

Building Codes for a Small Planet



BY DAVID EISENBERG, DIRECTOR, DEVELOPMENT CENTER FOR APPROPRIATE TECHNOLOGY

It's exciting for me to kick off the new year with the debut of this column in *Building Standards*[™] magazine. For the next twelve months, these pages will be dedicated to exploring emerging trends in the fields of green building; sustainable development; and alternative designs, materials and methods of construction. I'm honored to have been invited by the International Conference of Building Officials (ICBO) to represent this growing, dynamic and crucial segment of the design and building industry at a time so full of challenges and opportunities, and gratified by ICBO's continued leadership in responding to the burgeoning interest in these issues.

Some of you may already be familiar with me through my work as head of the Tucson, Arizona-based Development Center for Appropriate Technology (DCAT), and many others will recall the *Building Standards* issues featuring alternative materials that my associates and I helped compile over the past few years. For the benefit of the rest of you, I'll be using this initial column to provide a bit of background information about myself and DCAT. I'll also be sharing what I hope to accomplish with this column and be giving an overview of some of the things you can expect to see in upcoming issues.

BACKGROUND

I have over 20 years of construction experience across the spectrum of building technologies. As a construction superintendent and then as a general contractor holding both residential and commercial licenses, I was involved with jobs that employed many different technologies and materials—from masonry and wood to adobe, rammed earth and straw bale. That experience was as diverse as troubleshooting the construction of the spaceframe and glazing systems covering Biosphere 2 and overseeing the construction of a hypo-allergenic structural steel house for a woman with extreme chemical sensitivities resulting from her career as a research biochemist.

About ten years ago, several colleagues and I started DCAT to help create sustainable solutions to basic human needs through the development and use of "appropriate technology," which we define as the simplest or lowest level of applied science required to properly accomplish what needs to be done. This approach is distinct from the prevailing cultural bias that higher levels of technology are always superior, and that professionals are therefore obliged to use the most advanced methods and materials at their dispos-

al. In contrast, advocates for the use of appropriate technology are mindful that many so-called “advances” are necessarily accompanied by higher levels of unintended consequences. So while they almost always appear to be safer and more reliable in terms of the criteria they’ve been designed to meet, the reality is that the more complex the technology, the less we actually know—in many cases, the less we may ever know—about the risks inherent in its application.

The adoption of this broader perspective to the evaluation of building methods and materials leads to some genuinely eye-opening observations. For example, consider the fact that less than one-third of the six billion people living on the Earth today live or work in structures like those described by our current building codes. More than one-third of the population occupy structures of earthen materials like adobe, rammed earth, puddled earth, cob, or wattle and daub. The remainder use buildings made of other kinds of non-industrial indigenous materials, scavenged materials, or—in the case of many millions—no buildings at all. Yet even with only roughly a third of us using “modern” buildings, construction accounts for about 40 percent of the material resources flowing through the global economy . . . and a similar proportion of the various negative environmental impacts.

Should we encourage the other two-thirds of the world’s people to build in the resource-, waste- and pollution-intensive ways that are tacitly endorsed by our current codes and standards, or do we need to rethink what we’re doing and how we’re doing it? The foremost and overarching mission of the codes is to protect the public health, safety and general welfare. If we accept that the ways we now build our structures are not only not sustainable but actually contribute to the undermining of the Earth’s natural systems, it becomes incumbent upon every stakeholder in the code-development process to actively pursue measures to correct the situation.

GOALS

What I hope to accomplish with this column is the establishment of an ongoing discussion on the wide range of emerging issues related to green building; sustainable development; and alternative designs, materials and methods of construction. To assist me, I’ll be inviting some exceptional people as guest columnists to write about ideas, organizations or technologies that I believe merit attention. These might relate to DCAT’s work with ASTM International to develop standards for earthen building materials; they might be about

green building programs, requirements integrated into local or state laws as special requirements for certain projects like government buildings or schools; or they might provide highly technical and specific coverage of an alternative technology. I also hope to be able to share contributions from code officials who have experience with related subjects and can pass on valuable insights.

