GOLD TO PLATINUM

"A Journey Through Cost Containment, Alternate Choices and Decision Making"

The design and construction of the building was essentially more about quality of work life and building performance than it was about how the building looked or the LEED® rating it would receive. Planners and architects realized the more time spent on conceptual planning to enhance water efficiency, indoor environmental quality, materials and mechanical system performance would lead to a rating commensurate with the effort we made to spend funding judiciously on those substantive items.

Alternatives were presented to the state project management team after performance of meticulous life cycle cost analyses and value engineering, not only by the design team but from valued experts at the Rocky Mountain Institute and others, to make the case of one alternative over another. Agreement occurred with and between various user groups, design team members and design and construction project managers.

Lewis and Clark State Office Building, Jefferson City, Mo.

The following detail of issues and outcomes is an account of actions taken throughout the decision making process, for securing funding, selecting a site, designing the building, using extensive life cycle cost analysis and construction as the project was ultimately directed through the process of LEED certification.

Appropriated Funding

Project funding was appropriated by the Missouri state legislature through the capitol improvement process once the leasing option was eliminated as the means to construct the building. The Office of Administration (OA), Division of Design and Construction (D&C) developed a detailed project scope of work, describing the project, including a component requiring performance of life cycle cost analysis, with budget allocations for separate design and construction contracts. The Missouri State legislature appropriated $1.57 million dollars in basic design services fees, $16.75 million dollars for construction costs and $1.67 million dollars in contingency funding based upon a building of 120,000 square feet.

Site Selection

Selection of state-owned property in the urban core in March 2001 avoided the cost of acquisition but other costs would be imposed such as for infrastructure. The chosen site allowed architects to design a building that took full advantage of the southern exposure to create ample daylighting using high efficient window glazing, reduced interior lighting requirements and mechanical systems that would subsequently increase building efficiency and systems performance and enhance indoor environmental quality.

Schematic Design Stage

Estimated building construction costs exceeded the available appropriated funding by 20 percent during the initial phase of schematic design and state project managers rejected the design in July 2001. The design architect concluded that the use of value engineering would be an essential component to eliminate $4.4 million dollars in design components unnecessary in the overall performance of the integrated building design.

Value Engineering Process

Forty-one items were identified in the value engineering process. These items were ultimately eliminated, reduced or changed during June 2001 to bring the schematic design in under the original budgeted amount. These items generally included, but were not limited to the following:

- Downsizing the atrium.
- Eliminating one column bay from the building design totaling 9,900 sq. ft.
- Downsizing the cistern.
- Eliminating certain exterior structural items, not necessary as a part of the building structure, such as the brick amphitheater northwest of the building designed to reuse brick from the demolished women's prison building.
- Reducing interior equipment items such as plumbing and kitchen equipment.
- Reducing the landscaping allowances.
- Changing the parking lot material to asphalt.
- Removing wheel stops in the parking lot and various other design components having little effect on the LEED certification.
- Reducing the design services contingency by 8 percent.
- Using less expensive building materials such as gypsum board, glass, concrete, wood and the roof ing material.

Life cycle cost analyses also began for the integrated design of the HVAC, lighting and envelope efficiency components, including the domestic hot water system. Among components analyzed were thermal ground source and alternative wind power technologies. It was determined from the life cycle cost analyses that the energy efficiency components of the design had little effect upon the estimated first-cost budget. The design team concluded that there was little cost difference between a building designed to meet ASHRAE and one exceeding ASHRAE by 50 percent or more. Getting first costs to the level equal to a base designed building also depended upon the type of technologies available, the advancements in technologies and how those technologies were bundled within the integrated design.

Life Cycle Cost Analysis (Decisions, Decisions, Decisions)

All critical mechanical systems, large material components and the building envelope, form and orientation were analyzed during the schematic design phase to determine feasibility, first cost necessity, and impacts on future equipment operation and maintenance costs. Decision making was dependent upon analyses of life cycle costs, assuring project partners that the design methodologies met project goals, were based upon sound judgment and system performance, and, that costs were based upon pay-back periods that were justified. Building performance and cost containment were paramount to the decision making process, but enough quality alternatives were located to attain a quality LEED-certified building within the available project funding.

State-of-the-art computer software program modeling was conducted on HVAC, hot water heating and treatment systems, renewable energy sources, daylighting, including lighting and window glazing (glass), building shape and orientation as well as for the many material components. Data was collected and reports written by design team members to focus discussions enabling partners to make decisions.

The following systems, equipment and materials were among those analyzed during the schematic design stage:

Renewable Energy Sources

Design team members had interest in designing as many renewable energy sources into the schematic design as were feasible and cost effective in terms of payback. Many different types of renewable energy sources were analyzed to determine if the design could support the addition of these technologies.

