

**TOWARD SUSTAINABLE SHOPPING CENTERS:
PROGRESS AND PROBLEMS**

**Henry S. Cole, Ph.D., President,
Henry S. Cole & Associates, Incorporated
7611 South Osborne Road, Suite 201
Upper Marlboro, MD 20772**

And

**Deborah A. Ciolfi, President
John C. Civilinski, Director of Real Estate
H. William deVries, Construction Manager
Linda J. McAleer, Property Manager
Gravestar, Incorporated
1 Broadway, Cambridge, MA 02142**

**For Presentation at the American Institute of Architecture
Conference “Mainstreaming Green: sustainable Design for Buildings and
Communities”**

Chattanooga, October 1999

Introduction

Gravestar is a real estate firm that owns and operates shopping centers in the greater-Boston area. The shopping centers range from small plazas with a few retail stores to large facilities with dozens of tenants -- most contain large groceries, pharmacies and the typical variety of clothing, video, retail, discount, hardware stores, and fast food outlets. The firm also owns and operates several office buildings. What is not typical is that the company has initiated a program to make its centers more environmentally sound. The principal avenue for improvement is the renovation and redevelopment of the shopping centers in its portfolio. Secondly the firm has used a pro-active community involvement process to incorporate the thinking of area residents in the redevelopment plans.

This paper describes Gravestar's program to improve the sustainability of its shopping centers and discusses progress to date and the problems and barriers encountered. The paper focuses primarily on the Porter Square Shopping Center, a renovation scheduled for completion for September 1, 1999. Since the redevelopment is barely complete, the paper does not include an evaluation of performance of any of the innovative measures.

The Challenge

Making shopping centers more sustainable for communities and the environment is not an easy undertaking. Shopping centers pose significant environmental problems, risks, and liabilities and Gravestar is working to alleviate them on a number of fronts.

- Large paved areas increase surface runoff and non-point source pollution, and adversely affect surface water and overwhelm the capacity of combined sewers. New commercial development in green (open) areas compounds this problem.
- Shopping centers are energy hogs. Typically heating, cooling and ventilation equipment as well as insulation and glazing are obsolete. Even new buildings are often slapped together with little thought to saving energy.
- Some of the businesses that occupy shopping centers also have big minuses for the environment. An example, discussed later in the text is traditional perchloroethylene based dry cleaners.

Corporate values

Gravestar has made a long-term commitment to make its facilities more energy efficient and environmentally sound and to do so as it goes through its cycle of renovating the shopping centers -- many of them built in the 1960's. There are several factors that have contributed to Gravestar's program:

- The company is family-owned. Principal owners, Carolyn Mugar and John O'Connor, have long-term commitment to the shopping centers, to the surrounding communities and to protecting the environment. The company's management and staff have pursued these values aggressively.
- The company has experienced significant environmental cleanup costs (e.g. dry cleaner tenant releases) and is attempting to minimize future liabilities. In a sense the project is a natural extension of company's remediation program.
- The firm is willing to make significant investments – both those that payoff quickly (e.g., energy efficiency) and those with long-term payoffs such as incorporating community requests into its development plans.
- Moreover, the company believes that it can at the same time make its shopping centers more sustainable and more profitable – by reducing liabilities, lowering energy costs, by making the shopping centers more attractive to customers, tenants (retailers) and to neighbors.

The Porter Square Project

One of the company's premiere renovations, and the first to incorporate the goals of sustainability, is the Porter Square Shopping Center, located in an urbanized neighborhood of Cambridge, MA. This shopping center is a hub of activity bustling with people including shoppers, pedestrians along Massachusetts Avenue and the many commuters going to and from the T-Station (Boston-area subway system) which abuts the shopping center. The Center is close to three major universities: Harvard, MIT and Tufts. The redevelopment includes: (a) renovation of the existing "strip center" building and (b) construction of a new building that houses a pharmacy and a health/fitness center.

The project included the following goals:

- Urban redevelopment (smart growth)
- Community involvement
- Energy efficiency
- Healthful indoor air quality
- Using non-toxic and low-toxic interior and exterior materials

- Use of sustainable (renewable) energy
- Encouraging retailers to increase sustainability
- Prevention-based safety and health plan
- Public education

In addressing these areas, Gravestar utilized both in-house talent and a number of outside experts and resources including,

- Leff Consulting Group (community stakeholder process)
- Croxton Collaborative Architects (conceptual design, energy analyses, material assessment)
- Henry S. Cole & Associates (sustainable technology applications)
- Zapotech Energy (photovoltaics and public information systems)

The authors believe that incorporating outside expertise into a team effort has been a critical part of the process.

