



4Cs Food Bank & Thrift Store

2005 Fleming SBDC Project, Haliburton, Ontario

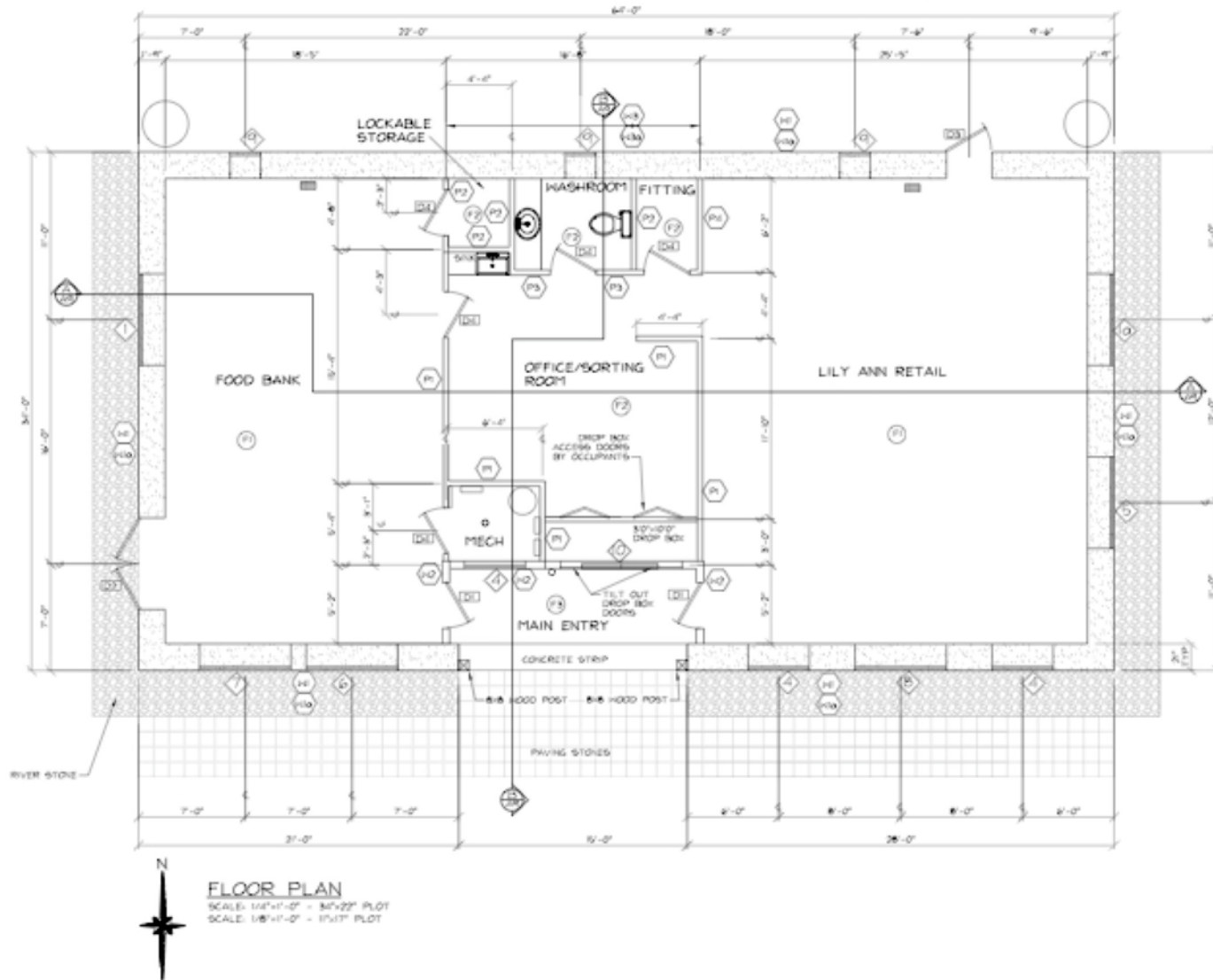
The 4Cs Food Bank/Thrift Store project

There is nothing like the excitement and nervousness that goes along with "firsts." And the inaugural offering of the Sustainable Building program at Fleming was full of firsts.

