

Building Safety JOURNAL

THE PROFESSIONAL JOURNAL OF CONSTRUCTION AND FIRE SAFETY



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- **The Cost to Go Green**
- **The Greening of Building Codes**
- **2007 Supplement to the I-Codes Significant Changes**
- **Building Valuation Data**



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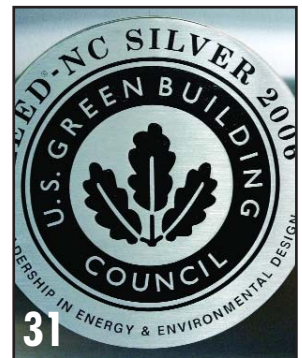
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Making it Easier to be Green

As ICC and its members have long recognized, green building is not just a trend: it is a way to significantly conserve our present resources and protect the environment for future generations. The Code Council has always been an active supporter of green building, and one of the initiatives I announced when I took office as President was to seek ways to increase our involvement in this important area.

The ICC Board of Directors' "Policy Position on Green Building/Sustainable Communities"—issued in December 2006—outlines several initiatives, including measures to further educate our members about green building and advocating sustainable policies and practices in the legislative, regulatory and code arenas. The purpose of developing an official, written policy on this subject was to reinforce the ICC's commitment to the environment and encourage efforts by our members to play leadership roles on matters related to green building. Among the specific initiatives called for was that the Code Council actively pursue opportunities to participate in activities with other organizations that will help assure that green building practices are not just sustainable but safe, and I am happy to report that we have since established valuable partnerships with the National Association of Home Builders and the U.S. Green Building Council towards this end.



BY WALLY BAILEY

As I am sure most of you are already aware, ICC and NAHB have joined forces to develop the first-ever residential *National Green Building Standard*. This new standard will make it easier for builders to integrate green building materials and methods into residential projects and help code officials and other building safety professionals better ensure that such practices are safe. By partnering with NAHB, we are making sure that code officials have a voice in the development of this landmark standard and that the safety requirements of the

International Residential Code remain front and center throughout the process.

More recently, under a Memorandum of Understanding between ICC and USGBC signed this May during Building Safety Week, the two organizations have agreed to work together to further green building practices. The initial goal under this partnership is to jointly develop a green building education manual to help educate code officials about the implementation and enforcement of green building programs and standards.

Despite this recent progress, I know that there are some in the industry who still cling to the belief that the I-Codes are not compatible with sustainable or green building. This is simply not so. An early report by the ICC Industry Advisory Committee Task Group on Green Buildings concludes that there are very few, if any, serious barriers in the I-Codes that would inhibit green building techniques and methods. In fact, many recognized green building methods are already included in the *International Energy Conservation Code*—which is referenced by the U.S. Department of Energy as the benchmark for conserving resources used in construction and daily living and has been adopted by some 15,000 jurisdictions in 38 states—and the education program offered during the upcoming ICC Annual Conference in Reno, Nevada, will include sessions on green building and the *International Building Code* and *International Residential Code*.

There can be no doubt that as more interested parties get involved in the ICC code development process, more green materials and methods will be considered for inclusion in the I-Codes. Whether a change proposal addresses sustainable, durable or low-maintenance building design and operation; energy or water efficiency; indoor or outdoor air quality; or the conservation or recycling of building materials, it will ultimately fall on our voting members to make sure that it is subject to the same exacting scrutiny as any other new or amended provision.

While every effort should be made to bring the use of appropriate green materials and methods into practice, the minimum requirements for public health, safety and general welfare must also be safeguarded. That is where we come in. As exemplified by the success of these and other recent initiatives, the Code Council and its members continue to answer the demand for the best possible practices by promoting the sustainable features of the current I-Codes and helping to lay the groundwork for the next generation of green building standards.

A handwritten signature in blue ink that reads "Wally Bailey". The signature is written in a cursive, flowing style.

Practicing What We Preach

In recent months, a broad and increasingly strong consensus has emerged among leaders in science, government and industry acknowledging the very real threat posed by global warming and climate change. In Washington D.C., in the halls of academia, and in boardrooms across the country, there is near universal agreement that now is the time for action. We all share a responsibility to safeguard the Earth and its vast but finite resources, and to leave things better for future generations.

The link between climate change and building safety is inescapable. You need only look at the intensity of recent global storm systems and the damage they have done. The good news is that it is possible to act in ways that support and protect the environment while also furthering the important goals we share as building safety professionals.



BY RICHARD P. WEILAND,
CEO

At ICC, we are embracing this challenge in two ways: by taking the lead in developing sustainable, or “green,” building standards for our members, and by using environmentally friendly practices and materials in our offices. In other words, we are practicing what we preach, going green internally while promoting green externally.

On the external front, we are working with the National Association of Home Builders to develop a *National Green Building Standard* for residential construction, and we have issued an ICC Policy Position on Green Building and Sustainable Communities. In May, we signed an MOU with the U.S. Green Building Council pledging to work together on matters of mutual interest. We have also created an ICC Green Building webpage, www.iccsafe.org/news/green, that offers a growing wealth of information and resources.

These efforts reflect the important role that ICC and our family of *International Codes* play in sustainable construction. The I-Codes will be critical to making green technology part of a comprehensive program of building safety, and preserving the general welfare of communities. As regulatory professionals, we are charged with safeguarding the public, and green buildings must be safe buildings. We will continue to produce codes and standards that protect people where they live, work and play. With regard to green building, our mantra must be, “If it’s not safe, it’s not sustainable.”

As we support sustainable actions in the built environment, ICC is championing green practices within our own offices. We recently moved our headquarters to a LEED-certified building in Washington, D.C., putting us just blocks from key decision makers. With a range of cutting-edge features, including rainwater collection, high-efficiency heating cooling and lighting systems, water efficient fixtures, and extensive use of recycled materials, the building is one of the greenest in the nation’s capital.

We are taking similar steps across the country. ICC has established Sustainable Workplace Action Teams in each of our district offices. Staff members are serving as our collective conscience, looking for ways to limit ICC’s impact upon the environment. While this is clearly the right thing to do, it is also the smart thing to do. Sustainable building practices will allow us to achieve significant organizational savings. We are reducing our utility bills and maintenance costs, and taking full advantage of efficiency incentives in the 2005 Energy Policy Act.

