Commons House

Community Features

Mailboxes in the lobby (students still have CPO boxes) encourage unintentional bumps when residents pick up mail. Glass doors allow residents to look inside to see what's going on. Community room is for most meetings and programs – for meetings of the entire community, the Folk Center across the street has low rental fees and we felt we didn't need to duplicate a space of that size with a commercial kitchen. The "kid room" allows children to have their own area during meetings or when parents are doing laundry. Laundry room has washers for residents of original apartments and dryers for use by all residents. Newer apartments have washers but not dryers to make using dryers a choice not an automatic assumption.

Examples of re-use

Barn siding on outside is from an actual barn.
Wood for ceilings came from a house.
Carpet in kid room and office is from recycled fibers.

Energy-saving features

Air conditioning in office only – community room has cross-ventilation
Compact fluorescent bulbs throughout
Ceiling fans in meeting room and kid room
Medite II cabinets made with formaldehyde-free particleboard
Richlite countertops made with cellulose fiber and resin
Solar light tube in meeting area
Concrete floor for thermal mass
Solar panel on south roof for radiant floor heating – to be used for heating hot water in summer
Double-paned windows with low-e glazing
Dual-flush toilet
Front-loading washers use less water and electricity than top-loading washers
Moisture-sensors in dryers can reduce drying time – no need to guess how long it will take clothes to dry

Other

Kid-friendly blinds without cords
Low window in kid room so the littlest children can see out
Gas stove provides cleaner, but still nonrenewable fuel)

BEREA COLLEGE ECOVILLAGE
Design Features

Bathroom floor

Forbo linoleum
Forbo linoleum is made from linseed oils, pigments, pine rosin, and pine flour with a natural jute backing. To clean, dilute a few teaspoons of ammonia in a gallon of water. Don't mix ammonia with any other cleaners. Be sure to use a liner with your shower curtain to keep puddles off the floor. Forbo linoleum does not like standing water

Cabinets

Medite II
Medite II is made of 100 % recycled or recovered wood fibers. It is formaldehyde free and meets or exceeds EPA indoor air quality regulations.

Keep water and wet towels away from your cabinets.

Ceiling Fans

Ceiling fans can allow you to set your thermostat 4 degrees cooler in winter and 6 degrees warmer in summer without noticing any change in temperature. If you usually set your thermostat at 68 degrees in the summer, you can actually set it to 74 degrees and not notice any temperature change. Running your fan without making the corresponding thermostat change will increase your energy consumption, however.

In winter, set the fan to blow upward, dispersing the warm air that tends to gather near ceilings. In summer, set the fan to blow downward into the room. Learn to use the remote control with your fan – it's pretty amazing. You can set your remote so that your fan comes on when the room reaches a certain temperature. Or, you can set the number of minutes you want the fan to operate.

Compact Fluorescent Bulbs

Incandescent bulbs produce light by passing electricity through a thin filament, which becomes hot and burns brightly. Much of the electric energy is converted to heat instead of light. Fluorescent lamps produce little heat. They produce light by passing electricity through a gas, producing ultraviolet light, which is then absorbed by a phosphor coating on the inside of the bulb, producing visible light.

Lighting represents 5 – 10% of a home's energy use. Compact fluorescent bulbs use 66% less energy than a standard incandescent bulb and last up to 10 times longer. Replacing a 100-watt incandescent with a 32-watt compact fluorescent bulb can save $30 in energy costs over the life of the bulb. Installing just one fluorescent bulb can keep a power plant from emitting 1500 pounds of carbon dioxide – and you have a lot of them.

Compact fluorescent bulbs don't bum out often, but when they do, replace with another compact fluorescent bulb.

Best of all: turn off lights when you aren't using them.

Countertop Surfaces

Richlite

Richlite is a versatile surface material that is extremely durable. The composition of Richlite is cellulose fiber and resin. A simple wipe up with a wet sponge cleans up most jobs. With stubborn stains, try a non-abrasive household cleaner and a soft bristle brush.

Heating and Cooling System

Ground Source Heat Pump

Ground source heat pumps collect heat from the ground, where the temperature is more constant than the outside air, and uses it to heat your apartment. **A** heat pump can save 30 – 40% of the electricity you use for heating.

A heat pump can double as an air conditioner. In summer, the heat pump takes heat from the air inside your apartment and transfers it outside.

Best of all: open windows and doors on nice days instead of cooling.

Living room floor

Your living room floor is made of concrete, stained, scored, and sealed to look like tile. The floor provides your home with thermal mass. Thermal mass has the ability to absorb heat energy.

