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## The Natural Building Movement

Feature - *Environmental Building News* May 2005

Building materials have undergone a breakneck evolution in the past century. Standard dimensions and shapes, predictable qualities, and manufactured precision make it quicker and easier to design and construct new buildings with laser-flat walls, straight and sharp corners, and glass-smooth floors. For most people, the more crisp, precise, and shiny a building is, the more perfect it is. However, there are those who feel that the increased standardization and predictability of building materials has resulted in our built environment becoming sterile, uninspiring, and uninspired. That's not really a revelation; half a century ago, Frank Lloyd Wright wrote that "new machine-age resources . . . [do] not require that all buildings be of steel, concrete, or glass."

The symptoms of boring architecture are treated in many ways, often by adding more architecture. In a paper titled "Using Less Wood in Buildings," Ann Edminster, architect and principal of Design AVenues and co-chair of the U.S. Green Building Council's LEED Homes committee, wrote that "fussy, trendy, anachronistic rooflines, cupolas, and turrets [in] contemporary subdivisions are palliative attempts at endowing these spiritless developments with aesthetic substance." Inside, occupants spice up bland interiors however they can.

By contrast, the stimulating charms of pre-industrial, "old-world" construction and indigenous architectures include a nonuniform visual character inherent in the materials and processes used. The irregularity of the underlying materials contributes in unexpected ways to both finish and structure. Light catches and plays on hand-plastered walls; subtly imperfect floors offer sensory interest; unusual corners lend variety.

Combining this aesthetic with excellent thermal performance, longevity, occupant comfort and satisfaction, and a keen eye toward deep environmental concerns—and the ability to do it cost-effectively—is a challenge that the natural building movement endeavors to meet. But an aesthetic appeal is certainly not the only driver—many natural buildings are virtually indistinguishable at a glance from normal construction; they have flat walls, distinct corners, normal roofs. This is true of contemporary and historic examples alike.

This article takes a look at the resurgence of natural building over the last decade. It looks at some of the movement's current underpinnings, emerging aspects, and philosophies that are of interest to the broader mainstream green building community. See sidebar for



Photo: Sarah Machtey

*Looking out a window and door of a stone home in East Meredith, NY, built by Clark Sanders, builder and teacher of strawbale, cob, and other natural materials.*

a brief description of many of the more common natural building materials and techniques.

## Natural Building, Green Building

The term natural building has commonly come to mean using local, pre-industrial building materials and techniques whenever possible. These primarily include rough wood, clay and sand, stone, and—the most ballyhooed material of the movement for some time—straw, usually baled. Cob (a monolithic, hand-formed cousin of adobe) captures the imagination of many for its sculptability and earthiness. Earthbags (flexible-form rammed earth using polypropylene sandbags) have increasing visibility and use in the movement. Cordwood construction (using short lengths of unmilled wood as masonry units) is a recognized option with owner-builders in forested environments. Salvaged and repurposed detritus, such as car tires, junk mail, and broken concrete chunks (“urbanite”), is sometimes included under the natural building flag as well. The list also includes such natural material systems such as clay plasters, earthen floors, thatch, and dry-laid stone foundations. Traditional techniques that have maintained a contemporary presence, such as timber framing, unmilled logs, adobe, and rammed earth are also considered natural building.



Photo: Sarah Machtey

*Adobe house built in 1846 for Theodore Irving, nephew of Washington Irving (author of *The Legend of Sleepy Hollow*) on the shore of Seneca Lake in Geneva, NY.*

Each material and method has advantages, limitations, and its own set of requirements for appropriate use. Modern materials, products, and tools that can enhance performance, longevity, safety, healthfulness, and buildability are generally incorporated; but the emphasis is on using the lowest and most benign technology to best achieve what needs to be done.

Though it causes some members of both communities to bristle, natural building can easily be considered a subset of green building. At the very least, there’s a significant overlap.

Presentations at green building conferences routinely detail elements that natural builders cling to: sessions on holistic design, real energy costs, and even *wabi sabi* (a Japanese aesthetic typified by humble, rustic imperfection) mirror some of the permacultural (fully integrated designed ecosystems), conservation-minded, and aesthetic approaches of natural building. But the connection runs deeper than that. Speakers detail the role of structural and finish materials in passive conditioning; describe the use of natural ventilation and humidity control; delve into passive heating and cooling; outline human-centric design—concepts that are also at the root of well-executed natural buildings. Other considerations at the core of both natural building and the broader green building world include siting, appropriate material use, minimal embodied energy, low energy use, occupant comfort, and eventual reuse or low-impact disposal.

