**a case study in sustainable design**

The primary goal for the Hood River Middle School Music/Science Building was to fuse sustainable design with sustainability curriculum. The new building incorporates not only a new music room, practice rooms, teacher offices and a science lab, it also includes a greenhouse where students will grow plants using a ‘living machine’ that recycles nutrient rich wastewater from fish tanks for irrigation. Students will also tend to a seasonal garden, native plants, and orchard trees to grow fruits and vegetables that they will sell to their community at an on-site farmers’ market.

The design incorporates brick veneer to mimic the adjacent building surrounded by ICF (Insulated Concrete Formwork) walls. These, along with the R-38 roof insulation, below-slab insulation, and triple-glazed windows, provide an air-tight and well insulated building envelope with good thermal mass to serve as a buffer against outdoor temperature swings. Sections of the wall and floor assemblies are exposed so that students can see how they work. Students will also be able to observe reused and recycled building elements such as the wood scissor trusses. The trusses were salvaged from a 1940’s era bus storage barn that was torn down to make room for the new building.

To meet net-zero energy, the project uses: geothermal heating; cooling using heat exchange with water from an adjacent stream; a radiant slab; heat recovery ventilators using displacement air distribution; and a plenum that sits under the 35 kilowatt solar panel system, simultaneously preheating air for the building and cooling the panels to make them more efficient. The design team also performed daylighting studies to reach an ideal combination of translucent skylights, monitor windows, traditional windows, and deciduous vines on trellis shading devices. Part of the curriculum at the school will include managing a resource budget and tracking the building’s performance through a ‘building dashboard’ web site.

Teachers at Hood River Middle School in Oregon had already established a curriculum that incorporated sustainable concepts, so when a bond was passed to build new music and science classrooms at their school they knew exactly what they wanted to do: use the new building as a ‘teaching tool’ that would illustrate sustainable ideas put into practice.
music/science building sustainability features

Sustainable Sites
- The building is located on a previously developed site with connections to transit, bike lanes, and amenities within walking distance.
- Stormwater treatment will be done on-site by bioswales planted with native vegetation.

Water Efficiency
- The building will collect rainwater for use in toilets and for irrigation, combined with low-flow and waterless plumbing fixtures.

Energy and Atmosphere
- The building as annual net-zero energy use.
- ICF walls, extensive insulation, and triple-glazed windows provide excellent thermal mass. Additional energy usage will be augmented by a photovoltaic array installed on the roof.
- To ensure ongoing high performance, energy and water usage will be monitored through a measurement and verification system. This will then be displayed for educational purposes on a ‘building dashboard’ website, and integrated into an energy management curriculum for students to track.

Materials and Resources
- Over 95% of the construction waste is being recycled. Many materials from an old building on the site were deconstructed and set aside for reuse.
- Reclaimed materials, like the wood scissor trusses salvaged from a nearby storage barn, are used wherever possible, in addition to recycled and regional materials.

Indoor Environmental Quality
- Daylighting studies were performed to reach the optimum combination of translucent skylights, monitor windows, traditional windows, and shading devices.
- The building uses a natural ventilation system, to ensure the comfort of teachers and students as well as offer user control of air flow and temperature.

Innovation & Design
- From the farmer’s market to the resource management curriculum and exposed building elements, the project is designed to integrate sustainable design with sustainability education.