

EDUCATION



DYRON MURPHY ARCHITECTS, P.C.

Lawton Indian Health Service Hospital Project in Lawton, Oklahoma

Building Green

A Booming Industry Ties Us to Our Past

by W. Berkeley Kauffman

The Environmental Protection Agency (EPA) defines green building as “the process of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building’s life cycle from siting to design, construction, operation, maintenance, renovation, and deconstruction.”

A constructed environment can result in increased air, water and noise pollution, all of which is harmful to human health, detrimental to the environment, and results in the loss of resources. Many of these negative impacts can be mitigated by incorporating sustainable materials into a building’s construction, employing passive climate-control mechanisms, minimizing pollutants in the indoor environments, and landscaping with native plants requiring minimal extra watering.

A Brief History of Modern Green Building

Pre-20th century buildings were constructed with long-lasting passive solar designs (see sidebar) and were equipped with simple mechanical systems for heating, cooling and lighting. The industrial revolution provided architects with novel building technologies such as HVAC air-conditioning systems, fluorescent lighting, quality steel and reflective glass. As buildings became more complex, it became increasingly necessary to specialize, resulting in a separation between the builder and the architect, leading to a lack of whole-system thinking throughout the design process.

Cheap energy enabled builders to overpower environmental variations by employing climate-control systems, artificial light sources and novel insulating materials. These buildings are connected by stretches of asphalt and concrete and are arrived at by indi-

viduals in climate-controlled vehicles. Separation of the individual from the environment is a hallmark of the 20th century. The hidden costs of our constructed environments became readily apparent in the 1970s.

In 1973, the Organization of Arab Petroleum Exporting Countries (OAPEC) announced an oil embargo. This action was in response to the United States’ decision to provide military support to Israel during the Yom Kippur War against a coalition of Arab states led by Egypt and Syria. A mere six years later in 1979, the Iranian Revolution preceded a second oil crisis. Energy prices skyrocketed. Ultimately, the Organization of Petroleum Exporting Countries’ (OPEC) production declined by only 4%; however, supply-side fears drove oil prices to almost \$90 per barrel (inflation-adjusted).

Americans in many industries began thinking for the first time about energy conservation and the building industries were no different. The American Institute of Architects (AIA) formed the AIA Committee on Energy in 1973. Following the formation of the Department of Energy and the

Solar Energy Research Institute in 1977, the Sustainable Buildings Industry Council was founded in 1980.

Presently, taxpayers increasingly demand green construction practices in their municipal buildings. The San Francisco Federal Building, completed in 2007, was designed by the Los Angeles firm Morphosis as a green building that will consume less than half

the power of a standard office building throughout its lifetime.

Native Architecture

Dyron Murphy, Navajo, grew up on a Navajo Reservation. Although he now lives in Albuquerque, New Mexico, he still visits the reservation weekly both on business and to visit relatives.

After graduating from the University of Arizona with a B.A. degree in architecture in 1988, Murphy immediately began working with Native-owned architecture firms in Albuquerque. His dream



Dyron Murphy

PORTRAIT INNOVATIONS

Passive Solar

Passive solar designs are constructed around two main thermodynamic principles: convective and radiative heat transfer. The natural tendency of heated air to rise can be taken advantage of by the thoughtful use of windows or vents in order to keep a living space cool in the summer and warm in the winter.

Passive solar designs take advantage of the sun’s energy to heat and light living spaces. In the northern hemisphere, the sun arcs across the daytime sky and reaches its zenith toward the south. The opposite is true in the southern hemisphere where the sun passes to the north. In the summer months, the sun’s path takes it relatively high in the sky; however, the angle decreases through the fall and reaches its minimum on the winter solstice. A building with large, south-facing windows and a well-insulated roof can take advantage of the sun’s direct rays during the winter months. Adding a simple awning will limit the heat absorbed by the house in the summer by shading the energy absorbing windows.

The north side of the house (the shady side) should be well insulated to limit heat from the house being lost to the outdoors in the winter and to maintain a cool living space in the summer. This can be accomplished by planting bushes, or traditionally, constructing a compost pile. The plants will break up the sun’s rays and the decomposing compost provides a source of heat that can help mitigate a strong temperature gradient.