Ground Source Heat Pump

Visual DOE energy simulation software was used to model case studies of three types of HVAC systems. A ground source heat pump system was modeled against two other system designs, including one typical system meeting basic ASHRAE 90.1 requirements and one modeled specifically for the building exceeding ASHRAE 90.1 by nearly 60 percent, containing the following features:

- Thermally effective window, wall and roof construction.
- Chilled water storage created by a Nightsky Radiant Cooling System (ultimately deleted from the design plans).
- Highly efficient centrifugal chiller with VFD control.
- Primary only chilled water pumping with VFD control.
- Highly efficient boiler.

Solar hot water (HW)for 50 percent of the domestic HW heating, with energy savings equating to approximately $700/yr with the proposed 120 sq. ft. HW panels.

- Oversized cooling tower w/ VSD fan for economizing and heat rejection.
- Ultra-efficient dedicated outside air units.
- Extremely efficient fans for under-floor plenum supply.
- Dimming control on lights and motion sensors.
- Reduced exterior lighting.

From the analysis, including test borings to determine the depth of groundwater and number of wells required, the first-costs of energy efficient ground source heat pump technology far exceeded those of the system designed for the building due to the cost of pumping water, requiring intensive energy usage.

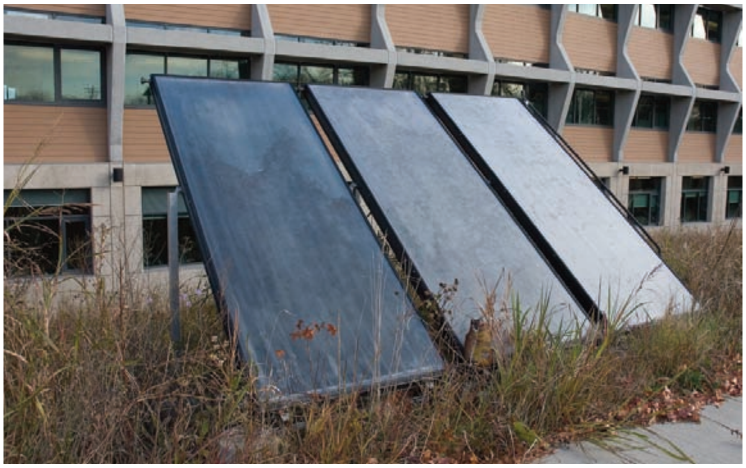
Photovoltaics (PV)

The installation of photovoltaics (PV) was discussed throughout the schematic design and design development stages. The percentage of building power that could be generated by photovoltaics was dependent upon the efficiency of the cells deployed, their orientation, tilt and the size of the array. With no site obstructions interfering with the availability of sunlight on the site it was feasible that 2.5 percent of the building power requirements could be met from photovoltaics which met the LEED requirement for this credit.

A 22 kw grid-tied photovoltaic system, composed of 168 dark-colored, 128-watt panels provides 2.51 percent of building's electricity.

Solar Domestic Hot Water System

It was initially thought possible that solar hot water panels could supply the hot water needs for domestic use and boiler operation. However, a more reasonable



Photovoltaics also provide heating for 42 percent of the Lewis and Clark State Office Building's hot water needs.

cost-effective alternative was to provide hot water for domestic use only. Calculations of the domestic hot water system requirements confirmed that approximately 96 sq. ft. of panels would provide approximately 42 percent of the daily building domestic hot water requirements.

Other design components in the original schematic design were evaluated using life cycle cost analysis. These items were considered major system and material components that would possibly be perceived as extravagant and could have an effect on cost and energy efficiency and could negatively impact building operations and performance.

Wind Energy

In an initial analysis of wind energy feasibility in Jefferson City, Mo., a potential for up to 5 to 15 percent of total annual building energy was found achievable by reasonable wind turbine installations. Equipment was installed on site to measure wind speed once the site was chosen during early stages of schematic design. Data was then compared and extrapolated with data from the Jefferson City and Columbia airports for the past five years. It was determined that an average wind speed of 8 mph would not generate the amount of power needed to make the design and purchase monetarily feasible.

Nightsky Radiant Cooling System

A Nightsky Radiant Cooling System was part of the original schematic design. Ultimately, state project managers questioned the feasibility of such a system due to high humidity levels in this temperate zone during the summer months when the system would be most needed. The associated first-costs related to this equipment component and future operation and maintenance costs were also questioned.

The Nightsky Radiant Cooling System is designed to spray water on the roof of the building at night and collects the water in a tank for use in the day. The "Nightsky" system eliminates the need to cool water during the day, thereby saving energy and reducing chiller operating hours which would have saved maintenance costs and prolonged the life of the chiller. It was estimated this system could save about $1,250 per year. However, the pay back period was longer than we thought necessary and eliminating this system from the design saved an unnecessary up-front cost.

