Project Green Buildings

Spertus Institute of Jewish Studies

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The History of the Spertus Institute

The Spertus Institute is a Jewish organization founded in 1924. Located in Chicago, Illinois, it promotes the exploration of Jewish history and culture through a mixture of public programming, exhibitions, collections, degree programs and research facilities. The original facility, located at 618 South Michigan Avenue, was erected in 1911. The building was renovated in the mid 1950's, but despite the renovation, the technology needed to protect Spertus' extensive collection of books, manuscripts and other artifacts was inadequate. In addition, the institute had outgrown the space, so in 2005, they purchased a nearby empty lot at 610 South Michigan Avenue, which was one of only two vacant lots in the district, and construction of a new facility was soon underway.

Howard Sulkin, the institute's president, wanted the new building to embody the Jewish philosophy of bal tashchit, (do not waste), and tikkun olam, (repair of the world). The Spertus Board met with several architectural firms before deciding in 2003 on the Chicago based Krueck & Sexton Architects. From the start, the project was expected to be difficult, mostly because of the tight budget, which was limited to $40 million dollars. In fact, the budget was so low, that several competing architectural firms withdrew from the bidding process, believing the budget needed to be at least 40% higher. Keep in mind that the list of essentials for the new building was very high. The institute wanted a gallery, a museum, a college – complete with faculty offices and classrooms, a library, a 400 seat auditorium, numerous community event rooms, a children's center, a kosher café and a gift shop. In addition, the building needed a state of the art climate control facility to protect and preserve the museums numerous collectibles and artifacts, which include 15,000 works of fine art, ritual objects, and cultural artifacts like immigration documents and family prayer books. In total, it was estimated that the building needed about 155,000 square feet encompassing 10 stories. This equated to about $260 per square foot, which was considerably low in comparison to other buildings that were built in the downtown Chicago area. Trying to fit all these needed items into a "green" building for $260 per square foot was expected by many, including the architects who accepted the challenge, Krueck and Sexton, to be overwhelming.

The architects were also not inspired philosophically by Spertus' Board of Directors. In one meeting, Byron L. Sherwin, a distinguished scholar and professor at the institute, told the architects that, *"buildings mean nothing to the Jews. We had one building that was important to us, the temple in Jerusalem and it was destroyed by the Romans in the year 70."* The architects didn't know what to make of a philosophy which described the project – from a religious standpoint – as meaningless.

The architects hoped to achieve a "gold" status and this is what was submitted to the Chicago Development Board for approval, (see appendix). Site work started in October 2005. Given the budget constraints, the architects made it clear to Spertus that their primary goal would be to incorporate the essential items first. Green aspects would be incorporated only to the extent it was economically possible.

What is LEED?

Leadership in Energy and Environmental Design, LEED, was developed in 1999 by the United States Green Building Council. Up until that time, there was no way to universally evaluate a structures positive environmental attributes. Buildings were rated based on estimated energy savings, but the criteria used were not universal, and determining how different buildings ranked in terms of their green attributes was impossible. LEED was established to define a universal standard of measurement. In addition, LEED sought to promote integrated whole building designs, recognize environmental leadership in the bulding industry, raise consumer awareness of the benefits of building green, transform the building market and stimulate green competition.

LEED is broken down into several different categories, dependingon the type of construction being evaluated. Therefore, different criteria are used for new and existing structures, since a new building can incorporate green design in the site preparation and foundation. In a renovation of an existing structure, changes to the site and foundation are simply not possible. For new construction, LEED evaluates a structure based on the following six categories:

1. Sustainable Sites
2. Water Efficiency
3. Energy and Atmosphere
4. Materials and Resources
5. Indoor Environmental Quality
6. Innovation and Design