While south-facing windows are terrific for seasonal variations in temperature, even day-to-night temperature fluctuations can be dramatic. To buffer these effects, materials with a high thermal mass can be used to absorb the sun’s energy during the day when it is warm, and later release that energy during the cooler nights. Southwestern and Meso-American pueblos, early Navajo earth-covered hogans, and the Plains Indians’ large earth-covered lodges are all examples of traditional dwellings built with passive heating and cooling mechanisms in mind.

had always been to own his own firm and, 12 years later in February 2001, he opened Dyron Murphy Architects, P.C.

Since then, Murphy has made a point of working with Native communities both locally and around the country, including 12 tribes located in the Southwestern U.S., the Tulalip Tribe outside of Seattle, Washington, the

Northern Arapahoe in Wyoming, and the Comanche Nation in Oklahoma.

His projects are as wide ranging as his clients. His firm has designed schools, health care facilities, hospitals and community centers, gas stations and convenience stores. He conducts renovations and feasibility studies, and is involved in the construction of the 1st Navajo casino located east of Gallup, New Mexico. Green design is a new concept to most tribal leaders, but Murphy says once informed, they are quick to realize the benefits.

Although only a few of Murphy's projects have been LEED certified (see sidebar), he always tries to implement sustainable design strategies. Most federal projects are now required to meet the LEED standards, while state requirements are often less stringent. Murphy feels that although the LEED framework is a huge step in the right direction, it should be viewed as a work in progress. He argues that differing regional environmental conditions mean no single set of criteria can be applied universally. For example, in the North, insulating to prevent heat loss in the winter is of primary concern whereas in the desert regions water conservation can be more important. Additionally, earning points in the alternative transportation category can be difficult for buildings constructed in remote locations that are not served by public transportation.

Murphy's advice to the green builders of the future centers around setting goals. "Without goals, you are like a rudderless ship," he affirms. Arriving at suitable goals can be a difficult task. One must look inward to discover one's strengths and then capitalize on them. Once identified, achieving goals often leads to the identification of new ones. Now that Murphy has become an architect and business owner, he has found it necessary to reflect on his current set of circumstances in order to set his next goal. Whether that is for his company to work toward becoming a design and construction firm, to work purely on architecture and engineering, or to focus on LEED-certified buildings remains to be seen.

Green Affordable Housing in Indian Country

Dr. Susan Thering, professor of landscape architecture at the University of Wisconsin at Madison (U.W. Madison),

The American Indian Council of Architects and Engineers

The American Indian Council of Architects and Engineers (AICAE) is a nonprofit corporation established in 1976. AICAE works to advance the role of American Indian professional engineers, architects and design professionals in practice; promote recognition of members' professional excellence, service, projects and contributions; encourage American Indians to pursue careers as professional engineers, architects, and design professionals; and consolidate the expertise of members into a single focus for representation on a national level.

For more information, visit www.aicae.org/index.html

The Leadership in Energy and Environmental Design Program (LEED): Standards for Green Construction

The U.S. Green Building Council (USGBC) is a nonprofit organization dedicated to the promotion of green building techniques. As a third-party certification program, USGBC sets standards for the design, construction and operation of high-performance green buildings, or LEED rankings. The LEED system focuses on sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality.

The USGBC writes, "The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ encourages and accelerates global adoption of sustainable green building and development practices through the creation and implementation of universally understood and accepted tools and performance criteria."

LEED-certified buildings:

