## Gateway Science Museum at California State University, Chico

The Gateway Science Museum celebrated its grand opening this spring and is a terrific example of sustainable building practices. Otto Construction in Sacramento and ANOVA Architects, Inc. in Placerville collaborated on the project with certain goals in mind. The history of Northern California would be represented in the architecture of the building while utilizing sustainable building practices throughout.

Photo courtesy of Anthony Dunn Photography

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The Gateway Science Museum, located at California State University, Chico has a new space for its lecture series and special events. While celebrating the grand opening of the museum this spring, the Museum Foundation is enjoying the results of a Design-Build competition that was first initiated in 2006. The team of Otto Construction and ANOVA Architects won this competition with a design that responded to requirements for the museum. Those goals were to tell the story of Northern California natural history by depicting it in the architecture while maintaining the budget and striving for a Leadership in Energy and Environmental Design (LEED®) Silver Certification.

The following year of design consisted of collaboration between the University, Museum Foundation, and evolving campus standards. The design resulted in 24 initial credits being approved toward the LEED certification. One of these credits was for Innovation and Design, specifically for educating visitors on sustainability for the

Gateway Science Museum. The building itself is located on the north/south axis, depicting Northern California. The northern gardens depict Northern California's mountain forests. The outside areas to the south represent the Delta region. By describing the sustainable practices in these gardens with native plants and low flow irrigation, as well as sustainable building practices, the visitors will learn easy ways in which they can reduce their carbon footprints.

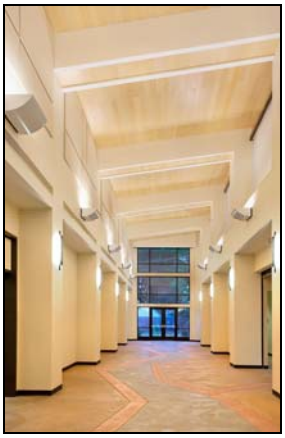
Photo courtesy of Anthony Dunn Photography

Other site-sustainable practices were designed into the project, including the reduction in the reliance of individual cars for transportation, on-site water retention, and heat island reduction. These efforts not only improve this project but reduce the carbon footprint upon the community. The location of the project within the community allows visitors to come from two different public transportation routes. In addition, we added parking for carpools and bicycles to decrease the need for individual cars. The overall effect on the community over the course of a year is estimated at a savings of 300 metric tons of carbon – enough to offset 27 average households.

Additionally, the project has enough underground water storage and permeable concrete paving in the parking lots to allow for the water retention on the site to be 90% of the pre-development water retention. This means that far less water is sent to city storm drainage systems for treatment. Another way the project helps the city is by reducing the heat island affect of the urban area. Typically, an urban area is four degrees hotter than the surrounding countryside. By using trees to shade the parking lot and light reflective hard surfaces and roofs, this project can offset this tendency. The reflective roof and shade also has the benefit of reducing the energy cost for the building by 10%.

Otto Construction poured the museum foundation in October of 2008 and work proceeded with framing while minimizing waste. Workers separated the construction waste, allowing it to be recycled. Concrete, wood, cardboard, and paper were separated. A total construction waste of 73% was diverted from the landfill. These waste products can be recycled for reuse such as aggregates for concrete and wood chopped

for other wood products and recycled paper. Otto Construction's diligence in separating waste and recording the waste divergence allowed this credit for LEED. The museum will maintain this recycling practice as the building has recycling stations for staff and public. The outside collection area has room for the separate collection of glass, metal, plastic, paper, cardboard and mixed trash. The goal to continue to divert 50-75% of trash from the landfill will continue.



Photos courtesy of Anthony Dunn Photography

The products used for the construction of the building were sustainable materials. The products have 20% recycled content including recycled plastic in the toilet partitions; fly ash in the concrete; plastic recyclables in the carpet; clays in the tiles; recycled paper in the gypsum board; and steel recycled content. In addition, over 20% regional products are used. This means that the products are extracted and manufactured within 500 miles thus using less fuel to ship to the site. This includes the plantings, site amendments, concrete, aggregates, wood, and gypsum board. Gypsum board is a product which needs to be balanced between recycled content and regional credit. A 95% recycled content gypsum board product is available on the east coast. However, the environmental impact of shipping does not offset the benefits from this recycle content. Therefore, the regional 5% recycled content product is a better solution for this region. ANOVA and Otto worked together throughout construction to ensure that the best valve for the project and the environment was achieved.

The wood used for the museum also supports the reforestation of the region. In addition to being provided from forests within 500 miles, 54% of the wood provided is also from sustainably operated forests. This is important to our forests since there are only 750 million acres of timberland in the United States. We are consuming timber at the rate of 18.9 billion cubic feet per year. At this rate, we would use up our timberland within 40 years. Sustainable practices are a must to maintain this resource.

The way in which the building is constructed affects the indoor environmental air quality of the museum. Otto Construction followed construction practices with this in mind. Ductwork was sealed as it was installed to ensure that they remain clean and free of construction dust. The filters that were used for the pre-use start-up were replaced prior to occupancy to ensure that any construction dust was removed. Occupancy filters are MERV 13 to ensure that allergens in the air are trapped prior to being sent through the distribution.

Thermal comfort is furthered by having a mechanical system that has separate variable air volume boxes and thermostats for each area and air handles for each side of the building. This mechanical system works with the building envelope and efficiency of the chiller and mechanical system to achieve a heating and air conditioning system 16% better than the California T24 standard, or 117,760 kwh/yr.

The completion of the construction process for a LEED project ends with the commissioning. Proper commissioning is important for a building to make sure that all of the electrical, mechanical and plumbing systems are working as designed. Start-up procedures do not always catch all the necessary pre-functional and operational needs. Typically, the cost of commissioning is paid back within two years as it saves 10-20% in the operation costs of the systems. This includes the sensors for the day-lighting occupancy, sensors for the lavatory faucets, dual flush valves for toilets, central chiller, VAV's, thermostats and interlocks for mechanical systems. We are waiting for the final commissioning reports in order to submit for LEED Silver Certification.

Special thanks to ANOVA Architects for sharing this sustainable project. For more information go to http://www.anovaarchitects.com/