A growing number of natural builders are evolving increasingly complex understandings of how basic materials behave individually and collectively as building systems—their moisture tolerances and behaviors, energy flows, and structural limitations—and are

reconnecting that building science with simple know-how.

### **Science + craft**

“There’s so much knowledge that’s been lost in such a short time. Just in the last hundred years, we’ve lost that artisan craft of building that was passed on, generation to generation. A big part of natural building is reconnecting with that; but at the same time, we’re still moving forward,” Doni Kiffmeyer, coauthor of *Earthbag Building: The Tools, Tricks, and Techniques*, told *EBN*.

Natural builders are rediscovering traditional knowledge and applying today’s more sophisticated understanding of the underlying physics and chemistry as they meld old techniques with new innovations. But even with the benefit of both old and new wisdom, there are significant challenges in using traditional materials while meeting modern expectations of comfort, durability, and low maintenance. Some traditional building systems were successful over time because the materials allowed heat and vapor to move through relatively freely; as those flows are constrained to improve energy efficiency, moisture can become trapped and durability can suffer.

#### **Sidebar:**

**A brief overview of a number of the more commonly recognized, though not always commonly used, traditional and contemporary natural building materials and techniques**

Tim Owen-Kennedy, cofounder of Vital Systems in Ukiah, California, told *EBN*, “The building-envelope science of natural building is just amazing.” He sees the evolution of a truly appropriate technology emerging from the marriage of simple, low-tech systems with serious building science. “Working with materials that people question, like cob and strawbale and earth plasters—things that raise concerns about longevity and moisture issues—causes you to re-examine the whole picture of it,” Owen-Kennedy notes, adding: “That’s improved me as a conventional builder and pushed me more and more towards natural building. At this point, I’m full-time with 20 people on the payroll, all doing natural building.”

### **The Economics of Natural Building**

Natural building materials and techniques are generally low in cost but high in labor—making them most appropriate for small structures, built with lots of cheap time and muscle, usually provided by the owners. Brent Katzmann of Balance Studio in Ithaca, New York, told *EBN*, “One of the things that many of us are trying to uncover is the economics of building with natural materials. You replace the efficiency of mass production with the efficiency of local gathering of materials. The balance shifts from material expense to labor expense.”

Claims that natural buildings are very inexpensive and simple are generally overblown, particularly when those buildings are expected to meet contemporary expectations of housing. Such



Photo: Mark Piepkorn

*A paddle mixer being used to mix lime-stabilized earthen plaster. The mixed plaster is stucco-pumped onto waiting strawbale walls.*

assertions are less common than they once were. The natural building materials most commonly cited lend themselves particularly to the walls of a house, which typically represent just 7–15% of the cost of a structure—savings in these cases don't account for the foundation, roof, windows and doors, mechanical systems, or any level of finish.

### ***Natural builders: for hire***

In spite of the potential for high labor costs, a number of design-build, general, and specialized contractors are making a successful, cost-competitive go of it in natural building. Log-home, timber-frame, and (in the Southwest) adobe builders have long been around; more recently, rammed-earth contractors have been on the rise. Just in the last few years, the number of builders plying the strawbale trade has mushroomed, and a new breed of builders-for-hire with offerings of cob, straw-clay, and natural plasters is popping up.

Better understanding of how to work with these materials in a capacity where the financial bottom line is a big motivator has been evolving. “I think that there's a defunkification going on. Not necessarily an aesthetic one—that comes and goes—but in terms of coming up with quality details that are buildable for a reasonable price,” says Paul Lacinski, co-owner of GreenSpace Collaborative in Ashfield, Massachusetts, and coauthor of the book *Serious Strawbale*.

In addition to devising techniques that are both simpler and better than the best practices of just a few years ago, some natural builders have begun harnessing mechanization—to the dismay of some natural building purists. Earthen and lime plasters, batched in paddle mixers, can be spray-applied. Motorized tumblers can mix straw or woodchips and clay (*leichtlehm*). Bobcats and rototillers can be used to mix cob.

