Potential Game Changers in Green Building:
New Developments Signal a Fundamental Shift and Perhaps Significant Opportunity for Building Materials Suppliers

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Green building certification is a relatively new phenomenon, with the first initiatives in the United States having begun no more than two decades ago. Mainstream programs, as well as scores of state, and regional programs, generally appeared within just the past dozen years. Today, most of these programs are evolving rapidly, such that changes are sometimes difficult to keep up with. In addition, what was only several years ago an almost completely voluntary green building movement has now begun to be reflected in building codes.

In this report we outline several recent changes in national scope programs and examine a rapidly developing trend toward inclusion of green standards in code requirements. Regarding the latter, we take a look at the recently enacted California Green Building Standards Code and its implications for building materials selection and use in the Golden State and beyond.

A Shift from Voluntary Green Building Practices to Code Requirements

A Recent History of Rapid Change

Although adherence to green building standards has largely been voluntary since such programs gained traction over the past two decades, the idea of incorporating green requirements into building codes is not new. In 2004, for example, the Small Communities Network published an overview of green building ordinances in the United States, chronicling more than 20 instances of green requirements in city and county building codes dating back to as early as 1985 (GCN 2004).

By 2007 it was clear that formal adoption of green requirements in building construction was moving into the mainstream. In that year 32 states debated more than 170 bills related to some aspect of green building, a number that grew to 33 states and over 200 bills in 2008 (Rossolo 2009). Also by 2008, the number of municipalities/localities with green building programs reached 132, up from fewer than 10 in 1999 (AIA 2008).

A year later the LEED[1] program alone reported a 50-percent increase in these numbers. In December 2009, according to the USGBC[1], various LEED initiatives in the U.S. (including legislation, executive orders, resolutions, ordinances, policies, and incentives) were found in 45 states.[2]

Recent developments in the green building movement include the emergence of national standards intended to provide minimum requirements for the siting, design, and construction of green buildings, and passage of the nation's first statewide green building code. The magnitude of change is epic with the potential to make "green" standard practice.

[1] Leadership in Energy and Environmental Design (LEED) is the rating system of the United States Green Building Council (USGBC)

[2] LEED initiatives reported in 2009 included 202 localities (138 cities, 36 counties, and 28 towns), 34 state governments, 14 federal agencies or departments, 17 public school jurisdictions, and 41 institutions of higher education.

Green as Standard Practice

NAHB/ICC National Green Building Standard Paves the Way

In 2007 the National Association of Home Builders (NAHB) and the International Code Council (ICC) began a joint effort to develop a nationally-recognized green building standard. The end product, the ICC-700-2008 National Green Building Standard, which received American National Standards Institute (ANSI) approval in 2008, and ICC approval on February 1, 2009, addresses single and multifamily homes, residential remodeling, and site development projects. The voluntary standard and associated point-based residential green building rating system is the first such system to receive ANSI approval.

The NAHB/ICC standard is comprehensive, covering energy, water, and resource efficiency, indoor environmental quality, site impacts, and homeowner education. There are a number of wood-related provisions in the standard, both within the resource efficiency and indoor environmental quality sections. Provisions of the resource efficiency section are shown in Table 1; several apply directly to wood, such as those calling for use of certified wood products, engineered wood, locally sourced, recycled-content, and salvaged materials. The use of life cycle assessment (LCA) tools in building design and materials selection is also a practice for which green building credits or points are available.

Table 1
Provisions of the Resource Efficiency Section of the NAHB National Green Building Standard

Provision
Minimize size of dwelling
Reduce quantity of materials and waste
Enhance durability and reduce maintenance
Reuse salvaged or scrap materials; reuse existing buildings
Use recycled content materials
Recycle waste materials during construction
Use renewable, biobased materials/ certified wood products
Use resource efficient materials, including light brick, engineered wood or steel products, roof or floor trusses
Use locally sourced materials for major elements of the building
Select environmentally preferable materials using LCA
Use products from ISO 14001 certified suppliers (1 point per % of products).