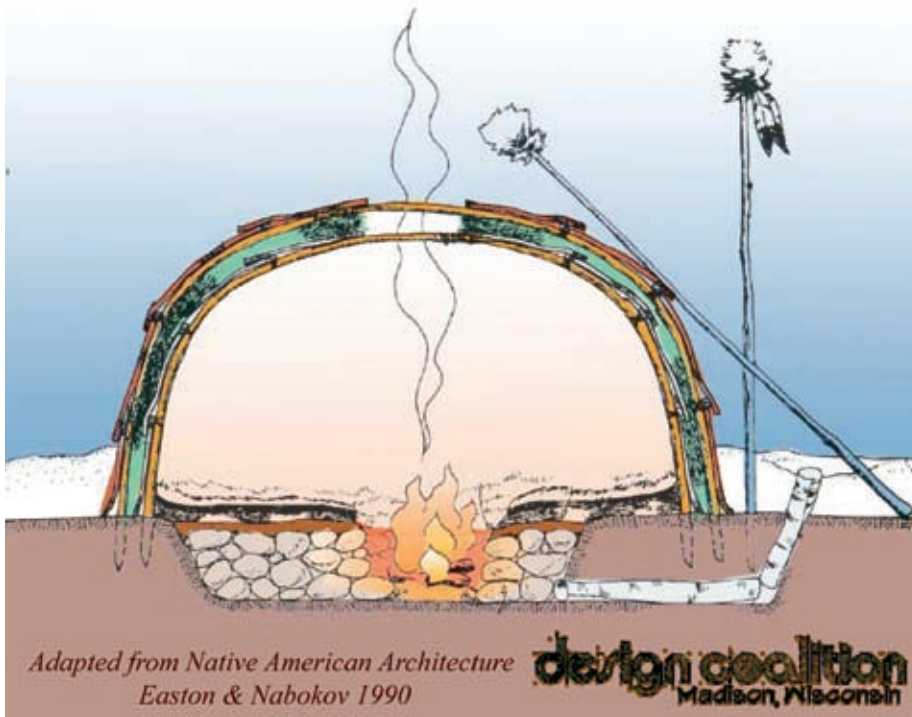
- Lower operating costs and increase asset value;
- Reduce waste sent to landfills;
- Conserve energy and water;
- Are healthier and safer for occupants;
- Reduce harmful greenhouse gas emissions;
- Qualify for tax rebates, zoning allowances and other incentives in hundreds of cities;
- Demonstrate an owner's commitment to environmental stewardship and social responsibility.

began her academic career at Buffalo State College's architecture program soon after the 1979 energy crisis. She received her master's degree from Cornell University and then earned a PhD in environmental science and forestry from State University of New York at Syracuse (SUNY).

After a post-doctoral stint at Maxwell School of Syracuse University, where she focused on the political and legal aspects of land-use management, Thering quickly found her dream job at U. W. Madison. She co-founded the Community Design Action Research Group and is the project coordinator for the Green Affordable Housing in Indian Country Initiative. By forming collabo-

rations among government granting agencies, nonprofit groups, and the academic community she works to forward ecologically and economically sound development principles in traditionally underserved regions.

At U.W. Madison, Thering quickly gathered a group of students and faculty and began consulting with the local Red Cliff Ojibwe people. They were looking to build housing on undeveloped land and needed assistance. It was important that the new roads preserved the area's natural and cultural resources. Once the roads were built, Thering was shown plans for the pre-fabricated buildings that were to be purchased for housing. The buildings were not environmental-



Traditional Ojibwe Shelter

ly friendly and they were manufactured off-reservation, trucked in, and assembled. Thering asked for and was granted time to research a green design that would conform to the budget.

The Design Coalition

Thering contacted the Design Coalition, a small nonprofit architecture and community development organization led by architect Lou Host-Jablonski. They had a design for a regionally specific, modest, affordable and green house that employed proven technology, and used no toxic materials inside or out. Of equal importance was that construction took place onsite, thereby providing construction jobs for members of the Red Cliff Ojibwe. The house's concept allows tremendous flexibility of design, allowing the owner to build as funky or traditional a house as desired.

These houses are built to last 100 years. They are equipped with a solar hot water system, a high efficiency boiler, and an energy recovery ventilator designed to retain the heat of air exiting the structure. The buildings also have high thermal mass, resulting from a refined mixture of very pure clay extracted from the region's loamy soil and wheat straw packed into the one-foot thick, wood-framed walls. These walls are coated inside and out with

a low clay plaster and weigh between 10-13 lbs per cubic foot. This is very light when compared to classic adobe or mud-brick structures (40 lbs/cuft³); however, the strength and insulating power (R-value=21) of the wheat straw and clay combination exceeds building codes. The houses were budgeted at \$130,000 each of which is 3-5% more than conventional construction. Once built, however, residents can expect monthly energy savings of 50-65%, a better built, longer-lasting house, and a more aesthetically pleasing living environment. The design plans were approved by the tribal housing officers and the regional director of Housing and Urban Development (HUD).

