

# What Makes the new White Mountain National Forest Headquarters “Green”?

## General

- The site and office building of the new administrative complex in Campton, New Hampshire, have been constructed to the Leadership in Energy and Environmental Design (LEED) standards set by the US Green Building Council. The project is designed to achieve a “Silver” Leed rating but it is believed that a “Gold” certification is within reach.
- The site and all buildings are fully accessible in compliance with Americans with Disabilities Act (ADA) requirements.
- During construction, all excess materials and waste were separated and recycled Offsite.
- Active composting and recycling programs are in place.
- For several years, the Forest Service has been introducing hybrid vehicles into its fleet. The Forest has asked to be a test site for a newly developed all-electric pick-up truck which, when charged with the biomass generated electricity, will technically scoot down the highway on wood pellets!
- The Weeks Conference Room, with capacity for 100, including a small coffee serving station and restrooms, will be available for use after hours by partners, cooperators, and other state and federal agencies.
- Throughout the three phases of construction, we employed three general contractors, over 50 subcontractors from New Hampshire, Maine, Vermont, and Massachusetts, one government Contracting Officer’s Representative (COR), and one part-time government inspector. Approximately 200 laborers and tradesmen worked on the site.

## The Site

- Location and orientation of the buildings resulted from an energy audit through a Department of Energy grant to maximize solar heat and light.
- All alternate energy sources – wind, geothermal, solar, and biomass – were considered. Biomass was chosen as the best way to go (see below).
- All of the roadbase was derived from cobble and boulders dug up and crushed on the site.
- The main parking area is divided by earth mounds planted with shade trees to reduce heat island effects.
- Parking lot surfaces use permeable brick or permeable concrete to reduce runoff levels. Two different types of each are demonstrated.
- Some parking spaces in the main lot have outlets for electric vehicles to plug in.
- Three detention ponds collect and filter all stormwater drainage before it goes back into the natural system. Ponds are sized and configured to slow the release of water to mimic the runoff from the site before it was developed. One of the ponds is an experimental wetland; if it is successful, the concept will be applied to the other two ponds.
- A series of water storage tanks totaling 37,500 gallons is buried at the back of the property to help support suppression in case of wildland or structure fire.

- Site landscaping features very little “lawn” – instead, maximum use is made of native groundcover and plants.
- Site lighting is specifically designed to minimize light pollution.

## **The Office Building**

- The 25,000 square foot structure houses both the Forest Supervisor’s Office and the Pemigewasset Ranger District (main station and Bethlehem substation), centralizing three locations into one.
- Steel used in the office building includes over 70% recycled content, and all of the steel used contains some recycled content.
- All of the timber used originated from FSC-certified source.
- Exterior materials on all buildings are designed to require no maintenance for 20 years of normal use.
- Concrete for the office building used fly ash to replace 10% of the cement content.
- The building is super tight. A rubberized layer was applied over the exterior sheathing to seal any cracks and then the interior was sprayed with insulating foam. There is also 1-inch of rigid insulation on the entire exterior. Ceiling insulation is R60; walls are R38 – both twice as much as a typical building. The building was vacuum or “blower door” tested (it was pressurized, then a theatrical smoke generator used to spot leaks – done from interior and exterior). The total air leakage for the building is comparable to a solid box of the same size with one double hung window open (~3 square feet).
- Interior finishes applied in the building are extremely low in VOCs (Volatile Organic Compounds).
- Interior lighting and temperature is computer-controlled. Light sensors automatically dim the lights when there is a sufficient level of natural lighting. Lights shut off automatically during non-duty hours.
- All energy-consuming systems (lighting/power/heat) are measured and trended using a Building Management System which will allow us to track energy use over time and troubleshoot potential energy issues before they get out of hand.
- Light shelves along all windowed walls are designed to reflect natural light deeper into the interior of the work areas.
- The building is fully sprinklered, with 10,000 gallons of water buried just outside the building for fire protection.
- The elevator hydraulics run on canola or vegetable oil .
- All equipment used inside the building is Energy Star rated.
- The main building is heated and cooled with a forced air system using the same ductwork. Interior air is exchanged with outside air continuously, with the amount of fresh air controlled by CO2 sensors within the system.
- The carpeting uses recycled materials; the steel and most other materials used in construction contain recycled content.
- All toilets in the office building are composting foam flush models with waterless urinals.

- Grey water is collected and filtered from all drinking water fountains and sinks throughout the office building and then recycled to an interior planter bed overlooking the main lobby/visitor information center.

### **Other Buildings**

- Outbuildings are constructed of steel and other metals to reduce costs.
- Light transmission panels bring natural light into building interior.
- The heated warehouse has a solar hot water system for domestic hot water.
- The heated warehouse has flush toilets that flow into a leach field, but no waste water comes from the office building except overflow effluent from the composters, overflow greywater , and water from the slop sinks in the janitors' closets.
- The heated warehouse also has showers to encourage bicycle commuting and employee fitness programs.

### **Biomass Energy System**

- A 1 million BTU wood pellet gasification Kob boiler provides 90% combustion efficiency, produces no harmful emissions, and supplies heat for the main building and heated warehouse. It works by essentially “baking” the pellets in a low-oxygen environment, producing a flammable gas derived from the hydrocarbon content of the pellet. This gas is moved into another chamber where oxygen is introduced and the gas completely combusted. The separation of the ash content of the pellet from the turbulent combustion of the gas results in a much cleaner flue gas. The boiler also uses a three-pass heat exchanger, which means the water in the heating loop passes over the hot flue gases three times before either exit the boiler. A typical residential boiler is only one pass.
- A 1 million BTU propane backup boiler can heat the office building in case of main system failure.
- Electrical generation is accomplished through a gasification process using the biomass wood pellets to fire a diesel combustion engine that runs a 125KW electrical generator. The generator will reduce the grid electricity provided to the complex (lower electric bill) and provide emergency power in the event of a grid failure. The genset is also equipped with a liquid-to-liquid heat exchanger to pull waste heat from the engine and use it to augment the pellet boiler and assist with space heating needs at the site thus making it a true combined heat and power system.
- All large motors and pumps are controlled by variable frequency drives, which allow them to ramp up and down according to demand – reducing energy consumption.