The Kresge Foundation Headquarters

A Case Study in Building Green

THE KRESGE FOUNDATION

STRONGER NONPROFITS. STRONGER COMMUNITIES.

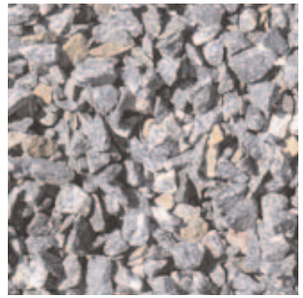
When The Kresge Foundation outgrew its long-time headquarters, it faced a number of decisions about how to address its need for a more effective workplace. Should we relocate to another site? Do we build an addition to our existing structure? Renovate another facility? Build new? Build green?

This is the story of our building—the options we had, the decisions we made, and the opportunities we hope the building offers to us and others.

Early Decisions

Location. For Kresge, the first decision involved location—should we remain on our present three-acre site or move to a new space? We decided to stay on our current property because:

- We believed we were acting as better stewards of the resources we had already developed
- Our site could accommodate an expansion



Building. Our site included an office building that we constructed in the 1980s connected to a 19th century farmhouse. After evaluating concepts and budgets, we decided to demolish our current office building because:

- The inefficiencies of the structure would remain, even after extensive renovations
- A new facility would allow us to build a workplace that fully met our needs

Environment. Our next decision was about whether we should build green. The Foundation had the flexibility and opportunity to explore green design and technology. And, as an organization that makes grants across the country, we could use our building to bring visibility to sustainable design. Early on, it felt like a good idea for many reasons, but as we learned more about how sustainable design employs best practices that result in a highly efficient, high-performing facility, we began to ask ourselves, “why not build green?”

Integrated Design Process

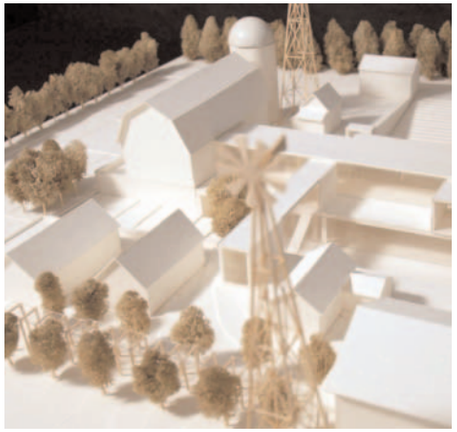
The integrated design process involves a highly structured team approach in planning a facility. It is essential in developing a green building. Project decisions are approached as part of a whole, rather than piecemeal—beginning early in a project's planning and carrying through to building completion and occupation. Members of the design team work collaboratively, resisting formulaic and isolated solutions.

After we made a commitment to remain in our present location, we conducted a charrette with the design team, including our architects, contractors, Kresge staff, and other consultants. We discussed and debated the following:

- Purpose of the building
- Stakeholder needs
- Organizational values
- Community values
- Environmental goals
- Operating costs
- Non-negotiable factors
- Challenges
- National/state/local requirements

The design professionals on our project team came prepared to answer our questions about green technologies, green choices, our workplace needs, and our interest in preserving the historic structures on our site. For each green feature, we discussed potential benefits, first cost, and long-term payback. We closed our meeting by prioritizing our options.

With this information, our lead architect generated an array of design options, each addressing the project's core goals in a different way. Our green consulting architect led the entire team through an evaluation of these designs.



Valerio Dewalt Train Associates

Integrated design is an iterative process. When we chose a geothermal heating and cooling system that would eliminate the need for natural gas service to our site, our architects and engineers examined the design for opportunities to reduce energy demand. One way we lowered demand was by embedding the building in the earth to shelter it from temperature change. The number of geothermal wells we used was based on careful calculations of our energy need.

Our team also designed a link between the new building's two wings that served as the staff entrance. In a conventional building, this link would be fully heated and air conditioned. But since no one worked in this space, we decided to simply temper it in the winter and summer. This seemingly small change resulted in a 2.5% annual savings in energy use for the entire building.