And what is good for ICC offices is good for the homes of employees and members. I encourage each of you to look for ways to spread these practices beyond the workplace, making our communities healthier for us all.

ICC and its members have a long and proud history of supporting the environment through responsible and innovative building. Together, we will continue to be positive agents of change, working to protect our environment while ensuring that green building practices are sustainable and safe. The years ahead will likely pose challenges we have yet to anticipate, but they will also offer possibilities we can scarcely imagine.

A handwritten signature in blue ink that reads "Richard P. Weiland". The signature is written in a cursive, flowing style.

Coalition to Raise the Profile of Code Officials

Key stakeholders convened for a second Raising the Profile of the Code Official Summit at ICC Headquarters in Washington, D.C. Hosted by Code Council Board President Wally Bailey, CEO Rick Weiland and COO Dominic Sims, the “Founders” meeting brought together industry association representatives to discuss the formation of a permanent coalition to promote the important role code officials play in making everyday life safer.

The goal of the coalition is to educate the public, industry and elected officials about the critical role code officials play in improving the level of safety in the built environment. Participants at most recent summit included the American Association of Code Enforcement, the Institute for Business and Home Safety, the International Association of Electrical Inspectors, the International Association of Fire Chiefs Fire and Life Safety Section, the International Association of Plumbing and Mechanical Officials, the International City/County Management Association and the National Electrical Manufacturers Association. ♦



Pictured, left to right: ICC COO **Dominic Sims**, National Electrical Manufacturers Association (NEMA) member and GEO Security Industry Affairs Director **Bob Boyer**, NEMA Codes and Standards Technical Director **Vince Baclawski** and ICC Board President **Wally Bailey** at work drafting the mission statement for a new coalition to raise the profile of code officials.

2007 Annual Conference Highlights

The 2007 ICC Annual Conference, which will be held September 30 through October 3 in Reno, Nevada, will feature a demonstration of the SMARTcodes system for code compliance checking; more than 30 educational sessions; opportunities for certification and testing; and a spotlight on plumbing, mechanical and fuel gas disciplines.

During the opening session, Code Council President Wally Bailey will address his key initiatives of elevating the profile of code officials and increasing the organization’s role in green

and sustainable construction. Other key events include an open forum on membership services, the annual Awards Luncheon, the Annual Business Meeting, a Candidates’ Forum and Cracker Barrel sessions.

The extensive education schedule will give participants the opportunity to learn about and apply the *International Codes* while earning continuing education credits. Course topics include green building, green building safety and transitioning to the new *California Building Standards Code*. New to the Annual Conference this year are certification exams for residential and commercial building, electrical, plumbing and mechanical inspectors. To pre-register for the exams, visit www.iccsafe.org/ABM-exams.

The ICC Expo has been expanded to three days this year and will include special sections for green building; plumbing, mechanical and fuel gas; and earthquake safety and mitigation.

In addition, this year’s conference runs concurrently with the Annual Meeting of the Western States Seismic Policy Council, which will facilitate contact with officials from the worlds of geology, emergency management, seismic research and building design. Of key interest is the impact of new seismic zone maps from the U.S. Geological Survey and resulting adjustments to national earthquake standards and model codes.

To register for the 2007 ICC Annual Conference and Expo, visit www.iccsafe.org/conference or phone 1-888-ICC-SAFE (422-7233), extension 4229. ♦



NYC Council Approves Modernization of Codes

The New York City Council has voted 47-0 in favor of the first major modernization of the city’s building codes in nearly 40 years. The plan, proposed by Mayor Bloomberg and Buildings Commissioner Patricia J. Lancaster, reflects lessons learned about emergency evacuations and fire safety after 9/11 and guarantees that New York’s buildings will continue to function as monuments to the city’s ingenuity, vision and expertise.

The vote was the culmination of a four-year process that involved more than 400 construction industry representatives. ♦



New York Mayor **Michael Bloomberg** signs the bill approving the city’s new construction codes.



Developing Green Building Programs or Ordinances

by Peter Bruck

by Peter Bruck, LEED AP

Concerns about resource depletion and global warming are changing the dynamics and scope of the building code profession in the U.S., with more and more jurisdictions across the country adopting measures to encourage—and in some cases, require—the implementation of “green” building features in new construction and the renovation projects of existing structures.

While no single approach is going to work for every situation, City of Rohnert Park, California, provides an example of how to embark on the road to more responsible development. In May 2005, Rohnert Park joined the other eight cities in Sonoma County in agreeing to pursue the goal of reducing greenhouse gas emissions throughout the community to 25 percent below 1990 levels by 2015 (after having already set the goal the previous year of reducing greenhouse gas emissions by city government operations by 20 percent of 2000 levels). Following a great deal of research and collaborative effort, city staff succeeded in developing a Green Building Ordinance which was subsequently adopted by the Rohnert Park City Council effective July 1, 2007.

Laying the Groundwork

Staff began by determining that a mandatory approach would not only place less of a demand on city resources and result in greater numbers of green buildings than a voluntary program but, if backed by the general public, would be acceptable to most local developers.

With this in mind, they began researching green building ordinances in place in other jurisdictions and came across one adopted by the City of Pleasanton in nearby Alameda County to use as a model. This saved a great amount of time during the initial development process and had the added benefit of making it easier for local builders to familiarize themselves with the new ordinance, illustrating that—as with all codes and standards—regional consistency in green building ordinances and guidelines can go a long way towards gaining compliance.

Building Support

One of the most important lessons learned during the development of Rohnert Park’s Green Building Ordinance was the value of the public process. The more opportunities people were given to be heard, the more the ordinance gained in public support.

Rohnert Park staff held several public meetings with the City Council and Planning Commission, including a Sustainability Workshop that attracted individuals with interests focused on concerns such as water conservation, transportation, solid waste management and universal design, as well as green building advocates. This workshop led to the creation of a new “Sustainability” title in the city’s *Municipal Code* which, once established, will contain the requirements for most issues related to the subject.