Heat always moves toward cold surfaces. During summer the floor helps absorb heat, keeping your home comfortable. In winter it can store the heat from the sun, releasing it at night as the room temperature cools.

A small area rug is provided for the living area, but don't add others. Your floor can't work for you if you cover it.

Low-flow showerhead

By restricting the flow and forcing the water through very small openings, these showerheads aerate and increase the velocity of the water. While a conventional showerhead uses 6 gallons or more per minute, low-flow showerheads use 2.5 gallons per minute. These showerheads save water and the energy it takes to h e a t the water. .Don't swap out your showerhead

Best of all: take short showers.

Thermostat

Your thermostat is programmable so that you can use less heating or cooling when you are away or asleep. Once you program your thermostat, the temperature changes automatically. Instructions are provided.

Toilet

Coroma Caravelle

The Caroma low consumption toilet uses a dual-flush mechanism to conserve water. A full flush uses 1.6 gallons of water; a half flush uses 0.8 gallons. Select the button at the top of the **tank.**

Washer

Your Frigidaire washer uses less water and about 50% less energy than standard washers. This machine's drum only partially fills with water during the wash and rinse cycles. As the drum turns about its horizontal axis, clothes are tumbled in and out of the water.

To save water and energy with any washer:

Wash full loads. Clothes washers are most efficient when operated with full loads.
Wash clothes in cold water.
Air dry clothes whenever possible.

Ecological Machine

The ecological machine (EM) is a series of aquatic ecosystems in tanks in a greenhouse, designed to treat sewage and other wastes by natural processes. The EM was installed to help the Ecovillage meet its performance goal that all water leaving the site will be of at least "swimmable" quality.

Sewage produced by the new ecovillage apartments, Commons House, SENS House, and CDL (approximately 2800 gallons per day) is treated by the EM. Sewage fiom the original apartments does not go to the EM.

Sewage first is collected at..

- The lift station, a vault buried next to the SENS House patio (has a control box with a red light on top). From here it is pumped into the large greenhouse into the...
- Septic tank, where anaerobic (without oxygen) bacteria begin to decompose the organic matter in the sewage. Then it flows to...
- Closed aerobic tanks 1 and 2. Air is pumped into these tanks, and odors are removed by the compost filter at the top of CA2. From CA2 the effluent flows through...
- Four open aerobic tanks. Air is bubbled through these tanks, and plants growing on floating racks assist the bacteria, protozoans and snails in further cleaning the water before it enters the...
- Clarifier, a cone-shaped tank where any solids, mostly dead bacteria, settle out and are pumped to CA1. The clear effluent flows to the sump where most of the water is diverted to the city sewer. About 400 to 500 gallons per day goes to the...
- Subsurface wetland where it is further cleaned before it goes to a storage vault, then is pumped through a UV-sterilizer and back to the new apartments to flush the toilets.

