AIA/COTE Top Ten Green Projects





**Green Projects Entry**

Hawthorne Valley Farm Store

## Section 1 - Project Overview Information Part 1

| | |
|---|---|
| Project name: | Hawthorne Valley Farm Store |
| Project owner: | Hawthorne Valley Farm |
| Project address: | 327 Route 21C<br>Ghent, NY 12075 |

## Section 2 - Project Overview Information Part 2

| | |
|---|---|
| Project completion date: | 12/2003 *(m/y) format* |
| Project Site: | Previously Developed |
| Project type: | Retail |
| Project site context/setting: | Rural |
| Other Building description: | New (100% new ) |
| Lot size: | 46000.00 ft2 |
| Building gross floor area: | 8467 ft2 |
| BOMA floor area method used?: | no |
| Number of permanent occupants: | 20 |
| Number of visitors: | 600 |
| Occupants (hours/week/occupant): | 40 |
| Visitors (hours/week/visitor): | 2 |
| Total project cost: | $1,450,000 |

## Section 3 - Project Overview General Description

General description: This project is a 8,467 sq. ft., single story retail (farm store) building associated with a biodynamic farm that is itself a part of an anthroposophic (Steiner) community that includes a K-12 Waldorf school. The store is located across from the school on the county road that bisects the hamlet of Harlemville in Ghent, NY.

A particular challenge was to size the retail operation — a space sufficient to generate an income sufficient to service a loan large enough to finance it. It was a constant feedback loop that operated incessantly from day one until the final hours of construction.

## Section 4 - Top Ten Measures

### Top Ten Measure 1: Sustainable Design Intent & Innovation

Key environmental aspects: This building is a biodynamic farm store for owners devoted to a notion of local/regional organic agriculture that, in their words "nurtures the land that nourishes us". By their own claims, the farm is "virtually self-sufficient, relying on its own feeds, manure, and compost… no fertilizers, pesticides, or herbicides are used." It is fitting that any building that aims to promote the farm's mission be as ecologically sensitive and resource efficient as is achievable with the available resources.

A guiding sustainable design strategy is the rendition of structure-as-finish, meaning that each component plays a dual role— both as support and as a finished surface. The concrete floor slab is stained and polished; steel columns and PSL beams are un-encased; the wood-steel trusses proceed rhythmically in full view over the space and rest plainly (Lego-like) on their supporting walls and beams — even the ICF (Durisol) wallform blocks are exposed to the interior. All this decreases the volume of material used, limits the construction site waste, and maintains serviceability and a functional flexibility — by design.

Finally, it underpins a simple, cost-effective expression befitting the objective of maximizing the amount of retail space that is the project's economic engine.

### Top Ten Measure 2: Regional/Community Design & Connectivity

Regional/Community Design: The new farm store building is nested in the Harlemville hamlet, broadly in accordance with a community master plan created three years previously by the German planner Herbert Dreiseitl et al. The farm operation's mission includes public education and community support, and this building is the portal through which the farm projects its presence. Accordingly, the scale is diminished at the entry, parking is broken into clusters with only enough in plain view to say "we're open!"; landscaping vegetation, building materials and colors, and the sunny and shady places have an enticing, friendly feel. "The Hawthorne Valley Farm store is not just a place to buy groceries. It is the social gateway to everything integral to the community - a social, economic, agricultural, environmental, and educational center actively promoting the local and regional economies."
--Laurily Epstein, Berkshire Grown

The store, in association with the Waldorf School and the bio-dynamic Hawthorne Valley Farm, is essentially a drive-to location - though for many it is a much closer "drive-to" location than they may previously have chosen. Parking has been reduced by taking advantage of the School parking; peak shopping periods occur at times when the school is not in session, or when parents are delivering their children to the School.

---

| | |
|---|---|
| Use other transport options: | 9% |
| Parking spaces per person: | 0.04 |

## Top Ten Measure 3: Land Use & Site Ecology

Site ecology:

The site is a tight parcel in the farm hamlet setting. The store is a people magnet, a life force in the community and its location there is essential. But as with many retail operations, it must accept bulk deliveries from vehicles whose scale is completely unsympathetic to its setting. Situating the building so as to integrate its vehicular requirements (parking and service deliveries) with the pedestrian scaled setting without adverse impact was very difficult. Our solution was to break the building mass in two. The front is scaled down and bent toward the street, maintaining the orthogonal progression of small residential buildings along the small bisecting country road. The bulk of the building, however, is bent toward the noon sun – an orientation that also abets a manageable circulation of the 18-wheeler delivery vehicles and screens them from the peopled outdoor areas.

