PROSPECTING FOR SILVER STRIKING PLATINUM: Our First LEED Project

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INTRODUCTION

Prospecting demands positive future orientation, hope, sometimes not even knowing what it is you might discover. We were hopeful prospectors on our first LEED project, not exactly sure what we might strike. We sought silver sustainability for the University of New Mexico (UNM) College of Education Building (COE); what we discovered was even more precious and rare, platinum. Getting there entailed chipping away at each sustainable LEED credit until we hit pay dirt, the first publicly-funded and second LEED Platinum building in New Mexico.

Gregory T. Hicks & Associates P.C. Architects was contracted by UNM to design a LEED Silver Certified building for its new COE Administration and Classroom Building, Phase 1. All new, state-funded buildings in New Mexico must achieve a minimum LEED Silver certification as mandated by Governor's Executive Order. Two of our staff, Jim MacGillivray and Jay Davis, are LEED APs, and our Principal, Gregory T. Hicks, has taken several USGBC courses, but this being our first LEED project, we participated in additional study in LEED certification and sustainable design. We also hired an experienced sustainable design specialist to serve as our LEED AP, our lead prospector, Susan Barnett.

Not knowing how easy or difficult it might be to achieve LEED Silver, the prudent approach was to strive for as many points as possible, so that if we lost a few points along the way we would still fulfill the obligations of our contract. UNM COE and other UNM staff championed this approach. Our initial strategy targeted LEED credits with minimal cost, those almost free, logical modifications that improve sustainability. Next, we focused on achieving four "Innovation in Design" credits, searching for ideas that would involve minor costs or creative design endeavor. UNM COE committed to a photovoltaic system for educational and research purposes as well as to purchase a renewable energy certificate. Our initial venture targeted up to 48 possible points, comfortably within Gold territory.

We submitted our project to USGBC for design review as the project went out to bid. The design review denied a few points in some areas, but serendipitously awarded a few extra points in other areas. UNM COE supported the prospects of achieving Gold so we provided additional information to successfully appeal denied credits, which brought us back up to a potential of 48 points, assuming targeted points were awarded during the construction review. At this point we knew we would certainly achieve Silver, possibly Gold.

Midway through construction, the COE Dean, Richard Howell, and COE Chief of Staff, Diane Gwinn, asked us if there might be a way to earn just 4 or more points to reach the 52 required for LEED Platinum. Steve Chavez, UNM Project Manager, strongly championed this effort. This seemed difficult, if not impossible at this juncture in the project, but we met with COE, UNM engineers, design engineers, LEED AP, and the contractor to brainstorm possibilities. We came up with eight possibilities, but not all were affordable, practical, or supported, so we whittled the eight down to five, but just before the construction review we lost one of the five, so we tried for four.

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When the USGBC completed their construction review, we learned we had scored 52 points awarded LEED Platinum certification. Partnership of UNM COE, architect, engineers, LEED APs, and contractor created this success through a relentless "can-do" attitude throughout the project, plus some luck. Boring down deeply, we sought Silver and struck Platinum.

This narrative is organized according to the USGBC LEED credit rating system and highlights the sustainable accomplishments of the project along with lessons learned.

KEYWORDS

site stewardship, storm water infiltration, habitat, low-albedo, ultra-low-flow, optimized energy, high performance, light spectrum, enhanced commissioning, peak performance

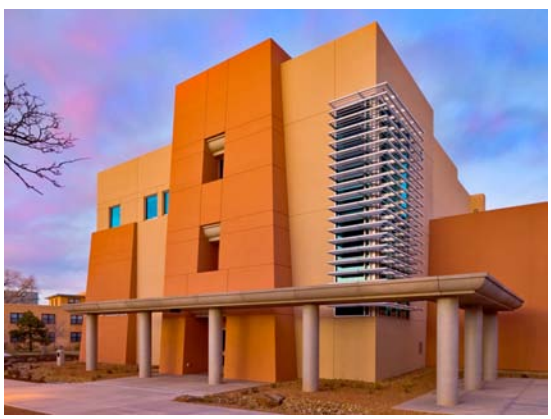
PROJECT BACKGROUND

As the leading New Mexico school of education, the UNM College of Education produces one in three of all teachers, counselors, and administrators in the state. The College is committed to education at the most fundamental level by encouraging students to engage in reflective practice and valuing democracy, social justice, and multiculturalism.

COE is located on the UNM main campus founded in 1889 and is situated in the heart of Albuquerque along Route 66. New Mexico is the Land of Enchantment for its scenic beauty and rich history, the Sunshine State for its generous sunshine, and the Land of Opportunity with its world-class research network and enterprise. From the country's largest surviving multistoried Pueblo Indian structure in Taos, to the National Labs at Los Alamos and Sandia, to Spaceport America, New Mexico combines rich and diverse ancient culture with the most technologically advanced achievements in the world. The 600-acre campus is reminiscent of a pueblo village connected by a well developed fabric of southwestern landscaping, pathways, plazas, and a central duck pond.

This new building is a three story 26,180 square foot pueblo-revival style structure providing state-of-the-art classrooms and administrative space for the UNM COE. The classrooms provide students and teachers with unlimited potential for learning, instruction, collaboration, and connectivity to the outside world. Classrooms feature integrated smartboards, multiple flat screen monitors, simultaneous imaging, audio, video conferencing, both hardwire and wireless Internet connections for each student, staff, and administrator, 10gb backbone, and an Internet cable delivery system designed to allow easy technological upgrades in the future. The classrooms are flexibly furnished with smart tables and chairs allowing whole-class instruction or small group collaboration.

