are covered under the ICC 700 National Green Building Standard (NGBS).

- The IGCC allows jurisdictions to choose ANSI/ASHRAE/USGBC IES Standard 189.1 as jurisdictional compliance option (much like the IECC and 90.1). The 189.1 Standard is published within IGCC.

Main Features of Green Codes

International Green Construction Code

- Is intended to be adopted by jurisdictions on a *mandatory* basis.

- Is intended to be administered primarily by *building officials*.

- Incorporates features that allow local jurisdictions to *customize* requirements to suit their geographical conditions and environmental priorities and agendas.

- Incorporates a number of "*project electives*", a minimum number of which must be selected by the owner or design professional, as a means to:
  - Encourages practices which are otherwise difficult to mandate; and
  - Encourages *higher performance buildings*
International Green Construction Code

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).

Main Features of Green Codes

- 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.

- Appendix A - Project Electives Checklists encourage the construction of higher performance buildings than would be produced by conformance with basic code minimum requirements, much like rating systems do.
International Green Construction Code

- 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.

**Main Features of Green Codes**

- Approximate minimum performance:
  - 30% above 2006 IECC and ASHRAE 90.1-2004
  - 10% above 2009 IECC and ASHRAE 90.1 2007/2010
  - Similar to LEED 2009 (ASHRAE 90.1-2010 + 10% using Appendix G)
International Green Construction Code

Of particular interest to the code enforcement community are the provisions addressing **Commissioning**:  
- Appliance information,  
- Radon mitigation and additional  
- Documentation requirements,  
were added to the commissioning provisions to ensure the health and safety of building occupants.

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**Transitioning to Green Codes**

- **Enforcement Capability**  
  - Lack of Personnel  
  - Lack of Training

- **Push-back by Developers and Owners**  
  - Additional Time  
  - Additional cost

- **Technological Advancements**  
  - Performance-based  
  - Certification and Testing
Advantages to Using Green Codes

• What sets ‘green’ building codes apart is that they can be administered by code officials as a mechanism to drive green building beyond those jurisdictions that have otherwise been using voluntary rating systems.

• Written in mandatory language, these codes have the potential of producing environmental benefits otherwise difficult to attain with purely voluntary green building programs and rating systems.

• The use of project electives are designed to encourage the construction of buildings that exceed the already stringent minimum requirements, much like rating systems do.

• Allowing owners and design professionals to select from a wide array of choices in all environmental categories is familiar and typical of most green building rating systems.

• ‘Green’ building codes allow jurisdictions to easily specify enhanced building performance in many critical areas, including energy, water, natural resource and material conservation.
Adoption of Green Codes

- International Code Council NEWS RELEASES:

- The U.S. Conference of Mayors endorsed
  - the IGCC on June 14, 2010.
- The City Council for the tiny town of Richland, Washington (population 47,527) recently adopted the IGCC as part of an amendment to the Richland Municipal Code.
- Maryland and Rhode Island are the first states to adopt the IGCC.
  - Both adoptions were voluntary.
  - Note: The ICC did not recommend adoption until the final published version is ready in March 2012.

Florida has adopted the IgCC as an option for the retrofitting and new construction of all state-owned facilities.

The North Carolina Building Code Council adopted the Rainwater Collection and Distribution Systems section of the IgCC PV 1.0 with amendments, enhancing the North Carolina Plumbing Code Appendix on Rainwater.

The 2011 Oregon Commercial Reach Code features energy-related provisions of the IgCC PV 2.0 with amendments.

In Scottsdale, AZ, the IgCC replaces and updates the city’s voluntary program. This change took effect Aug. 4.

Other recent adoptions include Kayenta Township, AZ and Keene, NH.
Resources Available

**ICC ES** – Evaluation of building products for code compliance and sustainable attributes.

Offers reports regarding sustainability under standards such as CALGreen (the California Green Building Standards Code), IgCC (International Green Construction Code), and other green rating systems.

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**ASHRAE 50% Advanced Energy Design Guide**

- Offers designers and contractors the tools needed for achieving a 50% energy savings compared to buildings that meet the minimum requirements of Standard 90.1-2004. **This is another step in the process toward achieving a net zero energy buildings.**
Designers and Specifiers

Have a crib sheet handy for all materials that shows:
• Typical recycled content.
• Recovery rate.
• Typical sourcing for the project site area (location of scrap, mill, fabricator).
• Typical transportation mode and split between modes.
• Availability of EPD and chemical content sheets.

Transitioning to Green Codes

Designers and Specifiers

• Estimate building mass and volume at each phase of design.
• Perform preliminary threshold calculations.
• Evaluate the possibility of incorporating used material.
• Prepare standard language for service life.
• Prepare to opine on the deconstructibility of the structure.
• Specify material requirements necessary to meet project thresholds.
• Determine life-cycle assessments and their limitations.
• Be prepared to educate local jurisdictions about these requirements.
Thank you,

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QUESTIONS?

Thank You

- You may now disconnect