The building adds spatial coherence to the small hamlet, connecting the farm to the Waldorf School across the road and placing the entrance to the Hawthorne Valley Farm in a more manageable location. At the regional level, it is the interface between the public (consumers) and the bio-dynamic farm (producers) and the surrounding agricultural landscape.

---

## Top Ten Measure 4: Bioclimatic Design

Bioclimatic design:

For this use, in this climate, a durable, thermally conservative envelope was the best, first strategic response. The building is substantially oriented to the noon sun, usefully defining community spaces and illuminating mezzanine workspaces and the bakery (previously in a basement, so added vitality was long overdue). Clerestories and southern windows allow diffused daylight and sunlight to enter the store, displacing electric artificial lighting and providing stimulating shopping, working and community spaces. But the retail zones are vulnerable to excessive solar infusions (see more below), and, besides, they want the wall space for shelving.

Concrete in the exterior walls and slab floor provides substantial thermal mass, stabilizing temperatures. The entry door is cradled in a “southeast pocket”, catching the rising sun and powering a morning melt-off on frosty winter days — an orientation which also draws the passing trade and presents an appropriate face to the neighborhood.

Though the high summer humidity limits the usefulness of passive ventilation, the bakery tower has operable high windows to dissipate oven heat and provide daylight. Furthermore, the exposed wood/cement ICF material acts as a “moisture sink” providing some measure of passive humidity stabilization — but not enough here to avoid mechanical dehumidification.

## Top Ten Measure 5: Light & Air

Light & Air:

Retail operations are vulnerable to excessive daylighting. There is risk of degrading products and of increasing the display lighting levels (so that items are seen to sparkle in their setting). But daylighting is known to be beneficial and attractive, to humans and to their inclinations to purchase stuff. So, what to do?

Physical model studies indicated that three large roof penetrations would provide a stable 20± footcandles across the retail floor, insufficient to elevate the display lighting level. Direct sunlighting stimulates the community café space at the southeast corner. The mezzanine clerestories light the office areas, limiting the need for further lighting. Blinds are necessary to avoid glare and to reduce radiant heat gain in the late summer — the roof overhang performs this function earlier in the cooling season.

A superior indoor environment was an expectation for a health food store in this health conscious community. The structure/finish materials are chemically inert, incompatible with mold growth (the Durisol is highly alkaline and the envelope is carefully conceived to eliminate all thermal bridge-induced moldy manifestations), and impenetrable to rodents. Particular attention through the post-occupancy has positively established our success in this endeavor — but not without effort (see more below).

---

| | |
|---|---|
| Percent of building area that is daylit: | 42% |
| Percent of building that can be ventilated or cooled with operable windows : | 100% |

## Top Ten Measure 6: Water Cycle

Water Cycle:

Water management considerations for this building were viewed in connection with the community Master Plan, prepared by Herbert

Dreiseitl, et al, in 2000. Though farm waste is efficiently re-directed to the fields, a worsening groundwater quality was determined at the time, due principally to the many decentralized building effluents. A community wide strategy involving a constructed wetland was developed to address the problem. We determined it best to support that effort rather than to invest in independent strategies beyond water conservation measures — especially as gray water flows are overwhelmingly the principal load and these are not well served by composting toilets.

All fixtures have water-conserving capabilities, but the human dimension is the driver here. It is the practices of the food preparation staff that will account for the real water flow reductions.

Storm water flows are substantially retained above grade and directed back toward the farm fields that abut the site. Water from the front (east) parking, the only area with impermeable paving, is directed to an infiltration chamber. All rainwater from the south roof is collected in an underground cistern for landscape irrigation use.

| | |
|---|---|
| Precipitation managed on site: | 100% |
| Total water used indoors: | 381000 gal/yr |
| Total water used outdoors: | 3000 gal/yr |
| Percent of total water from reclaimed sources: | 1% |
| Percent wastewater reused on-site: | 0% |
| Calculated annual potable water use: | 44.9 gal/sf/yr |

## Top Ten Measure 7: Energy Flows & Energy Future

Energy description:

There was a serendipitous match between the refrigeration heat rejected and the hot water demand — ±750 GPD (up to 140° F). for the bakery and deli operations is obtained by heat recovery.