West Entrance with reduced, deep-set, and protected glazing.



SUSTAINABLE DESIGN CHARRETTE

Our sustainable design effort began with an all-day sustainable design charrette led by Sustainable Design Specialist and USGBC charter member Susan Barnett. Attendees included the COE Dean, Chief Administrator, and staff; University Architect, University Engineers, and staff of UNM Office of Capitol Projects, Physical Plant, Maintenance & Operations, Campus Landscaping, Campus Recycling, and the architect Gregory T. Hicks & Associates with all design engineers. The charrette's success was its combination of education and participation. Ms. Barnett gave a short overview of each LEED sustainable category, solicited anonymous ideas on pieces of paper from attendees for how the credit

might be achieved, read the ideas out loud, then led an open discussion to form a consensus on whether the credit should be considered, and if so, how it could be accomplished. This process informed people less familiar with sustainable concepts while creating a forum where all stakeholders could voice their knowledge, expertise, and concerns. During the charrette, goals, priorities, and issues were documented. Disagreements between stakeholders were discussed, as the open forum exposed participants to other people's ideas and enabled them to work toward resolutions.

ALTERNATIVE TRANSPORTATION

UNM COE scored 3 out of 4 points in the alternative transportation category. One point was gained quite easily because the proposed site sat in the center of the UNM campus and was already located within one public transit route and several campus transit routes, both with multiple stops. A second point was gained by using existing parking, not increasing parking on the campus. Credit was not earned in the category of low-emitting and fuel efficient vehicles although consideration was given to the idea of dedicating some spaces in the main campus parking facility to low-emitting and fuel efficient vehicles. This idea was not pursued because such dedicated spaces could result in a reduction of parking revenue. A third point was scored for providing secured bicycle storage and changing facilities, an important consideration at UNM, with its warm summers, moderate winters, low precipitation, and well-developed network of bicycle paths. UNM's central location in the city makes it a cycling hub. This facility contributed to cycling accommodations by providing secure bicycle racks and one public shower and changing room. Some team members opposed providing a public shower because some public showers on the campus receive little use and it was argued that valuable funds should be dedicated to more important priorities. Consideration was given to renovation of some inactive shower rooms in an adjacent building, but the renovation would have been too costly. The decision was made to incorporate a shower room into the new building in order to qualify for the credit. The shower is located near the administration area where it serves students, staff, and administrators who are often on the campus for extended hours, in addition to cyclists. This shower will also serve as a LEED point for other new, nearby buildings.

RESTORING HABITAT AND MAXIMIZING OPEN SPACE

The UNM College of Education achieved 1 point for restoring habitat and 1 point for maximizing open space. Site stewardship is a high priority at UNM. The 600-acre urban campus is gridlocked in the heart of Albuquerque making placement of buildings and conservation of open space on the campus an important consideration. Two potential sites existed within the COE complex, a small site and a large site. The decision was made to go with the small site to preserve the large site for a future larger Phase 2. The smaller site was very constricted by an existing building to the south, well-established pedestrian arteries on the east and west, and a major campus utility tunnel on the north. To maximize open space the decision was made to join the new building to the existing building resulting in larger expanses of vegetated area. This connection also created a synergy with existing functions in the other building, made the new classrooms more accessible, and brought COE Administration closer to students. Also, by constructing three stories instead of two, we achieved a smaller footprint with more open space. This open space was heavily vegetated with native plants, providing quality open space for pedestrians to enjoy.

STORMWATER DESIGN

UNM COE earned 1 point for storm water quantity control and 1 point for storm water quality control. Local Civil Engineering firm Isaacson & Arfman, P.A. designed the site grading and drainage improvements for the site. The site posed a number of interesting drainage challenges due to a tight, flat site surrounded by existing infrastructure and crossed by a sanitary sewer main, a $7' \times 7'$ concrete tunnel with major campus utilities. The soil is silty sand with occasional layers of sandy clay to very sandy clay that hampers infiltration. It was necessary to route existing concentrated stormwater discharge from adjacent buildings around the proposed building and reduce and harvest the overall storm water discharge from the boundary area to achieve LEED credit.

The most interesting challenge was maneuvering through the various surfaces and over sub-surface obstacles on this flat site to establish positive storm water flow. Close coordination between civil engineer, architect, and landscape architect created a functional and aesthetic solution that integrated water harvesting with attractive, native vegetation.

The initial site analysis quantified the pre- and post-developed discharge rates and volumes, as well as off-site basins that impact the property. Working closely with the landscape architect's conceptual design using berms and depressions circumventing the building, a series of overflowing, shallow retention basins were designed with integrated swales to capture the site discharge, nurture landscaping, and direct excess flows to basins. Basins were sized to reduce the developed site discharge to 50% of the historic discharge. During larger rainstorms, overflow water from the three main basins is released to follow historic discharge paths. Routing the flow through rock swales and shallow basins allows suspended solids to settle, assisting with water quality control. Due to the occurrence of clay in the subgrade, percolation pits were added at the bottom of each water-harvesting basin to increase percolation of the retained flow to the aquifer.