Priorities

- *Support the health and productivity of building users*
- *Create an appealing environment that attracts and retains Foundation employees and welcomes visitors*
- *Remain in our current location*
- *Preserve and utilize the farmhouse, barn and other agricultural structures on our site; allow these original buildings to remain visually dominant*
- *Achieve efficiencies in energy, water use, and long-term expense*
- *Reduce waste production*
- *Obtain materials from surrounding areas to minimize transportation fuel used*
- *Achieve LEED certification through the U.S. Green Building Council*

The U.S. Green Building Council certifies green buildings through its ***Leadership in Energy and Environmental Design (LEED)*** *program. The LEED process requires careful documentation and verification.*

What we learned

- **Don't wait to consider LEED.** Though a building does not have to be LEED certified to be green, we thought this documentation would lend credibility to our building as a model for nonprofits considering green. Because we made this decision early, we were able to include "LEED services" in the architect-engineer team's scope of work.

- **Stick to the plan.** The integrated design process is front-loaded and solutions are interdependent. Changes downstream are not only expensive—they compromise efficiency. For example, we selected plants for our landscaping and green roofs that are drought-resistant and native to Michigan. For the most part, they survive naturally without the need for watering systems. If late in the plans, we had decided to have a manicured lawn instead, we would find ourselves without permanent sprinklers to water the grass. Retrofitting our site with them would be costly, and it would wash away our goals for low water use.

- **Take the long view.** Even some of our most expensive green choices were relatively low-cost when amortized over the expected life of our building—especially considering potential energy savings or health benefits. Still, sticking to the budget required discipline. We increased ours after the project began when we decided to use milk paint throughout the building's interiors. Originally, we had planned to use it in the farmhouse alone.

- **Innovate.** Our exploration of new ideas has resulted in some of our favorite solutions. For example, we filled our retaining walls with demolition waste, recycling it and saving about half the cost of concrete retaining walls.

- **Pave (or grass) the way.** City of Troy building code requires grass to be kept three inches or shorter. Thanks to the City's enthusiasm and interest in our project, and open communication between our architects and city officials, we were able to maintain our plan for natural landscaping and promote awareness of green practices within our local government.

- **Don't skip commissioning.** Commissioning the building's systems begins during the design process and continues for a year after occupation to test the systems through all seasons. This process proved valuable when, early on, it revealed that the diffusers meant to provide heat along the inside of our building during cold winter weather were releasing heat beneath our raised floor rather than directly into the space. Because we found out about this installation issue, we were able to rectify it before move-in and preserve the efficiency of our heating and cooling system.

- **Clear the air.** During construction, the building's ductwork was sealed to preserve indoor air quality. For the same reason, we prohibited smoking on the construction site.

***Commissioning** is the testing and documentation of building systems. It is an important step to take in conventional construction projects, but for a green building, it is critical. Done well, commissioning helps quantify environmental quality and efficiency goals, improves energy use and equipment performance, eases the transition from builder to occupant, and provides a history and roadmap for future users of the building.*

According to the U.S. Green Building Council, operational and cost savings of 5% to 10% can be achieved through commissioning.

Team Building

Design and Construction Team

Ron Gagnon, *Kresge Project Manager*

Valerio Dewalt Train Associates, *Architect*

Farr Associates, *Consulting Architect for Sustainability*

JM Olson Corporation, *Construction Manager*

Arup, *Mechanical, Electrical, Plumbing and Fire Protection Engineer*

Robert Darvas Associates, *Structural Engineer*

Conservation Design Forum, *Landscape Architect*

Progressive AE, *Civil Engineer*

Interiors Group Searl Blossfeld, *Farmhouse Interior Designer*

Lighting Design Alliance, *Lighting Designer*

Shiner + Associates, *Acoustic and Vibration Engineer*

Vinci-Hamp Architects, *Preservation Consultants*

A green building involves the same design and construction professionals as in a traditional building project plus a few others.