Establishing Guidelines

When considering which green building guidelines to use for a new program, jurisdictions should strongly consider referencing recognized standards and inspection service programs. It is also critically important to consult with legal counsel to ensure that a potential green building program or ordinance does not conflict with other state or local regulations. Similarly, partnering with third-party organizations that provide green building training, certification, plan checking or inspection services can significantly reduce the load on building department staff and help facilitate buy-in by the private sector. Utilization of outside guidelines and resources can be especially helpful for voluntary programs by minimizing “interest drift” on the part of designers and builders.

An important point for mandatory programs is, if possible, to defer the subject of compliance thresholds until the end of the development process because once the topic arises, the ensuing debate tends to supersede other issues. Finally, jurisdictions should keep an eye on the “triple bottom line” so that environmental, economic and social equity issues are equally addressed throughout the ordinance development process.

Marshaling Resources

Staffing and funding nearly always pose challenges when projects like the development of a new ordinance come along. Whatever the subject of the proposed ordinance, jurisdictions should find a “champion” on staff who has a desire to head the project and help ensure that it moves forward at a steady pace. In this case, someone with an interest in green building can be expected to make more progress than a staff member who views the project as simply another time-consuming task. Sources of funding beyond the normal channels should also be considered, including solid waste agencies, utilities and other revenue-generating departments that may stand to benefit.

Once the ordinance itself has been written, costs associated with the development of an implementation plan should not be overlooked, and the day-to-day green building plan check and inspection processes will also need funding once that plan is in place. For Rohnert Park, a fee study coincided with the implementation of the new ordinance, resulting in the inclusion of the green building plan check and inspection fees in the new fee schedule.

Also, bear in mind that green building training will be necessary—not just about the basics, but advanced levels as well—for all individuals associated with the program. Staff members and contractors alike will need to understand how the program or ordinance is structured and how it interacts with the green building guidelines in use, and everyone involved should be aware of the specifics of how the selected rating system will be applied.

Conclusion

Just as green building requires an integrated approach to design and construction, so does the development of a green building program or ordinance. One can start with a list of “things to do,” but the difference between a basic list and a fully functional and viable program is the ability to create processes and regulations that are easy to understand and implement.

Nudging the forces of the market to embrace new ways of considering how the construction of buildings affects the world we live in is no easy task. Ultimately, developing the means to a more sustainable future will require the cooperation of the best of both the governmental and private sectors. ♦

Peter Bruck, LEED AP, is the Building Official for the City of Rohnert Park, California. His Master’s paper on the development of Rohnert Park’s Green Building Ordinance is available on the city’s website at www.rpcity.org/content/view/567/183.

For more information about Rohnert Park’s Green Building Ordinance, including a link to the document itself, go to www.rpcity.org/content/view/468/183.

Fourteen Points to Consider when Developing a Green Building Program or Ordinance

1. Understand and assess the direction desired by the local council or board. Without strong political backing, gaining support for funding, staffing and other resources will prove more difficult.
2. Consider the pros and cons of a mandatory versus voluntary program and choose the one most appropriate for the jurisdiction. Consider the use of development agreements as an option to introduce green building features into the local process one step at a time.
3. Research local cities’ and counties’ green programs and ordinances for possible use as models.
4. Consider taking a “working group” approach consisting of a balanced mix of stakeholders including elected officials, governmental staff members, developers and builders, and the public at large.
5. Work with the Planning Commission and use its meetings as a platform for workshops and public participation.
6. Conduct a “sustainability workshop” to illustrate how green building is connected to a host of related issues and help garner support from special interest groups.
7. Select green building guidelines or standards that are appropriate for your jurisdiction and, when possible, are already used in your region.
8. Consult with legal counsel to ensure that proposed guidelines or standards do not conflict with other state or local regulations. In the case of an ordinance, be sure that it is legally defensible.
9. Consider the use of outside resources for green building plan check and inspection.
10. Keep compliance thresholds realistic and try not to address them until the end of the development process.
11. Keep the “triple-bottom line”—environment, economy and social equity—in mind to ensure a sense of fairness for all parties.
12. Determine how the program or ordinance will be staffed and funded.
13. Select a staff member to champion the development process.
14. Provide education about green building principles and your jurisdiction’s program or ordinance to staff members, developers, builders and residents.



Chicago Green Permit Program signage for Loyola University's new Information Commons.

The City of Chicago Green Permit Program

by Erik L. Olsen, P.E., LEED AP

Growing interest in sustainability has resulted in numerous public policy initiatives across the U.S. encouraging, requiring or seeking to enhance the capacity for green building. Although there are some state and federal programs, most such efforts are occurring at the municipal level.

It is difficult to find a major jurisdiction today that does not require its own public projects to be built green, typically meaning LEED (Leadership in Energy and Environmental Design) certified. Others, like Arlington, Virginia, also offer incentives such as floor area ratio bonuses or, as with the Austin, Texas, Green Building Program, technical assistance for private construction projects. Some municipalities, like Boston, Massachusetts, and Washington, D.C., have even experimented with green requirements for private buildings.

Expedited permitting programs, although frequently mentioned as an incentive worth consideration, currently have few full-scale implementations. The City of Chicago, Illinois, provides an excellent example of the successful implementation of such a program. Introduced in 2005, the Chicago Department of Construction and Permits Green Permit Program is the first of its kind in a large U.S. jurisdiction, and its success—from 19 permits in 2005 to 71 in 2006 and a goal of over 100 this year—has helped significantly accelerate the growth of private-sector green building in the city. Today, Chicago leads the nation in number of LEED registered projects.

Developer Benefits

Chicago's Green Permit Program offers two main incentives. First, permits for large or complex projects can be issued in as little as six weeks from the time of construction document submission—approximately half the typical time. This time savings can translate into substantial financial

benefit for developers because earlier construction starts mean earlier sales or leasing and reduced interest on construction loans.

The program also offers a more direct financial incentive in the form of reduced fees. Developers of larger projects typically pay additional fees for the services of city plan review consultants, and up to \$25,000 of these fees are waived for projects that qualify for Chicago's Green Permit Program. Whereas expedited permitting is mostly of interest to for-profit developers, the reduction of fees associated with permitting can be a major benefit to nonprofit and affordable housing developers. Even \$50,000 is a nearly invisible line item in a \$100 million development, but \$15,000 or \$20,000 is a substantial contribution to the bottom line of a proposed \$10 million affordable housing project with 10 different funders.