Heating and Cooling System Redundancy

Many past, non-sustainable building design plans contain heating and cooling system redundancy for HVAC needs equal to the amount required for normal operation, doubling the size of need and cost. Most state leased office buildings are constructed with twice the electrical and mechanical load requirements necessary for normal operations requiring exorbitant operations costs and results in system inefficiency. However, some redundancy is necessary to keep indoor environmental conditions and building materials from deteriorating during a mechanical failure. A second boiler was designed for the building but was reduced in size, partly due to their being operable windows in the building eliminating the need for twice the redundancy of other buildings.

Light Pipe Skylight

The interior atrium entry, from the front vestibule to the reception desk, was designed as a long tube to highlight exterior views, beyond the atrium facing north, when entering the building. Designers suggested a horizontal light-pipe skylight that would capture and channel light into the tube from the exterior above the entry vestibule. The light pipe was a design feature that would allow maximum light infiltration through the skylight using a reflectance material lining the inner tube. The concept was more of a design feature, something relatively new as a building design component, but had no discernable impact upon the LEED certification. Although the concept had merit as a daylighting mechanism, first-cost was prohibitive and maintenance would have been difficult, so the idea was eliminated during the design development stage.

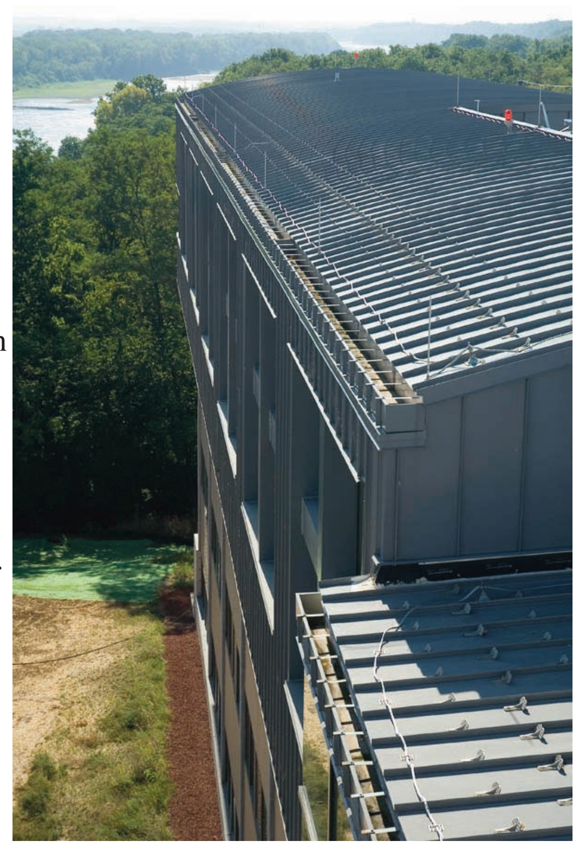
Smaller roof-top skylights were installed above the 4th floor women's and men's restrooms to harvest daylighting into those two spaces. The skylights effectively eliminated the need for an amount of lighting and corresponding electrical usage.

Roof Construction Material

The building roof was originally designed using copper. Office of Administration, Division of Facilities Management personnel described wear and replacement problems they were experiencing with copper on the Missouri State Capitol Building roof. State project managers requested that at least two additional materials, besides copper, be analyzed, including KYNAR 500 fluoropolymer- (polyvinylidene fluoride) coated galvanized aluminum (Galvalume).

All three roofing materials were analyzed for:

- Reflectivity.
- Total first-cost.
- Life cycle cost over 50 years.
- Life cycle cost over 100 years.
- Amount of material in square feet.
- Recycled content of roofing panels.
- Recyclability of product.



A KYNAR 500 fluoropolymer-coated galvanized aluminum roof was used due to its reflectivity, life-cycle cost and recycled content.

State facility managers and engineers, through their experience with copper on the Missouri State Capitol Building, thought the analysis of copper obscured certain facts, overestimated conditions or properties of copper and underestimated replacement costs over a one-hundred year period. They further indicated that the replacement schedule for copper was 3 times more than estimated, and since our building was being designed to last 100 years, felt the use of copper would defeat the purpose of that goal.

