

PAYETTE SUSTAINABILITY ACTION PLAN



Payette's open studio, in a LEED Platinum Certified building, fosters collaboration.

History

Three generations, many voices, one practice. In 1932, Fred Markus and Paul Nocka started a small design firm in Boston. Using pioneering time-and-motion studies, they helped hospitals throughout New England take apart and retool complex, mission-critical processes including nursing units, kitchens and pharmacies. In 1960, Tom Payette joined the firm, adding a modern design philosophy to the firm's innovative process. Tom led the firm in designing a series of New England hospitals that were centered on the experience of the patient, manifested by an intimate connection to the landscape, abundant use of color and natural light to help orient patients and visitors.

Through the promotion of the same humanistic values and fundamental design approach, the firm broadened its focus in the following decades to include high technology buildings, bringing deep technical expertise, commitment to rigorous research and dedication to beauty to a new class of projects. Today, the practice has advanced as an international leader by providing planning and design services to leading institutions across the country and abroad.

We approach design as a process that combines problem-solving, research and invention. The architecture we practice is inherently multidisciplinary. Our definition of architecture embraces planning, programming, landscape architecture and interior design as being intimately intertwined in producing our work.

2030 at Payette

Our practice specializes in technology-rich and energy intensive buildings such as healthcare facilities, laboratories and museums. By definition, these buildings consume large quantities of energy and have a substantial environmental impact unless conservation is considered as a key design driver. Because of our core belief in good stewardship we know that we cannot use the functional programs of our buildings as an excuse for poor practice. Long before LEED and discussions about Zero Net Energy buildings began, Payette committed to minimizing our environmental footprint and focused heavily on energy usage issues.

With this in mind, we enthusiastically adopt both the 2030 Challenge and the AIA's 2030 Commitment. We firmly believe that the design and construction industry has been slow to recognize the deleterious impact of our work and it is time to take a bold and decisive stance. There is no doubt that the specialized environments we design make this challenge more difficult. We know that failure to commit and set a plan in motion will result in 20 more years of marginal progress. Consequently, signing the 2030 Commitment is an obligation that we take seriously: publicly acknowledging our role and responsibility to mitigate climate change.



At the Aga Khan University in Pakistan, we designed water features in strategically placed courtyards to passively cool the local environment in an area where air conditioning was not feasible.



The Massachusetts Institute of Technology PDSI (Physics, DMSE, Spectroscopy and Infrastructure) Project was initially conceived as a traditional renovation within the university's central structure, the historic Main Group. As proposed in Payette's Main Group Master Plan Study, future work within the Main Group would preserve its historic fabric while supporting flexibility of use and upgrades to essential building systems. The PDSI Project was transformed into a strategic development that provides new and renovated program areas while also providing core infrastructure to nearly one quarter of the Main Group's 1,000,000 square feet.

“THE MAIN GROUP WAS BECOMING LIKE AN ‘INNER CITY’ WHERE ONLY OFFICES WERE LEFT BEHIND AND RESEARCH WAS GOING ON IN NEW FACILITIES IN THE ‘SUBURBS’ ... WE WANTED TO TRY AND USE IT AS IT WAS MEANT ORIGINALLY — AS AN INTEGRATION OF SCIENCE, EDUCATION, AND COMMUNITY.”

MARC KASTNER | DEAN OF THE SCHOOL OF SCIENCE, MIT
ARCHITECTURAL RECORD, NOVEMBER 2008

Common Design Methods

The underlying values of the 2030 Commitment are not new to our practice, with our firm having held similar unwritten principles throughout its history. Our long-term dedication to environmentally responsible design served to develop a philosophy that supports pursuit of the Commitment: focusing first on understanding then reducing building demand through technological efficiency solutions. Over the past ten years the following hierarchical steps came into sharper focus:

Reduce Excess Capacity

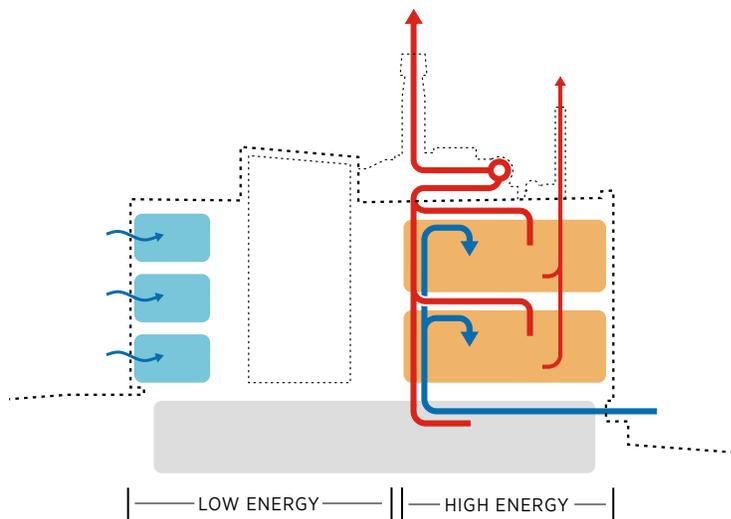
Often the simplest thing we can do to reduce energy use in a building is to eliminate redundant or unnecessary programmatic elements. For example, in a research building a single traditional fume hood can consume as much energy as 3 ½ houses over the course of a year.¹ Working closely with our clients to reevaluate preconceptions and find hidden synergies, we can make substantial impacts to reduce energy consumption and eliminate redundant fume hoods without functional compromises. Our experience shows that every project is unique and rarely do “tried and true” standard practice solutions lead to an optimal energy performance.

Study Building Operation

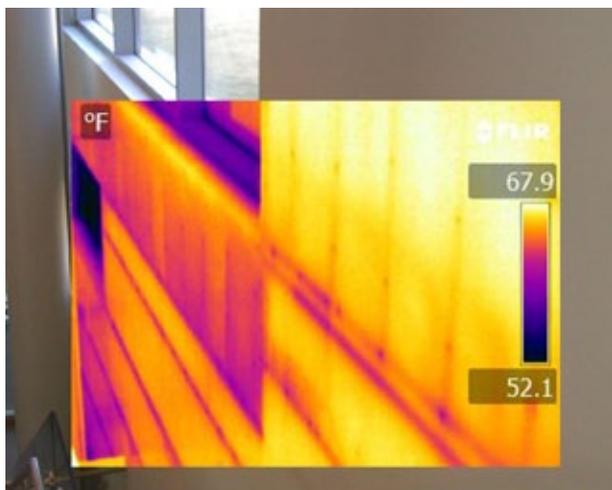
One of the most significant drivers of total energy consumption is determined by how the building will be operated. Often it is easy for a design team to blindly follow an Owner-supplied narrative that dictates occupancy schedules, set points and even air change rates. Through energy modeling and other quantitative methods, we believe in working with our clients to understand their intent, communicate the ramifications of decisions and identify opportunities to improve environmental performance.

Our past work can provide a wealth of information as to how our designs perform. Ongoing research projects can be used to learn from what has been done in the past to improve the performance of our work going forward.

¹Mills, Evan and Dale Sartor, “Energy Use and Savings Potential for Laboratory Fume Hoods,” Lawrence Berkeley National Laboratory, Energy Analysis Department, July 2003.



Columbia University: The lab side was accepted as a “high energy” environment with complex mechanical VAV and control systems. The office side was designed as a “low energy” structure with operable windows and individual fan coil units. This strategy enabled overall airflow in the building to be reduced by 36% from the project’s all-VAV baseline design.



While the occurrence of thermal bridges in commercial wall assemblies is a widely understood phenomenon, the few research studies that have been conducted show that thermal bridges can reduce assembly R-values by up to 45% or more. Our ongoing in-house research, which is being supported by an AIA Upjohn Research Grant, suggests that thermal bridging may have an even larger impact than that.

