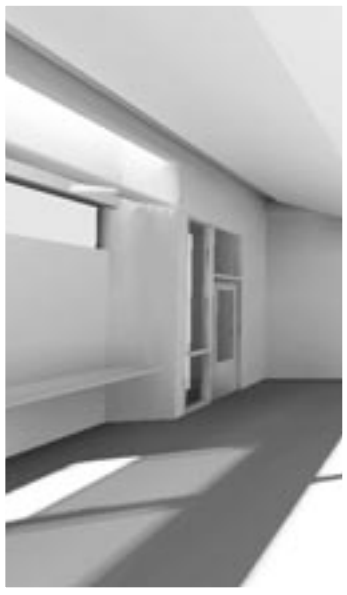


CLACKAMAS HIGH SCHOOL

CASCADIA REGION GREEN BUILDING COUNCIL



FLOOR SPACE: 265,355 ft²
BUDGET: \$ 30,950,000 (\$116/ft² – including site work)
BUILDING POPULATION: 1,800
CONSTRUCTION DATES: 2000-2002

ARCHITECT: BOORA Architects
STRUCTURAL ENGINEER: KPFF Consulting Engineers
MECHANICAL ENGINEER: CBG Consulting Engineers
ELECTRICAL ENGINEER: Interface Engineering
ENERGY CONSULTANTS: Rocky Mountain Institute,
Eley Associates (DOE-2 modeling)
LIGHTING CONSULTANT: Lighting Design Lab
LANDSCAPE: Beighley and Associates
CIVIL ENGINEER: Compass Engineering
CONSTRUCTION MANAGER: Milstead and Associates
CONTRACTOR (PHASE I – SITE): Brundidge Construction
CONTRACTORS (PHASE II – BUILDING): OC America Construction and
Andersen Construction

PROJECT NOTES

SITE AND WATER

- **Orientation:** Building layout arranged for optimal daylighting and solar access.
- **Water drainage:** Biofiltration facilitated in retention areas adjacent to wetlands.
- **Area vegetation:** On-site wetlands preserved.
- **Landscaping:** Design includes native plants, trees as shading devices, and strategically placed and colored hard-surface areas.

ENERGY AND ATMOSPHERE

- **Energy:** Consumes 44% less energy than stipulated in state code.
- **Lighting:** Interior daylighting, occupancy and daylighting sensors, and dimmer controls in the classrooms, offices and meeting rooms limit electricity load.
- **HVAC:** Most areas rely on natural ventilation by natural convection with fan coil backup units. Air conditioning is only provided for year-round use areas (i.e., media center, administration, counseling wing and theater) with capability to transfer cooling to any other selected areas.
- **Solar:** Provisions made for photovoltaic units.
- **Vehicles:** Infrastructure provided for electrical vehicle recharging stations in the parking lot.

MATERIALS AND RESOURCES

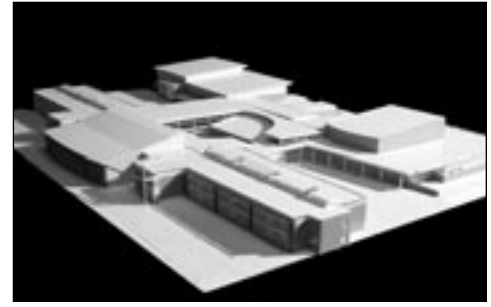
- **New materials:** Used recyclable concrete, metal, glass, carpet and fabric.
- **Wood:** Doors, gym floor and wall paneling constructed from certified wood.
- **Recycling:** Used recycled materials such as rubber flooring, plastic toilet partitions, upholstery and acoustic tiles. Wood chips from tree stumps on the site were recycled.
- **Longevity:** Used long-life, low-maintenance materials such as concrete, ceramic tile, brick, metal and linoleum.

INDOOR ENVIRONMENTAL QUALITY

- **Air quality:** Low-toxicity building products used.
- **Lighting:** Daylight maximized by innovative window placement and ceiling sculpting.
- **Ventilation:** Natural ventilation and cooling in all classrooms, commons area and gymnasiums via mechanically controlled dampers, louvers and air stacks.

CLACKAMAS HIGH SCHOOL

In 1996, the Energy Foundation selected Clackamas High School to serve as a national model for performance-based compensation and exceptional energy performance. The project team therefore took up the challenge of designing a high-performance school that by its very structure would facilitate learning for its students. The Clackamas High School project team intends to show that besides being good for the long-term health of our planet, green building provides immediate benefits to people—in this case, teachers and students.



The two most easily identifiable improvements that can be made on most schools are in lighting and HVAC. Children, like adults, have trouble concentrating in an environment of clunky institutional heating and air-conditioning systems and harsh artificial lighting. The second of these two items became a special priority for the project.

LETTING THE SUN SHINE

The Portland design firm hired for the job, BOORA Architects, explored all available testing options to come up with a lighting configuration that would save energy and make the best possible use of natural sunlight. The process began with sophisticated computer imaging far superior to the two-dimensional drawings of building cross-sections commonly used in architecture. The building was oriented on an east-west axis to capture maximum sunlight. A narrow building mass and the incorporation of courtyards allowed penetration of light into the building. High-performance glass, shading devices and light shelves that transfer daylight into the building without glare provided control. Visual DOE energy simulations were able to estimate \$50,000 annual energy savings from this test.

This design was then made into a scale model and tested at the Lighting Design Lab in Seattle. For further tests, Portland General Electric funded the building of a full-size classroom in the Lighting Design Lab's mock-up facility. These tests helped the team further hone the design to the current structure, an innovative new classroom shape proven to draw as much natural light into the room as possible. In addition, the school district authorized and high school students built a full-scale mock-up of a classroom, which was instrumental in testing the daylighting as well as the natural ventilation and convection strategies without the use of a fluid dynamic analysis.



COMMUNITY CONNECTIONS

Formerly located outside the immediate community, the new high school returns the school to the heart of the community it serves. At the same time, the school maintains a strong connection to the natural world. Views to the outside are provided in nearly all occupied spaces, including a spectacular view of Mt. Hood from the commons area. The site preserves the natural beauty of the neighboring wetlands (which will be used as a nature lab), and landscaping consists of native vegetation.

AWARDS AND HONORS

FEATURED IN NORTHWEST COMPANION EXHIBIT TO THE INTERNATIONALLY ACCLAIMED
"TEN SHADES OF GREEN"

CASE STUDY SPONSORED BY:

		O'Brien & Company	
		Interface Engineering	
		Glumac International	