It was the first time a group of college students would be undertaking the complete construction of a large public building. It was the first earth plastered, load-bearing straw bale public building in the country. Many of the technologies and materials we would be using would be groundbreaking. And by footing the entire bill, the Municipality of Dysart et al was definitely pushing the boundaries for publicly funded projects.

By creating a new, healthy, energy efficient home for the valuable food bank services that the 4Cs provides to the community, we certainly had the spirit of the community behind us. To see the students and the 4Cs members gradually getting to know one another and watch this project progress together was one of the most remarkable experiences in my career as a builder and teacher.

The Sustainable Building program couldn't have had better partners or a more successful project. The students, the college, the municipality, the 4Cs, the Haliburton community and lots of suppliers and trades all contributed to a wonderful building. It has served the 4Cs well ever since, lowering their overhead and increasing their sales, allowing them to do what they do best: help the community around them.



4Cs floorplan

The 1800 sf building has two wings, divided by office/sorting room, washroom and change room.



Class of 2005

The first day of class for the new SBDC program.



At Queen's University

The first order of business was building a test wall at Queen's to satisfy the building code.



Queens' wall test

The earth plastered, load-bearing bale walls performed well within code requirements.



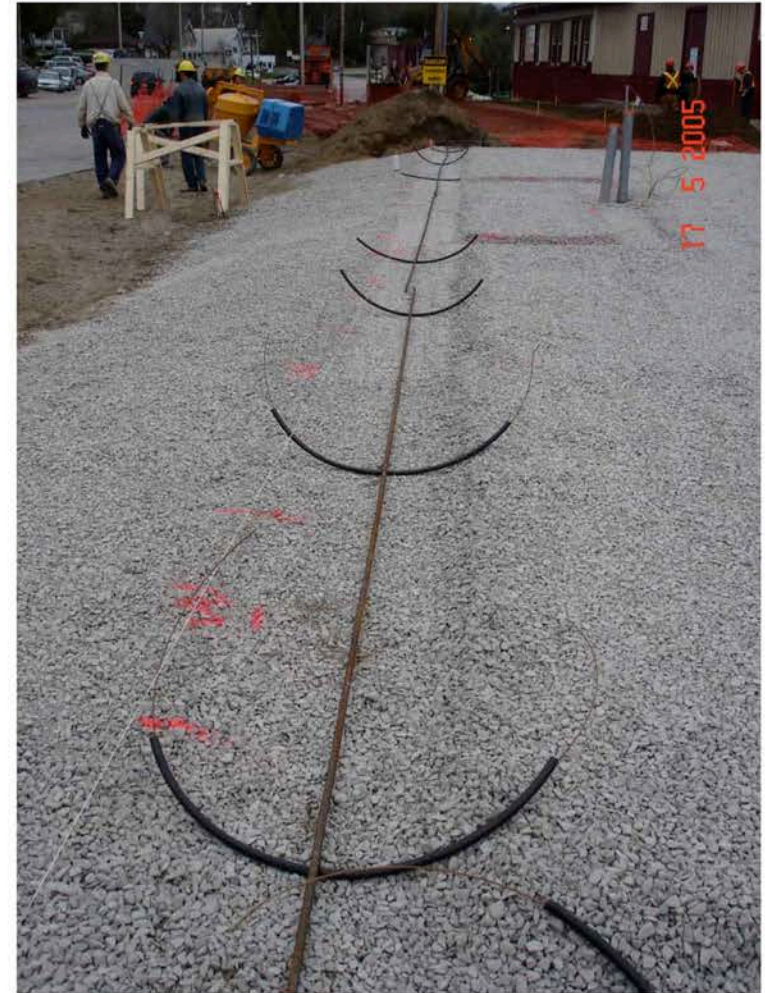
Who we are and what we do!

This sign greeted onlookers in downtown Haliburton to explain the nature of the project.



Foundation pad

One end of a downtown parking lot (next to the art gallery) was de-paved and a gravel pad laid down.



Tie down tubes

The load-bearing bale walls need compression straps, which are fed under the foundation with these tubes.



