

Durango Discovery Museum



Project Type:	Science & Technology Museum
Owner:	City of Durango
Construction Cost:	\$3M for Phase II design, construction, and exhibits
Building Size:	11,000 sf (2 buildings)
Site Size:	1.7 acres
Number of Floors:	1 + basement
Completion: Phase II	December 2010

Project Team:

Museum Exec. Director:	Claire Bradshaw
Owner's Representative:	Jim Ketter
Contractor:	Colarelli Construction
Architect:	Feeney Architect
Mechanical Engineer:	Animas Engineering
Electrical Engineer:	Rocky Mountain Consulting Engineers, Inc

GEO High Performance Consultant (HPC)

Hutton Architecture Studio / ME Group

Information and images courtesy of Durango Discovery Museum
Exterior photo by Jonas Grushkin

practicing what they teach—energy, discovery and revitalization in a historic powerhouse

high performance goals

- Save energy by utilizing high performance energy strategies and innovative mechanical systems.
- Minimize operational and maintenance costs.
- 50% energy use savings over ASHRAE 90.1 2007
- Renovate and re-use historic structure.

project description

The Durango Discovery Museum (DDM) was founded in 1994. By 2002, the museum had outgrown its original 1100 sq ft space and made plans to renovate and reuse Durango's historic Powerhouse. Built in 1893, the Powerhouse is the oldest standing alternating current coal fired power plant in the world. The project was broken into three phases. Phase I included the historic renovation of the Powerhouse and brownfield remediation of the site. Phase II includes further renovation of the Powerhouse as an interactive exhibit space. The existing maintenance building will be renovated as an Education Center with office, education, and multi-use event space. Phase III will include new exhibit and education space, administrative offices, and a café.

partnerships provide pathway to revitalization

Despite being adjacent to historic downtown Durango and fronting the Animas River, the plant had been abandoned for over 30 years. While the town had purchased the property over 20 years ago, financing the necessary site remediation proved difficult. After the DDM made its proposal to the city, a number of

local groups were able to partner with the DDM to seek grants and additional funding. The supporters successfully placed the plant on Colorado's Most Endangered Places List, which helped to enable additional funding options. Some of the time, labor, and materials were also donated by local firms.

community involvement in the project process

A number of community forums were held to define the link between the facility's historic use and its potential to educate visitors about power generation and related sciences. The DDM and community set high performance construction practices and energy efficiency goals. Then, the architect worked with the museum board to create a phased master plan for the project. In addition to the phased improvements, a public plaza will be created for outdoor exhibit space and community use.

efficient systems provide educational experience

All aspects of the building were evaluated for sustainability. The design team worked with the GEO consultant to verify projected energy use and to identify efficiency strategies through energy modeling. This model established an accurate energy use benchmark for the project and helped assess costs and payback periods. The life cycle analysis, supported by the energy model, identified that insulating the thermal mass walls of the Powerhouse would have had very long payback periods. As a result, it was decided that the money was better spent on other high performance features and exhibits.

The DDM is intended as an educational facility so several heating and cooling systems are demonstrated including in-floor radiant heating from a water-to-water ground source heat pump, infrared natural gas radiant heaters, natural ventilation, and large diameter destratification fans.

The education center's roof mounted photovoltaic system demonstrates on-site renewable energy opportunities. Visitors can access the online monitoring system, which tracks power generation, carbon avoided, and energy cost savings from the PV system. Grant funding is being sought for a solar hot water system.

interactive, energy focused exhibits

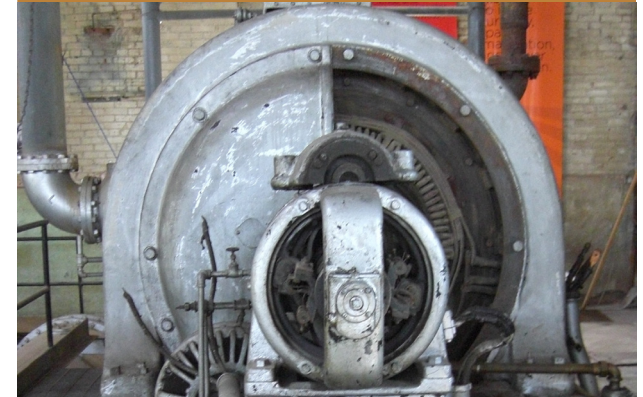
The Discovery Museum at the Powerhouse will be a unique interactive museum where visitors of all ages can explore energy of the past, present, and future. Exhibits will explain the science of electricity generation using the remaining turbine generators and other equipment from the Powerhouse. The exhibits will demonstrate innovative technologies for creating energy and techniques for conserving energy usage. The museum exhibit space is primarily daylit and specific exhibits will highlight how the sun can be used for light and energy. Exhibits will use low VOC finishes and will be built from sustainable materials, such as recycled sheet goods, recycled plastics, and sustainably harvested woods.

By incorporating community input, educational opportunities, preservation, and public plazas, the Powerhouse has moved from an eyesore to an asset. The Durango Discovery Museum is now a high performance demonstration project and catalyst for river front revitalization.

high performance design features

- Geo-exchange loop connected to ground source heat pumps for radiant heating. Additional radiant heating is roughed in for future expansion of the geo system.
- Large diameter destratification fan for distributing air and balancing thermal comfort. Additional fan locations are roughed in as funding allows.
- Future submetering of electrical use at each zone will help visitors further understand energy use.
- Energy efficient lighting and controls.
- Insulating window blinds for light/thermal control.
- Spray foam insulation in the education center.
- One foot thick brick walls provide thermal mass in the historic Powerhouse.

community benefits and energy savings



community benefits

- Renovation and reuse of historic Powerhouse.
- Brownfield remediation.
- Riverfront revitalization.
- Enhanced connectivity to historic downtown.
- Resource for community education and outreach.
- Energy efficiency demonstration project.

energy savings summary

From the GEO energy model:

- **69 kBtu/sf/yr** - benchmarked energy use index for similar public, educational facilities.
- **34 kBtu/sf/yr** - projected energy use index.
- **50%** energy use savings over ASHRAE Standard 90.1 2007.
- **5661 MMBtu** - projected energy savings over the 20 year life of mechanical equipment.

The current low cost of natural gas in Durango means that the energy cost savings are reduced to 19%. However, the DDM is well positioned for future savings as energy costs fluctuate.