Assuring the successful transition from design intent to construction implementation was imperative on this flat site. The most carefully planned design will only function if it is constructed as designed, so the civil engineers, architect, landscape architect, and contractors tightly coordinated each level of material as it was installed. Landscaping subgrades were installed at the depths called for on the civil plans so that design grades were maintained after landscaping materials were installed.

HEAT ISLAND EFFECT

The UNM COE achieved 2 out of 2 points, plus 1 exemplary performance point, in the category of reducing the heat island effect. Over the last 30 years UNM has substantially mitigated its heat island effect throughout the 600-acre campus by planting deciduous trees with reliable, well-maintained irrigation systems, installing low-albedo paving, and replacing dark roofing with white roofing. These improvements along with the central duck pond have made the campus a pedestrian friendly place where people from all over the city seek respite. The new building achieved 88% out of 100% in the category of low-albedo roofing through the use of SRI 88 white TPO roofing, and 100% out of 100% in the area of low-albedo sidewalks and patios through the use of SRI 35 natural grey concrete.

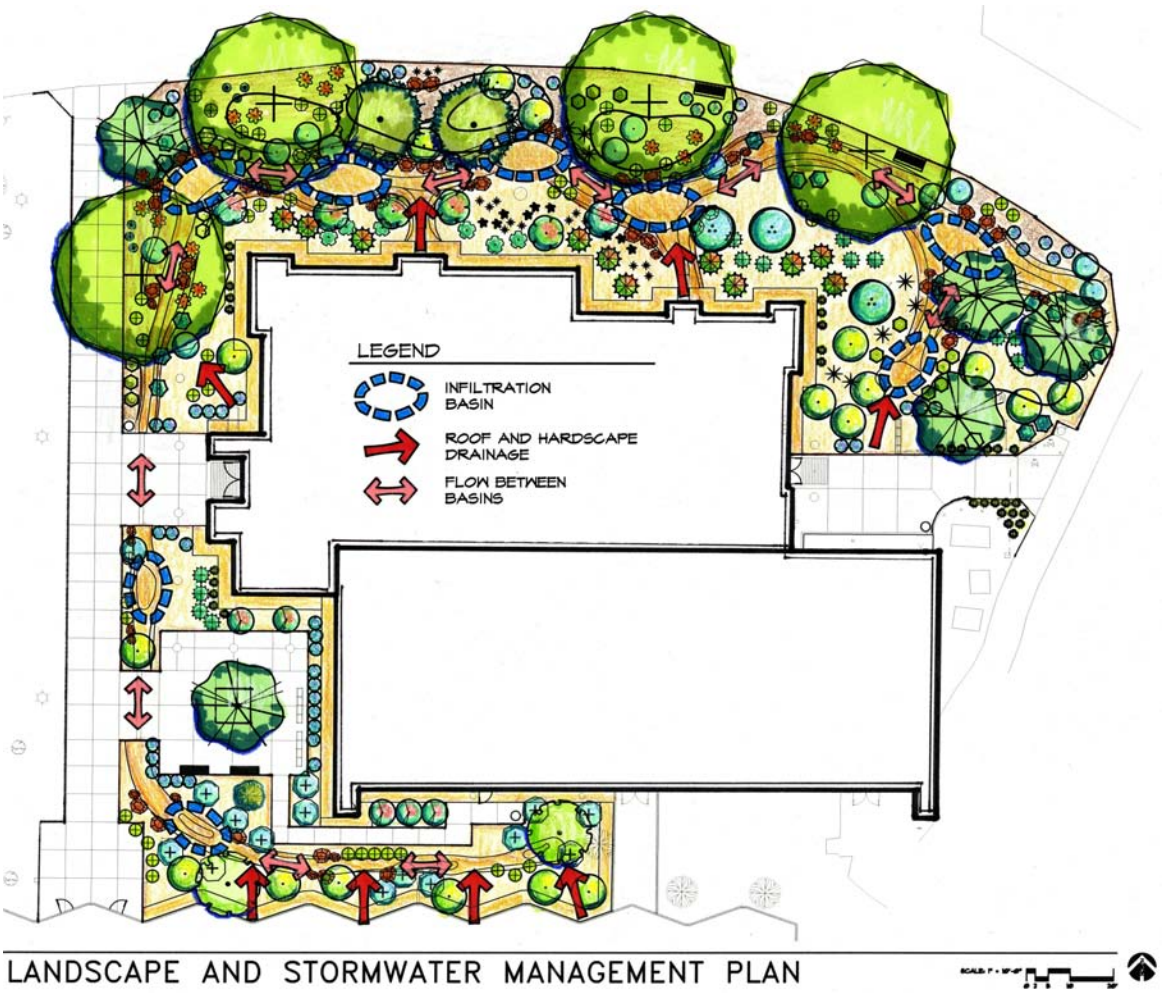
LIGHT POLLUTION REDUCTION

The UNM COE earned 1 point in the category of light pollution reduction. Addressing the college's site lighting security needs, while successfully reducing light pollution, resulted in challenges successfully addressed by the local engineering firm, The Response Group. First, flood lighting was minimized by incorporating only two strategically placed pedestrian-height pole lights with cut-off fixtures at small plazas near the entrances to the building. These lights were pulled back from the LEED boundary, keeping within the requirement for zero foot-candles at a distance of 15 feet beyond the LEED boundary of the site.