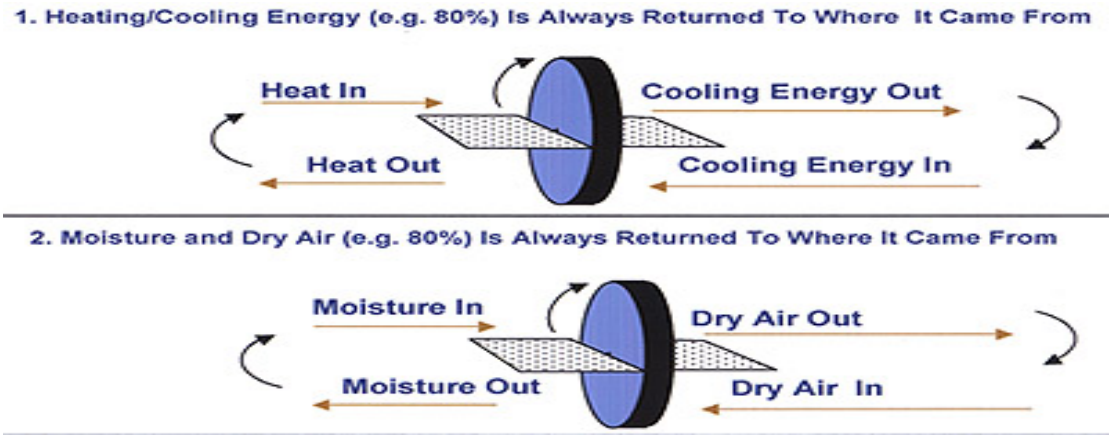
Each category contains a checklist of possible attributes that, if incorporated, make the structure more "green". Each attribute is allocated a certain number of points. Based on the number of points achieved, the building achieves a higher LEED certification.

Spertus' Green Features

One of the most difficult and expensive aspects of the Spertus building was the climate control system. Spertus's extensive collection of rare books, manuscripts and other artifacts and the space needed to store, conserve and display these items required an HVAC system that would keep temperatures and humidity levels within a very tight range. The system would have to maintain this even state regardless of outside conditions, which in Chicago, can range from brutally cold dry winters, to sweltering hot steamy summers. In addition, the highly variable occupancy levels meant that the galleries and auditorium could be empty at one moment but serve as a setting for a 500 guest party the next.

The engineer's solution was a demand based ventilation system that utilized carbon dioxide sensors to monitor building occupancy and adjust fresh air accordingly. The building also has enthalpy wheels that salvage useful energy from discharged air. An enthalpy wheel is a cylinder, usually 4 to 10 inches deep, packed with a heat transfer medium that has numerous small air passages, or flutes, parallel to the direction of airflow. The flutes are triangular or semi-circular in cross-section and form a honeycomb pattern of interwoven flat and corrugated layers of a high conductivity material, usually aluminum, surfaced with a desiccant. The design saves energy by reducing the need for cooling in the summer and heating in the winter. The technology proved to be especially

appropriate for the archival and exhibition areas because of the need for both high ventilation and humidity.



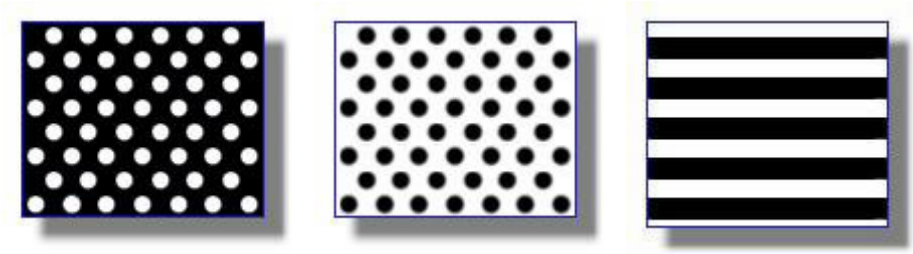
Enthalpy Wheel Example

Some of the buildings green features are hidden from view. For example, the roof contains a 6,650 square foot green roof, (planted with special vegetation), that helps reduce storm water runoff and mitigate the urban heat island effect, a phenomenon that causes the city to be 2 to 10 degrees hotter than nearby rural areas. The roof deck however, is not accessible to the public.

The transparent glass façade was selected for two reasons, to portray a welcome image of transparency and to utilize as much natural daylight as possible. The footprint of the building is 80 feet wide and 180 feet deep. The long sides and back wall of the building are sandwiched between neighboring buildings. Since only one wall and the roof are open to the sun, the architects were concerned about daylight reaching the inner rooms. So, in addition to the glass façade on the easterly wall, a roof clerestory was added with a light shaft and atria to get light into the center of the building. The natural lighting works in conjunction with occupancy sensors and dimming controls. Based on the amount of available daylight, the dimmers scale back artificial lighting as needed to save electricity.

