

# Kroon Hall



Yale University designed and built Kroon Hall in alignment with the U.S. Green Building Council's LEED (Leadership in Energy and Environmental Design) rating system at the Platinum certification level.

## ENERGY EFFICIENCY

Kroon Hall was designed to use 61.1% less energy than a standard building of similar size and program. The building's east-west orientation takes advantage of solar access and natural ventilation. The wide southern facade provides both ample natural light and significant heating potential. The building is highly insulated, and concrete walls and exposed concrete ceilings retain heat in winter and help cool the building in summer. Fresh air ventilation and free cooling cycles on air handling units reduce the need for air conditioning. Indicator lights alert occupants when conditions are suitable to open windows for natural ventilation. When air conditioning is necessary, displacement ventilation and indirect evaporative cooling are designed to condition the spaces using 73% less energy than a typical building. In winter, the heat recovery system warms the air using available energy from the occupants, lights, and appliances before making use of geothermal energy. This system draws water, at a constant temperature of roughly 50 degrees, from four 1,500-foot wells near the building. High-efficiency electric lighting and controls further reduce energy use and the cooling load. All appliances and equipment are rated Energy Star™. The photovoltaic array on the roof, funded in part by the Connecticut Clean Energy Fund, has a 105 kw system that provides for more than 20% of the building's electrical consumption on an annualized basis. Solar hot water is used to heat at least 50% of potable water. The all-electric building's design protects the atmosphere by eliminating on-site combustion. The ground source heat pumps serve as the building's heating and cooling plant and utilize only HFC refrigerants.

**80% of the timber** used was certified by the Forest Stewardship Council

**16% of purchased materials** contain recycled content

**34% of purchased materials** came from regional sources

**81% reduction** in annual potable water use is anticipated, saving more than 500,000 gallons of potable city water each year

**61.1% reduction** in energy use in comparison to a conventionally equipped building of similar size and program is anticipated

## INDOOR ENVIRONMENTAL QUALITY

The building's shape provides views to the outside for most occupants, and skylights bring ample daylight to the center of the building, reducing the need for overhead lights. Carpeting is low-VOC (volatile organic compounds) and made of natural, recycled, and recyclable materials. Paints, coatings, adhesives, and sealants are also low-VOC. Composite wood and agrifiber products are free of added urea-formaldehyde resins. Furniture manufacturers were selected based on their environmental record and sustainable manufacturing processes. Wood for office furniture is FSC- and SFI-certified; particleboard is made from 100% wood fiber content. Classrooms have CO<sub>2</sub> monitors and utilize a demand controlled ventilation strategy.

## MATERIALS

Priority was given to regionally sourced materials with recycled content. Some of the FSC-certified timber came from Yale's own sustainable forests. The concrete mix that insulates many of Kroon's walls and ceilings contains 25% Ground Granulated Blast Slag (GGBS), a postindustrial recycled material that is a product of steel smelting, which decreases the CO<sub>2</sub> emissions associated with concrete production. Demolition and construction waste was recycled, reducing the amount of material sent to landfills by 94.2%. Dedicated recycling areas throughout the building promote the recycling of paper, bottles and cans, and general trash.

## WATER EFFICIENCY

The constructed wetland at the southeast corner of the building uses native aquatic plants to help remove sediment and contaminants from rainwater collected from the building's roof and grounds. After additional filtering, the water is reused for toilet flushing and irrigation. Low-flow plumbing and irrigation fixtures further reduce demand for water.

## SITE AND TRANSPORTATION

A gas-fired power plant, a parking lot, and assorted dumpsters were removed to make way for Kroon Hall. Asbestos-containing materials and contaminated soil required remediation prior to the start of construction. Materials, such as light-colored concrete and the south courtyard's green roof, were chosen to combat the urban heat island effect. Hiding the maintenance and delivery garage beneath this courtyard provides an appealing outdoor space and views from the building interior. This centralized underground delivery, trash, and recycling node for neighboring Science Hill buildings reduces vehicle trips, idling vehicles, parking, and traffic. Situated close to downtown New Haven, Kroon Hall enjoys easy access to the Yale Shuttle and CT Transit bus service. Secure bicycle storage includes dedicated cyclist locker rooms with showers.

## INNOVATION IN DESIGN

The design prioritized strategies to minimize energy use through siting and use of building form, materials, and exterior envelope to enhance energy gain, energy retention, and natural ventilation. Kroon's design ensures that occupants see the benefits of sustainable building features firsthand. High-performance windows set deep within precast concrete shade occupants from the summer sun.



### Architect

Hopkins Architects in partnership with Centerbrook Architects and Planners

### Total floor area

52,635 sq ft

### Opening date

January 2009

Yale

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