One thing that will remain constant is my commitment to making this column a source not only of information but inspiration. What I ultimately hope to promote is the idea that codes, code officials and building departments are community resources which can foster and facilitate the best in design and building practices, not merely prevent the worst. One of the most important insights I've come to is the realization that DCAT's goals closely parallel those of building officials. We all want safe buildings but recognize that there are risks associated with many mainstream practices that threaten to jeopardize our ability to pass on a safe and sustainable world to our grandchildren and their grandchildren. The hundreds of building officials I've spoken to who endorse these goals, including leaders like Jon Traw and several current and past ICBO board members, have served to affirm and encourage DCAT's mission of building sustainability into the model codes.

WHAT'S IN THE PIPELINE?

The next issue of *Building Standards* will mark the third in as many years to feature alternative building methods and materials. Expect to see articles addressing green building programs, the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) green building rating system, daylighting, integrated design, and water resource issues. I'll also be reporting on the results of the DCAT survey that many *Building Standards* readers participated in this past summer on the subject of green building and the model codes.

Of course, I'd be very interested in hearing about specific topics you, the readers, would like to see covered. This is a broad field, and I look forward to sharing the best and most useful information I can in order to help make the crucial transition to sustainable building as smooth as possible.

A FINAL WORD

Since the beginning of my involvement with building codes, I've been meeting wonderful officials and administrators who recognize the importance of sustainability—chief among them being the late Bob Fowler. For those who may have missed it, I highly recommend the interview of Bob and me that appeared in the January 2000 *Building Standards* article, "An Alternative Future for Building Regulation" (available on the ICBO website), for an idea of how strongly he felt about this effort and a more in-depth description of DCAT's origin and activities.

I want to conclude by dedicating this and future "Building Codes for a Small Planet" columns to Bob, whose unwavering commitment to incorporating sustainability into the model codes was a source of continuous inspiration. Bob's recent passing leaves an enormous void, but I—like thousands of others who knew him—will be forever grateful for the opportunity to benefit from his friendship, integrity and wisdom. He was one of those rare and valuable individuals: a "practical visionary." ♦

A professional member of ICBO, David Eisenberg co-authored The Straw Bale House and helped write the first load-bearing straw bale construction building code for Tucson and Pima County, Arizona. He can be contacted by phoning DCAT at (520) 624-6628 or via e-mail at david@dcate.net. For more information about DCAT, direct your browser to www.dcate.net.

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Building Codes for a Small Planet

BY DAVID EISENBERG, DIRECTOR, DEVELOPMENT CENTER FOR APPROPRIATE TECHNOLOGY

The purpose of developing, adopting and enforcing building codes is to manage risk and uncertainty, not guarantee against building failure. The codes are sophisticated guidelines based on accumulated knowledge about what does and does not work. While highly informed, they are still best guesses based on assumptions of certain general conditions, reached through a process that attempts to balance numerous, sometimes conflicting, needs and demands. Code requirements are continuously evolving as we learn more, deal with failure and innovation, and shift our focus based on new awareness of problems, opportunities and responsibilities, with the overall goal being to protect the public by establishing minimum safety requirements for the built environment.

One area of concern is the growing realization that what is required to make buildings safer often creates harm and risk elsewhere. We all become less safe when we deplete finite resources and undermine the health of the natural systems that support life, and we are beginning to see that the health of these systems is crucial to the health and welfare of current and future generations. With this perspective, we can then acknowledge that we cannot simply make buildings safer without seeing what is connected to what we do. The fact is that we constantly jeopardize some lives to protect others and destroy some things to create others. Only by recognizing and balancing all the risks—including those we are trying to avoid and those we inadvertently create elsewhere or defer to future generations—can we fully discharge our responsibility to protecting the public safety, health and general welfare.

The connection between building and planetary health is undeniably becoming more apparent as we will be joined by an estimated minimum two billion more people this century. Without considering rising standards of living, this population growth alone will have enormous economic and social impacts and force us to completely rethink the way we do almost everything, including sheltering ourselves. Among human activities, building has one of the greatest environmental impacts—matched only by transportation and agriculture—so responsibility for regulating the built environment is critical to guiding our society either toward or away from a sustainable and healthy future.