We involved structural, civil, mechanical, and electrical engineers, as well as lighting and acoustic specialists in our project. We hired a project manager because Kresge staff did not have the skills or time to oversee the work. Because we wanted to continue using the historic farmhouse and barn on site, we needed to add a historic preservation specialist to our team.

Unlike most projects, we hired two architects—a lead architect to design the new and expanded headquarters and another firm specializing in sustainable design to consult on the project. This decision increased our project budget, but we wanted to add greater knowledge of green design to our team.

What we learned

- **Seek out green experience and monitor results.** We augmented the design expertise of our lead architect with the consulting services of an architect specializing in sustainable design. Whenever possible, we hired contractors and subcontractors with green experience. Throughout the process, we had to be vigilant, replacing standard practices with green alternatives.

- **Clarify roles, but build in a bit of overlap.** The integrated design process requires synergies between design and construction professionals beyond what is typical of traditional building projects. With two architects, it was especially important to agree on distinct roles early on. But because our team kept information flowing, the project didn't grind to a halt when members needed to step away to handle other obligations.

- **Expect staff involvement.** While we hired a project manager, staff and Trustees remained more involved than in a typical construction project. We were new to green design, and there was a steep learning curve. We underestimated the time needed for this involvement—but we realized its necessity in creating a workplace that responds to our specific needs with efficiency.

- **Rally around the project.** Champions of our project and its goals carried us through to completion. Across every job function and discipline, project champions stepped forward to remind us why we wanted to build green and what we hoped would come of it—keeping everyone on board and on task. Champions helped us "expect the unexpected" from our building, since we chose to explore new green strategies and share our experience with others.












Green by Choice

Green solutions can be evaluated in a number of ways. Some consume less energy, use fewer raw materials, or present some other health or social benefit. And what makes a choice "green" is relative to other available options.

While planning our building, we considered these and other factors before making decisions. Some of our green choices were based on cost-effectiveness or a short-term payback. In other cases, we decided to invest in a technology expected to yield a long-term financial payback. Finally, we selected some solutions solely based on the social good they promised. A few choices were expensive, primarily because they involved new technologies, but by incorporating them into our project, we believed we could contribute to the knowledge base about green design.

Some of our choices could be incorporated into any building project and would contribute to greater energy efficiency. However, it is the sum of these parts, created through the integrated design process, that provides the maximum benefit.

The examples highlighted in this section are placed into one of three categories, though many afford some benefit in all categories.

$ = **Short-term payback**
◴ = **Long-term investment**
★ = **Social good**

Building placement: $
- *Orientation involved strategic site planning, not material expense*

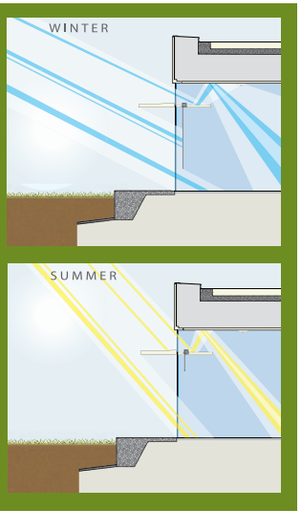
Sunshades and light shelves: 🕘
- *Attractive*
- *Moderate first cost*
- *Significant energy savings*

Monitored light system: $
- *Motion sensors promote security and ensure a comfortable work environment*
- *Low energy/operating costs*
- *Cost for specialized controls*

Valerio Dewalt Train Associates

Building orientation and lighting. The Kresge office building is oriented with its longest sections facing north and south. The east-west sections of this thin building are relatively short. Fifty-two percent of the building's north-south façade is glass, while only 29% of its east-west façade is glass. The differences in surface area and opacity allow cool northern daylight and controlled southern light to penetrate the building while shading it from morning and afternoon light that is more difficult to control.