“Since we have the right equipment to be able to do large-scale work, we can come in at a price competitive to stress-skin panels,” Mark Hoberecht, a principal of HarvestBuild, Inc., in Columbia Station, Ohio, told *EBN*. “All the benefits of the textures you get, the curved walls, the undulations—we can offer those at no extra cost, where the people that do standard construction just can't without charging a premium.”

Sometimes contractors get paid well for putting in lots of time working with natural materials. Rob Roy, director of Earthwood Building School in West Chazy, New York, and author of several books about building, told *EBN*, “There are clients with money out there. Willie Nelson had a beautiful cordwood house built for him; Dennis Weaver had an earthship made for him. There's room at both ends of the economic scale.”

Natural building is happening in the commercial sector as well. The 26,000 ft<sup>2</sup> (2,340 m<sup>2</sup>) administration building for the new \$18,000,000 Santa Clarita Transit Maintenance Facility in California features exterior walls infilled with straw bales, lime-plastered on both sides. HOK is providing full architectural services for the project. Tom Nelson, a vice president and senior project designer in HOK's Los Angeles office, told *EBN*, “I believe that this is the first strawbale project to pursue a LEED rating. And as far as I know, it will also be the largest strawbale commercial structure ever built.”

Having a powerhouse like HOK involved lends legitimacy to strawbale construction; but there have been, and very likely still are, inexperienced contractors offering services in

natural building, just as there are in green and conventional building. Many have come and gone—hanging out their shingles with seemingly little more thought than “how hard can it be?”—only to find that working with unfamiliar, nonstandardized materials that are by turns fussy and forgiving, using outdated techniques and incomplete knowledge, led to poorly performing, unhealthy buildings that they made no money working on. There have been failures. There have been lawsuits. There will be more. In the building industry, that’s nothing new.

### Building Codes

Building codes are perhaps the biggest hurdle to natural building. The International Building Code and International Residential Code from the International Code Council (ICC)—like the earlier building codes from the Building Officials and Code Administrators International, Inc. (BOCA), International Conference of Building Officials (ICBO), and Southern Building Code Congress International, Inc. (SBCCI)—contain provisions for alternative materials and methods not covered by the prescriptive guidelines. However, local code-enforcement representatives have the final say—and while some are open-minded or even enthusiastic, not all of them are eager to deal with anything out of the ordinary. Sometimes, all a building official wants are plans stamped by an architect or engineer.

Sigi Koko, principal and owner of Down to Earth, has had a number of strawbale structures—one with cob features, one with earthen floors, and most with earthen and lime plasters—permitted in the Mid-Atlantic (including suburban Washington, D.C.), with no problems getting code approval. “I make sure the officials know that they can ask me absolutely any question, and I’ll respond,” she told *EBN*. “In one county in Maryland, I had to prove things like dimensional stability and fire-resistance; they initially wanted the tests repeated three times—after the first round, they gave me the go-ahead. It clearly exceeded expectations.” (See the “Checklist for Gaining Approval for Alternative Designs, Materials, and Methods of Construction” in *EBN* Vol. 10, No. 9 for advice on working with building officials.)

Where it’s been adopted, ICC’s Performance Code for Buildings and Facilities, rolled out in 2003, presents another option: rather than specifying *how* to achieve the intent of the code, it describes *what needs to be accomplished*, giving a clear basis from which to proceed. Either process has the potential to be expensive and aggravating, likely requiring accredited materials-testing facilities and engineering studies.

Some municipalities and states—including Austin, Texas; Boulder and Cortez, Colorado; Pima County, Arizona; and the states of California, New Mexico, and Nevada—have adopted prescriptive codes for natural building materials, principally strawbale. Though



*The new Santa Clarita (California) Transit Maintenance Facility features a 26,000 ft<sup>2</sup> (2,340 m<sup>2</sup>) administration building with strawbale-infilled walls, lime-plastered on both sides. HOK is providing full architectural services.*

#### Sidebar:

[Finding Out More](#)

initially helpful, those codes are considered flawed by some natural builders, who feel that they keep techniques frozen in place long after they've been improved or even abandoned. For instance, most strawbale codes require rebar pins to be pounded through the center of a wall as it's built; while this lends some stability during construction, it adds no real structural value to the finished wall system, and other methods offer increased stability and ease of installation. In another longstanding example, adobe codes often require the use of cement-based plasters, which can trap moisture and lead to structural failure. Many builders have requested and received variances from established codes.