A common focus with regard to sustainability is addressing the increasing demands on diminishing natural resources. We must come to recognize that ecosystems are far more than just resource banks—that our survival and well-being are unalterably tied to our dependence on the services that nature provides such as purifying and recirculating our air and water, regulating the global temperature, creating topsoil and maintaining soil fertility maintaining the health of forests, maintaining the health of ocean ecosystems and fisheries, and pollinating plants (including virtually all of our agricultural crops).

As technically proficient as we have become, we have yet to officially acknowledge this fundamental scientific and practical reality. Our best scientists do not really understand how these systems work, and our most sophisticated technologies do not come close to doing what nature does with such apparent ease, efficiency and splendor.

Most importantly, we have yet to comprehend the extraordinary opportunity we now face. We are capable of seeking and creating sustainable and even regenerative systems to meet our needs, but we first need to see what we are doing, where we are heading and what we are risking. Only then might we be able to adopt a more objective perspective and find that we have the will, integrity and—most importantly—the authority to act in support of such a transition.

Nature has no perfect preconceived plan or destination, but there is a code that has guided the Earth's natural systems for over three-and-a-half billion years. Nature does not create two trees exactly the same but rather sets out a general pattern for structure, function and relationship. The individual trees respond throughout their lives to the actual places, conditions and relationships that exist in their immediate environment. Nature's code is totally responsive to reality, not to abstract ideals. At its core lies an affinity for life, inter-

connectedness, diversity, and the health and well-being of the entire system. We cannot repeal the laws of nature, and the fact that this "alternative" code remains in force means that we still have the ability to begin to design, collaborate and work with instead of against them.

Our building codes need to evolve and shift toward a more performance and proscriptive basis (proscriptions take the form of "Thou Shalt Not . . ."). Performance criteria could be developed for what we want to have happen and proscriptions would serve to protect what needs to be protected. We could create a more responsive, less standardized and rigid approach to building safety—with tenets firmly embedded in places, communities and ecosystems; in knowledgeable responses to local resources, skills, traditions and economics—all in an effort to more fully comprehend and minimize risk and protect public welfare.

Our focus on industrialization and standardization has kept us from seeing the perils of abstraction. By having placed our faith in generalized ways of viewing things, we have come to believe that we can do the same things everywhere with the same results. In spite of overwhelming evidence to the contrary, we continue to design our human systems as though it makes no difference how, by whom or where they are to be used. Depending on technology, resources and cleverness to make up for any discrepancies, only minimal concessions are made to the importance of place, real versus idealized conditions, and actual lives versus hypothetical occupants.

The paradox is that although today's sophisticated information technology could enable us to apply much greater attention to the specifics of place and circumstance, we use it to process greater amounts of work at the same level of abstraction. Vinyl coated drywall, for example, was developed for modular and manufactured housing and works well in the northern, colder climates in which it was originally used but has proven highly problematic in the hot, humid climates of the Southeastern U.S. In the north, this system keeps warm, moist, interior air from migrating outward and accumulating in wall and ceiling cavities. The same assembly creates a serious health and safety problem when built in the south as the different climate means the moisture barrier is on the cool, interior side of the building envelope, thereby trapping moisture from coming through from outside at the interface between the vinyl and the gypsum. This creates a perfect environment for mold and fungal growth.

What does this all mean for the future of building codes? I invite you to consider that the future starts with

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(continued)

the next set of plans that comes across the counter in your jurisdiction. Will that building enhance the well-being of everyone in the community? Will the materials used be from sustainable or renewable sources or processes? Will it be easily maintained, repaired, remodeled, reused, disassembled and recycled? Will it be beneficial to the landscape in and on which it sits?

Even more importantly, if that set of plans includes natural "alternative" materials or elements intended to save water or energy through the implementation of passive or alternative methods for lighting, ventilation, or heating and cooling, will it get a better or worse reception as it goes through the review and approval process? Will the process support or hinder the shift to more sustainable and responsible building and development?