During the winter, when the sun is low in the sky, light and warmth enter the building from overhanging sunshades on the building's south sides. When the summer sun is high in the sky, the sunshades block hot, direct rays. Exterior sunshades and interior light shelves work together to bounce indirect natural light deeply and evenly into the building's interior. This "harvested" light is monitored and complemented by just the right amount of artificial lighting for a pleasant work experience with minimal use of energy.



Recycled materials. The newer portion of the Kresge headquarters incorporates 27% recycled materials (17% post-consumer waste). Seventy-six percent of building materials used came from within 500 miles of the site, reducing use of transportation fuel and expense.

Because large portions of the office building are embedded in the earth, the site relies on many retaining walls for structure. These walls were formed with gabions as an alternative to traditional concrete. The gabions are baskets of recycled concrete finished with crushed granite. Our retaining walls contain more recycled concrete than was created by the demolition of the former Kresge office building, sparing it from the landfill.

Inside, wood flooring and desks are made of rapidly renewable wheat board finished with a veneer of FSC-certified sustainably-harvested wood. Walls are coated with "milk paint" that is made from milk protein, herbs and minerals and contains no volatile organic compounds (VOCs).

Window shades are made of recycled plastic fabric that can be recycled again and again for the same use.

Gabion walls: $
- *Lower initial cost*
- *Made use of demolition waste*
- *Attractive appearance*

FSC-certified wood-veneer flooring and desks: ★
- *Very small cost premium*
- *Assures wood is from sustainably-managed forests*

Window shades: ★
- *Increase occupant thermal comfort*
- *Reduce glare*
- *Can be recycled repeatedly for the same use*

The Forest Stewardship Council *(FSC) is a nonprofit organization that sets standards for forestry practices that are environmentally responsible, socially beneficial and economically viable.*

Volatile organic compounds *(VOCs) are chemicals commonly emitted by products used inside buildings, e.g., paints and lacquers, building supplies, and cleaning supplies. While VOCs are often perceived as a somewhat positive "new car smell," they are linked to short- and long-term health risks.*

Geothermal system: 🕘
- *Low energy/operating cost*
- *No carbon dioxide generation*
- *No need for gas hookup*
- *High upfront cost*

Raised floor: 🕘
- *Energy savings*
- *Smaller distance required between floors*
- *High upfront cost*

Heating and cooling. Forty geothermal wells extend 400 feet into the earth below the parking area. Water moves through 1¼-inch pipes to three heat pumps that serve all buildings on the site. The system incorporates six miles of pipe—longer than the Mackinac Bridge connecting Michigan's upper and lower peninsulas.

In the summer, the geothermal system moves heat from the building into the earth. By taking advantage of the near-constant ground temperature, our geothermal solution is expected to be 20% more efficient than conventional systems serving buildings of the same size and purpose.

Through much of the building, a raised floor supplies cool or warm air depending on need. In buildings where heating and cooling flows down from sources near the ceiling, it must be supplied 10 degrees warmer or cooler than needed to make up for losses during its descent to the ground. Supplying it at ground level rather than overhead is more efficient and provides better ventilation.

The raised floor system also allows Kresge staff to control their workspace temperatures using adjustable vents. This increases our individual comfort—and encourages eco-friendly behaviors. Without individualized controls, people tend to work against building systems, which can compromise energy and cost savings.

Insulation. Two-thirds of the new building's 19,000 square footage is located in the lower courtyard level. Large portions of the building are embedded in the earth, where year-round temperatures remain near 55 degrees, cooling the interior in summer and insulating it in the winter.

The Kresge office building is super-insulated. Its walls and roofs provide double the thermal resistance of the typical office building.

Barbara Karant

Green roof. The headquarters is partially covered by four green roofs—each populated with drought-resistant native plants. Rather than deep soil, the rooftop plants are rooted in five fine layers of materials selected to irrigate foliage and protect the building's interior.

The remaining roof is covered with a membrane light in color so that it reflects, rather than absorbs, sunlight to minimize heat pollution, a major problem in urban areas.