A second challenge involved how to provide security lighting mandated by the UNM Police Department while still achieving light pollution reduction. Security, an essential priority on a university campus, required exterior lighting designed to prevent dark hiding places in the landscaping around the building. To achieve this, the design team pulled shrubs away from the building and incorporated a minimal number of strategically placed bollards about 10 feet away from the perimeter of the building. The bollards were one-sided low-level cut-off lights, illuminating the base of the building with extremely low-level lighting. This solution also created attractive base lighting for the building, eliminated all glare toward pedestrian walks, further enhancing security. Upper building masses were not illuminated to meet the requirement to keep lighting directed below 90 degrees from Nadir.

LANDSCAPING & WATER CONSERVATION

The UNM College of Education earned 1 out of 2 points for achieving a 73% reduction in potable water usage for irrigation, below a calculated baseline. Landscaping and water conservation were a primary consideration in this project. The landscape was designed by the local landscape architectural firm Morrow Reardon Wilkinson Miller, Ltd. and



Riverbed landscaping directs and retains water flow.

is currently a Pilot Project in the American Society of Landscape Architects Sustainable Sites Initiative Program (SITES). The design is a demonstration of green building techniques to students and faculty, and it incorporates sustainable design elements beyond LEED requirements. Prior to development, the existing site was covered with high-water-use turf grass and ivy-covered walls reminiscent of times past when water was assumed to be more plentiful in our arid, high desert. The grass and ivy were removed to allow placement of the new building. A few mature trees also had to be removed. These trees were chipped and used as mulch on the campus. The new landscape design includes native and naturalized plantings that are oriented along a drainage swale system. Storm water drainage was harvested for irrigation in a series of small infiltration ponds. The surfacing material consisted of gravel mulch from local sources, as well as bark mulch. The soil was decompacted and amended with organic material prior to planting. Sustainable features not directly addressed by LEED included use of organic mulch materials to simulate natural processes and use of plantings to match the campus arboretum. Plantings reinforce the architectural forms. The active irrigation system is a low flow bubbler system that supplies water directly to the plants, and meets the university's maintenance requirements for a commercial system. The site design also incorporates bike racks, a recharge station for the university's electric vehicle fleet, designated smoking areas away from building entrances and fresh air intakes, and site furnishings made of recycled materials.

WATER-USE REDUCTION IN THE BUILDING

Water-use reduction is an important component of this design. The UNM COE earned 2 out of 2 points, plus 1 exemplary performance point, for achieving a 50% reduction in water use. We achieved this goal by specifying ultra-low 1.3 gpf water closets, 0.1 gpf urinals, 0.5 gpm sensored lavatory/kitchen/classroom faucets set to 15 seconds, and 1.5 gpm shower heads. Water-use reduction was also achieved by installing aerators on all faucets, although these required frequent replacement due to calcification from hard water. A recycled grey water system for toilet and urinal flushing was considered; however, storage, sanitization, and dual piping were deemed too expensive. A building specific rainwater harvesting system using cisterns was also considered for landscape irrigation purposes; however, the university currently has plans to build a central water harvesting system where it will be able to harvest utility blow-off water in addition to rainwater, as well as consolidate maintenance, so UNM chose not to install a smaller cistern on this project.

COMMISSIONING

The UNM College of Education earned 1 point for enhanced commissioning. UNM's Physical Plant Division has long been active in retro-commissioning as part of their energy savings strategy. All new buildings on the campus, including COE, receive both fundamental and enhanced commissioning. The benefits of enhanced commissioning included early design review to identify energy savings strategies, a comprehensive system manual, and a post warrantee review of the equipment ten months after occupancy. To ensure quality commissioning of the new building, UNM's Commissioning Authority, James Wernicke, PE, LEED AP, selected Beaudin Ganze Consulting Engineers to provide support to their Engineering and Energy Services team. Commissioned systems included the new air handling unit and variable air volume system with hot water reheat, the steam-to-hot-water converter, high performance lighting with occupancy controls, and photovoltaic system.

At the end of construction, commissioning inspections proved extremely fruitful in identifying over 50 equipment performance issues. Beaudin Ganze not only scrutinized the performance of the systems, they provided excellent diagnostic assistance to help determine illusive issues. The result was a building with well constructed, fully-functional building systems. Specific examples of performance issues identified by the commissioning agent included: identification of a missing outside airflow sensor on the air handling unit, which was key to achieving increased ventilation and energy savings, locating a leaking heating water steam valve that would have resulted in a decrease in energy efficiency, finding incorrectly set differential pressure controls that would have resulted in decreased efficiency of pumps, noting air in the system that would have caused inconsistent

delivery of hot water, and correctly calibrating CO_2 sensors that would have resulted in energy consuming ventilation when not required.

