



# Berndt Hall Reconstruction for Biology Green Building Profile

## BUILDING INFORMATION

Location	Durango, CO
Square Footage	31,355 ft
Building Population	20 fulltime faculty/staff with teaching and study space for 204 students
Construction Dates	2008-2010
Owner	Fort Lewis College
Architect	Anderson Mason Dale Architects, P.C.
Local Architect	Janet Wiley Architects, P.C.
Landscape Architect	AECOM
Mechanical, Electrical, & Plumbing Engineers	Smith Seckman Reid, Inc.
Civil Engineer	Goff Engineering & Surveying, Inc.
Structural Engineer	Martin/Martin, Inc.
Construction Manager	Adolfson & Peterson Construction
Commissioning Agent	Engineering Economics, Inc.
Sustainability Consultant	Earthly Ideas LLC

## PROJECT NOTES

Berndt Hall Reconstruction for Biology is the second Leadership in Energy and Environmental Design (LEED) certified facility at Fort Lewis College. The LEED® Green Building Rating System™ is a voluntary, consensus-based national standard for developing high-performance, sustainable buildings administered by the U.S. Green Building Council. Pursuit of LEED for New Construction certification for Berndt Hall is an outcome of former President Brad Bartel's signing of the American College and University President's Climate Commitment in April 2007.

Durango, located in southwestern Colorado between the San Juan Range of the Rocky Mountains and the high desert, is at 6,513 feet in elevation and has a four-season climate. Fort Lewis College (FLC) is located on College Mesa approximately 300 feet above Durango's downtown. Berndt Hall Reconstruction for Biology removed the middle of an existing 1-story section of the Berndt Hall building and replaced it with a basement, main level, and second floor with a mechanical penthouse above. The reconstructed building houses the Biology and Agriculture Departments. It contains 10 teaching laboratories, 19 faculty offices, a departmental office, support spaces, and a greenhouse divided in 4 distinct areas. The building occupies a footprint of 12,362 square feet with a gross square footage of 31,355.

Berndt Hall incorporates numerous integrated green building strategies including demand controlled ventilation, extensive use of daylight, two active solar thermal systems,



water conserving fixtures, and sustainable materials use. Below are some of the specifics of the project's green building strategies and features:

### SUSTAINABLE SITES

- **Orientation:** The existing building layout was conducive for the new construction to have optimal daylighting and solar access.
- **Site Selection:** Development did not impact farmland, endangered species habitat, parkland, or wetlands.
- **Community Connectivity:** Within half mile radius of on-campus housing and at least 10 community services and amenities.
- **Alternative Transportation:** Measures taken included installing 20 bicycle storage spaces and a shower/changing room for faculty and staff, implementation of a campus wide Green Permit program for low-emitting and fuel-efficient vehicles, and not adding any new parking spaces.
- **Open Space:** Area preserved in the John F. Reed Natural Area equal to twice the building footprint, which earned an innovation credit for the project.
- **Heat Island Effect:** Roofing materials reject solar heat to reduce thermal gradient differences between developed and undeveloped areas minimizing impact on microclimate and habitat.
- **Stormwater:** The new building's footprint and hardscape are just slightly larger than the previous improvements so the team chose to direct runoff to existing storm drain systems, which were already designed to prevent excessive stream velocities and erosion.

### WATER EFFICIENCY

- **Landscaping:** Two spruce trees were relocated prior to the start of construction to another location on campus in keeping with the campus Tree Relocation/Replacement Policy. The project used mostly native and xeric plants and grasses, which are all suited to the Durango area. The new Biology Garden replaces a previously high water use bluegrass lawn area with a garden comprised entirely of native species plants. Shrubs and trees for the garden were relocated from an existing campus native plant garden and seeded grasses in the garden are a mix of native species.
- **Irrigation:** No potable water was used for irrigation. The City of Durango Water Treatment Plant provides raw, untreated water to FLC for its irrigation needs. Irrigation systems serving the project are managed by the overall campus irrigation water and control system, which is based on real-time evapotranspiration (ET) data collected from a campus weather station. The irrigation system is properly zoned to serve the various landscape hydrozones and microclimates and employs appropriate, efficient delivery methods and equipment to serve the various plant material types.
- **Water Usage in the Building:** Selection of dual-flush toilets, ultra-low flow urinals, low-flow faucets with automatic sensor operation, and a low-flow showerhead resulted in more than 48 percent savings over baseline fixture performance requirements of the Energy Policy Act of 1992. Exceeding 40 percent reduction earned an innovation credit for the project. In addition, laboratory sinks have a flow control regulator to limit flow.