General facts

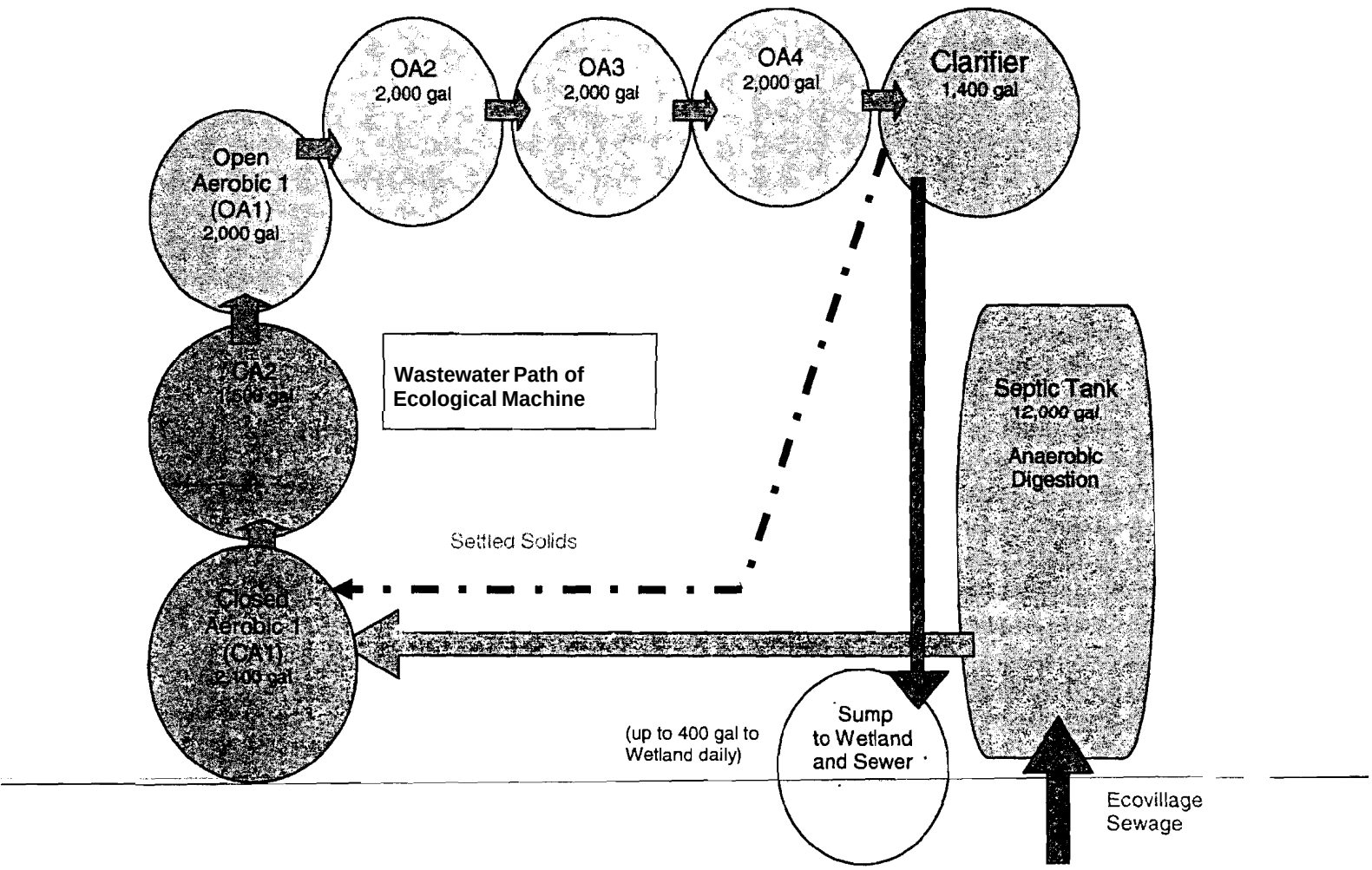
It takes the sewage about eight days to move through the tanks in the greenhouse.

On average, the eco-machine and wetland remove 99% of the organic matter, 79% of the phosphorus, and 94% of the nitrogen fiom the sewage.

Evaporative coolers (swamp coolers) and natural gas heaters maintain reasonable temperatures in the greenhouse.

The five small tanks in the greenhouse are for display and student research. They operate independently of the main eco-machine.

Berea College Ecological Machine



• October 2005

SENS House

The Sustainability and Environmental Studies (SENS) House promotes sustainable living and works to engage all members of the College community in the creation of a sustainable campus. We do this by providing a demonstration for the campus and the rest of the world of how ecological design, simple living, and community can intersect to provide a high quality of life without degrading the environment. We showcase technologies that contribute to a sustainable society, operate a resource library, organize campus- and community-based programs and workshops, and promote campaigns to move Berea College toward sustainability. As a member of the Berea College Ecovillage, the SENS House works with the other residents to achieve the Ecovillage's goals of community, sustainability, and learning.

Four SENS House Directors live in the SENS House, and together with three non-resident directors conduct a variety of workshops and programs as part of their SENS labor positions. **A** student does not have to be a SENS major or minor to work for SENS, but they must work for SENS to live in the SENS House.

Key features of SENS House

Same as apartments:

passive solar design
concrete floor for thermal mass
low-emissivity windows
Richlite countertops and Medite II cabinets
compact fluorescent bulbs
ceiling fans
heat exchanger
Solatube skylights
low VOC paints
low-flow showerheads and faucets
low-flush (two-button) toilet
SIPs panels (roof only) R-46
Hardi siding (fiber cement material)
50% fly ash concrete patio and sidewalks

Unique to SENS House:

Post-and-beam construction for living room; Virginia pine from College forest

Strawbale wall with earthen plaster (R-45); remainder of house is stick frame with 2 x 8s for greater insulation (R-25) with Johns Manville formaldehyde-free fiberglass insulation

(over)

Cornposting toilet – shavings and peat mixture added after use, drum rotated every few days; emptied about every six weeks; 12-volt fan draws air through unit and up vent

Rainwater is collected from the roof in a 3000-gallon cistern buried by the north wall. This water is filtered and ultra-violet sterilized