Earth bag loader

An earth bag foundation perimeter beam was laid using a home made loader for the gravel/cement mix.



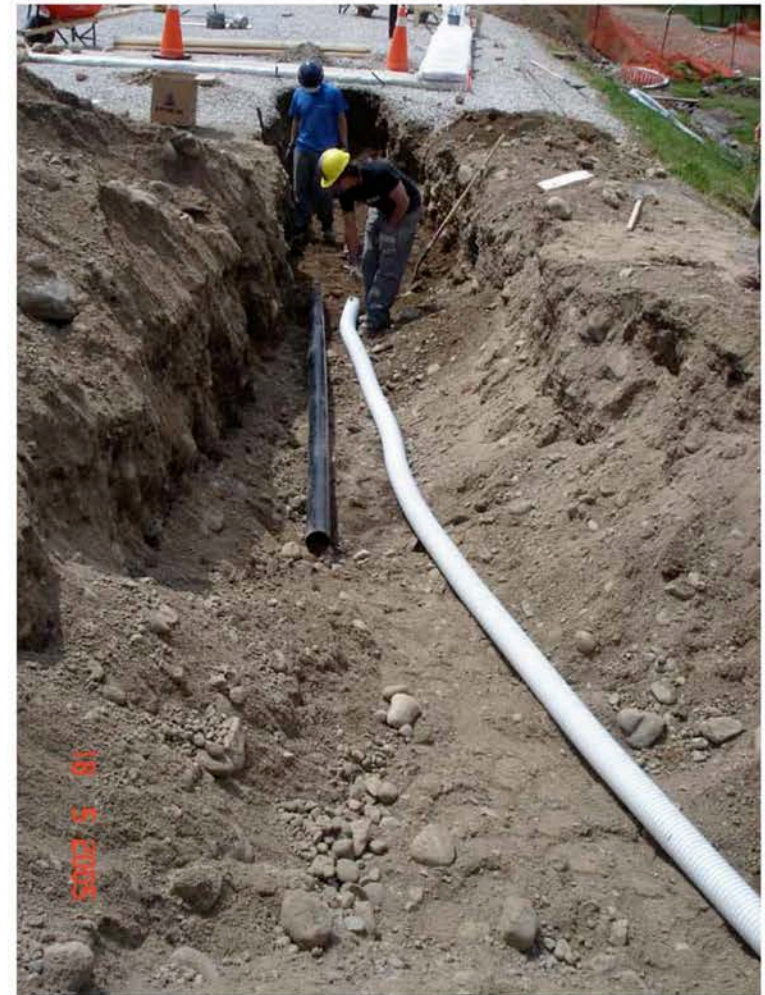
Tucking in a bag

Where runs of earth bag join, the ends are folded over to make a tight seam.



Foundation and sills

The earth bag foundation and the wooden sill plates show the layout of the building.



Earth tube trench

4 inch tubing buried behind the building will provide tempered ventilation air winter and summer.



Top plate assembled
on the foundation.



Concrete beam

A short concrete beam
was needed on the south



Framing up

Door and window bucks are placed on the
foundation prior to the bales being installed.



Bale dipping

Each bale has the inner and outer face dipped in a clay slip before stacking to help the plaster adhere.



Lifting top plate

With the bales in place, the top plate is lifted onto the walls, ready for compressing.



Insulating top plate

The top plate cavity is filled with sheep's wool.



Sheep's wool

The raw sheep's wool is completely sealed in the top plate with a plywood cap.



Bales up trusses ready

With the walls up, compressed and leveled, the roof trusses arrive.



Compression straps

Each compression strap is tensioned several times until the top plate is completely level.



Walls compressed

The walls were compressed to meet the tops of the buck frames, which were then fastened securely.



Stuffing gaps

Straw/clay is used to fill all gaps and joints.



Clay arrives

A mound of local clay soil will become the main ingredient in the earthen plaster.



Interior plastering

Some interior plastering was done by hand, some by mechanical pump.



Trusses go up

Each truss is lifted up onto the walls, squared and fastened.



Truss pile

It was tight working quarters on the downtown site!



Girder truss

The dormer is supported by heavy girder trusses.