### ENERGY AND ATMOSPHERE

- **Energy:** Whole building energy simulation model indicates over 30 percent reduction in energy cost between the design building model and the base building model prescribed in ASHRAE 90.1-2004.
- **Lighting:** Lights are controlled by a combination of occupancy sensors, daylight sensors, and dimmers with override switches. Light fixtures consume 1.22 watts per square foot in public spaces to efficiently meet the lighting needs of the building.
- **Commissioning:** Employed as a quality-control process to ensure the fundamental building systems are designed, installed, and calibrated to operate as intended by the design team for the FLC's long term benefit.
- **Building Envelope:** Double-glazed low-e windows, building overhangs, metal framed walls with continuous exterior insulation, and insulation below the metal roof were used to improve the building's envelope and set a path for long-term energy efficiency.
- **Heating, Ventilation, and Air Conditioning (HVAC):** Conditioned with a high efficiency hydronic boiler for heating and an existing campus chiller plant for cooling. A

variable volume ventilation system reacts to the activity in each room of the building to maintain comfort, dilute and remove laboratory contaminants, or idle at minimum airflows to save energy. Since the laboratory ventilation system is controlled by occupant requirements, it results in a significant annual makeup air reduction and resultant energy savings. The building automation system controls these complex HVAC systems and also monitors the energy used in and produced by the building.

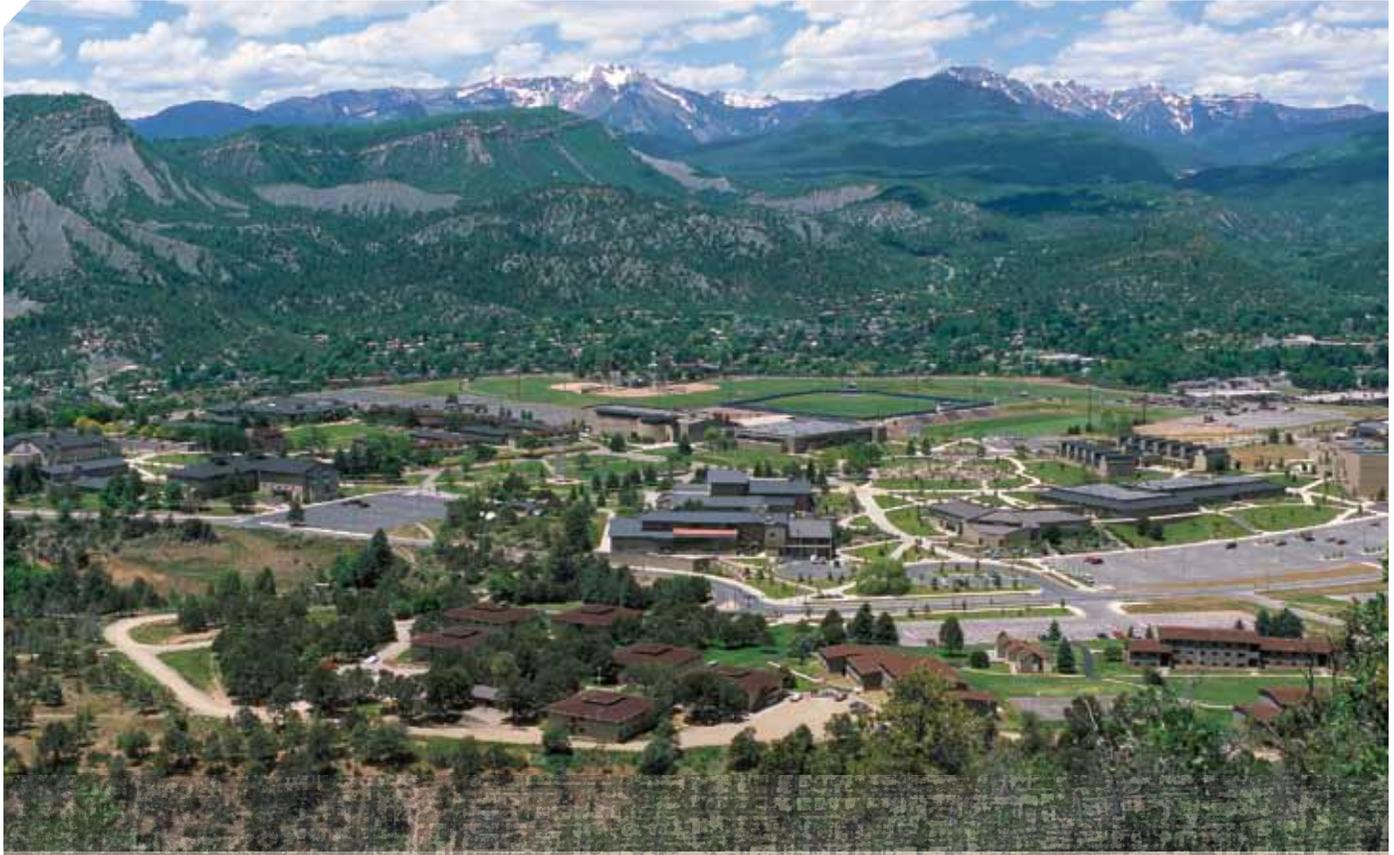
- **Renewable Energy:** Two active solar thermal systems – one to preheat outside air before it is drawn into the building and one to heat domestic water for use in the building – contribute 2.88 percent renewable energy towards the Berndt Hall's energy usage. After completion of the project and its LEED certification, Fort Lewis installed seventy-eight 240-watt photovoltaic panels that comprised an 18.72 kilowatt system.
- **Measurement and Verification:** Through the use of sub-meters, Fort Lewis College will be able to systematically monitor building energy usage on an ongoing basis and compare this to a simulated energy model and energy usage baseline. This provides the ability to characterize building energy usage, document operating efficiencies, and fine-tune the performance of the building based on building operating problems, condition changes, or systems modifications. To provide accountability to energy goals, FLC will implement a plan to measure and analyze energy consumption and building performance for one year of post-construction occupancy.
- **Green Power:** Seventy percent of the building's conventional electricity from fossil fuel sources is offset with renewable sources through the purchase of Green-e certified Renewable Energy Certificates for two years. Doubling the required 35 percent offset earned an innovation credit for the project.