Rationale

Expedited permitting is likely to be of greatest value in large, dense cities. Moving green projects to the front of the plan review queue may expedite permitting in some jurisdictions, but in Chicago most would still be at risk of delays because of the complexity of the permitting process.

To help developers navigate this complexity, projects that qualify for Chicago's Green Permit Program receive a much higher level of customer service than typical large developments. The number of projects in the program at any one time is deliberately controlled through the adjustment of program criteria in order to ensure a single point of contact. This is critical to maintaining involvement with projects early on and throughout the design process in order to identify potential permitting problems and solve them in advance.

This approach surprises both new customers and visitors from other jurisdictions, distinguishes Chicago's approach

from green building programs elsewhere, and is a key to the program's success. Green assistance and permit assistance are fully integrated, so rather than provide an outside advisory group specific only to green strategies, one individual is responsible both for ensuring a project's sustainability and coordinating its regulatory process. Only 10 percent of the time spent on a typical project involves evaluating its green elements. The remainder is spent on typical permit management concerns such as developing and maintaining project schedules, coordinating with related city departments, and providing code interpretations.

If a project is identified as a Green Permit Program participant, all City of Chicago departments are expected to provide priority service. Nonetheless, any required legal review periods must be maintained and necessary legislative approvals obtained. Such potential concerns emphatically underscore the need for early coordination. After all, designing a green building is not worth much if final approval cannot be gained.

Additional Considerations

A benefit of any such program is risk reduction. Project teams are often reluctant to consider the use of alternative building products or systems for fear of rejection during the permitting process. Providing dedicated assistance for green projects turns this attitude on its head: "If you're trying something different, we'll work with you to try to approve it as quickly as possible while still following all appropriate protocols."

On the downside, jurisdictions considering a permit-based green building incentive program must be cautious of "greenwashing": attempts to promote projects with questionable environmental value. That is why Chicago's Green Permit Program has published qualifying criteria that include LEED certification for commercial and large residential projects and Chicago Green Homes certification (provided by the Chicago Department of Environment) for small residential projects. In addition, a pre-permit review is required to ensure that prospective projects meet program requirements, and free technical assistance is provided to help meet designers meet their sustainability goals.

Conclusion

Although Chicago's Green Permit Program has been remarkably successful over its short history, there remains room for enhancement. For example, additional incentives—such as the partial waiver of basic permitting fees—may be necessary to draw in more small projects like the installation of solar thermal panels on single-family



residences, and providing prototypical plans or system diagrams may serve to encourage such projects.

By the same account, Chicago is beginning to see a troubling increase in "greenwashing," with more and more products and systems with no clear environmental value being marketed to homebuyers. This troubling trend poses an important public education challenge and emphasizes the importance of third-party green building certifications. ♦

Erik L. Olsen, P.E., LEED AP, is Green Projects Administrator for the City of Chicago Department of Construction and Permits. His current projects for the department include managing of its Green Permit Program, developing a green building code and piloting an electronic plan review process.

Olsen is also a member of the U.S. Green Building Council's Greening the Codes Committee and writes and edits "GreenBean" (<http://greenbean.typepad.com>), a blog dedicated to reporting on built, in-progress and unbuilt green buildings in Chicago.

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The Cost to Go Green

by Courtney France, EIT, LEED AP



The predominant issue for almost anyone interested in the pursuit of a more sustainable building project is: what is the cost to go green? Most building industry professionals have been using standardized percentage increases for “green premiums” based on published studies and reports. This can be of some use, but is rather like evaluating a sprinter’s finish time without taking into account whether the race was a 20-, 50- or 100-meter dash. Determination of a project’s baseline or “starting block” allows the cost, benefits and even scope change of a specific design decision to be evaluated much more intelligently and accurately.

Obviously, such a first-cost approach does not include life-cycle or other costing analyses which provide information about long-term or collateral savings. Efforts are ongoing to educate owners, developers and occupants about the cost benefits associated with life-cycle paybacks, return on investments and other financial parameters that support the decision to invest early for long-term benefits, but tight budgets and deadline-driven schedules often mean that a first-cost analysis is often the only opportunity to quantify the cost to go green.

Standards and Measures

Generally speaking, a building project’s baseline reflects the prevailing minimum building and fire safety standards. As a result, a project’s baseline can vary—sometimes significantly—from jurisdiction to jurisdiction. For example, California’s “Title 24” energy efficiency standards set minimum performance thresholds substantially higher than those of most other states, thereby raising the baseline in terms of both scope and budget.

Although there are a number of sustainable building metric tools available, the LEED (Leadership in Energy and Environmental Design) rating system developed by the U.S. Green Building Council (USGBC) is currently the one most widely used by federal and state agencies

to facilitate the integration of energy efficiency and environmental responsibility into building design, construction and operations. Using the latest version of the LEED rating system for new construction and major innovations, LEED-NC 2.2, one can begin to assess how building codes and standards influence the cost of green building.

Returning to California, the state’s Title 24 requirements for design parameters such as building envelope, glazing and lighting power densities essentially meet—or in some cases exceed—American Society of Heating, Air-Conditioning and Refrigerating Engineers/Illuminating Engineering Society of North America 90.1-2004, *Energy Standard for Buildings Except Low-Rise Residential Building*, which serves as the basis for the LEED-NC 2.2 energy criteria. In contrast, the State of Indiana currently references the energy provisions of the 1992 *Model Energy Code* with amendments—resulting in less stringent standards than the LEED-NC, Energy and Atmosphere Prerequisite 2, Minimum Energy Performance, criteria.

How does this apply to an analysis of the cost to go green? Consider the fact that while a project in California may not incur a cost premium to meet this LEED prerequisite, a similar project in Indiana would likely be impacted with construction hard costs and administrative design fees above and beyond those necessary to meet the state’s minimum energy efficiency requirements.

This is just one example of how the cost to go green is largely based on the applicable referenced standards and, correspondingly, how the cost premium may be expected to be lower in regions with more up-to-date building codes. Stated another way: using default percentage premiums to evaluate the costs of green building measures fails to account for the possible baseline “head start” that the local building code may provide—which in turn has

the potential to lead to drastic over- or underestimation of the costs of meeting targeted sustainability goals.

