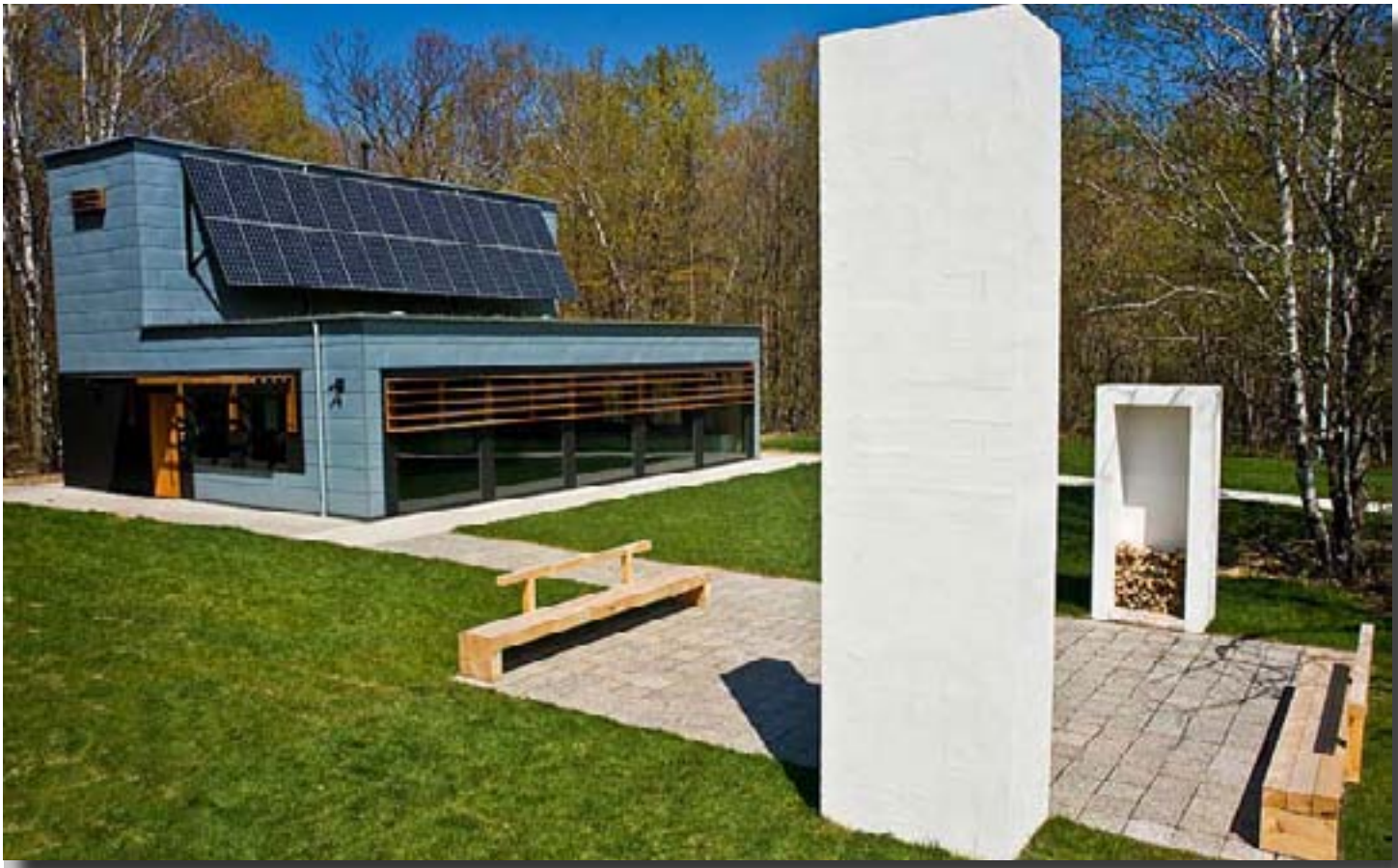


Welcome to the Bagley Classroom!