First Principle Engineering

We are proponents for traditional engineering that is based on starting at first principles on every project. While an Owner can always elect to change a building’s future operational efficiencies, we believe it is critical to establish a baseline profile from the start. This helps provide equipment that is right-sized for operation at peak efficiency. The creation of a Basis of Design document is at the heart of this effort. Developed in partnership with our clients and engineering consultants, it establishes in-depth building loads early on to finely tune systems for the real need.

Beyond the operational energy savings, and reduced embodied energy that comes from this kind of good engineering, the savings realized here is what permits Owners to select higher-performing building components. At times a higher initial cost is offset by greater return on investment in terms of energy use and longevity.

Harnessing Available Resources

After studying and predicting building demands, we look to exploit passive and low energy solutions. Identification and early consideration of climate opportunities and building program synergies can take advantage of energy saving options. Careful consideration of climate and program may influence an atrium’s orientation to allow it to preheat air for the building or organize the program so that natural ventilation is possible in suitable spaces.

Adoption of Technological Solutions

Once beyond the “low-hanging fruit” yielded through low technology energy saving options, we turn to more progressive and sometimes more complex systems. A longstanding tradition for early adoption of new technology is a reflection of our passion for exploration. We are also equally likely to reinterpret an indigenous solution that evolved over centuries of experimentation, as we are to recommend a new technology. In the end, we are committed to seeking out the least energy-intense solution possible for the challenging problems that we face.