Construction Practices

As with California's Title 24 energy requirements, many jurisdictions mandate construction practices recognized under the LEED system. For example, many local codes require strict measures and continuous maintenance to prevent construction activity pollution in keeping with LEED-NC Sustainable Sites Prerequisite 1, Erosion and Sedimentation Control. In addition, the site remediation measures required by many jurisdictions for brownfield redevelopment projects are often similar to those of LEED-NC Sustainable Sites Credit 3, Brownfield Redevelopment.

In contrast, consider LEED-NC Indoor Environmental Quality Credit 3.1, Construction IAQ [Indoor Air Quality] Plan. For some building types—healthcare or other mission-critical facilities, laboratories, etc.—IAQ best practices are typically required by the local building code and are therefore part of the baseline scope and associated budget. However, associated measures such as covering ductwork, material protection and onsite IAQ quality control inspections are typically not required for the average office building, meaning that complying with the LEED criteria is likely to incur a cost premium.

Industry Response

The preceding examples illustrate how the cost to go green is heavily contingent on local codes, standards and permitting requirements. The next question, then, is how does the construction industry view enhanced sustainability requirements?

The answer requires some qualification. The building market is driven first and foremost by bottom-line decision making, meaning that employing the most economical methods for achieving minimal compliance is the rule. That does not mean, however, that building industry leaders are ignorant of the inherent value of maintaining a safe and secure built environment, and as we have all become more aware of the impacts of human actions on the global environment and individual health, they have consistently supported reasonable efforts to promote sustainable design and construction practices. As a result, in the numerous jurisdictions across the U.S. that have adopted "green" code provisions or performance standards, the associated costs are rarely viewed as premiums but rather as a regular part of doing business in a rapidly changing world.

Towards a Greener Future

There is much anticipation that the pending release of Standard 189, Standard for the *Design of High-Performance Green Buildings Except Low-Rise Residential Buildings*, will fundamentally transform mainstream U.S. building design and construction practice. Under development by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) in conjunction with the Illuminating Engineering Society of North America (IESNA) and USGBC, the proposed new standard will provide comprehensive minimum guidelines for green building practices and is intended for adoption by reference in the next generation of model building codes.

The establishment of building baselines that include proven measures for enhancing sustainability promises to have a profound effect on how we evaluate the cost to go green, and the development of new standards like ASHRAE/IESNA 189 and the ICC/National Association of Home Builders *National Green Building Standard* (for residential construction), along with numerous other initiatives, foretells a greener, healthier future for the built environment. ♦



Courtney France, EIT, LEED AP, heads *France Sustainable Solutions*, which provides consultations to LEED project managers.

In her previous capacity as LEED Coordination Services Team Leader for Architectural Energy Corporation (AEC), France worked on more than 200 projects around the world for AEC, applying the LEED rating system from project inception to owner occupancy. She has also conducted LEED Accredited Professional training for over 2,000 individuals representing more than 150 firms from various sectors of the building industry.



Can Fire Protection and Life Safety Lead to LEED Points?

by Lisa E. VanBuskirk, P.E., LEED AP

“Green” and “sustainable” are among the latest buzzwords in the building industry. Jurisdictions across the U.S. are adopting green design criteria for both public and private buildings, and numerous major developers and construction firms are committing to have all of their future projects meet sustainable design criteria.

The U.S. Green Building Council’s LEED (Leadership in Energy and Environmental Design) system is the nation’s leading sustainable design evaluation criteria. LEED is a methodology for evaluating building design from several perspectives—sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality—which are broken down into design prerequisites and credits. A design that meets all of the prerequisites and a certain number of credit requirements is granted Certified, Silver, Gold or Platinum certification, as appropriate.

It is important to recognize that the various levels of LEED certification represent minimum sustainable design thresholds and are often achieved as a result of trade-offs between one or more areas and another. Obviously, in order to fully address the underlying intent of green building, it is essential that design teams work together so that all of a project’s systems and components contribute to the overall goal of environmental responsibility—even in areas that may not intuitively lead directly to LEED credits.

Fire protection and life safety systems may not play as critical a role in green design as some other building elements, but they nonetheless affect the overall environmental impact of a project. By examining design options worth credits under the latest LEED Green Building Rating System for New Commercial and Major Renovation, LEED-NC 2.2, and their application in certified buildings, we can begin to better understand the role of fire protection and life safety in green design.

Examples

- Energy and Atmosphere Credit 4, Enhanced Refrigerant Management, disallows the use of suppression systems containing ozone-depleting materials. The fire suppression industry has supported this measure for years by

offering a variety of “clean agent” systems in addition to the more common water, foam and carbon dioxide fire suppression systems.

- Sustainable Sites Credit 6.1, Stormwater Design, Quantity Control, allows the use of nonpotable stormwater reclamation for fire suppression. The Center for Health and Healing at the Oregon Health & Science University (LEED Platinum rating) harvests both stormwater and pumped groundwater for use in its nonpotable water systems. The nonpotable water is stored in a tank large enough to meet both firefighting water requirements and nonpotable water uses.¹

Note that if nonpotable water is used in the sprinkler system, the design team may need to consider the potential for sediment build-up within the pipes or microbologically influenced corrosion, which can reduce the life span of sprinkler piping and can often only be controlled through the introduction of chemicals into the water supply, which may negate the building’s environmentally friendly design goals.²

- Sustainable Site Credit 7.1, Heat Island Effect, Non-Roof, can also employ fire protection methodology. The design team for the U.S. Census Building in Suitland, Maryland, (LEED Silver rating) desired an exterior wood screen on the facade of the building which, besides serving as a striking visual element, would act as a shading device for the wall. The applicable building code does not permit exterior wood elements to the height and extent imagined by the design team, so the National Institute of Standards and Technology (NIST) Fire Dynamic Simulator (FDS) software package was used to evaluate the screen to determine the conditions under which it might ignite.

The FDS model demonstrated that the screen could safely be installed on the exterior of the building, justifying a code variance that served to effectively reduce the heat island effect of the building.

- As use of straw bale construction expands, Materials and Resources Credit 4, Recycled Content, and Credit 5, Regional Materials, become applicable. Straw bale construction has been evaluated for up to 2-hour

Fire Protection and Life Safety (continued)

fire resistance using ASTM E-119 test standards.^{3, 4}

However, many building and fire safety code officials may be hesitant to allow such construction because straw is quite flammable in loose form.