The increased natural lighting, however, posed additional concerns. Harmful UV rays could damage the artifacts in the museum. Also, too much sun could cause heat gain

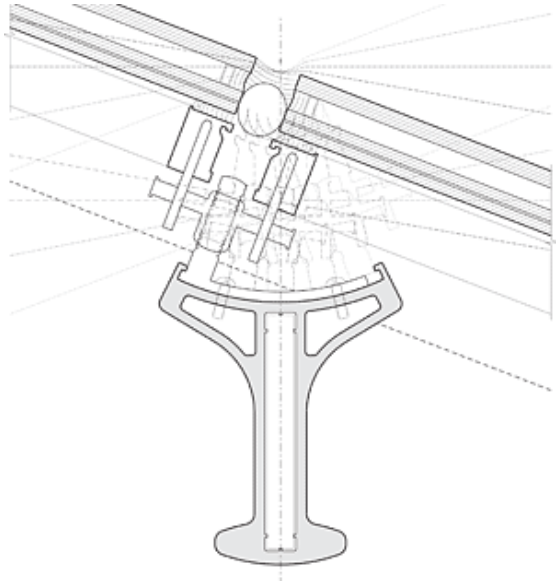
and glare. As a result, the architects installed insulated glazing units with a low-e coating and a ceramic frit pattern that reduces visible light transmission by up to 40%. Low-E coatings are metallic-oxide particles that are applied to the interior surface of the glass. It is invisible to the naked eye. Low-E coatings reflect the "long" infrared (IR) portion of sunlight, which is the radiant heat, and most damaging portion of sunlight. Depending upon which surface of the glass it is applied to, Low-E coatings can keep radiant heat from entering, or escaping a building.



Magnified Examples of Low E Ceramic Frit Patterns

Through measures including high performance lighting and demand-based ventilation, the building expected a 29% reduction in energy consumption, avoiding 550 tons of annual CO2 emissions.

The building's most unusual feature is the support system for the façade. The façade itself is made up of 726 pieces of glass, 566 of which have unique and irregular shapes. Supporting this multitude of glass are aluminum brackets that can rotate inside Y shaped mullions. The mullion design is what allows for the protruding, (both inward and outward), triangulated surface. In some spots the glass panels protrude outward over the sidewalk by as much as five feet and inward toward the center of the building by as much as two. The unique three dimensional geometry required individual units of glass that are parallelograms rather than rectangles.



Y Shaped Mullions that keep the Glass in Place

Advancements in material engineering allowed the insulated glass units with just a one inch silicone joint, to be the only components keeping wind and moisture from entering the building. The lightness of the wall and absolute minimal use of materials offer great efficiency and sustainability. Because a design like this was never used in construction before, a mock-up wall was tested at the Construction Consulting Laboratory in Texas in the spring of 2006. The design was tested for leakage while subjected to wind pressure of 47 lbs. per square foot and wind speed of 136 miles per hour. The mock-up passed without any leaks.

The Spertus Café, which is managed by Wolfgang Puck Catering, has teamed up with Chicago Bio Fuels to recycle their used cooking oil into biodiesel, a renewable, clean energy alternative to conventional petroleum diesel.

To save water, the building utilizes low flow fixtures and dual flush toilets. However, no provisions are used to capture and utilize excess rain water. There is no parking for cars anywhere in the building, but bicycle parking is provided.

Outside view of the glass façade protruding over the sidewalk
The facade is 161 feet tall and 80 feet wide

Conclusion & Criticism

The building was completed on November 30th, 2007 and achieved silver LEED status. Surprisingly, the final cost of construction for the new Spertus Institute was $39 million – one million less than the original budget.

While the silver LEED status is certainly commendable, it's not the gold status that was submitted to the Chicago Planning and Development Board in December of 2005, (see attached). I contacted the Spertus Institute and they put me in touch with Rico Cedro, Director of Sustainable Design, at Krueck and Sexton. Rico explained that in the final tally, Spertus lost points in the energy category for deciding against the use of green power. They also lost their commissioning credits by not utilizing an outside third party in a timely fashion. Lastly, they could not prove that the ventilation system was more energy efficient than a conventional system.

