WHITE ROCK OPERATIONS BUILDING

A CASE STUDY

2003

THE CITY OF WHITE ROCK OPERATIONS BUILDING

Exemplifying Innovation, Engineering Excellence and Environmental Leadership

Achieved in July 2003:
LEED™ GOLD CERTIFICATION, the second in Canada, and the first for new construction.

Highlights:

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Contribution to Sustainable Development of Our Society

BUSBY + ASSOCIATES ARCHITECTS

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The Project

In 2001, the City of White Rock appointed Busby + Associates Architects team to design a new Operations Building for the City of White Rock. Construction on the project was completed in 2003.

The resulting design located the new facility at 877 Keil Street in White Rock, British Columbia, over an abandoned Sanitary Treatment Plant, using the existing buried tank wall as the foundations for the new building. The building developed into two separate pavilions: a two-storey component on the north end of the site, and a one-storey building on the south end. The north building is built on the existing basement of the old Sewage Treatment Plant Control Building and houses the departmental elements which are only periodically used, such as Field Crew facilities, change rooms, first aid room, meeting and lunch rooms. The south building houses the office component of the department.

Site Size | 9,597 sm / 103,305 sf
Building Size | 608 sm / 6545 sf
Budget | $1,220,000

The Environmental Mandate

The mandate at the time of appointment was to make the project as green as reasonably possible, in accordance with the City's own policy of promoting Green Strategies in all the developments and planning strategies. As the project evolved, a decision was made to pursue LEED™ certification.

The Team

The City of White Rock
Busby + Associates Architects
Fast + Epp | Structural
Keen Engineering | Mechanical
Flagel Lewandowski | Electrical
Wendy Grandin | Landscape Architect
Helyar & Associates | Cost Consultant
KDS Construction | Builder
Pacific Environmental Consulting Services | Indoor Air Quality

Methodology

The White Rock Operations Building was designed as a green building, through the fundamentals of an integrated design approach. The entire process – through design and construction - was interactive. The City, as a Client, was fundamental in setting the direction and objective of a "deep green" development. All members of the consulting team were involved in the design of the project, achieving efficiencies in the design, maximizing the ability for cost effectiveness, modular pre-engineered components, and building in green design.

Environmental Strategies

There are many innovative strategies in this facility, each one having strong merits. All engineering and geoscience design decisions can be considered outstanding in and of themselves. But what makes this green building unique is the combination of so many strategies in one project. Although a small municipal project with a modest budget, a new standard of achievement in green buildings has been set for the community and the construction industry.

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To receive Gold Certification through the USGBC's LEED™ program we're using a wide variety of innovative building strategies from environmentally advanced design to renewable energy systems and water conservation techniques. Going green delivers an excellent return - environmentally, economically and socially.

Greg Scott P. Eng.
City Engineer
The City of White Rock
January 2003

To gauge the success of these strategies, the LEED™ (Leadership in Energy & Environmental Design) standards developed by the U.S. Green Buildings Council were utilized. An aggressive goal was set - obtain LEED™ Gold certification.

The City of White Rock Operations Building incorporates renewable energy technologies, solid waste reduction strategies, stormwater best management practices, atmospheric strategies and water conservation strategies within a 661 square meter facility.

The list below summarizes the strategies; a detailed description of the water conservation strategies is included as an example of interdisciplinary achievements through effective decisions.

Renewable Energy

> City purchased BC Hydro Green Power Certificates to augment photovoltaic panels for electricity;
> The facility will harness solar energy with the use of new locally purchased solar tubes to provide the base radiant heating for the building;
> Thermal energy in storm water that has been diverted from city streets into a detention tank will be used to augment heating the facility in the winter months and assist in cooling during the hot season.
> Daylight lighting shelves are provided to reduce lighting needs;
> Exterior window shades are provided to reduce heat gain.

Solid Waste Reduction

> Reuse of an abandoned waste water treatment plant's concrete clarifiers and pump house as a foundation for the facility;
> Recycling 97.75% by weight of the existing office building (diverting 467,670 tonnes from the landfill);
> Use of recycled construction material, such as heavy timber, components, wood decking, insulation;
> Sorting of construction waste into the accepted recycled components.

Stormwater Management Practices

> Use of a green sod roof to reduce runoff from impermeable surfaces on the site;
> Diverting all runoff from the facility to a stormwater detention facility;
> Construction siltation control plan;
> Gravel parking lot to allow infiltration of water into the ground.

Atmosphere Strategies

> An average 40% fly ash in all new concrete to reduce CO_2 emission from the production of cement;
> Use of green roof to reduce the heat gain in the environment;
> Natural ventilation strategies to eliminate the need for air conditioning;
> Use of materials that were produced within a 500 mile radius of the site to reduce transportation effects on the environment.

