BUILDING A "GREEN" ZOO HOSPITAL: BEFORE, DURING AND AFTER

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Abstract

Awareness of environmental impact is integral to the mission of the modern zoological facility, therefore environmentally-sound "green" ideas have become embedded into the processes of designing, building and using a new zoo veterinary hospital. Use of sustainably-produced construction materials, reduction of usage of mainstream power sources (natural gas or coal) for electricity, reduction of water usage, and minimization of landscape disruption can all contribute to a smaller environmental impact than traditional methods. Some of these non-traditional methods do not cost more than traditional methods; some do involve a greater initial cost that is recouped by lower utility costs or greater educational/conservation benefit in the long run. "Green" design features that were proposed prior to construction of two zoo veterinary hospitals in the Pacific Northwest, as well as those that have been in use for several years, are listed and compared in this presentation.

Introduction

The voting taxpayers of the Portland, Oregon region approved a bond measure in 2008 that will provide approximately $125 million for improvements to the Oregon Zoo, including approximately $9 million for the design and construction of a new veterinary hospital and quarantine facility. Taxpayers of the Tacoma, Washington region approved a similar bond measure in 1999 for $35 million, $3.1 million of which was directed toward the construction of Point Defiance Zoo & Aquarium's (PDZA) new 9000 ft^2 zoo hospital and quarantine facility in 2004. The governing authorities of both facilities realized that the construction and design features used in these two projects represented an unusual opportunity for public education regarding resource conservation; therefore "green" ideas were given great consideration in the design process.

Discussion

For each facility, a hospital design team was formed, comprised of zoo staff including veterinary team representatives, construction staff, and project managers. Oregon Zoo's hospital design team held several brainstorming sessions and solicited other zoo and Metro staff members for additional ideas. Proposed "green" ideas could be grouped into several categories: choosing a site, schematic design, building systems (water, power, heating & ventilation), building construction materials, and procedures for use of the building once it is a functional zoo hospital (including community support and education). Oregon Zoo's governing authority (Metro)

decided that Leadership in Energy and Environmental Design (LEED) certification of their new hospital/quarantine building was an important step to increase public understanding/awareness of sustainability and resource conservation at Oregon Zoo.

Some of the suggested construction elements were already considered to be part of standard "green" construction practices in the Pacific Northwest and therefore were not anticipated to add significant costs to the construction budget. These included the following:

- Basic stormwater management. Avoid directing all stormwater into drains, and instead collect and store it for other uses or use it for landscaping before slowly sending overflow to the storm sewer.
- Use of recycled materials in the site fill and site preparation (e.g., recycled glass cullet).
- Use of recycled content in construction materials, including steel, metal siding, gypsum board, ceiling, and fly ash concrete.
- Use of sustainable materials such as wood from certified forests or quickly renewable materials (e.g., bamboo).
- Management of demolition and construction waste, for example using old concrete from this demolition as nonstructural fill in later projects.
- Using materials produced locally/regionally, for example windows or concrete.
- Use of natural daylight for lighting (e.g., solatubes, skylights, and larger windows).
- Sensor control of lighting and heating/ventilation/air conditioning (HVAC) needs.
- Use of materials with low emission rates of volatile organic compounds.
- Low-flow plumbing fixtures.
- Design that captures solar energy for heat and/or light (e.g., designing the building with southern exposure).

Several rather non-traditional features were proposed that were anticipated to be more significant parts of the construction budget. These included the following:

- Roof landscaping / "green roof" / landscape islands. Approximate cost $40,000.
- Incorporation of a waste water treatment facility (a packaged pre-engineered "bioreactor") to treat effluent sewage from the hospital/quarantine building so that it does not need to enter the sanitary sewer system. Approximate cost $55,000.
- An additional level of stormwater management – Harvesting rainwater from the roof and rooftop planters, using minimal filtration, then storing the water to use it for flushing toilets or rinsing down animal stalls in the same building.
- Solar water pre-heat – A prefabricated solar system on roof of hospital/quarantine building that would preheat the water that goes into the building's hot water heater system. Approximate cost $10,000.
- Photovoltaic solar – Use solar exposure on roof of hospital/quarantine building to produce electricity that would be used in the same building. Estimated cost $50,000 or more.