David Eisenberg, director of the Development Center for Appropriate Technology (DCAT) and an *EBN* advisory board member, has led efforts to reform building codes to address issues of sustainability (see *EBN Vol. 10, No. 9*, "Sustainability and Building Codes"). His work led the trade journal of the International Conference of Building Officials, *Building Standards*, to devote three issues—in 1998, 2000, and 2002—to alternative building materials and processes, including natural building materials; copies of these articles are archived at DCAT's website, [www.dcat.net](http://www.dcat.net).

Eisenberg is also a regular columnist for *Building Safety*, the journal of ICC. In a recent "Building Codes for a Small Planet" column, he wrote, "Imagine two fundamentally different builders. One knows the code as a set of minimum standards for recognized designs, and builds to those minimums. The other is always looking to create the most resource- and energy-efficient, least toxic building he or she can. Which one typically has the easiest time getting plans approved? Clearly, no one intends to reward the lowest-quality building legally possible while penalizing builders who push the upper limits, but this is typically the outcome."

### **Through a Glass, Darkly**

The evolution of commercially viable, widely accepted techniques notwithstanding, without consumer demand the mainstreaming of natural building is unlikely—unless market conditions become such that there's little alternative. In addition to decreasing the inefficiency and toxicity of buildings, a larger, sobering consideration on the minds of many natural building proponents is the issue of embodied energy, taken to its extreme.

"As we run up against the end of cheap, abundant oil," Eisenberg told *EBN*, "a lot of the things we think are normal are going to become incredibly expensive, difficult, or impossible." Eisenberg sees an increasing need for local solutions using old skills and techniques—some of them married to newer technology and information. "[While right now] natural building looks like a little tiny niche movement that's about sort of quirky stuff, I actually think it's about some of the most important, fundamental things we need to relearn and reinvent."

Chris Magwood, professor in the Sustainable Building Design and Construction program at Fleming College (in Ontario, Canada), coauthor of the book *Straw Bale Building*, and former editor of *The Last Straw*, echoed the sentiment, telling *EBN*, "In some ways, this is the cutting edge; some of these ideas are going to percolate up into the mainstream. Sooner or later, when it gets too expensive to truck materials around, everybody's going to *have* to be moving towards this. Thanks to the natural building movement, there's going to be a pool of knowledge for everybody else to draw on."

### **Underneath the Aesthetic**

The “hippieness” of natural building—which is both real and imagined—is at once a draw and a drawback for the movement. Natural buildings can and often do look more or less normal. But picturesque images of hobbit-like, storybook houses with soft corners, thatched or covered with small green plants, with curls of smoke rising from their chimneys, appeal to many people . . . and consequently a good many natural buildings emulate this aesthetic, frequently with great success.

For many proponents, providing a soft, textured, visually interesting space that engages occupants on an instinctive level is as important as any of the other benefits. “Having good, clear, open-hearted conversations in a flat-walled box is really challenging,” Owen-Kennedy told *EBN*. “In my exploration to discover what are the buildings that heal, what are the buildings that are most humane, that are most serving the real needs and desires of the people that are intended to be served—that search has led me time and time again to natural building.”

Valuing organic forms can reflect a worldview steeped in respect for nature, or it can express a desire for a greater emotional sense of place. In many cases, it may simply reflect the awareness that there are pleasing alternatives to the ubiquity of sheetrock. Andy M. Shapiro of Energy Balance in Montpelier, Vermont, told *EBN*, “Green professionals tend to operate under the assumption that the industrial materials stream is all that’s available. The idea that we can do things other than flat surfaces and square corners, get more connectedness into the buildings, I think can bring a lot more heart into our built environment.”

## Final Thoughts

The natural building movement is evolving rapidly. In many ways, it’s following the path forged by the larger green building movement; in some ways, it goes beyond green building, taking that ethos to its furthest reaches. But, ultimately, those distinctions don’t really matter. As Owen-Kennedy told *EBN*, “Natural building and green building, it’s all a continuum. The next step is to get past the dogma—the righteousness of it—to where it’s just common sense.”

– Mark Piepkorn



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