Roof framed

The completed roof frame defines the shape of the building.



Roof with Typar

With the protective barrier on the trusses, the building is now tight against rain.



Roof with steel

Galvanized steel roofing is the main protection against the elements from above.



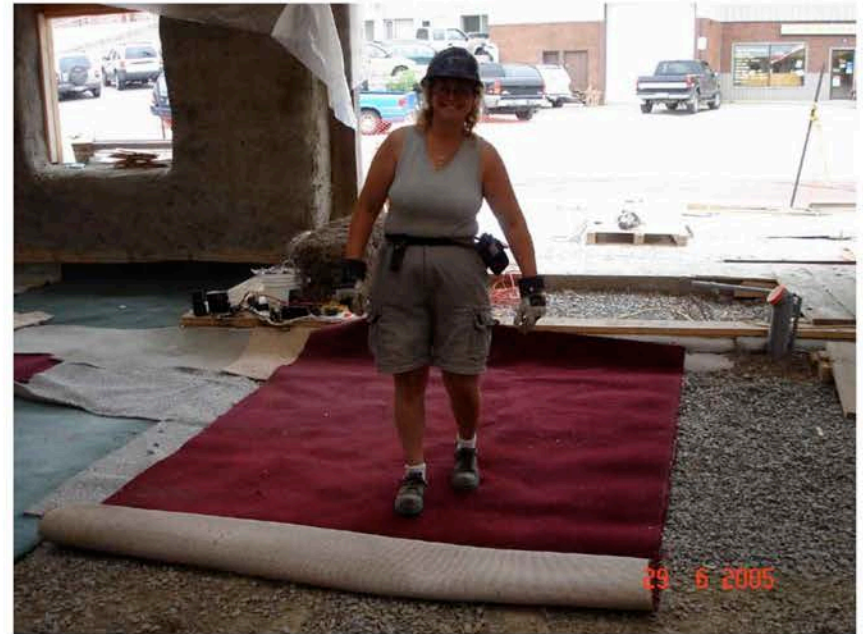
Night plastering inside

A night time plastering party helped get the interior done without any other distractions.



Carpet layer

Used carpeting is part of the under-floor insulation strategy for the building.



The used red rug

The old red rug welcomes its last dignitary before getting buried in the floor.



Radiant heat grid

Recycled foam insulation over carpeting separates the radiant heating tubes from the ground.



Radiant floor header

The six zones of the radiant heating system all come together at the header.



Earthen floor base

A clay/gravel mixture forms the floor base.



Earthen floor base raked

The floor base is raked to level throughout the building.



Earthen floor base tamped

A mechanical tamper compacts the earthen sub floor to prevent settling later.



Strawboard walls

Metal channels contain compressed straw board wall panels as partitions.



Interior frame walls

The bathroom gets stud framed walls.



Bottles in hempcrete

Old glass bottles are put into the hempcrete as decorative elements.



Hempcrete wall

The bathroom stud walls are infilled with hempcrete, a mixture of ground hemp and lime.



Plastered pop bottle wall

Once fully bottled, the wall is plastered.



Pop bottle truth window

A view into the pop bottle wall makes its construction obvious to visitors.



Pop bottle wall

Stacks of old 2 liter pop bottles make up the infill for this frame wall.



Ceiling barrier

A poly vapour barrier seals the ceiling from air leakage.