OPTIMIZED ENERGY—SUMMARY

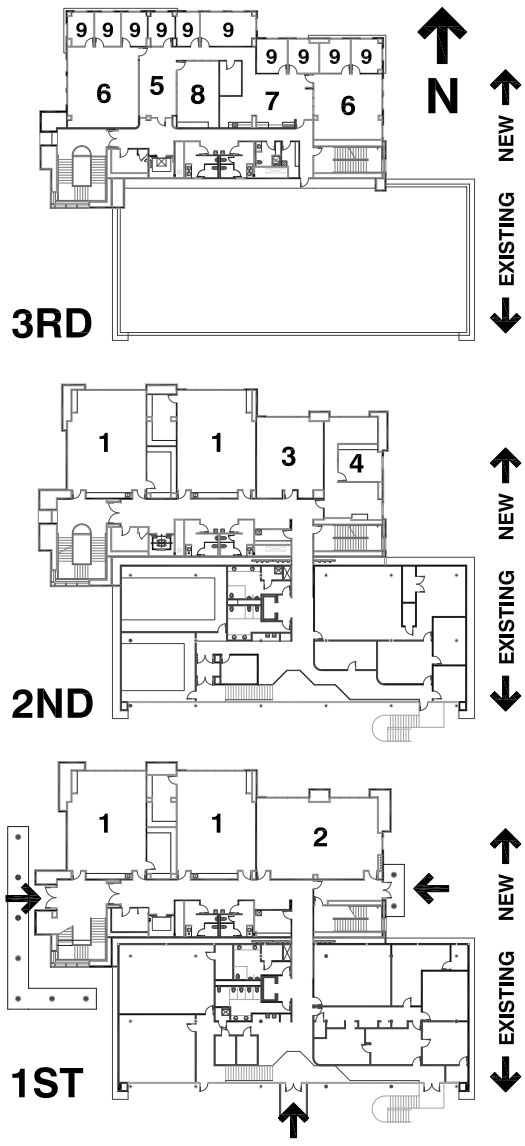
UNM is committed to achieving carbon neutrality by the year 2030. UNM COE garnered 7 out of 10 points in the category of optimized energy. In addition to meeting LEED requirements, the new building was also required to meet the New Mexico Governor's Executive Order of 2006 which required that each new state funded building achieve a LEED Silver or better rating and reduce the energy consumed by 50% or more based on the DOE Target Finder scoring or the CBECS value, or as approved by the New Mexico energy monitoring data base for similar buildings. The primary elements contributing to the building's success were its high-performance envelope, integration with the UNM central boiler-chiller plant, centralized air handling, efficient lighting system, and the on-site power generating photovoltaic system.

OPTIMIZED ENERGY—BUILDING ENVELOPE

UNM COE employed tried-and-true principles of envelope design beginning with surface-to-volume ratio. The new building was laid out as a 120 foot by 60 foot by 45 foot high mass with short ends oriented east and west and longer surfaces oriented north and south. The new three-story structure was added to the north side of an existing two-story structure of similar massing and orientation, forming a consolidated mass with a low surface-to-volume ratio overall. The reduced surface area will result in reduced heat loss and heat gain, which will in turn result in lower energy costs for the life of both buildings. An enclosed non-cooled penthouse was placed over the third floor creating a significant climate buffer overhead.

The building's exterior walls consisted of six-inch metal studs filled with R-19 foil scrim fiberglass insulation, and a 1.5 inch R-6 expanded polystyrene insulation and finish system that also provided a continuous thermal break and weather barrier. Steel headers were filled with R-20 sprayed cellular insulation. Roof construction consisted of sloped steel decking with 1.5 inch perlite board, white TPO

Consolidated multi-floor arrangement promotes optimized energy.



roofing membrane, and R-38 foil scrim fiberglass insulation beneath. Foundation walls were insulated with 1.5 inch R-6 extruded polystyrene and protected from moisture beneath by a 15 mil 0.0084 perm polyolefin vapor barrier.

High performance glazing was used to reduce solar radiation gain, reduce conductive heat-gain and heat-loss, and maximize visible spectrum daylight. Glazing consisted of 1-inch low-E tinted insulated glass units with a Solar Heat Gain Coefficient (SHGC) of 0.38 (a measurement of how much solar radiation is blocked by the glass), an exceptional Light to Solar Gain (LSG) ratio of 1.84 (meaning that the glass stops 62% of the total solar energy while allowing 70% of the visible light spectrum), and an excellent thermal performance winter nighttime U-value of 0.29. Manual shades with an openness factor of 3% on the east and west, and 5% on the north, were also provided at all windows to provide users with the option of additional solar protection or to achieve a partial room darkening effect for professors using projectors.

A daylight-filled grand entrance stair tower was incorporated consisting of a partial glass curtain wall with exterior louvers and high performance glazing. The louvers reduce direct solar gain all year round while defusing light deep into the tower for even daylight distribution.

OPTIMIZED ENERGY—HVAC

The building mechanical conditioning system consisted of a variable air volume (VAV) system with a single air handling unit with a chilled water cooling coil, hot water heating coil, dedicated outside air intake with 100% economizer operation, MERV 13 air filtration, and VAV supply and return fan serving zone VAV terminal units with hot water reheat. The distribution system consisted of medium pressure single duct supply to VAV terminal units with low velocity space distribution, and ceiling plenum return with sound boots.