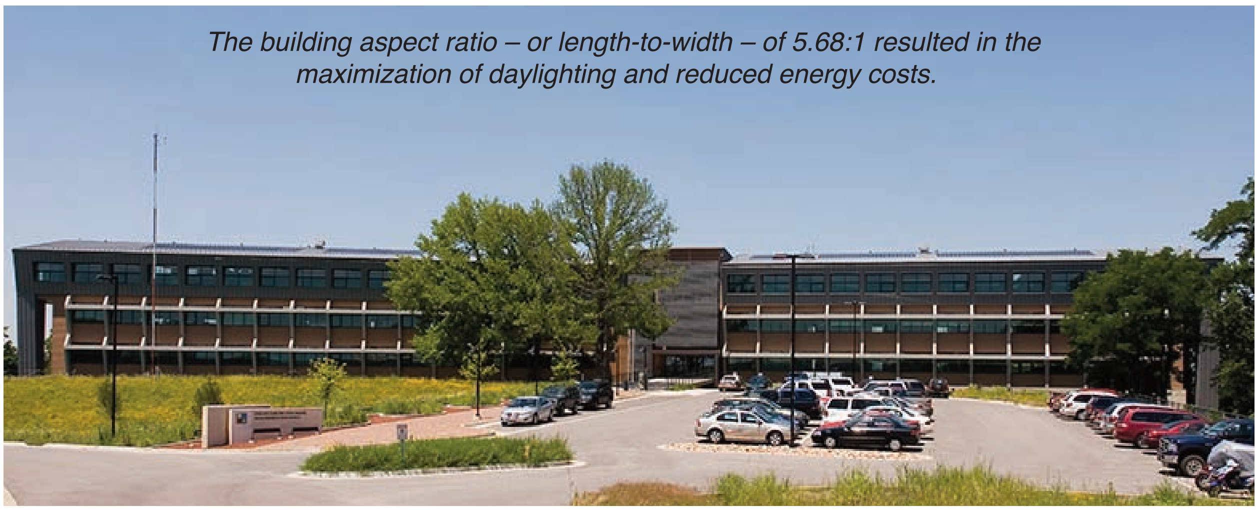
OA and department staff also felt that the use of copper might be perceived as extravagant or irresponsible, in that the use of copper might be viewed as an excessive expenditure, regardless of its first-cost. Analysis of the roof construction material resulted in a change of construction materials from copper to KYNAR 500-coated galvanized aluminum, based upon first-cost, replacement costs and market volatility and how the material would possibly be perceived by the public.

Additional decisions were made concerning other supplementary design components allowing the project to earn further LEED credits or to strengthen those credits already within the design.

Building Aspect Ratio

The building aspect ratio, or the building proportion of length and width, was analyzed to determine the ideal balance between interior flexibility with high environmental performance. Designers determined that a long slender building with an aspect ratio of 5.68:1, sited in the east/west direction had several advantages over buildings that are wider, by:

- Maximizing daylighting potential and reducing operating costs by $50,000 per year.
- Reducing environmental impact (by minimizing lighting loads and blocking unwanted solar gain) and the economic effects of CO_2 and NO_2 pollutant emissions by $4,125. to $8,259 per year.
- Reducing building construction costs by $146,436 to $484,536 per year.
- Maximizing the LEED certification protocol and subsequent rating.
- Enhancing the work environment and productivity, which was somewhat difficult to quantify.



The building aspect ratio – or length-to-width – of 5.68:1 resulted in the maximization of daylighting and reduced energy costs.

Analysis and associated results suggested the building aspect ratio should be established at 5.68:1 or 71 X 403 feet, rather than at 4:1 or even 1:1. There were residual results from this type of analysis in that in designing the building with a longer length, views of the river from additional buildings constructed to the south of the building would not be obstructed. It was another example of how the wise stewardship of funding was a prime motivating factor in each decision effecting building design and construction and how the building was designed as integrated pieces having impact on the whole.

Design Development Stage

The schematic design was approved slightly below budget in September 2001. The design development stage began by state project managers soliciting comments from many organizational sources throughout state government. Project success would be highly dependent upon soliciting substantive comments during this period.

Planners, engineers, chemists and others knowledgeable about sustainability were brought together in a continuing collaborative partnership with those responsible for building operations and management. Designers wanted to engage our partners to scrutinize and question the sustainable design strategies to ultimately improve the design, make future operations and maintenance less cumbersome and strengthen the LEED credit certification process.

Feasibility and first-cost considerations were significant in the decision making process. State project planners were reluctant to consider the use of contingency funding for LEED related items until such time as construction was well under way and unknown or unresolved design and construction problems were all but eliminated.

Building Construction Stage

Design completion, selection of a construction contractor, demolition of the women's prison and building construction all began within four months, between December 2002 to March 2003.

Unknown site development problems would be relatively easy to fix, but not without the use of contingency funding. Problems would relate to property infrastructure improvements to and water runoff onto the site from property south of the construction site, two buried debris fields from the Department of Corrections discovered during site excavation activities, the existing penitentiary water tower and its ultimate disposition, and the roadway access into and through the state surplus property operation south of the site.

The roadway entering the construction site was a narrow, somewhat graveled, pot-marked and muddy passageway that allowed rain water from several acres of land to drain over it towards the wooded area to the east. The nearly 10 acres of land included state surplus property plus the land portioned to the building construction site.

The roadway entering the construction site was a narrow, somewhat graveled, pot-marked and muddy passageway that allowed rainwater from several acres of land to drain over it towards the wooded area to the east. Improvements to the roadway will continue to be made as the entire 144-acre site is developed.