Embedded building: $
- *Reduced quantity/cost of exterior walls*
- *Provides energy savings*
- *Allows farm structures greater prominence*

Super-insulated walls: $
- *Small cost premium*
- *Significant ongoing savings from high energy performance*

Green roof: 🕘
- *Extends life of roof materials it covers*
- *Provides insulation*
- *Absorbs storm water*
- *Coherent with natural grasses on site*
- *High upfront cost*

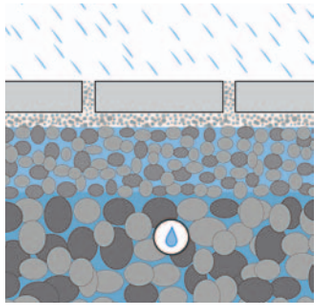
Membrane roof: ★
- *Reflects solar energy back into the atmosphere*
- *Low upfront cost*

Pervious pavers: ★
- *Filter pollutants from parking lot*
- *Provide additional onsite storm water retention*
- *Make effective use of scarce land*
- *Attractive*
- *Higher first cost*
- *Weight limits restrict approach of some trash removal/recycling vehicles*

Storm water system: $
- *Filters pollutants from storm water*
- *Cistern collects rainwater for supplemental use on green roofs*
- *Bioswales provide snow storage location*
- *Requires land area*
- *Requires an onsite pump*
- *Low first cost*

Landscaping: $
- *Creates wildlife habitat*
- *Upfront cost offset by smaller storm water system requirements*
- *Low maintenance cost*

Parking area. The parking area is covered with pervious pavers resting on layers of crushed rock. Water soaks through the pavers and filters into the ground naturally rather than running off into the sewer system as a harmful concentrate of automotive chemicals. Like the building's rooftops, parking pavers are light in color to minimize heat pollution.



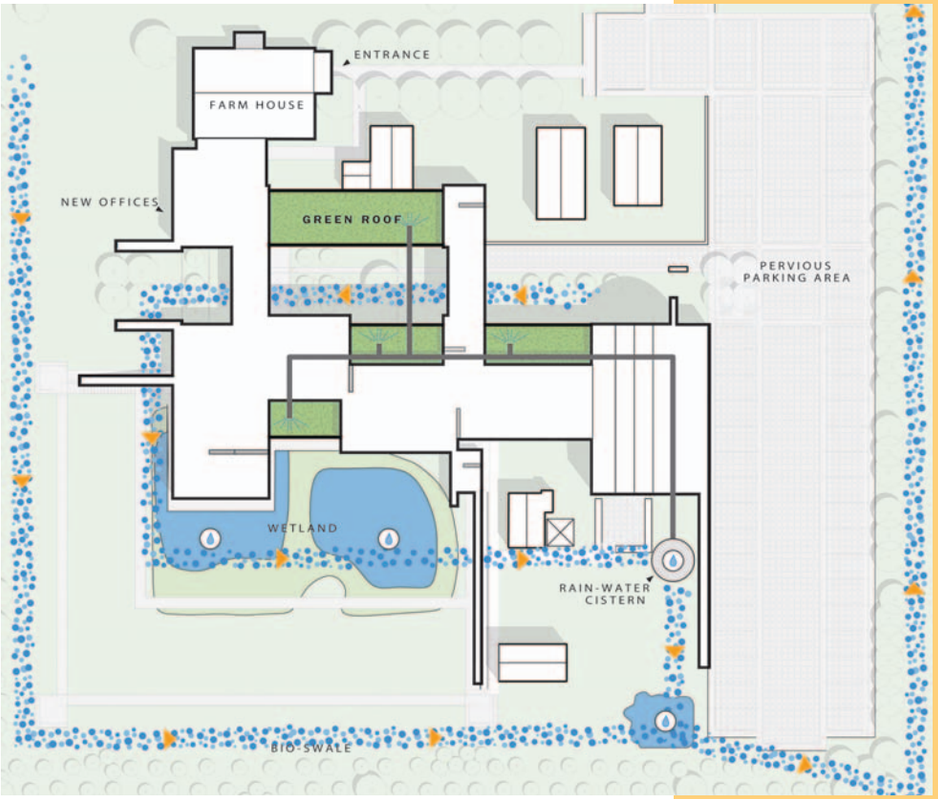
Rain run-off from the parking area is minimized by using pavers set on gravel.