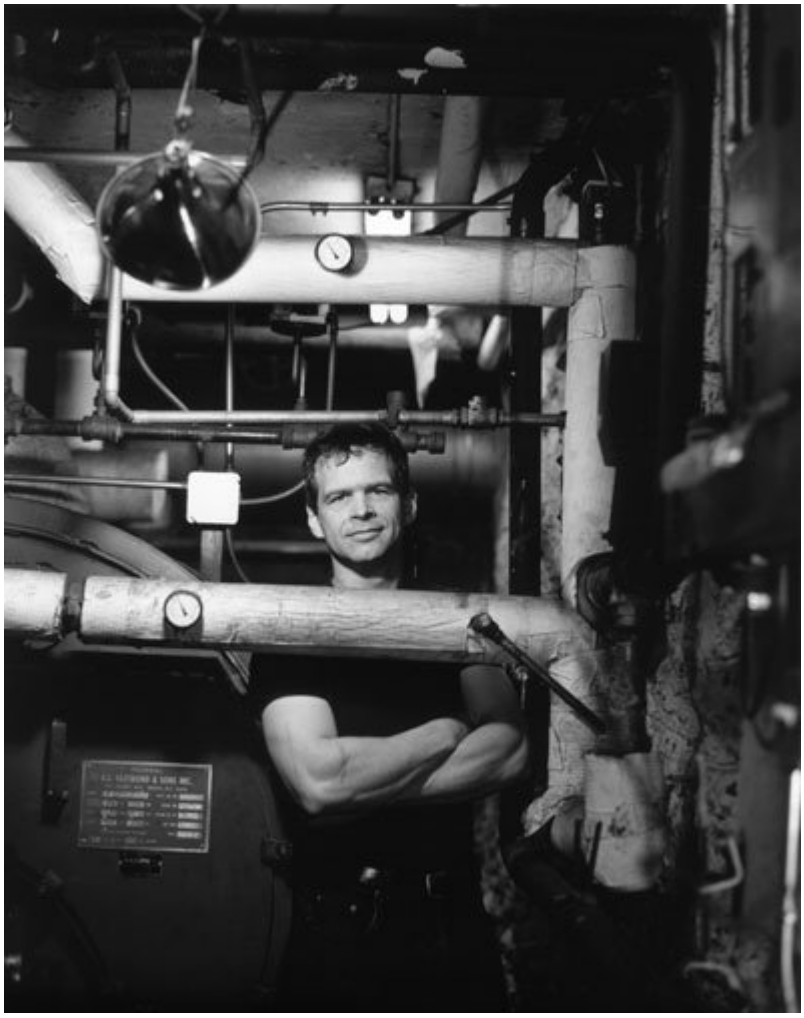
Worth noting is that the institute received $3 million dollars of free funding from the City of Chicago. Essentially this was a gift from the taxpayers as an incentive to develop vacant areas of the City with green based construction. I was unable to obtain a list of "minimum criteria" for eligibility, but given the project's tight budget, it makes you wonder how many of the buildings green attributes were included only to qualify for city incentives.

Less than half of the roof is covered with vegetation, (6,550 square feet out of 14,400). With the exception of the roof clerestory, it probably would not have cost much more to have the remainder of the roof covered with vegetation. Also, there are no provisions to utilize excess rain water for plumbing or humidity control. Whatever the roof plants don't absorb runs off the building into the streets. According to the LEED specification sheet, the project was granted LEED Water Efficiency points by saving water for landscaping irrigation. In reality, the building occupied the entire lot, so outside landscaping was not possible. Offering LEED points for water conservation by excluding a green landscape is not, in my opinion, the best allocation of LEED points. In addition, LEED gave points for bicycle parking. I looked into the specifics, and LEED only requires bike parking for 5% of full time employees. In the case of Spertus, this resulted in LEED points being granted for a single bike rack that holds only nine bicycles. I hardly think that a nine bicycle rack is adequate for an institution that brands itself primarily as a school. This called into question the validity of the LEED rating system itself….

The problem with LEED

Henry Gifford is a boiler expert that specializes in systems that heat and cool buildings in New York. His opinions formed largely after his extensive experience working inside LEED and non LEED buildings and noting that sometimes LEED buildings required greater heating and cooling loads than did conventional construction. After years of real world experience, he published his findings.

According to Gifford, the best available data shows on average, that LEED certified buildings use *more* energy than comparable buildings. What LEED creates is the *image* of energy efficiency, not *actual* energy efficiency. The root of the problem goes back to the U.S. Green Building Council, USGBC, which created the LEED system. The USGBC was founded in 1993 by David Gottfried and Rick Fedrizzi. At the time, David was a real estate developer and Rick a marketing executive for an air conditioning company. While the name implies that the USGBC is a group of "independent environmental experts", in reality there are no restrictions to membership and the largest players are currently the same executives running the construction industry. Therefore, the USGBC, which created LEED, is, in essence, the construction industry telling itself what is green.