There were several roadway issues, including future connection to the redevelopment site to the west. Temporary infrastructure improvements were needed for the entire roadway, leading to the new building, until such time as the upper and lower redevelopment sites are connected at Chestnut Street west of the building site. This work, as well as infrastructure improvements to property south of the construction site would require use of contingency funding but were value added, primarily to provide employees and visitors with a temporary means of entry to and egress from the building.

The first design team visit to the site, including representatives of the Conservation Design Forum, occurred during an unexpected torrential rainstorm. It gave landscape design architects an immediate vision of problems facing them when designing a storm water management system to control runoff on-site and eliminate erosion of wooded areas surrounding the site.

Site storm water management was a crucial design factor, not only as being mission sensitive to the department, but also to receive LEED credits for water conservation and efficiency. The LEED credit was critical in the process of validating efforts made to develop strategies to effectively manage storm water runoff on site. The project received all possible LEED points associated with water efficiency due to roadway design strategies and temporary infrastructure improvements on property south of the construction site. However, the design strategies and infrastructure improvements did add costs to the project requiring use of contingency funding to eliminate the problems.

Site erosion to the east of the site would prove to be a major factor in land-use planning and design, in order to eliminate runoff from occurring after construction was done.

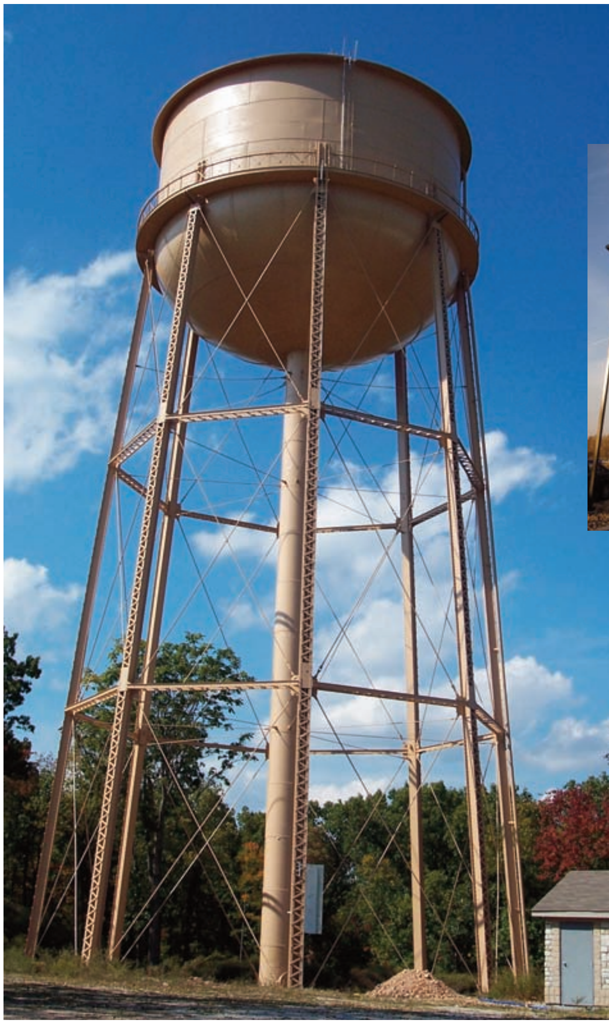
Water runoff from the rear entry of property south of the construction site emptied onto the lower southwest detention basin doubling the amount of water and silt entering the storm water control system. Water runoff from the roadway and property to the south of the construction site had to be redirected to the east, away from the property south of the construction site, since the site basins were not designed to handle the increased water runoff from additional acreage not a part of the construction site.

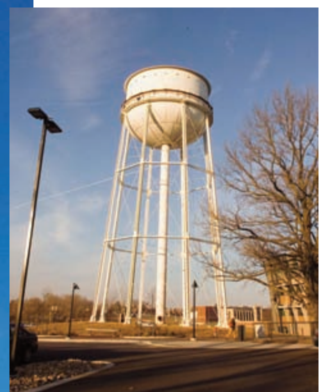
Poor off-site land-use practices contributed to the degradation of some water retention basins during the latter part of construction. Silt fencing was put in place to mitigate this problem until more permanent measures could be implemented later.

Scheduled construction site excavation turned up several interesting debris fields formerly used as dump sites by the Department of Corrections. Although the debris had been there for many years, most of the material was ferrous metal that was source separated by heavy machinery and was ultimately taken to metal recyclers. There was a cost to contingency funding but the recycling of ferrous metal was added to the amount of recycled material percentages for the LEED certification.

There were other less costly post schematic design infrastructure improvements that were made to the site, including decommissioning the water tower and other improvements that allowed the surplus property operation to continue to operate at its present location. Ultimately, these type of expenditures would cease, leaving additional contingency funding available to leverage improvements to the building design and ultimately to the LEED certification process.