## **MATERIALS AND RESOURCES**

- **Occupant Recycling:** Easily accessible containers and separate storage areas serve the recycling needs of the entire building, allowing for the recycling of the following materials: paper, corrugated cardboard, glass, plastics, and metals.
- **Recycled Content Materials:** To reduce the impacts from the extraction and processing of virgin materials and support closing the loop for recycling, recycled content materials included: fly ash in concrete, reinforcing steel, structural steel, particleboard, metal roofing, hollow metal doors and frames, coiling doors, insulation, ceiling tiles and grid, metal framing, gypsum board, carpet tile, and toilet accessories and partitions.
- **Regionally Extracted Materials:** To reduce transportation impacts and support regional businesses, regionally extracted materials (those manufactured and whose raw materials are extracted within a 500-mile radius of the jobsite) included: concrete, stone veneer including reused stone salvaged prior to demolition, concrete masonry units, reinforcing steel, insulation, gypsum board, and landscaping materials.
- **Certified Wood:** Over 58 percent of the wood used on the project was procured from sources that encourage environmentally responsible forest management.
- **Construction Waste Management:** Successful waste management program diverted more than 84 percent of the demolition and construction waste from landfills. Fort Lewis College and Habitat for Humanity salvaged many reusable materials from the existing building prior to its demolition. Concrete from the building demolition was crushed and used for on-site staging area and vehicle tracking control. Recycled materials included concrete, masonry, wood, cardboard, metal, copper and aluminum wiring, aluminum cans, and plastic bottles.

## **INDOOR ENVIRONMENTAL QUALITY**

- **Outdoor Air Delivery Monitoring:** Permanent monitoring and feedback of ventilation system performance help sustain long-term occupant health and well-being.
- **Construction Indoor Air Quality (IAQ) Management Plan:** To help sustain the comfort and well-being of construction workers and building occupants, the construction team implemented a combination of housekeeping, HVAC protection, source control, moisture control, and scheduling measures.
- **Low-Emitting Materials for IAQ:** Low-toxicity building products such as adhesives and sealants, paints and coatings, carpeting, and composite wood products were used to reduce the quantity of indoor air contaminants.
- **Pollutant Source Control:** Entryway systems installed at each exterior entry point will be maintained on a regular basis. Areas with chemical use (labs, storage, custodial closets) are physically separated from other spaces and have appropriate ventilation.
- **Air Filtering:** Air quality is enhanced by use of permanent air filters with air cleaning efficiencies above normal market installations.
- **Controllability of Systems:** One hundred percent of the individual workstations have individual lighting and thermal controls including an operable window. All shared multi-occupant spaces have controllable lighting and thermal comfort systems.
- **Thermal Comfort:** The HVAC system is designed to make each space as comfortable as possible to each occupant. A temperature sensor in every classroom and office allows the automation system to adjust the amount and temperature of air supplied to condition individual spaces.
- **Thermal Comfort Verification:** Fort Lewis College will implement a thermal comfort survey of building occupants to assess overall satisfaction with thermal performance and identification of thermal comfort-related problems in the fall of 2010.
- **Daylighting:** Generous and judiciously placed windows allow daylight to illuminate all non-basement spaces. Both stairs



include large windows to take advantage of the views and provide natural illumination. Daylight from the north lobby flows through a floor-to-ceiling translucent wall into the interior student study. Three second floor labs are outfitted with north-facing clerestories (in addition to the full-width south-facing windows) to introduce diffuse overhead illumination. The second floor Seminar Room has full windows on two of its walls and also opens directly to a balcony.

### **INNOVATION AND DESIGN PROCESS**

- **Green Building Education:** Berndt Hall Reconstruction for Biology will educate its students, faculty, and staff and the public about sustainable design and the impacts of buildings on the environment. In addition to case studies like this one, the building features a comprehensive signage program.
- **LEED Accredited Professionals:** Several principal participants of the project team have successfully completed one of the LEED Accredited Professional exams.

### **AWARDS AND HONORS**

Berndt Hall Reconstruction for Biology earned LEED Gold (42 points) in January 2011, making it the second building on Fort Lewis College's campus to earn LEED certification