Other features that made the HVAC system energy efficient included thermostat setback, optimized temperature and fan static, night flush capability, and 100% economizer operation. The energy efficiency of COE mechanical conditioning and domestic hot water systems was primarily due to their association with the UNM central boiler and chiller plant. Chilled water and steam are provided from central plants on the campus. The heating and domestic hot water used in the building is generated off of dedicated on demand steam-to-water heat exchangers. The campus central steam plant operates at a higher efficiency by utilizing the diversity in the campus operation paired with the multiple steam boilers operating at peak performance to match demand. The Campus Central Chiller Plant operates at a 16 degree delta and higher efficiencies than small dedicated building plants primarily because of the larger campus diversity factor and greater overall part load efficiency based on the plant having more chillers running at optimum efficiency to meet actual demand. Similarly, the building's central air-handling system and subsequent VAV terminal units are sized for total peak building load runs. This is more efficient than multiple packaged DX units each sized for peak space load.

OPTIMIZED ENERGY—LIGHTING

Energy use reduction was achieved through the use of energy efficient fluorescent lighting and sensors throughout the building. Occupancy sensors were used at all occupied and non-occupied locations throughout the building, except corridors. Dual switching was used in conjunction with occupancy sensors at classrooms, and daylight sensors were used in conjunction with occupancy sensors at stair towers. On the exterior, entrance lights, patio lights, and the building identification lighting were set to photocell-on, photocell-off, while security bollards were set to photo-on, time-clock-off.

ON-SITE RENEWABLE ENERGY

New Mexico is one of the leading solar energy research hubs in the world. Our sunny climate combined with a network of private, federal, and university research facilities makes our state a prime location for the development of alternative forms of energy. UNM COE earned 2 out of 3 points in the category of on-site renewable energy. To reduce carbon emissions, promote clean energy, and provide a case study for students and researchers, we incorporated a 10 kW photovoltaic system comprised of forty-eight 224-watt panels capable of producing 21,120 kWh of electricity per year, or 7.5% of the building's power requirement per year. The system

48 panel 10 kW photovoltaic system.

was placed on the penthouse roof, which resulted in a number of special considerations including increased dead load, wind load, pigeon control, accessibility for servicing, and fall protection. Consideration was given to incorporating the panels into the design as an architectural cladding; however, the idea was declined due to the difficulty of accessing the panels for servicing. The total cost of the system including panels, inverter, electrical runs, additional structural steel, and bird control, was $109,569. At the current UNM Renewable Energy Credit rate of $0.13 per kWh the system would save $2,746 per year resulting in a 40-year payback time; however, if a typical 4% per year inflation cost is factored in, the payback time would be reduced to 25 years.

MEASUREMENT AND VERIFICATION PLAN AND THERMAL COMFORT SURVEY

UNM COE earned 1 point for creating a Measurement and Verification Plan and 1 point for planning a thermal comfort survey. Our initial design was meticulously planned, and during the initial planning stages it was determined that two credits related to building commissioning could be costly to obtain and the decision to include those would depend on the total points achieved during the construction phase. Both credits involved assessing the actual performance of the building. The first credit involved verification of the actual thermal comfort experienced by the occupants through conducting a thermal comfort survey, and the second was verification of the actual energy consumption versus the design projection through measurement and verification. Both credits are very challenging.

Thermal comfort verification is extremely difficult because numerous variables enter into a person's determination of comfort, i.e., an individual's personal metabolism, clothing, air flows, heat gain or loss through windows, incident sunlight, the location and placement of air diffusers and the temperature of the supply air itself. To meet the intent of the credit, over 80% of the occupants must indicate by survey that they are satisfied with the thermal comfort of the building. In the case of Measurement and Verification of the building performance, UNM planned to install a Building Utilization and Measurement Panel to measure all incoming energy systems. This is a standard UNM procedure as part of its energy reduction strategies. The LEED requirements add two significant controls to what UNM normally does. First, using temperature records for the actual occupied year, the building energy model is applied and the expected energy consumption is determined. The total btu/kwh used is then compared against the calculated value. If the building uses more energy than calculated, all energy systems are monitored using data loggers at a sub-level to see where the overage is occurring. For example, is too much lighting being used on the second floor? Is domestic hot water consumption high? Is an occupant using a space heater under the desk? Was additional equipment installed beyond what was originally planned? Based upon the results of this study, a corrective action plan will be developed between the physical plant and COE staff.

GREEN POWER

UNM COE earned 1 point by purchasing green power (grid-source renewable energy), as a two-year Renewable Energy Certificate (REC) from Sterling Planet. Sterling Planet won the U.S. Department of Energy 2008 Renewable Energy Marketer of the Year Award for being a sustainability pioneer and innovative supplier of renewable energy, including solar, wind, small hydro, geothermal, and organic bio. The REC cost $4,427 for 460,000 kWh of power. Based on the default energy consumption of 331,999 kwh/year, the REC will provide 69% of the building's power requirement per year for two years, doubling the LEED requirement. COE purchased the green power using non-project funds.

Renewable energy certificate from Sterling Planet

STORAGE AND COLLECTION OF RECYCLABLES

The UNM Recycling Program is now diverting from the City landfill more than half of the waste UNM generates. UNM's recycling program is extensive and recycles an amazing variety of materials. Some of the recycling is internal. Brush, tree limbs, and other green waste from campus landscaping are composted with sludge taken from the UNM Duck Pond. Other waste such as scrap tires, motor oil, batteries, and electronic scrap is sent to firms that specialize in specific kinds of recycling. UNM recycles more than a dozen kinds of plastic, paper, and cardboards. UNM recycles approximately 1,754.43 tons of material per year. UNM is exceeding the state target of 10% and the national average of 30%. In keeping with UNM's plan, COE provided a centrally located recycling alcove on each floor for the collection of paper, cardboard, aluminum, glass, and plastic. Maintenance staff collects the recyclables and transports them to a central holding location where they are picked up and taken to recycling plants.