* Designed by internationally noted Duluth architect, David Salmela
* Located in the 55 acre Bagley Nature Area
* Serves as a learning tool and model of sustainable design and construction for all of northern Minnesota

An outdoor classroom building was an idea that faculty proposed.

* Classes used to meet underneath an old Box Elder tree, dubbed the "Learning Tree."
    - o Trampled the grass
    - o Compacted the soil, threatening the vegetation in the area
    - o Not the best learning environment in bad weather (Teaching under a tarp?)
* Who uses this building?
    - o UMD Department of Biology, including: general biology labs, ecosystem ecology, ornithology, entomology.
    - o Additionally used by:
        * Environmental studies
        * Geography studies
        * Teacher education
        * Outdoor management/operations studies
        * Art/drawing
        * Recreational outdoor programs
        * Early childhood learning activities.

Original proposal called for a modest pavillion. Code needs forced the building to evolve to what it is now.

* Built on previously developed site: old volleyball court

The building met Passivhaus standards for energy. *(Passivhaus refers to the rigorous, voluntary, Passivhaus standard for energy efficiency in buildings. It results in ultra-low energy buildings that require little energy for space heating or cooling).*
Greatest story of this building lies in the extreme energy efficiency. The Bagley Classroom is a super-insulated and airtight building:

* Desiged to be a nearly net neutral energy building
* The building heating load is reduced by 90% with simple insulation and high-performance windows
* Supertight building envelope
    - o Blower door test: 0.47 air-changes-per-hour (average house: 5.0) at 50 pascals
    - o Passivehaus

= $ + carbon savings

<u>Structurally Insulated Panels (SIP)</u>

* 16" of insulation on walls, 14" plus tapered ISO insulation on roof, 12" along foundation and under slab
* 100% recycled content
* Contributes to super-tight building envelope
* Made in South Dakota
* Leftover EPS foam sent back to the factory for reuse

Installing SIP panels, August 2009

6 kW grid-connected solar array designed to produce nearly the annual energy consumption. This is something we will be monitoring.

UMD is also pursuing LEED certification at the highest level: Platinum. While Passive Haus is focused on energy, LEED has five categories where points are earned towards certification:

* Sustainable Sites
* Water Efficiency
* Energy and Atmosphere
* Materials and Resources
* Indoor Environmental Quality
* Extra credits for Innovation and Design

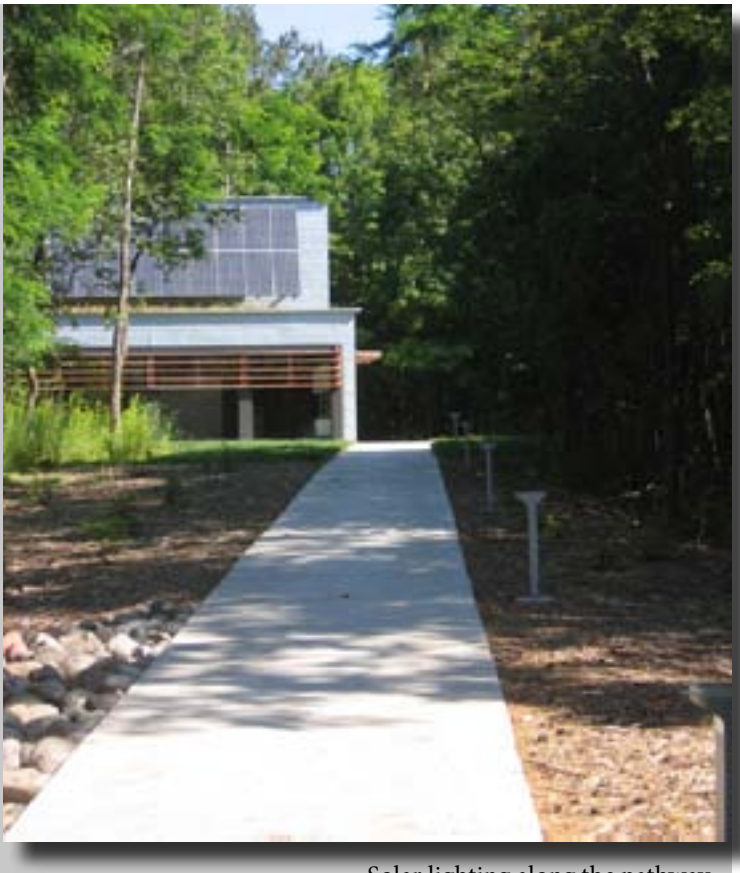
* The building is heated with the energy equivalent of 2000 watts, or 3 hair dryers, even on the coldest day of the year. A normal house would require the equivalent of 30-40 hair dryers. The element that provides this heat is an electric heat coil at the ventilation system. An electric boiler and in-floor radiant heating system is the back-up heating system. The heating system is so efficient that there wasn't a unit available as small as needed! The unit installed is rated for 3500 watts, but the building will only use 2000 watts.