Reduction of use of artificial light and reduction of energy use overall was an important goal to address in the design process. The following energy and lighting related features were proposed:

- Programmable HVAC and lighting in human and animal areas, with energy-saving settings in human areas
- Heated flooring. Although this is usually considered a human/animal comfort element, rather than a "green" element, "enhancement of human and environmental health" is a component of the LEED certification process.
- On-demand hot water heaters, instead of traditional stored volumes of hot water.
- Natural lighting if at all possible including skylights, solatubes (www.solatube.com), louvered windows, light scopes/shelves, and window light panels that reflect light onto the ceiling of the indoor space.
- Natural ventilation instead of air-conditioning, using openable windows especially in human areas.
- Compact fluorescent lights (lower-mercury type), extended life lamps, LED lighting.
- Metal roof without black glue, to reduce temperature of roof.
- Passive solar for water heating.
- Active solar (photovoltaic production).
- Fuel cell as backup for 12 volt LED lighting.
- Generate power (or at least heat) from "Zoo Doo." At Oregon Zoo, it was determined that this would be cost-effective only on a whole-zoo basis, not developed just for the hospital/quarantine building.
- Use heat exchangers in HVAC system.
- Wind turbines for energy production.
- Incorporate good insulation on indoor/outdoor animal area shift doors.

Community support, community awareness and therefore education regarding our low-environmental-impact goals were addressed with the following proposed features:

- Decrease noise (disturbance to animals and neighbors) by enclosing or wrapping the electrical backup generator that is next to the hospital/quarantine building. Like heated floors, this feature addresses "enhancement of human and environmental health" as mentioned in the LEED certification process.
- Incorporate the sustainability/resource conservation message into public presentations at/about the hospital/quarantine building. Tell the story of what design choices were made and why. Give building tours to other zoo and Metro staff once it is complete.
- Install video link ability in hospital/quarantine area to send images to other more convenient visitor areas, so visitor amenities do not have to be built in hospital/quarantine building. However, will have explanatory displays and a small visitor-ready area in hospital for behind-the-scenes tours.
- Alternatively, if space is available in the hospital/quarantine building itself, build a classroom in the hospital building that can be used for "green/sustainable" training events or meetings, not just hospital tours.
- LEED certification of the hospital/quarantine building to increase public understanding/awareness of sustainability and resource conservation at the zoo.
- Install interpretative signs that are visible from the visitor train track, noting hospital location.
- Develop ways to measure the benefits of "green" design and procedures.

- Incorporate art into educational/interpretative space of hospital (e.g., art made from old radiographs).
- Minimize tree removal during site prep for building construction. Native plants that are removed from site during construction should be replanted either adjacent to building or elsewhere.
- Could combine art and solar power collection together, making artistic-looking solar panels.

General efficiency and "green-ness" of building design was addressed with the following proposed ideas:

- Integrate hospitalized and quarantine animal housing into the same building, reducing the amount of redundancy in facility space and materials.
- Re-use existing buildings for office space, instead of building office space into the new hospital/quarantine building. This eliminates the need for a second story in Oregon Zoo's new building and potentially saves 25% in overall project costs. At PDZA, existing buildings were incorporated into the new hospital footprint to provide personal locker space, a staff kitchen and animal commissary.
- Incorporate space for recycling bins.
- Use recycled/reused building material from existing/old building and from local sources.
- Use quarantine building's demolition materials (cinder block concrete) as nonstructural fill, grinding it up and keeping it on zoo grounds for new structures.
- Flooring material made of recycled or renewable-resource materials (linoleum, polished ground concrete, terrazzo or glass tile, cork).
- Animal pools which use minimally-toxic methods for waste treatment instead of chlorine.
- Use recycled paint for walls.
- Use compacted gravel instead of asphalt in newly "paved" areas, thereby reducing asphalt use and distributing drainage in parking areas, for example.
- Improve kitchen compost program, for animal food/waste as well as human. Composting of human bathroom waste is not yet an option in the region.
- Use "carbon-neutral" products whenever possible.

Water use reduction was an important component of the design, especially for Oregon Zoo, since the Oregon Zoo has the highest water use of all Metro facilities and Metro has a goal of 50% water use reduction.[1] This was addressed with the following proposed features:

- Bio-reactor waste treatment system active on stormwater, making stormwater available for a variety of uses. This could include plant irrigation, animal enclosure washdown, and possibly toilets.
- Landscaped islands on roof, using native plants that are butterfly or bee attractants; this reduces the need for irrigation but still provides plant growth. Some of these plants are able to be harvested as browse sources for animal nutrition and enrichment. Or could maintain the entire roof as a "green roof", other than skylight portals.
- Aquatic animal holding area's pool should have a filtration system installed, to reduce need for dump and fill.
- Low-flow shower heads in human areas.

- Low-flow dual-flush toilets in human areas.

Unique challenges are encountered during the design, construction and use of any new zoo hospital and quarantine facility. The "brainstorming" phase is extremely important during hospital design planning, considering many more design features than will ever be possible or practical. Communication with other zoo facilities, learning from their experiences, helps prioritize those design features that be of greatest benefit in the long term for both your zoo and the planet.

LITERATURE CITED

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