CONSTRUCTION WASTE MANAGEMENT

UNM COE earned 2 out of 2 points for diverting 76% of construction waste away from landfills. The general contractor, Jaynes Corporation, effectively managed construction waste through education of its workforce and assignment of risk. Regular announcements at weekly jobsite meetings, and continuous interaction with subcontractor supervisors, resulted in few issues with contaminated construction waste. Contract language was included in subcontracts outlining the subcontractors' waste sorting responsibilities so that waste dumpsters being rejected by the recycler were the responsibility of the subcontractor. As a result, no loads were rejected by the recycling facilities. Jaynes reported that significantly lower waste management costs were experienced on this project compared to estimated cost. Prior LEED projects in the region have experienced nearly $1.00/sf in costs for sorting and recycling of waste materials. The waste management costs for COE were $0.52/sf total, with $0.15/sf spent to sort and transport the recycled materials. Reduced recycling costs can be attributed to the fact that additional recycling facilities have become available in the Albuquerque area to receive waste materials such as wood and concrete, thus reducing transportation costs to the recycling facilities.

RECYCLED MATERIALS

UNM COE earned 2 out of 2 points for incorporating 20% recycled Division 2-10 material into the project, with only a small premium increase in cost. Steel and concrete were the biggest contributors. Recycled ceramic tile for floors and walls in

restrooms also contributed. Jaynes reported that vendors in the region have generally increased their sophistication for obtaining and documenting materials with a high-recycling content. Manufacturers have noticeably improved their product lines to provide for products with a high recycled content. Specifications concisely describing approved vendors and products allowed for concise purchase order and subcontract language, thus defining the recycling goals from the inception of the contracts.

REGIONAL MATERIALS

UNM COE earned 1 out of 2 points for incorporating 15% Division 2-10 regional material into the project. Jaynes Corporation reported that with few manufacturing facilities in New Mexico, the points earned for regional content on the project are more of a function of design than vendor or material selection during construction. For example, structural steel is not manufactured regionally, so designs utilizing locally produced masonry for load-bearing walls will calculate more favorably in the category of regional material than traditional steel-framed designs like COE. Acceptable regional product manufacturers were generally approved in the specifications, so little to no cost was included by bidders for regional credits.

CERTIFIED WOOD

UNM COE earned 1 point for incorporating 65% FSC certified wood in the project. Achieving a high percentage was relatively easy because the building is a non-combustible building, incorporating a minimal amount of wood, making the small premium paid for certified wood negligible. Materials containing certified wood included interior wood doors, casework, and wood blocking. Jaynes reported that the availability of certified wood has noticeably increased, with numerous vendors now offering certified wood products. FSC-certified dimensional lumber, once difficult to source several years ago, is now readily available for shipment from several suppliers. Typical cost premium for the certified lumber runs approximately 25% over non-certified lumber. Other wood products used in the building, such as wood doors and casework, were obtained with a certified-wood content at no cost during initial buyout negotiations with the vendors and subcontractors.

OUTDOOR AIR DELIVERY MONITORING

UNM COE earned 1 point for providing outdoor air delivery monitoring. The new building provided air quality management as required, with the addition of room CO_2 ventilation air control. An air flow measuring station was located at the intake of the main air handling unit to ensure that minimum required ventilation air rates are maintained consistently into and circulated throughout the building. The CO_2 monitoring was provided at all high occupancy spaces such as classrooms. The CO_2 stations will not only warn occupants when CO_2 levels are too high, but they will also allow for shut down of the HVAC zones when not in use for energy conservation purposes.

INDOOR AIR QUALITY MANAGEMENT DURING CONSTRUCTION

UNM COE earned 1 point for indoor air quality management during construction. The key to achieving the credit was the general contractor took a proactive leadership role in training the construction team for good IAQ. It also involved a conscientious effort on the part of the subcontractors. HVAC protection included: minimizing use of the HVAC system during construction; installing MERV 8 filtering if HVAC had to be used; protection of equipment and ducting; sealing of distribution systems; and filter replacement before occupancy. Source control included: moisture protection of materials, isolation of construction zones from occupied zones, location of carpenter cut stations outdoors, and enforcement of no-smoking policy. Pathway interruption included: isolation of construction zones from occupied zones and exhausting of contaminated air to the outside. Housekeeping management included: minimization of dust, fumes, vapors, gas, dust suppression, dust cleaning, keeping work areas dry, and storing volatile liquids outside the building.

BUILDING FLUSH-OUT BEFORE OCCUPANCY

UNM COE earned 1 point for performing a building flush-out prior to occupancy, which was selected based on availability of time and qualified air testing contractors. Before flush-out could begin, all finishes had to be installed, final cleaning achieved, test and balance completed, and temporary MERV 13 filter-

ing installed. The flush was then performed based on an optimized ventilation rate, while maintaining a minimum building temperature of 60 degrees and a maximum relatively humidity of 60%, with the highest amount of ventilation air within the shortest operating time frame. The project timing was fortunate in that the completion date of the project was scheduled for spring, allowing the flush-out period to occur after the more problematic winter months, when air delivery rates have to be reduced to maintain proper temperature and humidity levels. This timing resulted in a shortened flush-out time and modest energy costs. Following the completion of the building Jaynes reported that several laboratories in the area had begun offering air sampling services at reasonable costs, reducing the cost of indoor air quality credit.