Through consolidating uses and careful planning:

* Building footprint was minimized
* Vegetated space preserved
* "Heat island" effect is reduced

Why is it important to build buildings this way?

* The building sector contributes between 40% and 50% of all carbon emissions in the US.
* UMD's commitment to reducing our greenhouse gas footprint by building more efficiently to save energy, and maintaining and upgrading our existing systems.
* Demonstrates UMD's commitment to sustainability
* Other LEED projects on campus:
  - o Life Sciences – LEED Silver
  - o Labovitz School of Business and Economics- LEED Gold
  - o Civil Engineering- LEED Gold



Solar lighting along the pathway

Tour stop 1) Inside the building

Super-insulated and airtight building:

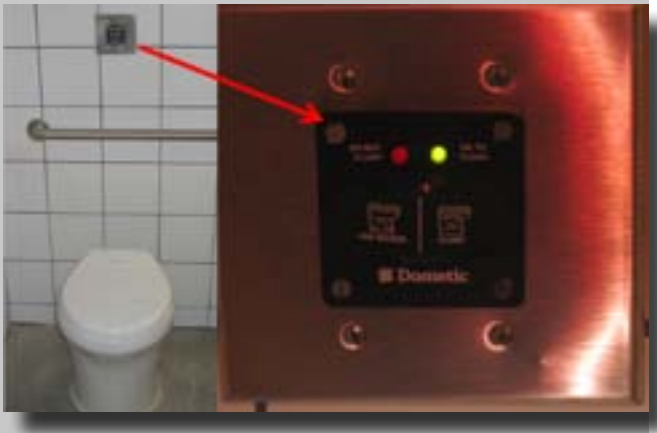
* South wall comprised of glass: passive solar heating will help satisfy a large portion of the building's heating needs
* Protected north wall- save heat in winter
* Leafy, deciduous trees and shades provide shade in the summer
* Two solar tubes provide additional daylight

Because the building is air-tight, is important to supply constant fresh air to the building using mechanical ventilation.

* High efficiency heat recovery ventilation unit continuously provides fresh air.
* Filters the air using a MERV 13 filter
* Recovers 85% of the heat before exhausting the air (very minimal heat loss)

Water efficiency:

*Over 86% reduction in water use
*Composting toilets- symbol of low-waste building
  - o Peat moss added daily