The state penitentiary water tower, which was sold and subsequently dismantled and reconstructed for reuse in Branson, Missouri, was originally to be used as the potable water source for the building. Problems associated with tower cleanliness and water quality, pressure, overflows and drain lines ultimately proved too cumbersome and costly for the state to maintain and operate.





Soon after construction, the existing, former prison water tower (below, inset) was completely dismantled and sold to the city of Branson West in southern Missouri. Reconstructed (left), it saved yet another valuable resource through recycling.

Building and roadway excavation adjacent to the water tower created concerns for construction managers about the stability or lateral compaction of the soil surrounding the tower. The roadway elevation and direction was analyzed a multitude of times due to revisions made in the roadway path, between the water tower and the state surplus property operation, as part of a future parkway connecting the upper parcels of property to the lower decommissioned prison site. Problems with roadway planning, storm water management and debris fields would eventually be eliminated through team consensus allowing the project to proceed.

Verifying Project Success

Department management and staff participants in the conceptual planning process felt that the state's efforts to design and construct a "Green Building" should be validated using a nationally recognized rating and certification protocol. We did not want to underestimate the importance of international recognition of not only our wise stewardship of natural resources and a corresponding reduction of our footprint upon the environment but that funding was expended wisely in doing so.

Research indicated that the framework provided by the United States Green Building Council (USGBC)/LEED certification protocol was the developing strategy being used by public and private entities to assess building performance and substantiate efforts to meet project sustainability goals. It was conceivable that a LEED gold rating was possible for our project with the available funding appropriated by the Missouri state legislature. However, the project would require an integrated sustainable design using life cycle cost analysis and value engineering as the basis for making decisions with the appropriated funding.

A LEED certification agreement was added to the project design services contract as an addendum in March 2003, to verify the success of our efforts to design and construct the highest quality sustainable building as the budget would allow. BNIM Architects provided the LEED certification project services necessary to accomplish the following:

- Guide schematic design components.
- Partner with the prime construction contractor to channel their efforts to choose building materials and process indoor air quality and construction waste management records.
- Conduct or request design subcontractor life cycle cost and value engineering analyses that would ulti mately be used to make funding decisions and meet project goal oriented LEED requirements.

From Gold to Platinum

Verifying LEED credits throughout the design development and construction stages was a constant process of addition and subtraction. A design concept may be added and deleted multiple times before the project team and LEED design architect can verify the validity of a credit at the end of the construction stage.

Analysis of the finished design by BNIM on September 2001 indicated the building design could possibly receive a gold rating, which was a conceptual design goal for the project. However, analytical verification would be required to verify fifteen design components in the ensuing year, during the early stages of the construction project. The construction contractor also had control over certain LEED components, such as:

- Construction waste management and material resource reuse.
- Recycling on the premises during construction.
- Recycled content and low VOC emissions of construction materials.
- Purchase of rapidly renewable resources during the subcontractor's materials bid processes.

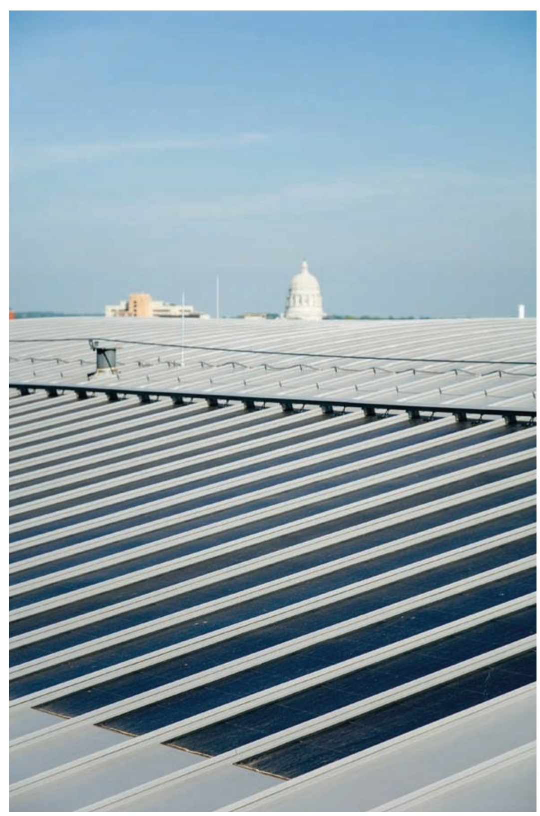
Mechanical system installation, controllability and the commissioning efforts would also become primary components requiring analytical verification.

Twenty-four design and construction concept credits would be added to the LEED template, for a total of 44 credits, from September 2001 to October 2002. There was high probability that the project could earn the prerequisite credits to be certified gold. Once building construction was under way in April 2003 the project team began looking at design components that could be added to the building that might strengthen our LEED certification opportunities. BNIM architects began the process of analyzing possible design options and costs at this time.