Water use. The site's water system reduces demand on the community's potable water and storm water systems. It also produces minimal sanitary waste water.

Approximately 72% of the site is covered with native plants that require little maintenance. All of the water needed for landscaping is obtained through direct rainfall or rainwater collected by a cistern. The long native prairie grasses are also highly absorbent, allowing for reductions in the size of retention ponds.

Rainwater nourishes the deep-rooted plants on the site and recharges groundwater. Any excess water is diverted into a system of bioswales (shallow, vegetation-filled channels flowing around the property) and constructed wetlands that encourage further percolation into the site. In the process, rainwater is naturally filtered. Excess water from heavy rains is pumped from the constructed wetlands to a cistern that waters the green roof during drought.

Inside the building, dual-flush toilets and a waterless urinal minimize use of drinkable water.



Rainwater is collected on site, filtered and recharged into the soil.

Leaving things out. Our building's components were designed to work together as parts of a system. In some cases, the best choice we could make for the system as a whole involved leaving out a green strategy or technology.

For example, the Foundation evaluated photo-voltaic panels and wind power. After considering that southeast Michigan is often overcast and that wind speeds are not predictable unless windmills are mounted very high, it became clear that the impact of these technologies would have a high first cost and minimal long-term payback, so we left them out of the plan.

Many green buildings incorporate specialized windows, such as argon glass or dual glass walls separated by an air-filled cavity two feet wide. For our purposes, this option promised little impact on energy use and extremely high cost. Based on these findings, we chose to use conventional glass, placing it mostly on the building's north-south façades, where incoming light is easiest to manage.

A Fresh Green Start

Valerio Dewalt Train Associates

Our workplace integrates elements new and old, fabricated and natural. The original stone farmhouse welcomes visitors as a reception and consultation space, and we have staff meetings in the barn. Glass walls flood our offices and conference rooms with natural light, yet grassy embankments obscure neighboring office buildings and highway traffic.

As occupants of a green building, Kresge staff had to become fully aware of the behaviors required to achieve the building's intended economic, health and environmental benefits. We received an orientation led by our architects.

Our maintenance and cleaning crews use methods and products that maintain the balance of the interdependent systems at work on our building site. And as an organization, we're examining ways to "work green" on a daily basis—from using recycled and recyclable office supplies to carpooling.

What we learned

- **Expect company**. To ensure that the building operates as planned through all weather conditions, building professionals are onsite in the year following move-in.

- **Learn and share**. As we settle into our new building, we're encouraging open conversations about its benefits, challenges, and surprises—so we can learn about what works and what doesn't. It's our goal to make this building a model and share our lessons with nonprofits considering building green.

About The Kresge Foundation

Established by Sebastian S. Kresge in 1924, The Kresge Foundation seeks to strengthen nonprofit organizations that advance the well-being of humanity. We fulfill this mission by…

Catalyzing nonprofit organizations to help them grow
Connecting nonprofit organizations with their stakeholders
Challenging nonprofit organizations with grants that leverage greater support

We believe that strong, sustainable, high-capacity organizations are positioned to achieve their missions and strengthen their communities.

To learn more about The Kresge Foundation and our pursuit of sustainability—for ourselves and for nonprofits—please visit www.kresge.org.

The Kresge Foundation
3215 West Big Beaver Road
Troy, Michigan 48084

(248) 643-9630 Telephone
(248) 643-0588 Fax

www.kresge.org

Printed on 100% post-consumer waste fiber recycled paper with soy-based inks.

Building photos by Justin Maconochie, exceptions noted.