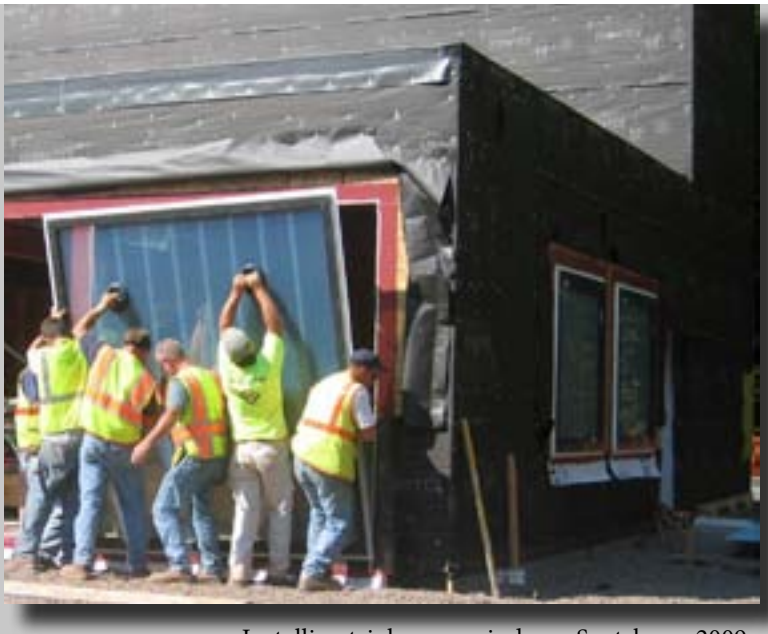
Close-up of the composting toilet flush mechanism

Lighting system:

* Minimal use- natural daylight provided in 100 % of occupied spaces
* LED vs. CFL- little use, so CFL has a better payback
* While the building is in occupied mode, a daylight sensor monitors the amount of daylight in the space, determining if artificial lights are needed

Windows:
* German company, mfg. in Vancouver, BC
* Triple-pane glass
* R-value: 5.5 *(R-value measures thermal resistance)*
* 12% recycled content
* Finding frames a bigger problem than finding windows

Doors:
* Insulated core, thick wooden frame
* R-value: 6
* Mfg. in Paynesville, MN



Installing triple pane windows, Septebmer 2009

Materials & Resources:

* 35% of the project materials are harvested and manufactured within 500 miles of the project
  - o This reduces energy wasted on transportation of construction materials and supports the local economy

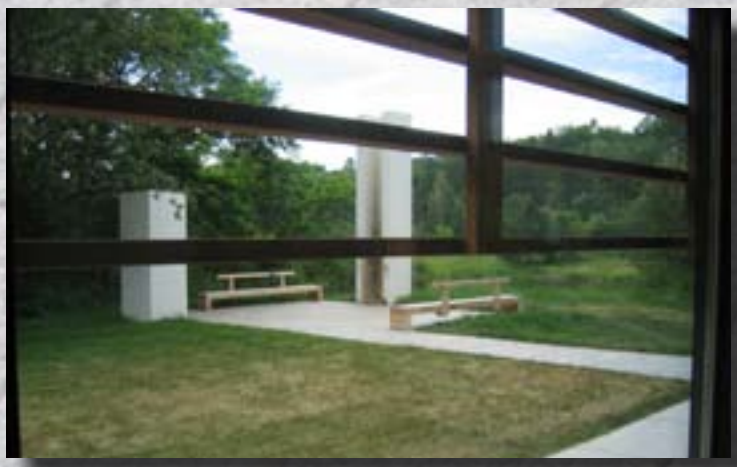
View of the foundation, early in construction

* 100% low-Volatile Organic Compound (VOC) interior environment
* FSC-Chain of Custody (COC) certified Basswood paneling harvested from Westby, WI
* Local concrete blocks and concrete materials for foundation
* Vegetative roof trays grown in southern MN
* 86% of the wood products used come from sustainably managed forests FSC-COC certified

<u>* 15% of project materials reclaimed</u>
- o Douglas Fir timber roof beams salvaged from a Chicago warehouse
- o Alaskan Yellow Cedar benches
- o Zinc siding

<u>* 17% of materials contain recycled content</u>
- o Local, recycled concrete used in the aggregate under foundation
- o All EPS insulation foam used in walls, roof, and under foundation has 100% recycled content
- o Ceramic tile has 40% recycled content
- o Vast recycled roof pavers from Minneapolis (95% recycled content)
- o Cabinetry particleboard is 100% recycled content
- o Cotton batt insulation is 100% recycled denim jeans- sound and thermal insulation
- o Black Richlite: laminated paper board
  - + Siding, tables, countertops, wall finishes

Wood horizontal screen on south-facing windows: warns birds to stay away



Views of Rock Pond from both the building and from both the building and from the outdoor spaces are maintained and the scale of the natural setting is respected.