When confronted with unfamiliar designs or technologies, caution is certainly an understandable response. When faced with the known risks inherent in the unsustainable designs and technologies of mainstream building—practices that unquestionably threaten the quality of life for our children and grandchildren—should we be any less concerned?

The future of building codes is in all of our hands. The process of change is wide open and the need for leadership is profound. Code officials and building departments can become community resources for this transition. The solutions do not reside in the codes themselves, but in the hearts and minds of tens of thousands of caring, committed people awakening to broader responsibilities and greater possibilities for creating the type of future that we all desire. ♦

*A professional member of ICBO, **David Eisenberg** co-authored *The Straw Bale House* and helped write the first load-bearing straw bale construction building code for Tucson and Pima County, Arizona. He can be contacted by phoning The Development Center for Appropriate Technology (DCAT) at (520) 624-6628 or via e-mail at david@dcate.net. For more information about DCAT, direct your browser to www.dcate.net.*

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Building Codes for a Small Planet

by David Eisenberg, Director, Development Center for Appropriate Technology

Much of our work at the Development Center for Appropriate Technology (DCAT) is prompted by the conviction that the building regulatory sector needs to change in order to facilitate and promote sustainable building practices. Some of these changes need to be to the codes themselves, but what most needs to change is what we think about as we write, use and enforce them. If we could see what actually happens as a result of our decisions and actions, we would act differently and make different choices. In the process of making decisions about changes in codes or considering individual approvals of buildings, how often do we stop to consider the real consequences of what we are requiring people to do?

There is probably a pen within your reach right now. Pick it up and look at it. What do you really know about its origin? Where did the various materials used to manufacture it come from? What are their constituent chemicals, processes and byproducts? Where were they assembled and what is the waste stream like? How much energy was required to assemble the pen and get it to you? What would the map of the trips all the molecules in that pen took to arrive here in your hand today look like? What will happen when it runs out of ink or you no longer want it? Now ask these same questions about something as large and complex as a building.

When we are thinking about new requirements to improve building safety, we should also be thinking about the millions of times those changes would need to be carried out. What will flow from our decisions—not only when an affected building is being designed and built and not only at the site of the building, but throughout the life-cycles of the building and the products, materials and systems used to construct, maintain and, eventually, demolish it? These types of considerations are all-too-rarely part of the way any of us think about buildings, regardless of our roles in relation to them.

To make truly informed decisions about buildings, we need to look at the full range of consequences of our choices. There are impacts from the acquisition of all the resources needed to produce the materials, equipment and systems that go into a building; impacts from their transportation (typically interwoven with multiple stages of processing and distribution); impacts from the assembly of all those components into the building itself, including the

waste generated and the energy and materials used; and impacts from the ongoing operation of the building, including heating, cooling, ventilating, lighting, maintenance, repairs, and any remodeling or redecorating that will occur over the life of the building. Finally, we need to consider the impacts when the building reaches the end of its useful life. Will we have to deal with toxic materials? Can the building's components be disassembled and reused, or will they be destroyed or damaged in disassembly and end up in landfills, or perhaps be recycled?

Once aware of this larger set of impacts and concerns, we will recognize in many of them the potential for significant risks to public health, safety and general welfare. After we have identified these possible risks, how do we begin to incorporate them into the decision-making processes for codes? If associated with a legitimate part of building regulatory responsibility, what is the appropriate role for the building regulatory community in facilitating the process of reducing and reversing larger and longer-term risks? In particular, how can this be accomplished given that codes do not mandate what is built or how, only that the results meet minimum requirements for public health, safety and general welfare?

Take, for example, energy codes and their role in supporting general welfare. Such codes are often not considered to be related to health and safety, but when considered from a life-cycle perspective building energy usage is, in fact, a pertinent concern. If we posed our previous set of life-cycle questions we would apprehend the enormity of energy use related to buildings. Such use has major environmental impacts and competes with resources for maintaining our food production and distribution systems, our transportation systems, and the other vital uses. Energy codes are therefore a legitimate life-safety matter—as central to our responsibility for protecting the public as any other aspect of the codes.