Verification that the photovoltaic solar electric power system would produce the required power requirements specified by LEED and additional storm water treatment components would be the only two credits added to the project from October 2002 to January 2004, for a total of 46 credits. The reason only two credits were added during this period was due to project team members spending this time assuring that the site infrastructure and building construction projects were proceeding well. The LEED certified architect and construction contractor also continued collecting information and data on all LEED category components to fulfill the reporting requirements that would be necessary to certify the building.

The photovoltaic solar electric power system had previously been added to the roof design as a mission based technology demonstration to provide 2.56 percent of the building's electricity. A domestic solar hot water system had also been added to the schematic design and these two components together would be verified to meet the 5 percent renewable energy source credit under the LEED Energy and Atmosphere category.

The BNIM LEED-certified architect began the process of finalizing documentation to strengthen the LEED gold rating for the project. Having tentatively received enough credits to be certified gold, only six LEED credits would be needed to reach the platinum level as of



Another view of the 22 kw grid-tied photovoltaic system on the Lewis and Clark State Office Building's roof, with the state capitol building in the distant background.

January 2004, if the 46 credits previously verified, remained viable during latter stages of construction.

Project managers began to consider the possible use of contingency funding to improve the building performance, as change orders became less frequent for construction completion and non-site specific infrastructure improvements. From January through June 2004 state project managers and BNIM architects began discussions to determine what LEED credits were still available to the project, possibly to reach the platinum level.

LEED Energy and Atmosphere design components where the first options to receive further analysis to determine their impacts upon building energy performance, what contingency funding was available to support these components and their impact on future operating costs. Essentially, the primary purpose of these design components was to improve systems performance, increase energy efficiency and eliminate future operating costs.

The following six components augmented the LEED credit documentation during the last six months of construction from July to December 2004 at minimum costs to the project budget. The addition of these final components would ultimately provide the project with the requisite number of credits needed to earn a platinum rating.

Optimization of Energy Performance:

The performance of the building would ultimately rely on superior integration of systems, exceptional building envelope design, an extremely efficient central utility plant and a low resistance air-side system that brought the HVAC system energy savings well beyond 55 percent compared to the ASHRAE base case model. Computer simulations were developed by Rumsey Engineers summarizing end use systems including, interior and exterior lighting, electric and gas space heating, electric cooling, pumps, heat rejection, interior ventilation and exhaust fans, gas domestic hot water heating, office equipment, elevators and refrigeration. The building optimized the highest level of efficiency obtainable through the LEED certification process.

Site Specific Measurement and Verification:

The building was designed to operate 56 percent more efficiently than a baseline case building specified to meet ASHRAE 90.1. Additional measurement and verification (M&V) would require the building commissioning agent to develop an M&V plan and report findings to assure that building systems were designed and installed to operate at the higher level of design efficiency.

The M&V report findings indicated that the building conserves the energy expected and meets operating specifications as designed and is the basis for receiving LEED credit for these particular criteria. However, post-construction monitoring was also required to determine how well the building performs after occupancy.

Ozone Depletion:

Compliance with ozone depletion requirements of these LEED criteria essentially eliminates use of HCFCs or halon in HVAC systems, refrigeration equipment and fire suppression systems in support of early compliance with the Montreal Protocol. Analysis was completed with calculations to certify compliance by the mechanical engineer.

Green Power:

The LEED credit for Green Power purchase requires a two-year contract commitment for 50 percent of the building's expected electrical cost in support of the generation of power from renewable sources. Purchasing renewable energy green power certificates is a means of providing additional economic incentives for future investments in the renewable energy industry which includes solar and wind power initiatives, among other alternatives.

To receive this LEED credit, the department would need to purchase 343,000 KWH per year for two years, for a total of 686,000 KWH over a two-year period.

First indications indicated the purchase of green power or green tag certificates would be cost prohibitive during early stages of the building design. However, the cost was relatively low or about one-sixth of the original cost estimate when the department placed a national bid for the purchase of green power certificates during the later stages of construction.

Materials and Resources:

The construction contractor would make and ultimately document exemplary efforts to purchase materials with high recycled material content while also recycling construction waste at a very high level. The LEED credits available to the project for the recycled content of construction materials purchased and on-site construction material recycling would reach elevated levels that were instrumental in gaining additional LEED credits for the building. The project ultimately gained a LEED credit for advanced recycled content in building materials, but missed the 75 percent level, or the highest level of construction waste management, by just two percentage points.

Sustainable Sites: 4.4

The LEED rating system requires select parking for carpool and alternative fuel fleet vehicles in close proximity to the building. It was also imperative that off-street parking be provided to building occupants meeting local code requirements.