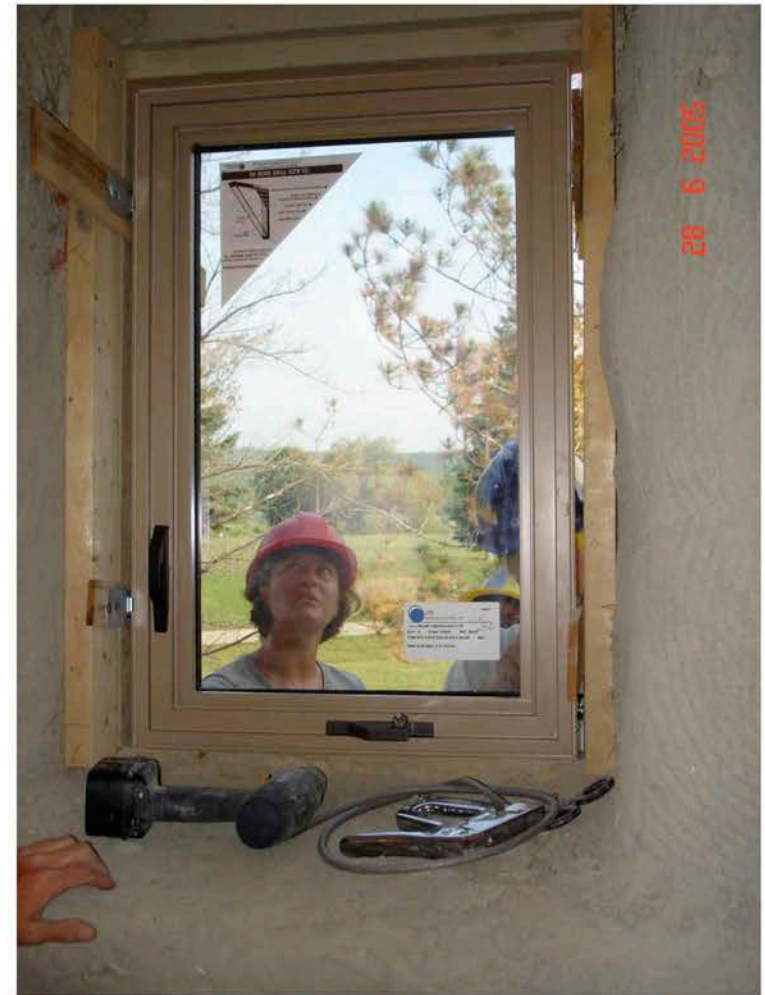
T&G ceiling

A locally milled tongue and groove wood becomes the ceiling throughout the building.



Colour samples

The exterior plaster has a variety of colour samples painted on to help choose the final colour.



Window install

The triple paned fiberglass windows are installed in the rough openings. Hemcrete will insulate the gaps.



Straw clay mixing

Hemp straw and clay slip are tossed together.



Straw clay installed

The straw/clay mix is packed into temporary forms for the south wall.



Straw clay wall

The south entryway walls are completely insulated with straw/clay.



Board & batten skirt

The base of the exterior wall has a board and batten skirt for protection of the earthen plaster.



Board and batten skirt

The board and batten skirt is also a nod to the other buildings in the downtown area.



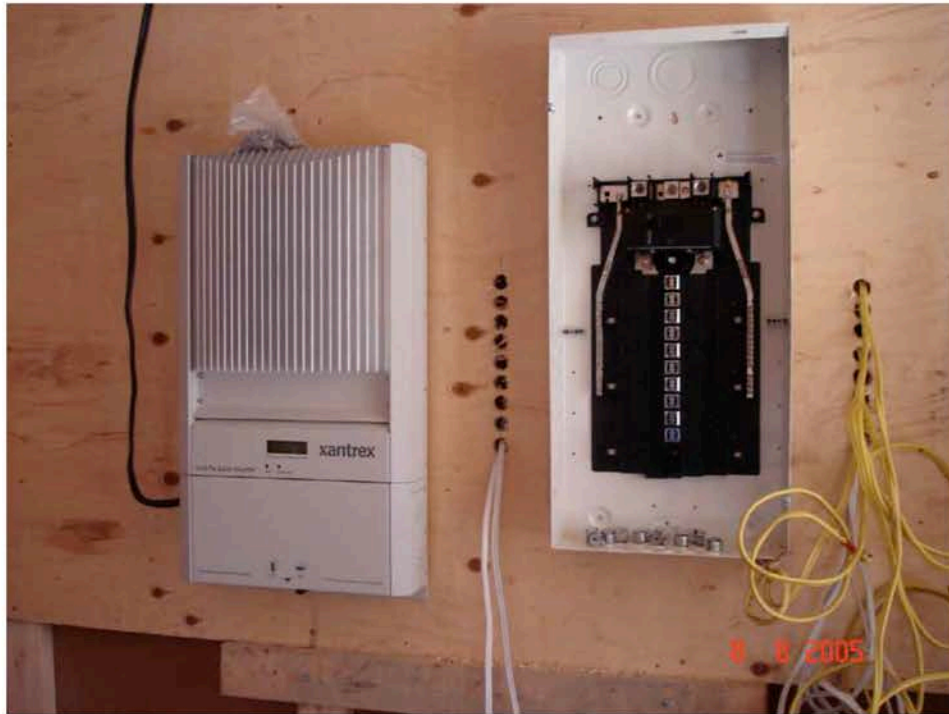
PV install

A 1kW photovoltaic system is tied into the electrical grid and will spin the meter backwards.