ASHRAE Unveils New Standard

Early 2010 marked a new chapter in green building standards development. On January 22 the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), in cooperation with the Illuminating Engineering Society of North America (IES) and USGBC released what is described as the first code-intended commercial green building standard in the United States (ASHRAE/USGBC/IES 2009).

The standard is not limited to heating, refrigeration, and air conditioning. Rather, it is a comprehensive standard, delving into many aspects of building construction. Included in the standard is a requirement that 60% of all wood used in construction be chain-of-custody certified (with the certification program to meet standards of ISO/IEC Guide 59, or the WTO[3] Technical Barriers to Trade document[4]). References to use of recycled-content materials, salvage and reuse, and locally sourced materials are also found in the standard. Also contained in the standard is a requirement that life cycle assessments be performed for a minimum of two alternative building designs.

As explained in a news release that accompanied introduction of the new standard, "Ultimately the aim is not just energy efficiency but a balance of environmental responsibility, resource efficiency, occupant comfort and well being and community sensitivity, all while supporting the goal of sustainable development." In the release it is noted that *"From site location to energy use to recycling, this standard will set the foundation for green buildings through its adoption into local codes."*

The new standard thus sets the stage for rapid adoption of green requirements into building codes across the U.S.

An International Green Construction Code Takes Shape

The ICC, which as noted earlier collaborated with the NAHB in developing the National Green Building Standard, is now developing code language to guide development of green commercial buildings in the United States. The fourth draft of the standard – the International Green Construction Code (IGCC) – was released for public comment on March 15, 2010 (ICC 2010a). The intent is to incorporate the final standard into the 2012 family of I-codes.

As in the National Green Building Standard, the new draft standard is comprehensive and includes language similar to the other standards discussed herein, including that related to use of certified wood, and life cycle assessment in building design and selection of construction materials.

The new standard, although still incomplete, is already having an impact. In January 2010, NYC leaders announced their intent to develop a green building code for the city based on the IGCC (ICC 2010b).

[3] World Trade Organization

[4] These guidelines set forth expectations for ensuring that various stakeholders are appropriately represented, that standards are coherent and consistent, that a system of due process is in place by which standards are developed and stakeholders involved, and that technical regulations are not prepared, adopted or applied with a view to or with the effect of creating unnecessary obstacles to international trade.

Nation's First Statewide Green Building Code Becomes Law

On January 12, 2010 the California Building Standards Commission unanimously adopted the Green Building Standards Code (CALGREEN). The new code document is the 11th of 12 parts of the *California Building Standards Code*.

The roots of the new statewide green building code can be traced back to 2007 when proponents sought to have the LEED program legislatively adopted as code for commercial and residential construction in the state of California. After two such measures were approved by the State Assembly, and subsequently vetoed by the governor, the state Building Standards Commission was directed to draft a statewide green building code (CALGREEN).

Voluntary until January 1, 2011, and mandatory thereafter, CALGREEN applies to all occupancies in the State of California. More specifically, the provisions of the code "apply to the planning, design, operation, construction, replacement, use and occupancy, location, maintenance, removal and demolition of every building or structure or any appurtenances connected or attached to such building structures throughout the State of California." Under the code, local (city, county, or city and county) governments may adopt code that is more stringent than CALGREEN, but not less so.

At this writing there are relatively few mandatory provisions of the code that are related to wood products (Table 2). A number of voluntary green building measures are encouraged, but not required. It is anticipated that many of the voluntary measures may, over time, become required elements.

