SCENIC HUDSON
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Redesigning the River Center: A Teacher's Guide to Green Building

We need buildings to live and work in, but we need to make good choices about design, materials and construction methods to reduce negative environmental impacts of building homes and offices. Green building is the art of designing and constructing a building so that environmental disturbance is minimized during the construction and life of the structure.

What makes the River Center green?

Using Green Materials: Extracting, transporting and installing building materials can be very detrimental to the environment. Green building materials seek to eliminate these negative effects.

- Salvaged materials – why use something new when you can use what you already have? We used the original posts and beams and kept most of the original first floor ceiling.
- Recycled materials – if you can't use old materials in their original form, use old materials that have been made into new materials. The River Center's floors are recycled rubber.
- Sustainably harvested – this term usually references wood products. It means that the forests are managed in a way that produces wood products without compromising the health of the forest. We used sustainably harvested cumaru as decking.
- Durability – replacing materials over the lifespan of a building is costly and puts more strain on the environment. Sustainable materials are often extremely durable, eliminating the need for new materials. The cumaru decking naturally resists rot and insects. The Timbersil deck framing has been impregnated with glass so that the white pine also resists rot and insects.

Designing for Minimal Energy Use:

- Heating and cooling – keeping a building a comfortable temperature can use a tremendous amount of energy. We carefully designed the River Center's system to use as little as possible.
    - The heat pump uses ambient air temperature to heat and cool the structure, making it very efficient. However, even the most efficient pump can still use lots of energy if it has to run all of the time. We made additional good design decisions to minimize pump run time.
    - We installed an attic fan that sucks hot air up and out of the building, allowing cool river air to come in the bottom floor windows and reducing the need for air conditioning.
    - The building is heavily insulated which prevents conditioned air from escaping.
- Lighting – energy used by lighting runs a close second to the amount used by heating and cooling. We used three strategies to reduce lighting energy use.
    - Daylighting – the large, strategically placed windows eliminate the need to even turn on the lights on sunny days.
    - Occupancy sensors – these sensors automatically turn lights off when a room has been unoccupied for a certain amount of time
    - High efficiency light bulbs – light bulbs that use as little energy as possible to provide the amount of light needed by building users if daylight is insufficient.

Redesigning the River Center Answer Key

Exterior

1. Total area of south wall – non-siding areas = area to be painted
   1130 ft^2 – 587.5 ft^2 = 542.5 ft^2
   Area to be painted/350 ft^2/gal = number of gallons for one coat
   542.5 ft^2/350ft^2/gal = 1.5 gallons for one coat
   1.5 gallons x 2 coats = 3 gallons
2. Total area of roof – 65% of roof area = area of roof to replace
   Total roof area = 2782 ft^2
   Area of roof to replace/2782 = 35/100
   973.7 ft^2 of new roofing to replace the leaking 35%
3. Total area of roof x 0.62 gallons = gallons of rain caught by roof/inches per year
   2782 ft^2 x 0.62 = gallons of rain/45.79
   78,980.4 gallons of rain caught per year
4. a. number of toilets x number of flushes x gallons per flush = gallons of water used per year
   3 x 3000 x 1.6 = 14,400 gallons per year
   b. Yes
   c. Use it for anything that doesn't have to be potable, like watering a garden or washing cars.

Interior

Floor Plan drawings

1. length = 50 ft, width = 41 ft
2. Southeast corner should be missing a triangle with a base of 5 ft and a height of 5.5 ft.

3-8. Drawings will vary. Encourage students to show their calculations on a separate sheet of paper.

Energy efficiency questions

1. Number of lights x kWh used per light per hour x hours lights are on = number of kWh used
   24 x .032 x 12 = 9.2 kWh
2. Number of lights x kWh used per light per hour x hours lights are on = number of kWh used
   24 x .032 x (12-7) = 3.8 kWh used during the 5 hours the lights are on
   kWh used during 12 hours – kWh used during 5 hours = kWh saved by turning off lights
   9.2 – 2.8 = 5.4 kWh

Design a Banner

Designs will vary. Encourage students to be creative and show area calculations.
Note: banners are conceptual only, they will not be produced.

Common Core Standards

6.G.1.

7.EE.3. 7.G.1. 7.G.6.