A state employee shuttle lot facility was chosen by the Office of Administration during building construction as a short-term and cost-effective means of providing shared parking for department staff and employees from the Department Health and Senior Services' laboratory.

Carpool and visitor parking was chosen in front of the building and parking for alternative fuel fleet vehicle parking was selected in the shuttle lot, in close proximity to the building, but not at the building.

Strategies for Innovation and Design

Final decisions were also made in late 2004 regarding what five strategies were to be chosen as Innovation and Design components allowed by the LEED rating system. The LEED rating system allows for five credits relative to innovative design components that go beyond what is required of the five specified certification categories.

Any number of LEED components and design strategies were considered to document innovative efforts of the project team. Some of the items documented in the LEED certification process, but not chosen, were:

- The paradigm shift of the State corrections industry to change their use of materials containing volatile organic chemicals in their systems furniture manufacturing processes.
- The building's green cleaning program developed through the normal state bidding process using specifi cations specifically defining what green cleaning programming and materials are required.
- Education efforts designed to inform the public about the sustainable design features and components of the building.
- The raised access flooring system.

All the above items received considerable consideration during the LEED certification process. However, the design team, led by the LEED accredited professional, believed documentation of the following design and construction components would better substantiate efforts either above and beyond what was required by LEED or those efforts that might have been substantial, but not quite to the level required by higher levels within the LEED rating system. The team thought that we should take pride in attaining these efforts, not only by the design team, but by the construction contractor as well, as a part of their efforts to attain a high LEED rating.

Five Documented Design and Construction Strategies

- Exceptional water use and reduction – Calculations demonstrated that occupancy based potable water consumption was reduced by 78.3 percent over baseline conditions. Furthermore, water fixtures were specified, purchased and installed that exceeded fixture performance requirements of the federal Energy Policy Act of 1992.

- Exceptional recycled content of materials – The construction contractor bid and purchased an elevated amount of building materials, specified by the design architect, exceeding both the 25 percent and 50 per cent credit levels of the LEED criteria. These building materials contained a minimum weighted average of 20 percent post-consumer or a minimum weighted average of 40 percent post-industrial recycled con tent material.
- Exceptional locally manufactured materials – Seventy-six percent of the building materials were manu factured regionally, within 500 miles, and was 3.8 times greater than required under the LEED Materials and Resources criteria.

- Exceptional locally harvested materials – Of the 76 percent of materials manufactured regionally, 53 per cent was harvested within the state of Missouri. This represents 40.3 percent of all materials and was 4.03 times greater than the minimum requirement for this credit.
LEED accredited professional – The project received one credit for using a LEED accredited professional from BNIM Architects.

- LEED-accredited professional – The fifth credit under the innovation and design process was for use of a LEED-accredited professional. This was a requirement of the LEED certification subcontract with BNIM Architects.

The praise for receiving many of the final credits to reach the platinum certification level was due to efforts by the construction contractor in locating specified materials with high recycled content within the State of Missouri, or at least, within 500 miles radius of the construction site. This impressive achievement was a testament to the high value the construction contractor placed upon the partnership and to the efforts taken to achieve the highest level LEED rating possible.

"We" (project partners) participated in a journey starting in 1999 not knowing to what degree we would be successful. We knew we only had so much money, and money was tight. We knew we had knowledgeable staff with the potential for more ideas than were imaginable. There were no conceivable constraints, but we were such novices, not only constructing a new state office building, but constructing one conceived on sustainable design. You picked up any magazine for facility design, construction, management, any magazine, and you might find only one paragraph about "green." Green architecture was not in its infancy, but it wasn't at the forefront of building design, either.

The environment is so important to those who work for the Missouri Department of Natural Resources. We were about to embark on a new century filled with hope that mankind could reverse the effects of the many years of environmental abuse upon our planet. This was our one chance to make a difference in what type of environment our employees would work in – for another 100 years. We wanted to be an example and set an example for others to follow. We received an opportunity – we accepted the challenge.

The United States Green Building Council (USGBC) gave us the only means we knew existed at the time to place judgment on our efforts. We grasped the opportunity and USGBC gave us the tool, the Leadership if Energy and Environmental Design (LEED) certification process. The more wisely we used the funds, the more wisely we worked to develop partners, the more wisely we made decisions, the more we could attain – Platinum! It's the highest rating a LEED-rated building can receive. We weren't thinking Platinum in 1999. We realized we only had so much money and we asked ourselves: "How successful can we be?" If a platinum award is any judgment of our success, we spent the money well. But, it's not an award, it's an honor. And we were honored to accept it.

We sincerely thank our many partners, for without them – all of them – we would not have been successful. We were allowed to exercise our best judgment, explore creative options and entertain every available avenue to achieve our goals. We never had to operate under constraints that would have limited that process or freedom. Everyone involved wanted the project to be a success. Our hard work ensured that it was.

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Missouri Lewis & Clark State Office Building DNR

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