

Rapid City High School



This 75 year old school was recently listed on the Historic Register and is undergoing a phased remodel and addition as part of a district-wide master plan implementation.

The first phase of construction involves a new 156 seat studio theater and support space addition, renovation of the main auditorium for use as an 830 seat community theater, and a new HVAC system for the gymnasium.

The second phase of construction renovates the remainder of the facility and will eventually allow consolidation of the alternative schools in the district.

Project Data

Owner

Rapid City Area Schools

Location

Rapid City, South Dakota

Building Type

Educational/Theater

Building Area

160,000 SF

Mechanical Systems and Features

Central Geothermal Plant
Thermally Active Foundation
Low Temperature Heating
Dual Core Energy Recovery
Thermal Displacement Ventilation
Demand Control Ventilation

Electrical Systems and Features

Refurbished Historic Lighting
3 Electrical Services (4000 amps)
145 KW Diesel Generator
Security & Communications
Fire Alarm

Construction Cost

\$ 9,250,000 (Phase 1)
\$ 9,525,000 (Phase 2)

Completion Date

May 2012 (Phase 1)
August 2013 (Phase 2)

Mechanical Engineering

Inefficiencies of the existing steam plant, substantial cost of repairing a collapsing utility tunnel, and a desire to provide air conditioning to the facilities led to a decision to develop a new central plant for this 160,000 SF school.

The new central geothermal chiller plant is connected to a ground source heat exchanger consisting of vertical bores and a thermally active foundation (geothermal piles). The new plant serves conventional VAV air handling systems allowing energy to be redistributed within the building without the maintenance issues associated with distributed water-air heat pump systems.

Air handlers are grouped in a single location to increase the efficiency and diversity of the central air-to-air energy recovery unit. The air handlers are also strategically placed above the central plant to reduce pumping costs and centralize system maintenance.

The thermal displacement ventilation system serving the historic theatre distributes air at very low velocity using a new underfloor plenum and diffusers below the seats. This distribution method conserves energy by only conditioning the occupied zone, while providing enhanced thermal comfort and acoustics within the space.

Electrical Engineering

Lighting is a delicate process in historical theatrical facilities. The design refurbishes the existing pendant house fixtures complimenting them with new theatrical fixtures and low-voltage aisle lighting. A branch circuit emergency transfer system allows the use of the original dimmed house fixtures and aisle lighting to be used for emergency fixtures within main auditorium theater.

Three electrical services at two voltages provide flexibility and future growth, including a dedicated service to capitalize on BHP's geothermal utility rate.

Special systems include security-CCTV and card access, fire alarm, wired cat 5E communications, and integration of theatrical equipment and controls.