Community Involvement

The initial planning for this project utilized a stakeholder involvement process to obtain input from the neighborhood associations representing communities that surround the shopping center. Keeping communities informed and soliciting input early in the process has a number of potential benefits.

- The process helps to build trust between community and the company.
- Accepting community recommendations increases the likelihood that redevelopment will be perceived by community members as beneficial.
- The community is the primary customer base. If residents are pleased, they are more likely to shop there.

In the course of the stakeholder inclusion process, community organizations made a number of recommendations. To Gravestar's surprise, neighborhood associations asked that the renovation include a new building – one that would fit the area's urban character better and bridges the gap often left by large expanses of asphalt parking lots. This design maintains the architectural integrity of the street and neighborhood. Gravestar followed this recommendation and included a new two-story building in its plans. This building dominates the view from Massachusetts Avenue the area's major thoroughfare. Additional community requests adopted by Gravestar include:

- Retail spaces for a number of community-based micro-businesses – 5 such spaces are housed in the new building’s atrium.
- A community activity space – Gravestar is donating what was previously a tenant space.
- A community information kiosk that will include space for posters and will include an interactive automated information system. This will be located along a patio for pedestrians. This area creates a new people-friendly zone between the parking lot and the shopping center.

Energy Efficiency

Increasing energy efficiency has been a critical goal of the project. Every Btu of energy saved both reduces emissions and environmental damage and reduces energy cost. Gravestar has engaged both R.G. Vanderweil Engineers (Boston) and Croxton Collaborative Architects, to explore a number of alternative energy saving measures for the Porter Square facility. Potential measures included building envelope (improved glazing, insulation, roofing, lighting, HVAC systems, refrigeration, day-lighting and the use of an automated energy management system). The analyses indicated that many of these measures will yield excellent returns on investment.¹

Barriers. The renovation incorporated a number of measures including highly reflective roofs with insulation values of R35 and R50 and improved glazing.² However, many measures that were found to be cost-effective from an engineering perspective were *not* implemented as part of the renovation. The principal reasons for this outcome are described below and reveal important barriers to “mainstreaming” improved performance in the context of shopping centers.

Under the current and traditional arrangement for shopping centers, the retail tenants are individually responsible for their own utility services including electricity, natural gas and water. The tenants (which vary from large retail chains to smaller concessions) have their own meters and pay their own bills. Moreover, although the landlord (Gravestar) owns the HVAC systems, each tenant has its own HVAC (heating, air conditioning and venting) controls (usually simple mechanical thermostats). Gravestar provides the energy used for common areas only, such as: the lights for sidewalks and the parking lot, elevators, etc.

¹ Vanderweil analyzed measures separately; Croxton utilized DOE2 modeling to determine the combined or systematic impact of multiple measures,

² The lower insulation value was used in cases where additional insulation would result in an energy penalty associated with excessive heat gain (e.g. for the health club).

This situation creates a “disconnect” between incentives and the desired outcome. First, the landlord can make investments that reduce energy use and cost – but it is the tenant and not the landlord that benefits from the savings. Secondly, while the tenants pay the utilities and have a direct incentive to save energy, most have limited control of the most energy consuming equipment, i.e. HVAC.

Possible solutions. To change this situation such that there is a fair apportionment of “energy profit” a new institutional arrangement is needed – one that maximizes win-win opportunities for both the landlord and tenant. Possible alternatives include:

- Educational programs or [lease provisions] that encourage [require] tenants to meet efficiency standards for equipment under tenant control (e.g. lighting, refrigeration, hot water heating, etc.).
- An agreement in which tenants agree to pay higher rents pro-rated to demonstrated energy savings brought about through landlord investments.
- A new arrangement in which the landlord supplies energy to tenants as part of its lease agreement.

Sustainable Energy Sources - Photovoltaics

The Porter Square renovation includes the installation of a 20-kw, roof-mounted, photovoltaic system (PV). Gravestar’s objectives for this system include (a) gaining hands-on experience with renewable energy and with onsite power generation (b) promoting public awareness and education for sustainable energy and (c) using the system to highlight the company’s efforts towards greater sustainability.

The PV system can produce enough electricity to power about 10 homes. However, most of the power generated will provide about 30 percent of the shopping center’s common area needs including elevators, air conditioning and exterior lighting. The system is also tied to “the grid” and any surplus (on a monthly basis) is sold to the local utility.³

Gravestar’s partners include Applied Power Corporation/Ascension Technologies (system design) and ASE Americas (PV panels). The project is expected to receive partial funding from the Department of Energy’s (DOE) Utility Photovoltaic Group (UPVG) TEAM-UP Project.