As successfully demonstrated in the design of the Friends Community School in College Park, Maryland (LEED registered project), educating code officials regarding the safe use of straw bale construction may be necessary.⁵

- Providing under-floor ventilation as part of Indoor Environmental Quality (EQ) Credit 2, Increased Ventilation, may offer appealing fire protection design opportunities. One example might be the installation of automatic sprinkler piping within the subfloor system with the sprinkler heads penetrating the floor slab (with appropriate fire stopping), eliminating the need to install a false ceiling on the level below to hide exposed piping.

Note that the use of under-floor ventilation systems requires the review of fire barriers and partitions to ensure that they extend appropriately through concealed spaces—which could impair the effectiveness of ventilation delivery. In addition, depending upon

jurisdictional interpretation of the under-floor concealed space, installation of sprinkler or smoke detection systems may be required.⁶

- As demonstrated on Portland, Oregon's Brewery Block (one phase of which has achieved LEED Gold rating), natural ventilation worth LEED points under EQ Credit 2 can also be integrated into a passive smoke control system. In this case, CONTAM—an airflow modeling software program developed by NIST—was used to justify the use of operable windows in several high-rise buildings.

Atria

Perhaps the greatest opportunity for coordination between green building and fire and life safety protection is when a fundamental design goal is to provide natural light in compliance with EQ Credit 8, Daylight and Views.

Commercial buildings are often enhanced through the incorporation of atria surrounded by glazing systems that transfer daylight and views to interior work spaces. Building codes typically require that atria be separated from adjacent spaces by 1-hour fire barriers, but most allow glazing systems in conjunction with sprinklers which wet their glass surfaces or appropriate fire-resistant glazing as acceptable alternatives. It is, however, important to note that the extensive use of glazing in commercial buildings can affect the placement of fire detection and protection devices—many of which do not mount well on glass. In fact, this emerged as a major issue in the location of such required devices in the Genzyme Corporate Headquarters (LEED Platinum rating) in Cambridge, Massachusetts, and Sara Lee Knit Corporate Headquarters in Asheboro, North Carolina (proposed sustainable design).⁷

Building codes also typically require smoke control systems for atria. Although the codes offer prescriptive methods for calculating the necessary exhaust and make-up air in order to maintain the smoke layer 6 to 10 feet above walking surfaces, such calculations may not accurately account for the unique configuration of a specific atrium. In such instances—with the approval of the building official—performance-based design may be employed to reduce exhaust and make-up fan capacities and egress modeling may be used to justify the allowance of smoke layer descent lower than permitted by the building code as long as occupants can still safely exit the atrium. At the Oregon Health & Science University Center for Health and Healing, for example, timed egress analysis was combined with the use of parking garage exhaust fans during emergency conditions to provide the necessary exhaust capacity.⁸

Again, NIST's FDS program is an excellent tool, allowing the fire performance of an atrium to be modeled during the design stage—including exhaust and make-up air



capacities and sprinkler interaction to limit fire growth and predict tenability conditions (temperature, visibility and carbon monoxide concentration). For example, the design team for the Sara Lee Knit Products Corporate Headquarters employed FDS to justify the reduction of smoke control requirements from almost 2 million cubic feet per minute to 840,000 cubic feet per minute,⁹ and FDS was used in conjunction with advanced egress modeling software to justify variances in ventilation inlet and smoke detector locations for the atrium in the Portland Center Stage Armory Theater (LEED Platinum rating). In both projects, use of FDS contributed to the design of integrated fire protection and life safety systems whose performance exceeds that of the prescriptive code requirements under “real-world” conditions.

Conclusion

While effective fire protection and life safety engineering alone will not yield sufficient credits to achieve LEED rating, the impacts of sustainable design upon related code requirements cannot be ignored. By the same token, engineering analysis may help demonstrate that a sustainable design meets or exceeds the intent of the building code in terms of providing occupants a reasonable level of life safety protection during an emergency event. ♦

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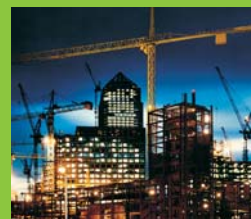


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From Ratings to Requirements: The Greening of Building Codes



THE 2030 CHALLENGE



by A. Vernon Woodworth, AIA, LEED AP

In response to the significant contribution of buildings to current greenhouse gas emission levels, the American Institute of Architects; the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE); the Illuminating Engineering Society of North America (IESNA); the U.S. Green Building Council (USGBC); and the U.S. Conference of Mayors—with support from the U.S. Department of Energy—have agreed to promote the goal of net zero energy building by 2030.

This ambitious initiative, termed the “2030 Challenge,” is just one among many springing up around the world as consensus builds that the environmental impact of human activity has altered natural systems to a point at which the future ecological stability of the planet may be at stake. In the U.S., an increasing number of cities, counties and states have made certification or certifiability under USGBC’s LEED (Leadership in Energy and Environmental Design) rating system a requirement for new publicly owned or funded buildings, and LEED certifiability is now being used in some jurisdictions as a condition for zoning approval of larger projects.

There is every reason to believe that this is only the beginning of a cultural shift that will lead to fundamental, positive changes in the way buildings are designed, permitted,

constructed, inspected and operated. In the near-term, however, good intentions alone will not necessarily produce the intended results.

Carrots and Sticks

Strategies for encouraging energy efficiency in building construction and operation can be classified within the broad categories of “carrots” and “sticks.” Carrots include tax credits and expedited project approval, and can encourage innovation and teamwork among owners, designers, builders and jurisdictions. Sticks, in the form of mandatory requirements that must be met to avoid delays or other penalties, have a tendency to discourage the investment of money, time or effort beyond that necessary to meet minimum standards.

Much of the success of the LEED rating system can be attributed to its incentive-based approach. Frequently cited as an outstanding model for voluntary market transformation, the program’s growing recognition has created additional incentives for building owners in the form of enhanced publicity and—potentially—resale value, designers are touting certification of their projects in an attempt to gain an edge over the competition, and numerous building products are now being developed and marketed for their value in achieving specific LEED points.