Henry Gifford

Gifford further points out that the energy used to create a building is just a small part of the total energy it will use in its expected life time. By far the largest part of energy consumption occurs during the buildings useful life, but once the building is built and the plaques hang on the wall, no one from LEED goes back to actually verify the actual amount of energy consumed and how it compares to the original "estimates".

In their own defense, the USGBC has countered Gifford's claims with their own studies which proves that subsequent to construction, LEED certified buildings are 25 to 30% more energy efficient than conventional construction. The devil's always in the details, so Gifford asked for them and found their study to be flawed. First, it was not based on random samples, but rather from those LEED buildings that *voluntarily* contributed their real world energy use. If a LEED building did not want to participate, it was ignored. He likened this to making generalizations about ALL drivers blood alcohol levels based on the results of people who voluntarily agreed to a breathalyzer test.

He also found that LEED consistently omitted data that did not support their claims. In some cases, they compared the *mean* energy use of conventional buildings with the *median* of the LEED buildings and reported the statistics as comparable. The USGBC stated that they chose the median over the mean because they wanted to exclude the "outliers" in LEED construction, such as laboratories and manufacturing facilities, which consumed large amounts of energy. He recalculated the findings himself and found that the LEED buildings that <u>voluntarily</u> gave information actually consumed 29% *more* energy than conventional construction.

Gifford's major problem with LEED is that it focuses on the *appearance* of energy efficiency, not the accomplishment. The LEED system does this by *predicting* that a building will save energy, not for <u>proving</u> that a building actually saves energy. The LEED system starts with a "baseline" prediction of how much energy the building should consume and then compares it to an *estimate* of how energy will be consumed if the green feature were added; the greater the difference, the greater the LEED points. But, predicting a building's energy use is like predicting the weather. Even if all the relevant factors are known, it's still almost impossible to predict. Because LEED doesn't

focus on real world energy consumption, designers are pressured to incorporate green gimmicks that give the appearance of energy efficiency than actually achieving it.

Gifford refers to the Solaire apartment building in New York City. The Solaire brands itself as the "most environmentally advanced residential tower in America," largely because the building is sheathed in solar panels. Gifford points out however, that the panels are mounted on the walls of the building and not tilted to face the sun. Worse, instead of facing south, many of the panels face northwest. Another group of solar panels are mounted behind rooftop equipment where they are in constant shade. Let's do the math. Currently solar panels cost about $9 per watt, ($9,000 before rebates for a 1 kilowatt system), but remember that these "watts" of energy can only be produced when the sun is shining and the panel is facing it. On average, under maximum conditions, a solar panel, facing south, tilted toward the sun and never shaded, can produce about 1,000 watt hours of electricity per year. In power company terms, that's called a kilowatt hour and they sell it for about 9 cents. In contrast, changing just 3 conventional 100 watt light bulbs with compact fluorescents saves the same amount in 4 hours that solar panels save in an entire year, at a substantially reduced cost. Which begs the question, are the panels mounted on the walls of the Solaire really providing a positive environmental impact? Gifford would say no, but it provides excellent marketing impact to prospective tenants.

So long as LEED focuses on green appearances as opposed to actual energy consumed, designers are forced to focus on what looks good in marketing brochures as opposed to what works in real world conditions. As he states, the difference between choosing what actually works, as opposed to what appears like it works, is choosing between obscurity and recognition and Gifford points out that most of the stuff that works is very basic simple technology, like light bulbs. But light bulbs don't look anywhere near as glamorous in a glossy brochure as solar panels do.

Gifford's additional concern is that because LEED has not paid attention to actual energy use in real conditions, and then obscuring the truth, they are squandering the public good will towards green projects and the cause of environmental friendliness. He believes that the only way to truly measure a building's energy efficiency is to review the

utility bills. LEED plaques should be mounted on the walls with removable screws. Buildings should be tested periodically and if they do not perform better than conventional construction, the plaques should be removed. Gifford believes that the LEED system is not only ineffective, but harmful to the environment it seeks to protect. He feels it should be abandoned immediately and replaced with a system that measures actual savings as opposed to theoretical savings.

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