Features of the CSLP Eco-Centre

The CSLP Eco-Centre is a multi-purpose facility featuring innovative and energy efficient building design and integrated heating, cooling, and electrical systems. It is the focal point for indoor and outdoor demonstration and educational programming on sustainability.

This building was designed to use as few energy requirements as possible. Also, energy requirements will be fulfilled as much as possible by renewable energy resources.

The building features post and beam construction, the timbers coming from elevators in Craik and Maymont that were destined for demolition. After milling, they were treated with a solution of linseed oil and turpentine. The interior ceiling material is solar kiln dried pine, which was treated with sand seal and varnish. The front doors were made from the cut-offs of the elevator timbers. As much as possible, materials used were recycled or local and those purchased were carefully selected according to environmental and socially sustainable criteria.

The exterior walls are made from durum wheat straw bales. They are standard rectangular bales donated by a local farmer. The straw provides an insulation value of R-40. The ceiling is insulated with cellulose, which provides an R-50 value.

Passive solar design incorporating many south facing windows will allow natural light into the building. In the winter, when the sun is lower, solar rays will penetrate to the back walls of the building. In the summer, when the sun is higher, the building will be kept cool by an optimum roof overhang.

The window frames are made from fibreglass as opposed to PVC, aluminum or wood. Like the glazing, the fibreglass is silica based. Therefore, during expansion and contraction, the frames and glazing move at the same rate minimizing cracking of the seals. The frames are not affected by UV rays; therefore they have a longer lifespan. Less toxic materials are involved in their manufacture than with PVC. Fibreglass frames have higher insulation value than any other window frames. The windows have a low-emissive coating and spaces are filled with argon gas. The windows facing south are double-pane whereas all other windows in the building are triple-pane. Although triple pane windows insulate better, they allow for less solar penetration.

The Finnish style masonry oven is made from approximately 3000 bricks, which provide a significant amount of thermal mass. The majority of the bricks were recycled from a school in Craik that was demolished in 1988. Within the oven, a channel allows the exhaust to circulate, exposing the bricks to a maximum amount of heat. The chimney extends from the bottom of the oven as opposed to the top as with most conventional fireplaces.

The field stone wall lies opposite a bank of south facing windows and serves as a heat sink. Solar energy from the sun will be absorbed and radiated into the space as heat. The wall was constructed of local field stones. The backbone of the wall is made from recycled cinderblocks, which further adds to the thermal mass of the wall.

Another heat sink is the concrete slab floor. No floor coverings, such as carpet, were used, as they would interfere with the floor’s ability to absorb solar energy and then radiate heat into the building. The concrete floor features a flagstone pattern. The floor was acid etched, neutralized with a baking soda solution and then rinsed with water. Three coats of a high-gloss acrylic sealant were then applied.

When passive solar radiation is not adequate, an in-floor radiant heat system may be used to warm the building from the floor up, a more effective method than a forced air system. To supply hot liquid to the in-floor tubing network, a ground source system consisting of 8 trenches, 3 m deep, extending 300 m from the front of the building is available. An antifreeze solution is circulated through plastic loops where it absorbs heat from the constant 11°C temperature at that depth. This liquid is further heated by a three and five tonne heat pump combination, which operates similar to a refrigerator except in reverse. In the spring and fall when heating requirements are reduced, the three tonne pump will be triggered initially while the five tonne pump will start only if required. In winter the opposite will occur.

Excess solar heated liquid is distributed through dedicated ground source loops to super-charge the earth at the 3 m depth. As a result, the workload of the heat pumps, which rely on electrical energy, is decreased and the efficiency of the system is increased.

All buildings require fresh air exchange. In this building fresh air is supplied by an earth tube system. Air is drawn underground through five buried tubes and is cooled prior to being distributed throughout the building. In winter, cold outside air is drawn through the earth tubes where it is warmed by several degrees and is further heated by a radiator prior to being distributed.

In summer the air is conditioned by the 1 m roof overhang, the thickness of the exterior walls and the earth tube fresh air system. As well, managing the reversible in-floor system and the insulated window treatments is crucial.

Rain water and surface water from Arm Lake are treated in-house by a biological water treatment system. Raw water is treated with ozone then filtered through sand and charcoal and a fine sediment filter. Ultra-violet radiation will kill any remaining pathogens. Drinking water will subsequently undergo reverse osmosis.

A composing toilet septic system handles human wastes. Wastes are deposited into storage bins in the basement. From these bins liquid waste is subsequently pumped into a separate storage tank. Solid wastes are composted by an automatic misting system, the regular addition of wood shavings and periodic raking. As well red wiggler worms are an essential part of the process. An exhaust fan moves air at 250 $ft.^3$/min and provides for the required ventilation.

Waste water from the dishwasher and sinks is processed through a “grey water polishing system”. An artificial growth surface and effluent filter in the first chamber of a septic tank comprise the pre-treatment phase. In the second chamber, a pump delivers the pre-treated liquid to a polishing tank. A nozzle in this tank distributes a fine water spray over a bed of broken glass. This material provides a growth surface for beneficial bacteria and represents an application for glass as a recycled material. The liquid then percolates through an underlying bed of crushed rock and sand and then into the natural soil underlay.