* 100% of habitable rooms have exterior views and natural daylight,
  - o Increases student and faculty performance
  - o Reduces energy consumption

Tour stop 2) Patio area

Chimney structures a signature of Salmela's

* The remaining open space around the building used as an outdoor classroom/ gathering area

The majority of construction and landscaping was done by the staff of the UMD Department of Facilities Management

* 88% construction waste diverted from landfill

All exposed interior and exterior materials are:
* Maintenance free
* Low-VOC

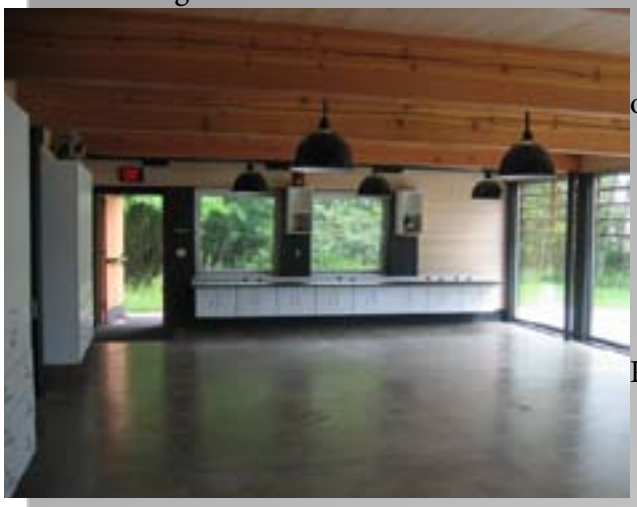
Zinc siding reclaimed from Burnsville Performing Arts Center
* 30% recycled content
* Lifetime expectancy 100 years
* Recyclable at end of life

Reclaimed granite pavers in patio area- formerly located outside the Darland Administration Building.

Trade-off: pervious paver walkway rejected due to budget constraints, concrete walkway poured. Minimizing footprint best stormwater treatment.

Roofs:

* Lower roof is vegetated and provides habitat, captures runoff, and keeps building and surrounding area cool.



o

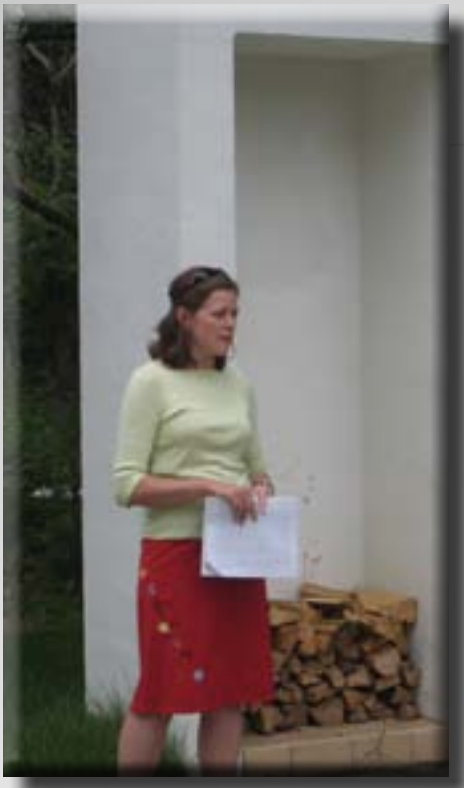
Requires no long term irrigation

o Reduces heat island effect

o Chives and flowering sedums will attract butterflies and bees

* Upper roof is has a white rubber coating to reflect sunlight

Want to reserve the Bagley Classroom? First visit the building's



The building will continue to serve as a learning tool and model of sustainable design and construction for all of northern Minnesota.