Solar hot water

The hot water collectors offset the heating and domestic hot water supply.



Grid tie inverter

Electrical current from the PV panels is converted to AC power and sent to the meter and the grid.



Grid tie meter base

A special meter is used to record both incoming and outgoing electrical current.



Solar hot water tank



Boiler and header

Compact boiler supplies heat and hot water.



On demand boiler

The boiler senses the incoming temperature from the solar storage tank and adds heat as needed.



Truth window installed

A hand-blown glass disc provides the view.



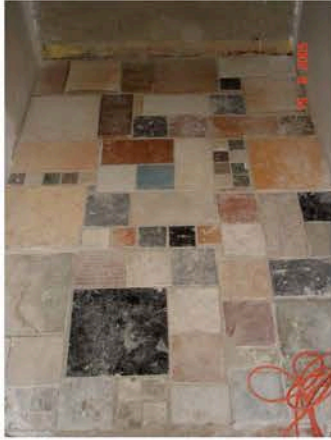
Plastering around truth window

Earthen plaster is built up around the glass to hold it in place.

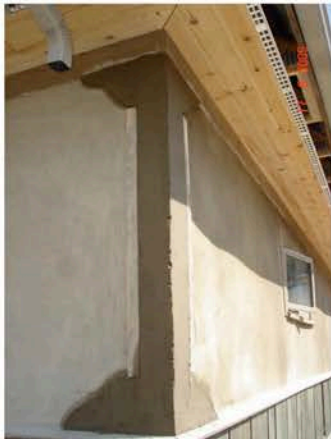


Finished 4Cs truth window

The finished truth window gives shoppers a view of the bales in the wall.



Change room floor
Leftover tiles!



Decorative plaster
Earth plaster moldings
at the corners.

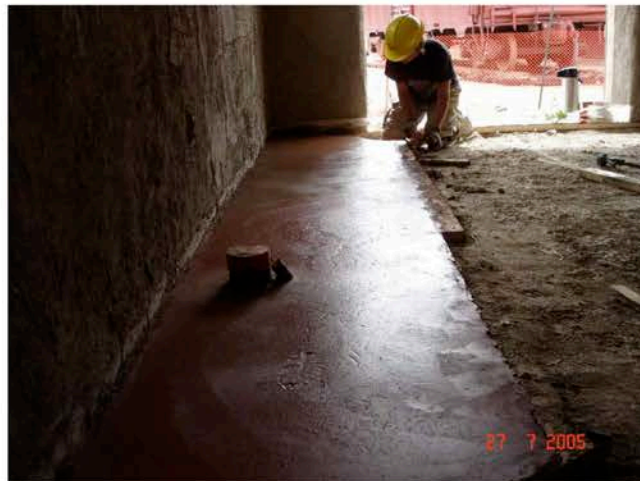


Tiling sink
The sink area is given a custom tiling job.



Floor segments

Soil cement floor poured in sections.



Soil cement floor install

Pigment is rubbed into the surface of the floor.



Soil cement floor finish

Linseed oil is used to protect the floor.