A Link to the Past

This is not the first time that such structures have been built by this country's indigenous people. In fact, this building is simply an optimization of ancient technologies. After seeing the cross section of the Native dome structures in Wisconsin, Lou Host-Jablonski was quoted as saying, "Maybe I'm not so smart after all... all I did was add glass!" Constructed by the Lac Courte Oreilles (Ojibwe), this structure had a light wood, double-frame packed full of local mosses for insulation. A large hole dug around the perimeter was filled

Top 10 U.S. Architecture Programs

In the United States, the National Architecture Accrediting Board (NAAB) is responsible for accrediting architecture programs. In Canada, the Canadian Architectural Certification Board (CACB) serves this function. Neither institution ranks the schools that they accredit; however, private sources do. *DesignIntelligence*, a bi-monthly journal of research and news about the design industry named the following schools as hosting the top ten architecture programs in the United States in 2008:

- Cornell University: www.cornell.edu
- University of Cincinnati: www.uc.edu
- Syracuse University: www.syr.edu
- Georgia Institute of Technology: www.gatech.edu
- University of Michigan: www.umich.edu
- Iowa State University: www.iastate.edu
- University of Illinois at Urbana-Champaign: <http://illinois.edu>
- University of Virginia: www.virginia.edu
- Texas A&M University: www.tamu.edu

Summer Internships

Summer internships and programs are offered at colleges, universities and technical schools throughout the United States.

For more information, visit the counseling office at your school.

with stones and the stone-lined center fire pit was vented through a hole in the roof's center. The stones were covered first with clay cement then with reeds and straw. The floor was lined with animal pelts for extra insulation and comfort. In the winter, fire warmed the stones, which would radiate heat upward through the floor long after the fire was extinguished.

And what about the energy recovery ventilator? The early architect had an answer for that too. As heated air from the fire exited the top of the dome, air had to enter from somewhere to take its



Dyron Murphy designed this LEED certified structure in Lawton, Oklahoma.

Greenlineblog.com

Jonas Risen earned a master's degree in architecture from Tulane University and a M.S. in sustainable design from Carnegie Mellon University. He was initially drawn to Carnegie Mellon by the Department of Energy-sponsored Solar Decathlon, a competition between 20 universities to design, build and operate the most attractive and energy efficient solar-powered house.

Risen now works for Ziger/Snead Architects in Baltimore, Maryland, and runs www.greenlineblog.com, a website focusing on news, architecture, products, case studies, energy and the environment. The site is very popular among those in the field, with 250,000 new visits per month.

Risen suggests that architecture fundamentally reflects our relationship with the environment. In the past, this interconnectedness was de facto; however, urbanization associated with the industrial revolution has severed this connection. By viewing our buildings as mediators of the environment rather than as barriers separating us from it, we can begin to restore this relationship.

MOA Architecture

MOA Architecture, an architectural firm located in Denver, Colorado, is owned by Robert Outland, Choctaw Nation of Oklahoma. Outland, who is the president-elect of the American Indian Council of Architects and Engineers, believes that green building is an important part of protecting, preserving and caring for the earth's natural resources. "At MOA Architecture," he says, "in addition to incorporating sustainable practices and specifying green materials on projects, we designed our own office to achieve LEED certification and we maintain a sustainable office culture complete with composting. Currently, more than 75% of our technical staff are LEED-accredited professionals."

place. This would result in a draft. By burying a tube that led from the outside to the base of the fire-pit, the incoming cold air would not only directly fuel the fire thereby reducing smoke, but would be heated immediately upon entry. The circular flow of air from the outside, through the tube, and out the roof would not be noticed by the occupants.

It was assumed the builders of these structures were all deceased until, during a presentation to an Ojibwe Tribe on the history of green construction techniques, a tribal Elder recognized the diagram. He had helped build a very similar hut as a young man. The man went on to build a home for himself using the same principles.

These techniques are a source of pride for those who understand their history. As we transition into a new green era that espouses being connected to the environment instead of attempting to dominate it, there is clearly an opportunity and a responsibility for indigenous people around the world to share their traditions and skills.

Looking Ahead

McGraw Hill Construction Company's analytical department predicted the green housing market would be a \$20 billion industry by the year 2010. The numbers were recently reviewed and the estimate has doubled to \$40 bil-

lion largely because roughly 30-40% of all the energy produced globally is currently used to heat, cool and light buildings.

As we become increasingly aware of the impacts our energy consumption has on the environment, it becomes clear that this impact needs to be decreased. Dr. Susan Thering stresses the growing need for green builders. Architects, engineers, project managers and construction workers will all be needed. Because of green construction's regional component she suggests getting an undergraduate degree then pursuing a specialized degree as close as possible to where one wants to live and work. And don't forget to take some art classes! As Thering put it, "If something is beautiful, people want to take care of it." ❖

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