Of course the ultimate incentive for the majority of those in the building industry is doing the right thing for the local community and global environment, but recognition for one's efforts in support of sustainability is the icing on this particular "carrot cake."

What's New?

What would result from making LEED's energy efficiency prerequisites mandatory? While this may well seem to be the next logical step in the intended transformation of the marketplace, can such a system—initially conceived to be voluntary and flexible—be effectively adapted and adopted as a set of prescriptive requirements? If so, how might stripping the underlying driving motivation—the mantle of doing the right thing—from the building owner and design team impact compliance? Such questions can only be conclusively answered through experience: trial and, almost certainly, some error.

That is nothing new. Modern building codes are the result of centuries of trial and error, and energy efficiency provisions have been added over the past several decades as the societal and environmental costs of energy consumption became manifestly apparent. To the extent that they are prescriptive, these provisions can be interpreted and enforced. Nonetheless, the full range of variables determining energy efficiency remain complex and situation-specific. Climate zones, for example, rarely correspond to man-made jurisdictional divisions, and the concept of "embodied energy" (involving life-cycle analysis of building materials, fixtures and furnishings) is very much in its infancy in any quantifiable sense.

Similarly, computer programs that allow for the modeling and manipulation of envelope or even whole-building designs are important tools in the move towards performance-based energy efficiency requirements, but many of today's building departments lack the resources to independently evaluate the complex data generated.

What's Now?

ICC's integrated family of model codes has laid the groundwork for the next evolutionary step in responsible social policy for the built environment. The ongoing development of the *International Energy Conservation Code (IECC)* and proposed standards like the ICC/National Association of Home Builders (NAHB) *National Green Building Standard* (for residential construction) and ASHRAE/IESNA/USGBC 189, *Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings*, are making it increasingly possible for the full range of con-

cerns associated with sustainable and environmentally responsible building to be properly addressed.

With regard to the IECC, more performance-based methods can—and eventually will—be incorporated. The result will be a range of thresholds, up to and including the zero net energy goal envisioned by the 2030 Challenge, that will allow individual jurisdictions to designate achievable levels of energy conservation with few, if any, code amendments. This will in turn eliminate redundant or even contradictory regulations and levels of enforcement and bring us all that much closer to realizing our shared goal of providing a safe and sustainable environment for the generations that follow.

What's Next?

Realistically speaking, the current enthusiasm for "greening" the building codes exceeds our ability to apply appropriate regulations in a consistent, efficient and effective manner. The critical question, therefore, is whether or not we are up to meeting the long-term challenge.

It is clearly appropriate for regulatory bodies to offer incentives for environmentally responsible building wherever and whenever possible, but the establishment of means for assessing the value of such measures must be incorporated into the code development and enforcement process. At the same time, tomorrow's model building codes and standards must allow for the types of market-driven—most often performance-based—innovations that engendered them in the first place.

Will tomorrow's building codes be effective vehicles for sustainability, incorporating the best of successful voluntary programs like LEED and facilitating the pursuit of ambitious initiatives like the 2030 Challenge, or will permitting and construction become more burdensome as ever more authorities, agencies and evaluating bodies are drawn into the design, construction and operational processes? Only time will tell. ♦

A. Vernon Woodworth, AIA, LEED AP, is a Code Consultant with Robert W. Sullivan in Boston, Massachusetts; Chair of the Boston Society of Architects Codes Committee; and a member of the AIA Sustainability Discussion Group.

To learn more about the 2030 Challenge, go to www.architecture2030.org. The latest news about the development of the ICC/NAHB National Green Building Standard is available from the National Association of Home Builders Research Center website at www.nahbrc.org/GBStandard.



ASHRAE/USGBC/IESNA Standard 189 on High-Performance Green Buildings

by John Hogan, AIA, P.E., and Steve Ferguson

In early 2006, the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE); the U.S. Green Building Council (USGBC); and the Illuminating Engineering Society of North America (IESNA) embarked on a project to develop a standard for high-performance green buildings that would apply to all buildings except low-rise residential buildings (i.e., condominiums and apartment buildings three stories or less in height). This summer saw the fruits of this effort when ASHRAE/USGBC/IESNA Proposed Standard 189, *Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings*, was made available for public review.

The document is written in mandatory language, with Code Council staff acting as consultants to the Standard Project Committee, providing guidance on format and structure. The intent is for the increasing number of public and private organizations that use a green building rating system like LEED (Leadership in Energy and Environmental Design) to adopt Standard 189 as a baseline and, in the broader perspective, help project green building practices into mainstream consciousness.

Coordination with National Initiatives

The Standard 189 Project Committee (SPC 189) sought to incorporate criteria that will support current initiatives including, but not limited to, the following.

U.S. Federal Agencies

Through a 2006 memorandum of understanding, available online at www.epa.gov/greeningepa/content/sustainable_mou_508.pdf, 16 U.S. federal agencies have agreed to:

- reduce the energy cost budget for new buildings by 30 percent compared to ASHRAE/IESNA 90.1-2004, *Energy Standard for Buildings Except Low-Rise Residential Buildings*;

- use a minimum of 20-percent less indoor potable water than the Energy Policy Act of 1992 fixture performance requirements and reduce outdoor potable water consumption by a minimum of 50 percent over that “consumed by conventional means”;
- specify materials and products such as adhesives, sealants, paints, carpet systems and furnishings with low pollutant emissions; and
- “use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 10 percent (based on cost) of the total value of the materials in the project.”

The American Institute of Architects

In 2005, the American Institute of Architects adopted a position statement on high-performance buildings, available at www.aia.org/SiteObjects/files/HPB_position_statements.pdf, that they achieve a minimum 50-percent reduction from the current level of consumption of fossil fuels used to construct and operate new and renovated buildings by the year 2010.

The U.S. Conference of Mayors

The U.S. Conference of Mayors passed a 2006 resolution whereby:

- new city buildings will achieve a minimum delivered fossil fuel energy consumption performance standard of one-half the U.S. average for the building type; and
- Conference members will work to increase the fossil fuel reduction standard for all new buildings in their jurisdictions to 60 percent by 2010, 70 percent by 2015, 80 percent by 2020 and 90 percent by 2025, with the end goal being to have all new buildings be “carbon-neutral” (use no fossil fuel greenhouse-gas-emitting energy to operate) by 2030.