The PV installation will include several features to promote education and public awareness:

³ This is facilitated by Massachusetts legislation that allow net metering.

- The PV panels will be aligned along the south-facing front of the center’s “strip building.” This location coupled with the 35-degree tilt panels make the array highly visible to the thousands of shoppers, pedestrians and commuters who frequent the area daily.
- Information pertaining to the PV system will be displayed interactively at the center’s community information kiosk. A touch-screen computer will give the viewer information on current output, electricity generated cumulatively, emissions saved, how the system works, information on the technology partners, descriptions of additional environmental features of the system, and community announcements. Gravestar plans to work closely with area schools to make the system an educational resource for area students and teachers.

The decision to build the system was not made using a narrow economic analysis – the payback period for a return on investment is many decades. However, Gravestar believes that the system can help to distinguish the shopping center and the company in the marketplace. Moreover, Gravestar will gain valuable experience with sustainable and decentralized power generation – technologies that will be increasingly important in the next decade.

Toxic Use Reduction

Many of the products used for commercial purposes, for exterior structures, interiors, and cleaning contain substances that are hazardous. These chemicals can expose building occupants to dangerous chemicals and/or create risks to public health and safety and damage the environment. The same substances also present the landlord with potential liabilities. Gravestar, has taken a number of steps to use non-hazardous or less hazardous materials where practical to do so.

Dry Cleaners. A good example is the perchloroethylene (PCE) used in traditional dry cleaning. PCE is highly volatile and exposes workers and customers to a potent neurotoxicant and a probable human carcinogen. Moreover, PCE from dry cleaners is one of the most frequent environmental releases encountered in shopping centers. Once in the ground PCE is difficult and costly to cleanup. A single release can threaten a public well field and water supply. Shopping center owners have had to pay hundreds of thousands dollars or *even millions* to remediate groundwater contamination resulting from such releases.

In order to reduce potential liabilities and improve indoor air quality, *Gravestar now prohibits any PCE-based dry cleaning at all of its shopping centers.* Gravestar and Henry S. Cole & Associates have been working with a cleaner (tenant) to examine more sustainable alternatives such as wet-cleaning and liquid carbon dioxide. The path has not been straightforward. The cleaner had concerns regarding the quality and productivity of wet cleaning and has opted to purchase a liquid carbon dioxide (CO₂) machine. The

cleaning firm plans to install the liquid CO₂ machine at Gravestar's Waltham Plaza and may locate drop-off/pick-up shops at several Gravestar shopping centers including Porter Square. However, the application of liquid CO₂ has been delayed because the only company currently providing this technology operates on a franchise basis, and the tenant is determined to remain independent. The cleaning firm is waiting for a second vendor that plans to sell the technology in late 1999 or 2000.

Materials Assessment. As part of Gravestar's renovation program, Croxton Collaborative Architects has (1) identified the hazards in commonly used materials and (2) recommended practical alternatives where they exist. Moreover, a health and safety plan currently being developed will require all tenants to provide a list of hazardous materials used or stored on site with Material Data Safety Sheets. Gravestar is in the process of reviewing its product specifications and has selected more environmentally sound products where they are practical. Examples include:

- Low-VOC paints, sealers, and caulking
- Use of non-toxic, biodegradable oils to replace hydraulic fluids for compactors, cardboard bailers and construction equipment
- The use of recycled materials for common-area signs
- Additional examples are given in following section.

The Outdoors

As previously stated, the extensive paving associated with parking lots, sidewalks and with buildings themselves, have a variety of negative environmental impacts including reduce recharge to groundwater, increased surface runoff and flooding, combined sewer overflow, and non-point source pollution. Gravestar has taken significant steps to reduce these problems.

Landscaping. Gravestar has increased the amount of landscaping at Porter Square – in all the renovation includes 400 additional trees and shrubs. The plantings are not only beautiful, but absorb pollution and provide shading and cooling. Landscaping promotes infiltration. Moreover, Gravestar uses wood-chip mulching, but prohibits the use of fertilizers and herbicides. Weeding is done by hand!

Surface Runoff. In order to reduce surface runoff at Porter square, Gravestar has designed and installed an alternative drainage system for the precipitation that falls on paved areas. This system relies on traditional catch basins to drain the surface. However, instead of going to sewers, the water flows first to an oil and water separator. The aqueous component then flows to a large underground collection basin. The basin allows sediment to settle and the stored water is used to irrigate shopping center's plantings.

