

Clackamas High School



FLOOR SPACE: 265,355 ft²
BUDGET: \$ 32.6 million (\$122.80 /ft²)
BUILDING POPULATION: 1,800+ students & staff
CONSTRUCTION DATES: April 2002
OWNER: North Clackamas School District
ARCHITECT: Boora Architects Inc.
GENERAL CONTRACTOR: Brundidge Construction (Phase 1); OC America Construction and Andersen Construction (Phase 2)
CONSTRUCTION MANAGER: Milstead & Associates
STRUCTURAL ENGINEERS: KPFF Consulting Engineers
MECHANICAL ENGINEERS: CBG Consulting Engineers
ELECTRICAL ENGINEERS & COMMISSIONING: Interface Engineering
CIVIL ENGINEERS: Compass Engineering
LANDSCAPE ARCHITECTS: Beighley & Associates

PROJECT NOTES

SITE AND WATER

- **Preservation:** A 6-acre wetland was preserved and trees and existing perimeter plants were left standing or salvaged and replanted.
- **Shared Use and Future Use:** Parking, buildings and fields were sited for shared use with the adjacent middle school and for community. Parking was designed to accommodate smaller cars and electric car charging stations were installed.
- **Native Landscaping:** Native plants that are drought and pest tolerant were used to reduce the need for irrigation and pesticide application. Wood debris from site preparation was chipped and recycled for landscaping.
- **Safety & Security:** Site designed to provide 'eyes' on the grounds. Service zones, vehicle and pedestrian areas, and bus service areas were separated.

ENERGY AND ATMOSPHERE

- **Energy Savings:** The building is expected to use 37.5% less energy than if it was built to minimum Oregon Energy Code requirements.
- **Significant Multi-system Integration:** A downsized HVAC system was the result of extensive collaboration within the design team to integrate the building systems.
- **Sensors:** Occupancy, CO₂, and light sensors ensure lights and air conditioning are provided only when and where needed.
- **Thermal Mass:** Concrete slabs and masonry walls are used as thermal mass to stabilize the building air temperature.

MATERIALS AND RESOURCES

- **Low Maintenance and Long Life:** Materials chosen for durability and minimal maintenance requirements included natural linoleum, concrete, ceramic tile, brick, and metal.
- **Local Sources:** Quarry tile, brick, and concrete were all sourced locally.
- **Recycled Content:** Rubber flooring, plastic toilet partitions, acoustical tile, and upholstery fabric all contained recycled content.

INDOOR ENVIRONMENTAL QUALITY



- **Views and Day-lighting:** Daylight was maximized by the use of an east-west building axis, narrow bays, courtyards, window walls and clerestory glazing. Additional techniques helped push daylight further into interior spaces.
- **Fresh Air:** Natural ventilation and cooling serves all classrooms, common areas and gymnasiums via mechanically controlled damper louvers and air stacks.
- **Pollution Prevention:** Low toxic and low emitting materials, which contribute to healthier indoor air included paints, adhesives, sealants, laminate, and paneling.

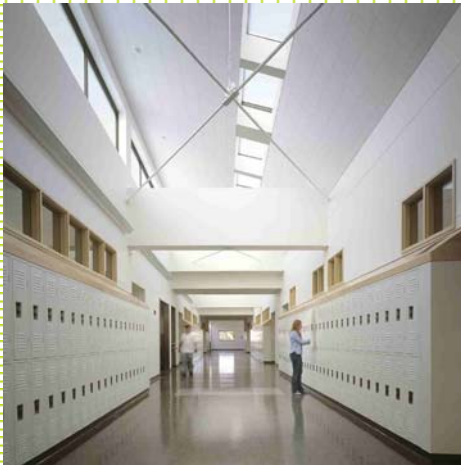
PERFORMANCE-BASED INCENTIVE DRIVES DESIGN INNOVATION

In 1996, Clackamas High school was selected by the Rocky Mountain Institute (RMI) to serve as a national model for performance-based compensation and exceptional energy performance.

As part of this effort, the design team conducted a total building and site energy analysis, and integrated the results into the design process. Specific requirements for the building envelope, HVAC, lighting systems, materials, and landscaping features were established, and capital costs for operating systems were balanced with life-cycle and energy use analysis.

The combined impact of these tactics is predicted to provide a respectable savings of 37.5% over Oregon's rigorous energy code requirements, according to modeling conducted at completion.

If the school manages to achieve even better actual performance, specifically, capture greater than 44% savings, the school (and the design team) would share in any additional savings beyond the 44% threshold. The threshold was set as part of RMI's performance-based initiative.



Daylighting techniques were used extensively throughout the building. A Synergy lighting control system was chosen to complement this by creating a seamless blend of artificial and natural light. The system monitors levels of daylight along with occupancy levels and then allows only as much artificial light as required to meet specified light levels. Lighting savings are estimated to be 57% over conventional lighting.

Light shelves and sloped ceilings in classrooms, as well as light tubes between upper and lower hallways helped direct light deeper into the building.



Acknowledgements: The information used in this case study was provided by Earth Advantage™, BOORA Architects, and Interface Engineering. For more information about green building in the region, contact: Earth Advantage™, www.EarthAdvantage.com, a program of Portland General Electric. All photographs and graphics are courtesy of BOORA Architects and Michael Mather.