Successfully incorporating this awareness into building regulation will be an ongoing process. The first step is to fully acknowledge the risks inherent in current practices and accept the need for change. Next, we need to set goals and develop a clear vision of what sustainable building and development might look like, then envision a regulatory framework that would facilitate moving toward it as rapidly as possible. Finally, we will need to develop and

implement workable strategies and mechanisms for the transition from where we are now to that vision of the future.

With the help of the International Conference of Building Officials® (ICBO) and the International Code Council® we have already begun this process. There is growing recognition of the need for change, and part of the vision and some of the transitional strategies already exist. This regular column and the three past issues of *Building Standards*™, which featured alternative materials and green building are indicative of that recognition within the building regulatory sector, and ICBO's becoming the first code group to join the U.S. Green Building Council (USGBC) further demonstrates its commitment and leadership.

In addition, regional green building programs and the USGBC's Leadership in Energy and Environmental Design (LEED) program are examples of real and effective transitional strategies and mechanisms. (Articles detailing each of which appear in the March–April, 2002, issue of *Building Standards*.) Programs like these lead us toward recognizing the full set of concerns we should consider when designing and building new buildings or renovating existing ones. They embrace a wide range of concerns including site-related issues, water conservation, energy efficiency, indoor environmental quality, materials, resource efficiency, waste reduction, recycling and reuse, and promoting integrated design processes. They also help focus attention on the whole lifecycle of buildings.

The LEED rating system has been gaining rapid acceptance as a national standard for evaluating the environmental performance of commercial and institutional buildings, and efforts are well underway to develop a LEED residential program. A number of jurisdictions (and a few government agencies such as the U.S. General Services Administration) have adopted the existing program as a requirement for their own buildings, making LEED certification part of the legal requirements for certain buildings in those jurisdictions.

In Seattle, Washington, for example, all municipal building projects must meet the LEED criteria, meaning that the building department must be able to process some highly innovative, high-performance designs, materials, equipment and systems. In Seattle and other cities like Portland, Oregon, features like waterless urinals, composting toilets, vegetated roofs, pervious pavement, building-integrated photovoltaic panels, fuel cells, natural ventilation, passive heating and cooling strategies, and raised floor systems are becoming much more commonplace in new municipal buildings.

John Guenther, the building official for San Diego County, California, and I co-chair the USGBC Greening the Codes Committee. This committee is in the process of



developing a survey for all LEED registered projects in order to gather information on code-related challenges and solutions. One goal is to use the resulting information to create a code-compliance guide for LEED projects. We also plan to develop code change proposals as needed, and hope to develop a cooperative relationship with ICC to jointly create training and educational resources for building departments.

As always, we invite the participation of code officials. Please e-mail Loretta Ishida at loretta@dcatt.net if you are interested. If your jurisdiction would like to look into joining USGBC, I encourage you to visit their website at www.usgbc.org. ♦

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Building Codes for a Small Planet

by Kelly Jon Andereck, Environmental Coordinator, Skidmore, Owings & Merrill LLP

Introduction

When I began this column, I mentioned that from time to time I would have other people share their thoughts about various topics related to the shift to more sustainable building practices. For this installment, Kelly Jon Andereck, Environmental Coordinator for Skidmore, Owings & Merrill LLP, one of the world's most prestigious architecture, engineering, interiors and planning firms, writes about some significant changes taking place in the commercial and institutional building market.

Investors and responsible businesses are beginning to realize that higher returns are likely with businesses that are committed not just to their own sustainability, but to the sustainability of communities, the environment and longer-term economic stability. This growing awareness is showing up as building owners and users demand more sustainably designed and constructed buildings and those in the financial investment sector become more savvy about what the real risks and benefits are for higher-performance, green buildings. We should expect this trend to continue for the foreseeable future as the true value of taking care of the things that matter is recognized as taking care of business.

*David Eisenberg
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The Times They Are A-Changin': The Evolving Environmental Marketplace

When it was released in 1964 many considered Bob Dylan's song, "The Times They Are A-Changin'," an anthem for the protest movement.¹ Many of us can still hear and feel the dynamic social change of the time, and in writing on the subject of the evolving environmental marketplace as it applies to the building community, I could not help but think of Dylan's plea that we must all get involved because "the chance won't come again." Fortunately, as developers plan and strategize in this current marketplace, intent on focusing and capitalizing on high security, telecommunications and high-quality power, many continue to seek environmental solutions if there is a cost benefit.