The full text of the “2030 Challenge” is posted online at www.usmayors.org/climateprotection.

Scope

Standard 189 addresses the same five major topic areas as the LEED rating systems—sustainable site development, water savings, energy efficiency, the effect of materials selection on the atmosphere and natural resources, and indoor environmental quality—and is intended to apply to the same categories of buildings covered by the *International Energy Conservation Code* (IECC) and ASHRAE/IESNA 90.1—residential buildings more than three stories in height and all nonresidential buildings.

Overview of Requirements

Also similar to the IECC and ASHRAE/IESNA 90.1, Standard 189 contains a series of mandatory provisions applicable to all projects as well as additional prescriptive and performance options for compliance.

Sustainable Sites

- Construction to take place on appropriate sites.
- Site development to provide means for managing and controlling stormwater.
- Projects to take steps to reduce heat islands to minimize the impact on the microclimate.
- Projects to reduce light pollution through luminaire cutoff requirements and outdoor lighting trespass limits.

Water Efficiency

- Site water use reduction through bio-diverse plantings, hydrozoning and smart irrigation controllers. Prescriptive and performance options would limit the area of landscape to be irrigated with potable water.
- Building water use reduction (generally, 20-percent lower than the 1992 U.S. Energy Policy Act) through criteria for plumbing fixtures and fittings, appliances, and HVAC systems and equipment. Prescriptive and performance options address water use in commercial food service and laboratory facilities.
- Requirements for meters, meter data collection, and data storage and retrieval to allow for informed operation of water systems.

Energy Efficiency

- Use of ENERGY STAR rated equipment and appliances.
- Projects to have a minimum percentage of on-site renewable energy power.
- Requirements for meters, meter data collection, and data storage and

retrieval to allow for informed operation of energy systems.

- Prescriptive option to achieve approximately 30-percent energy savings over current IECC and ASHRAE/IESNA 90.1 requirements.
- Performance option to address both annual energy cost and annual carbon dioxide equivalent.

Materials Selection

- Construction debris to be salvaged or diverted from landfill.
- Prescriptive option for reduced-impact materials to either have 10-percent recycled content, be 15-percent regionally processed or be 5-percent bio-based.
- Performance option for life cycle assessment.

Indoor Environmental Quality

- Additional outside air for offices and schools in accordance with prevailing ventilation codes or standards.
- Carbon dioxide monitoring for both mechanically ventilated and naturally ventilated spaces.
- Projects to comply with the thermal comfort criteria of ASHRAE 55, *Thermal Environmental Conditions for Human Occupancy*.
- Minimum sound transmission class (STC) ratings to control sound transmission from the exterior in areas with loud noises and between certain spaces.
- Daylighting through the use of skylights.

(continued on page 46)

DO YOU HAVE THE TOOLS TO KEEP YOUR BUILDING SAFE



The Fire Equipment Manufacturers' Association announces a brand new Life Safety Tool Kit with educational materials designed to teach you, building owners, managers, and others working in a commercial structure how to design a balanced fire protection plan. The Kit has all the tools you need to train others on how to use portable fire extinguishers, stand-pipe fire hose stations, and much more.

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Being Involved (continued)

with any suggestions or ideas. We anticipate active involvement in this important international association.

Looking Ahead

Since being appointed to lead these important initiatives at ICC, I have had the opportunity to travel to 11 cities in as many weeks and observe the inner workings of the organization and the sincere dedication of members and staff. I am invigorated and energized to see eyes light up with enthusiasm when I communicate the Board's vision for enhancing an already vibrant organization, and I am thoroughly impressed by the abundance of experience and genuinely believe that there is no organization with as much expertise in the field of PMG. There is a saying that "no problem can stand the assault of sustained thinking," and there is no question in my mind that there has never been a better time to focus our collective talents on the industry's ongoing and emerging issues.

While speaking at chapter meetings across the country, questions were asked about my experiences and my past.

My response—I have been in the mechanical and plumbing industry for almost 30 years. Sure, I am a tradesman. I've attained several journeyman licenses, a half-dozen contractor licenses, some inspector certifications and was a member of many associations, but I was only "in" the industry—now I am "involved."

How about you? I encourage everyone to submit applications for committees and explore the possibility of teaching courses. Are you interested in starting a plumbing chapter in your area? The opportunities to get involved are limitless, and ICC will support you completely.

With your help and involvement, we will provide a clear and concise PMG direction for the future. ♦



Jay Peters, ICC Executive Director of Plumbing and Mechanical Activities

The PMG Resource Center can be reached toll-free at 1-888-ICCSAFE (422-7233), extension 4PMG (4674), or via e-mail at PMGResourceCenter@iccsafe.org.

ASHRAE/USGBC/IESNA 189 (continued from page 37)

- Prescriptive and performance options for daylighting by windows.
- Prescriptive and performance options for the use of low-emitting materials in building interiors.

Additional requirements address subjects related to construction operation such as building commissioning, measurement and verification, and energy use reporting; and the development of plans for transportation management, durability, erosion and sedimentation control, and indoor air quality during construction.

Conclusion

There is a broad range of potential uses and users for ASHRAE/USGBC/IESNA 189. It could be used as the baseline for an individual project; by a corporation as the minimum standard for project development; by a university as the baseline for new campus facilities; or by a municipality, county or state as the baseline for expansion and infrastructure development. It could be adopted by local jurisdictions for use as an incentive in land use or zoning codes, and more progressive localities may even decide to use it as the baseline for all future development.

What can ICC's role be in all of this? Certainly, the development and eventual completion of Standard 189 offers

an opportunity to provide critical guidance in the green building arena by considering reference in the ICC family of *International Codes*. For example, using the model of 2006 IBC Appendix E, it could be employed to provide supplemental requirements for increased energy efficiency in the IBC or IECC. ♦

John Hogan, AIA, P.E., is the Chair of SPC 189 and a Senior Energy Code Analyst for the Seattle, Washington, Department of Planning and Development. He participates in state, regional, national and international work on energy codes and standards, and is a member of the ICC Energy Certification Exam Committee.

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For information about ASHRAE standards actions and announcements, including public review drafts open for comment, visit www.ashrae.org/technology/page/331#849.