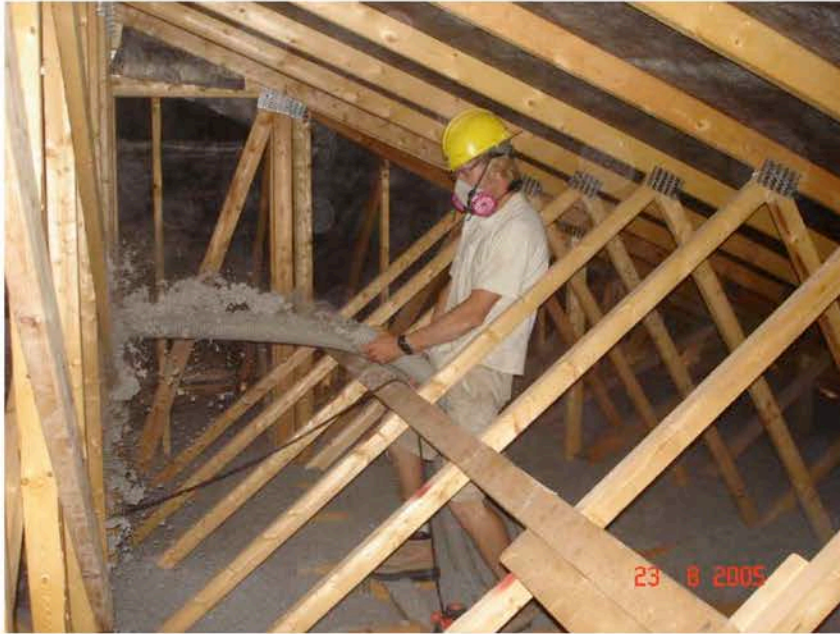
Soil cement: Bad choice

A lot of new technologies were successfully implemented at the 4Cs building. The soil cement floor, however, was not so successful.

There is very little history of earthen floors in this part of the world, and in attempting to make our first one, we looked at a lot of recipes from around the world, and made lots of samples. There are many advocates of soil cement, in which clay soils, aggregate and a small amount of portland cement are mixed together, and our samples certainly seemed to be hard. They were also quick setting, which was the primary advantage over mixes that only used clay and aggregate. Rushed for time at the end of the project, the soil cement gave us a fairly good environmental choice that fit our dwindling timeline.

However, the floor did not prove to be very resilient. Within a few months, it began to dust and crumble. A few more months, and it was clear a fix was needed. In the end, we returned to the building and laid a tile floor over the soil cement. This has served the 4Cs well for years now.

In the following years, it has become obvious to us that earth and cement are not a good match. Earthen floors we've made with only clay and aggregate have done very well. However, they do take a long time to dry, and it's been difficult to incorporate them on a large scale on SBDC projects because of our short timelines.



Cellulose in attic

A blower outside the building feeds the supply hose in the attic, where a thick blanket of the insulation is laid



Insulation skirt

Recycled foam insulation makes a blanket around the building, preventing frost from getting under the walls



Board and batten south wall

Local board and batten covers the straw/clay.



Wolf sculpture

A local artist provided a big bad wolf sculpture for the exterior of the building.



Home made door

Students made these doors in the shop, and a local blacksmith made the hardware.



Painting straw board

Low VOC paints are used on the straw board partition walls.



Silicate paints

Silicate mineral paints are used on the interior and exterior plaster.



Interior almost finished

The thrift store side of the building is almost ready for the 4Cs to move in.



Solar light tube

Solar light tubes bring a lot of sunlight into the middle of the building.



4Cs building

The 4Cs building takes its place in downtown Haliburton, on the edge of the park.