No central heating or cooling; a **wood stove** in the living room is the main supplemental heat source; bedrooms and bathrooms have in-wall natural gas heaters

Solar hot water panel on roof; in-line on-deinand natural gas heater boosts water temperature if needed; roof panel automatically drains into house when temperatures near freezing

Greywater treatment system for water from bathroom sinks and showers is located in the small attached greenhouse; greywater is collected in sump and then pumped onto soil beds where bacteria eat soap and dirt, and plants transpire the water; the attached greenhouse also assists in solar heating for the house

A 1440-watt **photovoltaic panel** array converts sunlight into electricity for the SENS House; the pole-mounted system tracks the sun for greater conversion efficiency; an inverter converts the electricity from DC to AC. The SENS House has no batteries for storing electricity, but uses "net metering," so that on a sunny day the House exports electricity to the grid, and draws electricity from the grid at night or on cloudy days. Maximum daily production has been 10 kWh, although 5 or 6 kWh per day is more common.

Information Kiosk

The information kiosk is a straw-bale, earthen-plaster structure designed and built by a SENS House Director. Construction was done during three public workshops so that others could learn this natural building technique. The kiosk floor is slate.

Solar Shed

The hexagonal shed will be a post-and-beam structure built with oak timbers from the college forest. A central skylight will be surrounded by a living or green roof, the soil and plants of which will insulate and cool the structure and reduce stormwater runoff. Each wall will demonstrate a different alternative building technique including cob, cordwood, and earthbag construction. Greenhouse glass on the south-facing wall will maximize passive solar heating in the winter, while a trellis overhang will provide shade during the summer.

The shed will be built through a series of workshops led by SENS House Director Phil Hawn. When complete, the shed will be an important demonstration of ecological design for visitors to the Ecovillage, and the hub for gardening at the Ecovillage as it provides space for storage, potting benches, and shelves for starting seedlings.

Solar Energy at the Ecovillage

Natural Building Shelter

The radiant floor heating system is supplied by a solar hot water panel with an independent photovoltaic panel for the water pump, which will only run when there is adequate sunlight and the water temperature is sufficient for heating. A 100-watt photovoltaic panel and battery provide power for indoor/outdoor LED lighting and irrigation of the living roof.

The edible landscaping will capture solar energy and store it in the form of food. Espalier fruit trees, trellised grapes, and a variety of perennials and annuals in raised beds will beautify the surroundings while helping to feed the Ecovillage.

Sustainability and Environmental Studies (SENS) House

1.5 kW grid-tied photovoltaic system on a tracking mount; 32 sq. ft. drainback solar water heating; passive solar design including attached greenhouse for solar heat and greywater treatment; portable solar oven. http://www.berea.edu/SENS/ecovillage/senshouse/default.asp

Ecovillage Commons House

Drainback radiant floor solar water heater with 3 solar collectors.

Ecovillage Apartments

Passive-solar design including south-facing orientation, concrete slab for thermal mass, and low-e windows with overhangs for summer shading.

Useful sources of information on renewable energy for the home and home energy efficiency:

US Department of Energy
Consumer's Guide to Energy Efficiency and Renewable Energy
http://www.eere.energy.gov/consumer/

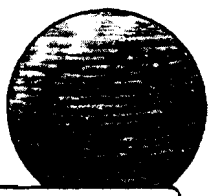
Kentucky Solar Partnership
http://www.kysolar.org/
Source of information and workshops on PV and solar hot water systems.

The Kentucky Solar Energy Guide, 2nd edition. Andy McDonald and Joshua Bills. 2006. Appalachia – Science in the Public Interest, Mt. Vernon, KY. http://www.kysolar.org/guide.htm

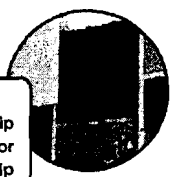
Berea College Ecovillage
Natural Building

An example of various methods of natural building and passive solar heating as well as a garden shed to store tools for gardening and potting plants.

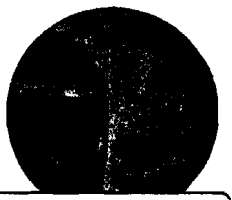
Materials and Construction: The basic structure of the building is an oaken post and beam fmme set on a concrete foundation. This frame will be the support for a living roof and natural building materials will be an infill between the posts to form the walls. The floor will be compacted earth.



EARTHBAG
Earthbag construction consists of fiber bags filled with earth or sand used to build entire buildings including the roof. These structures use very limited amounts of wood and once plastered can be virtually indistinguishable from cob, strawbale or adobe.