CONTROLLABILITY OF LIGHTING

UNM COE earned 1 point in the category of lighting control. Controllability was achieved through the use of dual-switching and task lighting. Classrooms were equipped with dual-switching so that users had the option of full lighting or partial lighting depending on the activities in the room and level of daylight. Lighting at marker boards and counters was placed on dedicated circuits providing even more flexibility in the classrooms. Bullpen areas and private offices are furnished with workstations equipped with private lamps allowing any combination of daylighting, general room lighting, or task lighting.

THERMAL COMFORT CONTROL

UNM COE earned 1 point in the category of thermal comfort control. Thermal comfort was a high priority to users. Being too hot or too cold impacts people's emotional well-being, attitudes, productivity, and health. Poor thermal comfort often leads people to improvise through the use of private fans, heaters, or even altering their schedules. To provide a high level of comfort, the HVAC system included a single variable-air-volume air handling unit with zoned VAV terminal units and re-heat. A thermal comfort zone is a space/area served by one dedicated variable volume terminal unit and a thermostat for user control. Each classroom received two zones, each four-person bullpen received two zones, and every two private offices shared a zone. The design resulted in a 58% overall user control rating in the building.

THERMAL COMFORT DESIGN

UNM COE earned 1 point in the category of thermal comfort design. Thermal comfort requirements were based on ASHRAE Standard 55 and discussions with UNM and College of Education. The building mechanical systems and air distribution worked together to provide cold, warm, or neutral air to the spaces as appropriate to maintain the space temperature settings and minimum ventilation. Supply air diffusers were selected to provide reasonable air speeds and air mixing at maximum and minimum air flows. The diffuser airflow patterns are manually adjustable. Summer Design Condition of 75 Deg F and Winter Design Condition of 72 Deg F are UNM standards for office and classroom spaces. Mechanical systems where designed to maintain the space temperature within +/−2 degrees for both heating and cooling modes. The mechanical systems were designed based on occupied spaces being designed for a maximum of 50% relative humidity.

DAYLIGHTING

Daylighting is very important as it not only reduces energy cost, but supports mental well-being for occupants. Relative to most buildings, substantive daylighting was largely achieved on the project, though it fell shy of LEED credit. The multistoried nature of the UNM College of Education building, combined with difficult site constraints, made daylighting a particular challenge. In one-story buildings, light can be brought down into the core of the building and to the rear of deep spaces using clerestories, monitors, or skylights. Bringing light down into the core of multi-story buildings can be more difficult. Consideration was given to the use of atriums, light shafts, and even daylight fiberoptics; however, such solutions resulted in costly floor area increases, costly fire suppression requirements, or cost prohibitive technologies. An effort was made to arrange all of the occupied spaces in the building so that sufficient daylight could be brought in through exterior walls; however, the building was tightly hemmed in on all sides by another building, pedestrian arteries, and

Daylight, suspended indirect light, task lights, provide quality lighting options for occupants.

utilities, making it difficult to achieve an optimal arrangement where full LEED daylighting could be accomplished in every space.

VIEWS

UNM COE earned 2 out of 2 points for providing exterior views for 92% of regularly occupied spaces in the building. The new building was situated in the campus in such a way that it was possible to obtain quality views of pedestrian corridors, plazas, and mature landscaping, in the foreground, with the majestic Sandia Mountains in the background. While it was possible to locate most occupied spaces on an exterior wall of the building, even some spaces near the core were able to access views through the use of interior window walls. Views were also provided from the main entrance stair tower to an adjacent plaza providing a dramatic sense of entrance and encouraging the use of vertical circulation.

COST ANALYSIS

Because our first LEED project entailed a full spectrum of sustainable features we thought it would be a prime opportunity to conduct a post-construction cost analysis of the project with a focus on cost related to sustainability. The cost study was organized according to LEED credits. The most expensive items were photovoltaics ($109,569), the shower room for cyclers ($15,000), extra climate zones for increased thermal comfort ($10,000), percolation pits for storm water retention ($9,000), and FSC wood ($1,560). The total labor and material construction hard costs for LEED sustainable features came in at 2.52% of Total Construction Cost. Soft costs for LEED design, energy modeling, commissioning, measurement, and verification, etc., were 1.63% of Total Project Budget. The cost premium to increase the sustainability for this building from a non-LEED certified building to a LEED Platinum building added 3.46% to the Total Project Budget. By way of comparison, the data and audio-visual systems in the building came to about 5% of Total Construction Cost.

CONCLUSION

As conveyed at the outset of the article, our project team started out as hopeful prospectors for LEED Silver, but due to the vision, hope, and "can-do" attitude of the entire project team, and with a little luck, we struck LEED Platinum for the first publicly-funded LEED Platinum building in New Mexico. The effort resulted in notable sustainable design achievements, lessons learned, and a quality building for UNM College of Education users to enjoy for years to come. In addition, these users will enjoy this facility over its life at a lower financial and environmental cost.