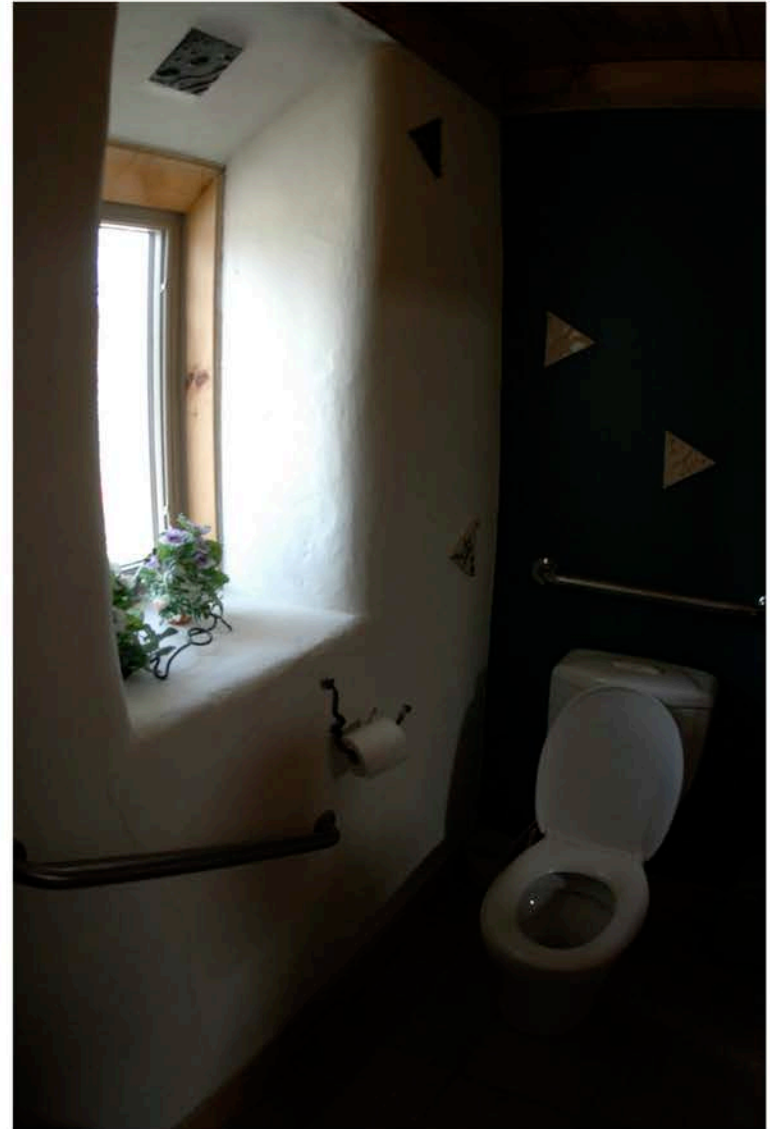
Full store

It took no time at all for the 4Cs to pack the thrift store side of the building with merchandise.



Finished window sill

The deep straw bale window sills are constantly kept full by the staff.



Finished bathroom

The bathroom has many unique touches in the finishing, including tile work.

2005 Sustainable Building Class

Andrew Buckles, Gaetan Deville,
Brad Ellis, Jen Feigin,
Dave Gable, Morgan Gadway,
Chris Gooderham, Andrea Johnston,
CJ Johnston, Jesse Klassen,
Dave Lavictoire, Seamus Little,
Sandi Luck, Lisa Malarz,
David Mason, Trevor Norland,
Geoffrey Ponsford, Doug Rowland,
Gayle Short, Martin Walder,
Cameron White

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Consultants

Blackwell Bowick Partnership, structural engineering, www.blackwellbowick.com
Colin MacDougall, Dept of Civil Engineering, Queen's University, structural testing,
www.civil.queensu.ca

Manufacturers/Distributors

Eco-House Paints, silicate mineral paints and tints, www.eco-house.com
Evolve Building Group, paints and finishes, www.evolvebuildinggroup.com
Foam Concept, recycled foam insulation, www.foamconcept.ca
Inline Fiberglass, fiberglass triple pane windows, www.inlinefiberglass.com
Moorcroft Hemp Farms, hemp bales and chopped hemp, 613-473-2713

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Suppliers

Blair Sand and Gravel, Haliburton, 705-457-1349
CRS Rentals, Haliburton, 705-457-9833
Emmerson Lumber, Haliburton, 705-457-1550
Highland Glass, Haliburton, 705-457-4527
Holden Truss, Haliburton, 705-457-1687
JAC Kernohan Construction, Minden, 705-286-1440

Trades

Artech Studios, blown glass truth windows, www.artechstudios.ca
Camel's Back Construction, plastering, www.strawhomes.ca
Churko Electric, electrical contractor, www.churkoelectric.com
Generation Solar, PV and solar hot water design and installation,
www.generationsolar.com
HavenCraft Natural Homes, geothermal heating, radiant floor heating,
www.havencraftnaturalhomes.com



A busy place

The 4Cs building is a busy hub of activity in downtown Haliburton.