Raymond Brown
Green Design & The City
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High Performance Zion Visitor Center

Introduction:

Covering 229 square miles in Southwestern Utah, Zion National Park was established in 1919 to preserve the areas natural beauty. At that time the park welcomed 1000 visitors a year. Today with nearly 2.5 million visitors, the national park service has worked with the department of Energy to minimize the impact on Zion's environment while saving energy and reducing costs. The new visitor center opened in may 2000, was designed to use 70% less energy than a typical building without costing more to build.

Features:

Clerestory Windows:

Clerestory (clear story windows are part of the lighting system as well as the heating and cooling system for the visitor center. Computer simulations are used to size the windows to collect the right amount of light. The sun enters in the winter, helping to keep space heated (passive solar heating), and roof overhangs shade the glass from the high summer. A low emissive coating on the glass reduces heat loss from the building while allowing light and heat to enter. The building was designed to block the west windows from the summer sun. These windows are made from glass that diverts the sun's heat. Trees also minimize the heat gain on summer afternoons.

Cool towers:

The visitor center provides relief from the hot summer days, which easily reach 95-100 degrees. When natural ventilation is not enough, cool waters help to cool the air.
Water is pumped over pads located at the top of the tower. This water evaporates, cooling the air. The cool dense air falls through the tower and exists through the large openings at the bottom of the tower. The energy management computer controls these openings and can direct cool air into the building or out onto the patio.

Day lighting:
Day light is the main source of light in the visitor center, and the building's energy management computer adjusts electric light as needed. No incandescent or halogen lights are used; instead, the building uses T-8 fluorescent lamps and compact-fluorescent lamps because they are more energy efficient.

Energy efficient landscaping:
Landscaping, including shade structures and existing trees, creates an extension of the visitor center. These outdoor rooms for permanent displays allow for a smaller building design as well as lower capital and operation costs.

Insulation/thermal mass flooring:
The Visitor Center is well insulated, increasing the building's efficiency. The roof is made of structural-insulated panels, which sandwich a layer of rigid foam insulation between sheets of oriented strand board. The panels are tighter than standard frame construction insulation systems, keeping heat out during the summer and inside during the winter. The building also has foam insulation in wall cavities and insulated windows.
During the winter, sunlight shines directly onto the center's concrete floor. Concrete is a massive material so it absorbs and stores the sun's heat. The warm floor helps to heat the building, and because the concrete stores the heat, the floor remains warm even after sunset.

The stonewalls of the Zion Canyon demonstrate how massive materials store heat. The rock walls remain warm on cool nights after the sun has warmed them on sunny days. During the summer, the walls are cool in the morning after the previous day's heat was released during the night.

Transportation:

Automobile traffic causes air and noise pollution as well as congestion, and Zion's canyon setting exacerbates these problems. So when officials planned to make the park friendlier to the environment as well as to visitors, transportation was an important consideration.

Clean-running propane buses now shuttle visitors to nine stops in Zion Canyon and six stops in the nearby town of Springdale, Utah. Visitors are asked to leave their cars outside the park and use Zion's buses at no charge, dramatically reducing the noise, air pollution, and congestion.

Trombe walls/Overhangs:

Zion winters are mild, and heavy snows don't usually reach the bottom of the canyon. Daytime temperatures can frequently hit 60s; nights are often in the 20s and 30s.

Heat from the sun is trapped between a pane of glass and a black selective coating. A masonry wall stores heat for release into the building later in the day. Winter surface temperatures of the inside of the Trombe wall often reach 100 degrees (38 degrees Celsius).

Because the sun is high during the summer, roof overhangs help keep the building cool by blocking the wall from the sun. During the winter when the sun is low, it can shine under the overhangs and into the building to provide solar heat. The length and position of the overhangs were determined based on the Zion Canyon latitude and weather patterns.

Ventilation

The high clerestory windows help to cool the Visitor Center by allowing hot air to escape while low windows near the doors allow cool air to come in. The building's energy management computer controls operation of the clerestory windows.

Conclusion:
The visitor center at the Zion National Park is energy efficient. The center saves energy and money while protecting the environment. Along with a shuttle system that relieves congestion and pollution, the center helps Zion achieve its most important goal preserving the natural beauty.

Sources:
www.nps.gov/zion/
www.nps.gov/dsc/b_what/b_5_za_zion.htm