Water Conservation Strategies

> Use of storm water rather than potable water for the toilets to reduce consumption;
> Waterless urinals and low flow faucets throughout the facility to reduce water consumption;
> Use of storm water from the water detention tank to wash down vehicles.

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Project Statistics

Water

> Potable water for sewage conveyance reduced by 100%.

> Potable water reduced by 87% (447,448 gallons per year) for building uses and process loads.

> Potable water consumption reduced by 36.4% for building uses.

> 26% decrease in the rate and quantity of stormwater runoff.

> 100 days without rain would be required before the water storage tank would run dry, even in summer

Energy

> Achieves energy savings of 60% better than the Canadian Model National Energy Code (50% of ASHRAE 90.1-1999).

> 100% of the purchased power procured through BC Hydro's Green Power Certificates.

> Photovoltaic arrays provide 4.15% of the project's total energy supply.

> A low energy consumption heat pump system is used for a majority of the time, saving approximately $1,670 in energy costs.

> 100% of regularly occupied spaces are daylit

Materials

> Project achieved a 97.75% landfill diversion rate for demolition and construction waste: wood, scrap metal (aluminum, copper, tin & steel), plastic lenses, concrete, asphalt, cast iron pipe and fittings.

> Salvaged materials are 6% of total materials.

> 7.9% of the total cost of materials contain post-consumer plus half of post-industrial recycled content.

> Recycled / reused material: (recycled) fly ash concrete, aluminum sunshades, entrance grating, gypsum wall board, rubber flooring, carpet tile, steel studs, structural steel, handrails, (reused) Red Cedar trellis material, salvaged timbers, used bricks, used polystyrene insulation, used 2x6 fir decking, salvaged plants.

> All new concrete achieved an average 40% replacement of cement with fly ash to reduce carbon dioxide emissions from the production of cement.

> 31% of materials were manufactured within 500 miles of the site; of this, 71% were extracted, harvested, or recovered locally: Fly ash concrete, red cedar siding, lumber package, salvaged timbers, rubber flooring, gypsum wall board, bricks, 2x6 fir decking, grass/gravel pave.

> Replaced 376 square metres of asphalt paving with natural, planted landscape.

Exemplary Detail of Integrated Strategies: Water, Re-use of Materials, Energy

The existing sewage treatment site left behind unique opportunities. The old foundation of the treatment plant and its clarifiers provided the foundation and mechanical and electrical rooms for the facility. An existing large round, concrete in-ground storage tank was re-used for stormwater retention and non-potable water uses, with the City's Engineering Group strategically redirecting some existing storm drainage lines to discharge into the tank.

These existing storm lines provide drainage for approximately one hectare of developed urban space, with the capacity of the tank being 108,000 gallon storm water storage tank. The annual rainfall on the collection area that is directed through the tank is approximately 40 inches per year, for a total rainfall of 3.1 million gallons

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With all of these strategies the initial capital expenditure is estimated to be no more than 8% over the cost of a conventional building and the payback on the facility is estimated at 10-11 years based on energy savings. In summary, the City of White Rock Operations Building represents a significant contribution towards urban sustainability, reduced environmental impact, and prudent expenditure of taxpayers' dollars. This project is a demonstration of local government leading by example by setting new standards for building construction in North America

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per year. The stored storm water is used for irrigation, flushing toilets, washing municipal vehicles and filling of a street sweeper. Any overflow from the tank is diverted back to the city storm drainage system. With allowances for evaporation, ground infiltration, leakage, etc. this annual rainfall is well in excess of the total usage of water from the tank. A hundred days without rain would be required before the storage tank would run dry, even in summer.

The ingenious integration of stormwater storage, the building design made possible an annual reduction in potable water use for building and process loads - from 512,000 gallons to 65,000 gallons, an 87% reduction. It has been the practice to wash the white fleet of civic utility vehicles about once per week. Potable water has been used for washing the vehicles, consuming approximately 150,000 gallons per year. Furthermore, the City of White Rock operates street sweepers and washes its garbage vehicles. The total potable water use by these vehicles is 260,000 gallons per year.

A energy related and indoor environmental benefit: the water in the tank provides heat to the building through the use of a water source heat pump.

Contribution to Sustainable Development of Our Society

Because of its exemplary use of water, energy and materials, this building project is an outstanding achievement in environmental engineering and provides an excellent example of green building technologies in British Columbia's Lower Mainland, advancing the cause of sustainability.

To contribute to urban sustainability, innovative ideas must be implemented in all aspects of a facility, from its use, to its impact on society and the environment. As the project statistics indicate, this facility does just that and can be judged as a whole or on any one component.

The project team made decisions that directly impact the local community: improved air quality; enhanced liveability; enhanced, more productive working environment; using renewable energy along with conserving it; implementing water and storm water strategies that meet best management practices; and reduce solid waste.

On a societal level, the City of White Rock demonstrated great leadership in the wise investment of public funds, leveraging green strategies for the betterment of the environment, their workforce and the municipal economy.