At least partially as a result of the federal government's movement towards environmental management, procurement and stewardship for its buildings, the broader building community is seeing first-cost benefits, resulting in more private-sector clients seeking environmental performance goals such as higher efficiencies, reduced construction waste and properly designed interiors. For example, an increasing number of clients are asking for studies on the benefits of daylighting and encouraging design decisions that favor products produced within a 500-mile radius of a project, thereby increasing the environmental benefit of the product and bringing a potential marketing benefit to the project.

The benefits of environmentally sound design and construction often show up in operations and maintenance as well as reduced absenteeism and worker's compensation complaints and filings (which can translate into increased productivity and increased sales figures for retail businesses). Studies conducted for the California Energy Commission; the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; and the European Union all show quantifiable benefits to energy-efficient and environmental design. Prompted by the results of such studies, some of

our clients have encouraged us to push far beyond sound sustainable or “green” design to the leading edge of benign environments and architectural design.

For more evidence that the times they are a-changin’ from a post-industrial to an eco-economy, consider the Dow Jones Sustainability Index: a new set of indicators of industry-wide best practices developed to analyze and quantify companies’ overall strategies for and management of sustainability opportunities, risks and costs. The creation of the index, which evaluates factors including innovation, governance, employee retention, environmental performance and other stakeholder interests, clearly demonstrates that large financial institutions are beginning to recognize the link between sustainable business practices and long-term shareholder value.

Motivations for investing in sustainability vary, but two key elements stand out. The first is the concept of corporate responsibility, which is tied to the integration of economic, environmental and social factors into business strategies. This trends toward long-term shareholder value, increasing value to potential investors. According to the Sustainability Index, “because corporate sustainability performance can now be financially quantified, they now have an investable corporate sustainability concept.”²

The second element that may interest an investor is the trend toward superior performance and better risk-to-return profiles than the typical investment. According to the Naturalist Network, the stock market performance of environmentally sensitive or “green” stocks outperformed others by 17 percent and, “. . . investor returns can be substantially improved by investing in companies with superior Eco-efficiency.”³ What this has meant to those in the business of developing, designing and constructing buildings is a significant and increasing demand for greener buildings and better environmental performance for the simple reason that they make good business sense.

As with all new and innovative design techniques, the real leadership in the field of sustainable building practices must come from those whose responsibility it is to carefully and impartially weigh their costs and benefits: designers, engineers and public officials. Our personal experiences and fields of professional expertise may vary, but the common threads of education, involvement and foresight should prompt us to point out to investors, other members of the building industry and consumers alike that, in Dylan’s words,

*If your time to you
Is worth savin’
Then you better start swimmin’
Or you’ll sink like a stone
For the times they are a-changin’.* ♦

Notes

1. “The Times They Are A-Changin’.” Bob Dylan. 1963, renewed 1991. Special Rider Music.
2. Dow Jones Sustainability Index. www.sustainability-index.com/sustainability/investment.html
3. “Annual Stock Market Outperformance of 17% is Achieved by Environmental Leaders in the Global Pharmaceutical Sector.” E-Wire. June 27, 2002. www.ewire-news.com/wires

Kelly Jon Andereck brings more than ten years’ experience in technical architecture and design to Skidmore, Owings & Merrill LLP. A specialist in sustainability, building performance, daylighting and the environmental marketplace, Andereck’s design projects range from Imagineering’s Euro-Disney to low-income housing in Southern California. He has also volunteered his work for projects such as the design of Playhouses for Friends, built to benefit The Easter Seal Society, and ongoing work for the U. S. Green Building Council, the State of Illinois, Cook County and the City of Chicago.

A graduate of California State Polytechnic University with a bachelor’s degree in architecture, Andereck has also conducted postgraduate work at the University of California, Los Angeles, mastering in architectural technology.

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