Table 2
Required Elements of the CGBSC (CALGREEN)

A minimum of 50% of the construction waste generated at the site is diverted to recycle or salvage.
Provide readily accessible areas that serve the entire building and are identified for the depositing, storage, and collection of non-hazardous materials for recycling.
Develop a water budget for landscape irrigation use.
Develop a plan to manage storm water drainage during construction.
Demonstrate indoor baseline water use reduction of 20 percent or more.
Multiple showerheads shall not exceed maximum flow rates.
Low-rise residential buildings shall meet or exceed energy efficiency design requirements provided by California Energy Standards.
Provide a weather-resistant exterior wall and foundation envelope.
Install a vapor retarder and capillary break at slab on grade foundation.
Install an air sealing package for all joints and openings (per Section 506).
Adhesives shall be no or low VOC.
Paints, stains, and other coatings shall be no or low VOC.
Carpet and carpet systems shall be no or low VOC.
Hardwood plywood, particleboard, and medium density fiberboard composite wood products used on the interior or exterior of the building shall meet the requirements for formaldehyde emission standards.

Table 2 (Continued)
Check moisture content of wood used in wall and floor framing before enclosure. Framing shall not be enclosed if it exceeds 19 percent moisture content.
Install HVAC, refrigeration and fire suppression equipment that do not contain CFCs, HCFCs, and Halons.
For mechanically or naturally ventilated spaces in buildings, meet requirements of Section 121 of the California Energy Code.
Exhaust fans which terminate outside the building are provided in every bathroom.
MERV 6 or higher filters are installed on central air and heating systems.

Non-required provisions of CALGREEN that apply to building materials selection include the following:

- Materials are produced regionally – in California or within 500 miles of construction site (at least 10% based on cost).
- Reused materials – use salvaged, refurbished, refinished, or reused materials (minimum 5% based on total materials cost).
- Recycled content – use materials with recycled content of at least 10% based on materials cost.
- Select bio-based materials (solid wood, engineered wood, bamboo, wool, cotton, cork, straw, natural fibers, products made from crops and other bio-based materials with at least 50% bio-based content).
    - Certified wood products
    - Rapidly renewable materials – use materials renewed in a time frame of 10 years or less for at least 2.5% or total materials value.
- Service Life – Select materials for longevity and minimal deterioration under conditions of use.
- Reduced maintenance – Select materials that require little, if any, finishing.
- Recyclability – Select materials that can be re-used or recycled at the end of their service life.
- Employ advanced wood framing techniques, or optimum value engineering (OVE), as permitted by the enforcing agency.
- Inform materials selection using life cycle assessment LCA.
- Use certified wood.

Regarding certified wood, the program under which wood is certified is currently not specified. Language within the document indicates that the California Building Standards Commission will work to develop a standard through the next cycle.

What the New and Emerging Standards Suggest

The latest green building initiatives provide a clear indication that the trend toward green in building construction is not temporary and that demand for recycled-content, re-used/refurbished products, regionally-sourced materials, and certified wood is likely to grow in the future. In addition, with language regarding life cycle assessment now in all of the new national scope standards, as well as the new California code and the Green Globes standard of the Green Building Institute, and likely soon in the USGBC LEED program (see following paragraphs), there is every indication that use of LCA represents a new way of doing business in the future.

LEED Moves toward Incorporation of LCA

LEED has been criticized in recent years for not employing a science-based systematic approach such as life cycle assessment in identifying environmentally preferable materials. USGBC has been studying the issue since the fall of 2004, and in 2007 began allowing an innovation/design credit for use of LCA to inform design and materials selection.

Now, however, LEED is piloting a new approach to incorporating LCA into all its standards – one that will likely stimulate considerable interest on the part of the design/construction industry. What will be tested through the pilot is a process whereby structural/envelope assemblies are evaluated using an approved LCA impact calculator. The calculator will allow the selected design to be compared to average and lowest environmental impact options. Then, credits will be awarded based on the magnitude of impact of the selected assemblies vs. the average and lowest impact options[5]. What is at present a single LCA pilot credit will translate to up to seven credits should the pilot program be adopted as currently written.

This is a major step forward for LEED. While the program as outlined is not mandatory and does not include the impact of a given assembly on energy use during a building's operational phase, the approach is nonetheless groundbreaking. By linking credits to selection of low environmental impact options as determined through systematic assessment, the LEED program is poised to take a leadership position in the application and use of LCA.