Special attention was directed to achieving a thermal envelope with durably high R-values and durably low levels of air/moisture infiltration. Blower door tests conducted at 85% completion determined an ELA of 1.15 sq. in. —according to the tester "a measured air tightness level [at] a mere 30% of similar commercial buildings' air leakage."

The retail area lighting has successfully combined product and ambient lighting

Energy description:

into a single, three-tube linear fluorescent fixture. The general lighting fraction is photo-senor controlled to adjust the artificial light relative to the available daylight. Other (non- accent) lighting is controlled by occupancy sensors.

This is not a wind site, but the bulk of the building's roof plane is optimized (orientation, slope, and absence of service penetrations) for PV conversion, and a 15 Kw system was designed and can be readily installed on the standing seam roof. Longer term, independently located, tracking arrays are part of the plan.

This massive, daylit building would allow staff to continue basic operations during a power failure.

Performance Rating

| | | |
|---|---|---|
| EPA | 84 | |
| HERS | | |
| Percent total energy savings | 45 | |
| | Base Case | Design Case |
| Total energy (Btu/sf/yr) | | 256175 |
| Electricity (Btu/sf/yr) | | 114756 |
| Natural gas (Btu/sf/yr) | | |
| Other: LP(Btu/sf/yr) | | 141419 |
| Heating (Btu/sf/yr) | | 27830 |
| Cooling (Btu/sf/yr) | | 4185 |
| Cooling capacity (sf/ton) | | 847 |
| Lighting load connected (W/sf) | | 1.05 |
| Lighting load after controls (W/sf) | | .81 |
| Plug load (W/sf) | | .99 |
| Peak electricity demand (W/sf) | | 6.7 |
| Percent on-site renewable energy (%) | | 0 |
| Percent grid-supplied renewable energy (%) | | 100 |

Energy data attachment: Available

Supplemental Narrative

## Top Ten Measure 8: Materials & Construction

Materials description:

The vast amount of mixed hardwood re-growth in our region is untapped for building. It awaits an appropriate construction system. Our firm has pioneered the use of a particular type of ICF, a formblock composed of cemetitiously bonded, de-natured, shredded wood, (non-biodegradable and non-combustible) – but it is imported from southern Ontario, Canada. However, once a critical demand is established, we anticipate a highly resourceful, regionally appropriate industry evolving. Additionally, the system is particularly well suited to high percentage substitutions of Portland cement (55% on this project) because the slower concrete set up time is well tolerated by stay-in-place form system.

The wall extends directly to the footing, diminishing slab edge heat transfer; the interior is unfinished except for paint, retaining its sound and humidity absorbing capacities; the exterior is stucco'd and colored. The result is a simple, resourceful, extremely durable exterior wall system.

A plastic lumber material is used for the fascia, rake and clerestory trim – a material that holds paint and resists decay – as does the fiber cement soffit and clerestory siding. A metal roof and pultruded fiberglass window frames complete an exterior envelope that persists with minimal demand for maintenance dollars from a cash-strapped owner.

## Top Ten Measure 9: Long Life, Loose Fit

| | |
|---|---|
| Long life, loose fit: | A particular challenge was to "right-size" the retail operation — determining the size sufficient hold the array of activities that can generate an income sufficient to service a loan large enough to finance the project. It was a constant feedback loop that operated incessantly from beginning to end, robustly testing our interactive design process (see below). Consideration for expansion, of course, is the second order of these concerns — what we can't achieve today should be possible tomorrow. To that end, the project built future capacity into the least flexible components (refrigeration, goods receiving, and food preparation), and set up an expansion to the retail space by installing a substantial lintel beam in the western ICF wall.<br><br>No matter how thorough the analysis supporting the determination of the retail layout, a change of store manager or even just a short space of time results in rearrangement. Fortunately, we avoided major infrastructural investment in the initial layout. A suspended wood grid/trellis, which was originally envisaged to provide for increased flexibility, was a VE casualty. Three years later, the shelving is running perpendicular to the lighting; this will be corrected, but not as easily as it might have been. |