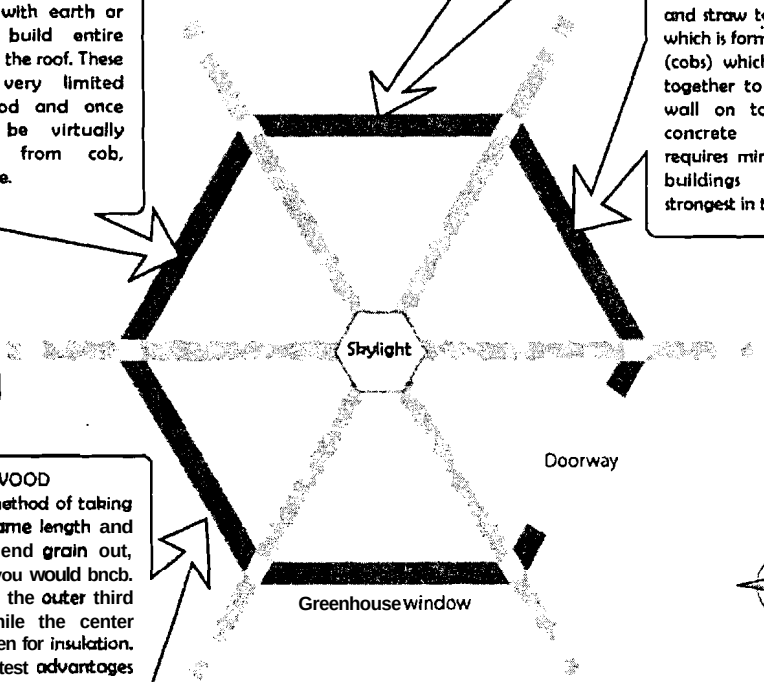


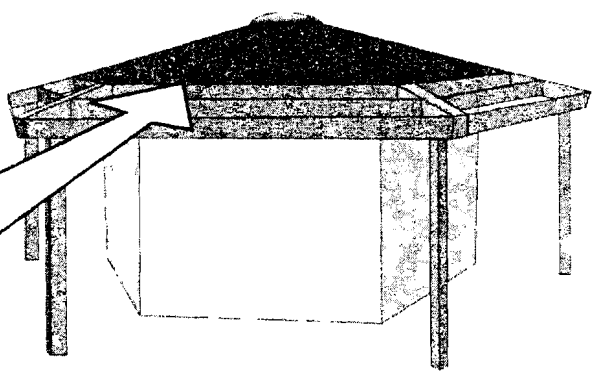
SLIPSTRAW
Loose straw coated with a clay slip forced into forms as an insulator for timber frame structures. Slip forms are set up between the framing members, and the straw clay mixture is tamped by hand in two-foot layers. Normally coated with an earthen plaster.



COB
Cob is a mixture of sand, clay and straw to create a stiff mud which is formed into small loaves (cobs) which are then mashed together to form a monolithic wall on top of a stone or concrete foundation. Cob requires minimal tools and cob buildings are among the strongest in the world.

CORDWOOD
Cordwood is a method of taking logs dl of the same length and stacking them. end grain out, with mortar as you would bncb. The mortar h at the outer third of the logs while the center portion is left open for insulation. One of the greatest advantages of cordwood is that once the log is mortared in place that portion of the wall requires no further finishing.





THE LIVING ROOF
A living roof is designed to accomplish several things: Replace living plant material normally displaced during construction, provide a safe means of controlling storm water runoff and provide summer cooling.

Child Development Laboratory

SIPS panels on walls and ceiling
Fiber cement siding
Windows are double paned with low-e glazing
Windows are low to floors so the smallest children can see outside
Linoleum instead of vinyl floors
Carpet made from recycled carpet fibers
Duct sox provide flexible ventilation and even flow of air and heat
Many different colors of paint provide stimulation or soothing of children
Paint is low VOC
Ground source heat pump for heating and air conditioning
Cupboards and countertops made without formaldehyde (wood fibers and resin)
Clerestory windows for daylighting
Solar light tubes
Recycling and composting are taught to children
Other sustainable teaching in the curriculum
Capacity – 118
Age-range – 6 weeks to after-school care for kindergarten children
Large muscle activities in center area
Two architects collaborated
    One older couple had much experience in designing childcare centers in sustainable ways
    Other architect did CAD
Observation areas with sound on second floor (for classroom and parent observation)
Classroom on second floor with media equipment
Large meeting room on second floor
Playground with berms with incorporated play equipment