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[5] For example, for a submittal that specifies an assembly in each of the Credit Calculator's assembly groups, an LCA score (between 0 and 100) will be calculated by the Credit Calculator based on the equation:

LCA Score = 100*(B - S) / (B - T), rounded to the nearest integer, where: "B" (benchmark) is the sum, across all assembly categories, of the area-weighted environmental impact scores for the *average (mean) of all assemblies* in each of the assembly categories (area-weighted environmental impact score = area [square footage] of the specified assembly times the environmental impact score per square foot for the average of the assemblies in that group),

"T" is the sum, across all assembly categories, of the area-weighted environmental impact scores for the *best performing assembly* in each of the assembly categories (area-weighted environmental impact score = area [square footage] of the specified assembly times the environmental impact score per square foot for the best performing assembly in that group), and

"S" is the sum, across all assembly categories, of the area-weighted environmental impact scores for the *specified assembly* in each of the assembly categories (area-weighted environmental impact score = area [square footage] of the specified assembly times the environmental impact score per square foot for the specified assembly in that group).

The LCA score is converted into LEED points as follows *(this is theoretical for pilot projects):*

LCA score 1-14: 1 point
LCA score 15-28: 2 points
LCA score 29-42: 3 points
LCA score 43-56: 4 points
LCA score 57-70: 5 points
LCA score 71-84: 5 points + 1 LCA innovation point for exemplary performance
LCA score 85-100: 5 points + 2 LCA innovation points for exemplary performance

What Changes Mean for Building Materials Suppliers

Recent developments point to increasing convergence in green buildling requirements among various green standards. *All* of the national-scope green building programs and new and emerging standards emphasize the same product characteristics over and over again. The same is true of virtually all of the regional, municipal, and local green building standards. Consistent elements of such green building programs and standards are: third-party certified wood, regional materials, recycled-content materials, and reuse of salvaged materials. And, as indicated, programs are beginning to align in awarding use of life cycle assessment to inform building design and materials selection.

Who will provide the third-party certified wood, and the locally sourced, recycled-content and salvaged materials sought by the growing green construction market if not existing building materials wholesalers and retailers? Who, if not existing materials suppliers, will assist builders, architects, and others weave their way through the myriad of standards in achieving green performance levels or in meeting green code requirements? Someone will. Who, for that matter, will help design/construction professionals learn how to use life cycle assessment tools – tools that almost invariably identify wood products as the lowest environmental impact options? Given what appears to be a clear need, and a fairly well defined opportunity, it is likely that someone/some business entity will emerge to provide this service as well.

All of the services described above, including life cycle assessment technical support, could be provided by those currently in the building materials supply chain, and this possibility would appear to represent a clear opportunity for established wholesalers and retailers who take the green market seriously. It is also clear, that supplies and services sought by green designers and builders will come from somewhere. They will either become available through traditional sources of construction materials and technical support – i.e., through established wholesalers and distribution channels – or through new businesses and market channels that may specialize in the green market. Should the latter come to pass, as is already evidenced by growing numbers of niche players, the current distribution industry will have missed a substantial opportunity.

The Bottom Line

The process of building construction is in the midst of significant change. Attention to green issues, largely unheard of just a few years ago, appears on the brink of becoming standard practice. Recent developments - including the emergence of national standards intended to provide minimum requirements for the siting, design, and construction of green buildings, passage of the nation's first statewide green building code, and language in both existing green building standards and developing codes focused on use of life cycle assessment to inform design choices and materials selection - all point to fundamental change in the building industry. One manifestation of increasing attention to green attributes of construction is interest in new kinds of products and new product attributes, including environmental attributes.

As the market for green products grows, and along with it a need for information and assistance in selecting, specifying, and obtaining such products, it remains to be seen who will assume a leadership position in serving this market. There appears to be significant opportunity for someone, including existing wholesale and retail distributors of building materials. Alternatively, new businesses and market channels that specialize in product lines unique to the green market are likely to emerge.

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