Overflow from the storage basin flows to two subsurface leach fields where the water infiltrates downward to groundwater.⁴

In addition, Gravestar has reduced the salt it uses to melt snow and ice. As a portfolio-wide policy, it prohibits the use of salt in any areas that may drain to wetlands. In all other areas salt is applied as only 30 percent of a salt-sand mixture.

Summary and Conclusion

Gravestar has undertaken a major program to improve the sustainability of its shopping center. The Porter Square project is the first of Gravestar's "sustainable renovation" projects to come to fruition. Significant innovations included in the renovation include:

- A community involvement process that actively sought community input and followed many community recommendations for the renovation.
- Upgrades of glazing and roofing that will save the energy used cooling and heating.
- Installation of a highly visible, 20-kw photovoltaic system that will provide about 30 percent of the shopping center's common-area electricity. Information on the system and its performance will be displayed interactively at the center's information kiosk.
- Initiation of changes and practices which reduce the use of hazardous and environmentally damaging chemicals (e.g. elimination of perchloroethylene-based dry cleaning, fertilizers and herbicide, and shift towards environmentally sensitive products such as low-VOC paints and sealers).
- A new drainage system that reduces the adverse affects of surface runoff to sewer systems and waterways by capturing and cleaning storm water and either using it to irrigate landscaped areas or allowing to infiltrate groundwater.
- Landscaping that adds hundreds of new trees and shrubs to Porter Square.

⁴ Oil and sediment are cleaned and disposed of periodically.

Our experience indicates that an undertaking of this nature is filled with complexity and uncertainty. Gravestar is committed to charting new territory and building new bridges toward a sustainable future. This commitment not only helps to sustain and enhance community, but is an example of the type of “smart growth” needed to halt the devastating impacts of sprawl.

About the Authors

Henry S. Cole, Ph.D. is President of Henry S. Cole & Associates, Inc. which provides scientific support, advice and project development to help firms and communities (1) obtain effective environmental cleanups and (2) adopt sustainable technologies and practices. Previously, Cole was Science Director of Clean Water Action, served as a senior scientist with EPA’s Office of Air Quality, and was a member of earth and environmental sciences faculties at the University of Wisconsin-Parkside and Howard University. He obtained his Ph.D. in meteorology at the University of Wisconsin-Madison in 1969.

Deborah A. Ciolfi is the President of Gravestar Incorporated. Ms. Ciolfi launched Gravestar in 1994 as a private asset management company. Gravestar Incorporated is a private investment firm engaged in real estate development and management, securities management, venture capital investment, and estate and financial advisory services.

Ms. Ciolfi has over 15 years of experience in real estate, finance and investment banking. Ms. Ciolfi is a former vice president of Ticker Anthony, Inc. and was certified public accountant with Price Waterhouse & Co. She holds a Bachelor of Science in Accounting and Economics from the University of Rhode Island.

John C. Civilinski is Director of Real Estate, Planning and Investment for Gravestar, Inc. Mr. Civilinski, who has been with Gravestar since 1994 has more than fifteen years experience in project management, real estate consulting and planning. He holds a B.A. in Political Science from Boston University and an M.A. in Public Affairs and Urban Planning from Princeton University.

H. William deVries is Construction Manager for Gravestar, Inc. and has supervised the renovation of the current portfolio for over the past five years. Mr. DeVries has more than twenty years of experience in office, retail and residential construction and has owned and managed his own construction firm. He received professional training at the New Hampshire Technical College.

Linda J. McAleer, RPA is Property Manager for Gravestar, Inc. Ms. McAleer has extensive experience in retail property management and leasing and has developed and implemented the company’s property management program. Ms. McAleer earned the Building Owners and Managers Institute’s (BOMI) Real Property Administrator designation in 1996. She holds an A.S. Degree from Massachusetts Bay Community College.



Healthworks Lobby Area



Porter Square entrance at Mass Ave.



Healthworks Exercycles



River Jhelum--imported carpets



Healthworks Interior



Mudflat Studio work in progress

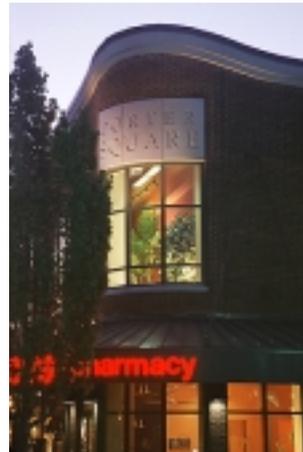


Otro Lado--colorful metal spoons



Left: Porter Square-- Mass Ave. Elevation

Right: Porter Square Festival Marketplace



Porter Square--CVS HealthworksBuilding Roof Detail



Mudflat Gallery



Community Arts Window

