from. The waste food from the restaurant is collected in a composting room on the lower level. As the plant matter decays, methane is released and recaptured for use in the fuel cell generator. Once the plant matter has decayed into useful compost, it is taken back to the top level and used as fertilizer in the food production tanks or the research systems. Any excess compost can be sold to neighbors or used in the park.

Water falling on the roof of the building is collected in tanks above the bathroom tower and serves dual purpose in the building. Most water gets distributed across the top of the stone wall to irrigate the plants growing in the wall. As the water reaches the base of the building, it is collected in a copper channel that carries the water back to a pool at the north end of the site before it enters the wastewater flow.

The water not carefully measured out for irrigation is used to flush toilets, while urinals throughout the building use a biodegradable cartridge to filter waste as it enters the sewage system and eliminate odors. The toilet and shower facilities in the building are all low consumption devices. As waste leaves the restroom facilities, it is sent to a large holding tank in the lower level where the composting process is begun. Similar to the food composting, the methane released during the composting process is harvested as a fuel source for the fuel cell generator. The volume of waste composting at any one time is held constant. As new sewage enters the tank, older compost is flushed to the waste treatment greenhouse in the park for complete breakdown and filtration. Street and site runoff seep into the uncompacted earth beneath the sidewalks and returns to the aquifer as it is filtered by the soils on site.

Set into the side of the hill west of the building as the grade slopes steeply down to Rock Creek, a small greenhouse terminates the waste treatment cycle. The greenhouse holds a series of tanks (built from the remains of the gas stations underground fuel storage) that comprise a “living machine” to treat the wastewater from the building, a tap into the city sewer, and collected runoff from the adjacent streets. It would be open to the public for educational tours during the day, and visitors to the Institute and to the park would be able to see the clear, purified water flowing out the end of the system down into the stream. Formerly raw sewage has now been treated to a point at which it is cleaner than the road runoff coming from the typical city street, and by lush plants instead of poisonous chemicals. Exposure to sunlight provides the final tertiary treatment as the water is released to Rock Creek Park. Should it ever become necessary to disable the greenhouse for a short period, the holding tank in the building would have some storage capacity. For longer periods of outage, a valve at the connection to the city sewer could be turned to shunt all of the building’s waste to traditional city treatment plants.

The waste treatment greenhouse also serves as a secure air intake for the building mechanical system, filtering out the exhaust fumes and particulates found in urban air at street level. The naturally cooler fresh air from the park is transferred to the building air handler units through a long underground duct that further conditions the outside air as the 55° earth temperature warms the outside air in the winter and
cools it in the summer. A highly efficient ground source heat pump finally conditions the air and distributes it throughout the building.

A baseline environment is supported by the use of the natural stack effect of warm air escaping from the greenhouse level and being replaced by cooler air at the lower level of the atrium. Windows are fully operable and can be opened by each pod of workstations to further adjust the comfort level. The natural cooling is supplemented by the mechanical heat pump in the lower level. Air is drawn up shafts inside the stone wall and distributed by ducts to the office areas for individual control of temperature. Plants selected for a low possibility of releasing allergens are grown in planters and on cable anchors on the stone wall also help control CO$_2$ in the building.

All of the processes used in the building and described briefly here are considered off-the-shelf assemblies (albeit a little unusual in some cases). Through what would be a team design effort involving engineering experts, the combinations and details of these systems would be further optimized to bring the Institute much closer to self-sufficiency. I can only surmise the reasons why a fully integrated system such as this is not done today. Since each system is unusual in its own right, finding an expert consultant to fine-tune and unify the systems would be a daunting task. Budgetary and time constraints could also limit a completely integrated assembly such as this. There would be a possibility that some of the systems would prove incompatible at some level and require modification or elimination as well. Given ideal conditions, it seems a possible and worthy goal to push for a building that fully integrates energy, water and air systems into a harmonic balance that has little to no negative impact on the ecosystem, and may even provide substantial long-term benefits.
One of the aspects of this design I would spend additional time on would be integrating schemes for adaptive reuse of the space as the needs of the community change. Should the time come when the Institute needed larger space, or for another reason left the building, the office space in the building could be converted into condominiums or a hotel. Some thought was given to this in the separation of systems for each office suite, and the ways in which the services cross the atrium at each bridge. This would allow a future developer to run plumbing across into the former office areas and change the space into residential type units. Access to units could be planned at every other floor to allow individual units private access across the atrium to the views over Rock Creek Park. The greenhouse could be used as garden space for the residents, or could remain in use as a separate food production operation for a restaurant or market that could provide a source of income for the residents or owner of the building. Other major systems like plumbing and mechanical could quite conceivably be modified for the new use as well. The creative reuse of this building could be an entire design project in itself, and while I could have spent far more time than I did addressing ways that things could be modified, there is some satisfaction in knowing that there could be a life for the building beyond its use as office space.

The other issue I considered as a part of the lifespan of the building was the inevitable time when the building ceases to be a useful, functioning shelter. The systems and construction methods are meant to be easily disassembled and separated into material types for reuse or recycling at the end of their use in the building. The roof and perimeter walls can be removed from the concrete slabs and separated into the aluminum frames and hardware, ceramic panel and glass windows. Solar cells are sandwiched between panes of glass in the roof and can be removed when the roof panels are removed. The steel structure that supports the concrete slabs can be disassembled and melted down for fabricating new structural steel. The concrete can be used again as fill for new site work or construction. Interior finishes could be removed and recycled or composted. Even the mechanical systems could be removed – central equipment and piping could be remanufactured and reused, while metal in the ductwork is recycled. Should the building last until the area returns to wilderness, one can even imagine ruins of the stone wall as a true part of the park, somewhere between the wilderness and the urbane.

CONCLUSIONS & REFLECTIONS


Dillard, Annie. The Pilgrim at Tinker Creek.


Office of Urban Agriculture, Vancouver, BC, Canada <http://www.cityfarmer.org/>


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