## Top Ten Measure 10: Collective Wisdom & Feedback Loops

| | |
|---|---|
| Collective Wisdom & Feedback Loops: | As with all our projects, we convened early and continuing interactive design sessions, including multiple representatives of the owner, design team consultants and construction manager – the latter inducted at the very beginning of the process. The all-consuming concern with construction costs was successfully managed and the investment objectives were understood by all participants.<br><br>A year after moving in, building occupants began reporting headaches and nausea of such persistence and severity that they were unable to complete their working days. For some months we tracked the situation seeking a solution. Staff maintained |

log-books recording their maladies along with coincident time, temperature and any other data that seemed remotely relevant. Eventually, a focused diagnosis identified the problem. The three skylights over the store were intended to have short mirror-finished shafts streaming sunlight down through diffusing lenses, but our clients came to love the clear sky view and the shafts were omitted but the mirror-finished well through the roof plane was not abraded — and that was a large part of the problem; a seemingly inconsequential irritation with profoundly damaging implications for a productive workspace. Remedial actions were taken and the building attained its promise as a delightful working environment.

## Section 5 - Project Economics

Finance:

Financing for the project was complicated by the astonishing success (in sales per sq. ft.) of the store in its then-existing location as an annex to the dairy barn: they were generating more than double the industry standard. So an enlarged building in a better location was a sound business decision, but lenders were not inclined to assume that the new location would also perform so well — they felt bound by their conventions. This was the root the continuing struggle to "right-size" the building. Projecting a 10% sales increase in the new location, the first year saw 30% growth.

Financing was largely through a commercial lender, but there were important partnerships. A small portion of the capital was provided by HVF employees, who were sufficiently confident in the project to invest in it. NYSERDA, New York State's Energy agency, through their aggressive subsidies for electric use reduction, provided nearly $30K of funding, based on our the substantial heat recovery from the coolers (the grease content of the rejected heat from the ovens put that prize beyond reach), daylighting solutions, and increased insulation and tightness of the envelope. An incentive for photovoltaics was not taken at the time of construction.

---

Cost and payback analysis:

As described in the Energy Calculations submission, Design Team and Owner worked with the local utility incentive program to implement demand side management of electricity. An independent contractor hired and paid for by the utility provided energy modeling and analysis. The goal was to determine how to accomplish an effective design with the available funds of the store. Through the implementation of the daylight controls, building shell improvements, heat recovery from refrigeration and the design of a photovoltaic system, Hawthorne Valley Farm Store was eligible for a total incentive of $93,626 through the local utility program.

The overall cost of the completed building was $1.45M in 2003. For this client, the fundamental purpose of the store is to be a healthy economic engine for the farm, while also investing the available budget in the most effective places.

Daylight Controls

Energy savings: 19,293 kWh Incremental cost: $10,000 Payback period: 1.56 years

Building Shell Improvements

Energy savings (propane): 2,784 gallons Incremental cost: $38,527 Payback period: 9.5 years

Heat Recovery from Refrigeration

Energy savings: 63,438 kWh Incremental cost: $15,000 Payback period: 1 year

Photovoltaics (yet to be installed)

Energy savings: 15,825 kWh Incremental cost: $150,000 Payback period: 47 years

## Section 6 - Process and Results

| | |
|---|---|
| PreDesign: | We invited our client to select a construction manager using the same procedure that they used to select us — by interview, reference, and by their record of achievement. They complied a short list of four candidates and we assisted them in interviewing. Before the first schematic design proposal was tabled, we had the Construction Manager on the team. The architects and three of the HVF management team made a two-day “road trip” visiting six similar retail operations; asking questions; making observations. Traveling together, we discussed what we have seen and progressively refined the design program and performance expectations as we went — again all together. |
| Design: | Our first creative action was to convene a “design concepts workshop” involving all of the HVF management team, ourselves and our site design consultants, our client’s retail operations consultant, and multiple representation from the construction manager. During that day-long session, all major constraints (budget, site, regulatory, and function needs) were reviewed and prioritized, and principal solution concepts were articulated — and everyone |

had “ownership”.

Later, with the Owner and CM support, we drew the refrigeration system contractor into a design-build collaboration between ourselves, our mechanical engineers, and NYSERDA’s reviewing engineers, managing a topsy-turvy situation to a durably effective, heat-recovering conclusion. There were concerns regarding the situation of a retail store in the middle of such a small community. We thought we had a fine solution, but we had to invest considerable time meeting with the neighborhood regarding traffic management — particularly the heavy goods vehicles movements, and with the district’s Planning Board regarding parking policy. Consistent with current New Urbanist thought, the Board expected parking to be “back and behind” — and especially in this setting. We explained why this was not completely wise or necessary, and a good balance was determined.

---

| | |
|---|---|
| Construction Process: | Given that the CM had been on the team as long as the Architect, a strong relationship was built that made the construction process easy. Regular meetings were held, along with a special air-sealing meeting with all of the subcontractors. Wall sections, details, and the products to be used were reviewed and questions addressed. The building was blower door tested to ensure that the infiltration rates were achieved. The project had a very low change order rate, and the additions were added scope that could be funded within the contingency, such as the rainwater cistern. In short, construction went extremely well. |
| Operations/maintenance: | After opening for the holiday season, the store managers were able to settle in to their new store, and learned how to operate the new building. The mechanical systems were more advanced than their previous store, and there were control items that had to be addressed. The refrigeration system was producing water that was hotter than desired and some adjustments were made in the mixing valves and settings. The air based heating and air conditioning system required basic balancing, but for the most part the building worked well. The store manager was trained in how to operate the daylighting system, and we learned there is a true benefit for the manager to determine the lighting levels to suit the mood and the season.<br><br>To date, we are unaware of any unusual maintenance items beyond regular cleaning, and that is not insignificant in a store on a farm. |

| | |
|---|---|
| Commissioning: | No formal commissioning was performed. The control contractor was engaged in a service contract after the completion of construction. The Construction Manager worked hard with the Design Team to resolve any problems. In hindsight, we might have designed a mechanical system that was either simpler for them (and less efficient), or identify the person who would operate the system and engage them from the beginning of design. The second approach has the risk of tailoring a system to a person who might not be there after the year or more of design and construction. |
| Measurement & verification/ post-occupancy evaluation: | See Question 10 and Energy Calculation submission. |

Rating System Name:
Version:
Rating Date:
Score or rating level:
Comments:

## Sections 7: Visuals

Exhibit A

HVF_ContextPlan.jpg

*Image has been scaled down. Click it to view actual size...*

Description: Context Plan: The Hamlet of Harlemville

Exhibit B

HVF_Floor_plan.jpg

*Image has been scaled down. Click it to view actual size...*

Description: Floor Plan

Exhibit C

HVF_WhiteElevations.jpg

*Image has been scaled down. Click it to view actual size...*

Description: South and East Elevations

Exhibit D

HVF_HamletView.jpg

*Image has been scaled down. Click it to view actual size...*

Description: Hawthorne Valley Farm in the Hamlet of Harlemville

---

Exhibit E

HVF_light_breeze.jpg

*Image has been scaled down. Click it to view actual size...*

Description: Site plan.

---

Exhibit F

HVF_SE_pocket.jpg .jpg

*Image has been scaled down. Click it to view actual size...*

Description: Entry in the Southeast Pocket

---

Exhibit G

HVF_patio.jpg

*Image has been scaled down. Click it to view actual size...*

Description: Farm Store from across the Green.

---

Exhibit H

HVF_cafe.jpg

*Image has been scaled down. Click it to view actual size...*

Description: The Cafe.

---

Exhibit I

HVF_Retail.jpg

*Image has been scaled down. Click it to view actual size...*

Description: In the Produce Section.

---

Exhibit J

070130 render.jpg

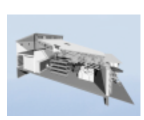

*Image has been scaled down. Click it to view actual size...*

Description: Section peel.

*Our thanks to the U.S. Department of Energy and the National Building Museum for co-sponsoring this program, and to BuildingGreen, Inc. for hosting the submission and judging forms.*

For more information about the AIA/COTE Top Ten Green Projects, contact AIA COTE. For help on how to use this Web site, contact Allyson Wendt.