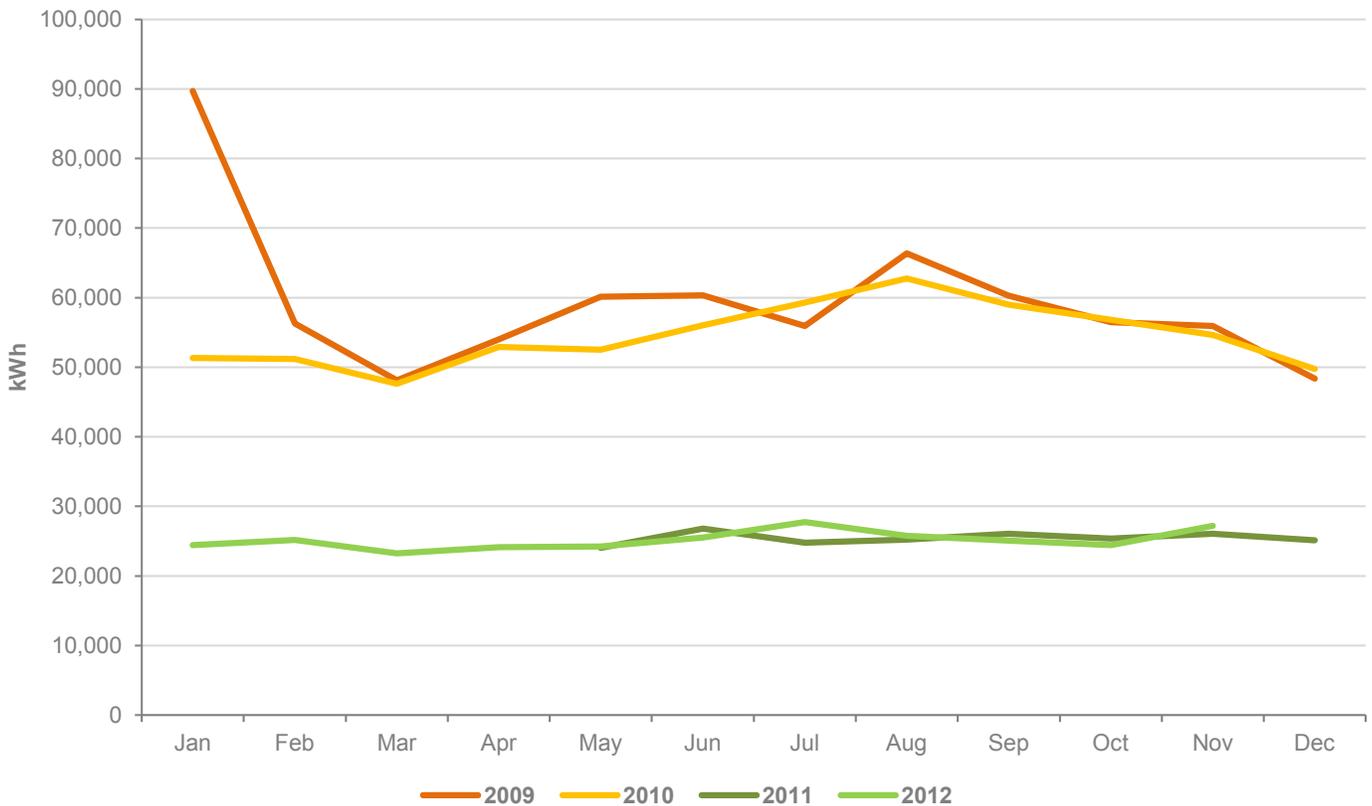
Our First Year

We signed the Commitment letter in January of 2011 ready to make changes to our work environment. As a first step, we designed and occupied a new office space that implements bold energy use reduction measures. Located in a LEED Platinum Certified building, our office fit-out is also seeking LEED Gold Certification. The design eliminates all incandescent lighting sources and a progressive HVAC system with air-system reheat zones restricted to the perimeter.

For our equipment, we eliminated CRT displays and approximately 50% of our printers while also upgrading file servers to state-of-the-art energy efficient systems.

Most importantly, however, we reduced the amount of occupied space per person. Consolidating the firm on one floor reduces building envelope heat loss and electricity consumption by elevators. These strategies, based on an analysis against historical data, have reduced our electricity consumption by approximately 55%.

Office Electricity Usage



ONGOING ACTION PLAN

To demonstrate our commitment to sustainability, Payette has already adopted a number of policies and guidelines; this Action Plan expands upon that base to clearly map our forward direction. We have divided our plan into three parts: Project Goals, Operational Goals and Staff Development. Following Architecture 2030's lead, we established a sliding scale for each goal to plot realistic paths and to track progress in quantifiable ways.

Project Goals

Meet Core Sustainability Basic Requirements

Payette projects will be designed to a minimum of a LEED Silver certification level. However, project certification will only be pursued at our clients' request.

Integrated Design Charrettes

Our design methodology is heavily dependent on utilization of design charrettes or workshops. In these sessions we work collaboratively to develop new approaches and solutions. They provide an opportunity for team members at every level to participate and to ensure every problem is viewed without preconceptions.



Reconfigurable pin-up alcoves line the interior of Payette's open studio. Alcoves are divided by movable pin-up walls hung from the ceiling, allowing them to be reconfigured to suit projects of varying sizes. Located along the main internal hallway, these alcoves foster impromptu design discussions between the members of different project teams.



As a part of our Action Plan, Payette projects are required to complete at least one Integrated Design Charrette with their full consultant team at or near the project kick-off. The charrette will be documented and shared with the rest of the firm through our internal blog to distribute new ideas that might be applicable to other projects. While only one charrette is required, larger projects will typically implement one at the start of each design phase.

Charrette agendas are flexible. Key topics will include reviewing Owner environmental standards, challenging occupancy and use intensity, mapping energy loads, exploiting site context benefits and setting aggressive energy reduction targets.

Establish Energy Benchmarks and Targets

We believe that to reduce energy consumption, projects first need to understand their project typology's prototypical building energy profile. All projects will establish quantified energy usage targets based on benchmarked energy usage from the most appropriate energy sources such as CBECS, ASHRAE, Labs21 or historical client data. A better understanding of similar buildings' energy usage profiles allows prioritized establishment of performance targets. While targets will evolve with the design, early incorporation into Basis of Design documents creates clear goals for the project team.

Interior projects will establish early lighting power density targets to reduce the energy consumption within the project scope.

Understanding Program Requirements

While addressing our clients' programmatic needs, we endeavor to prevent over-construction and inefficient buildings by designing projects that generate right-sized, customized solutions with reduced construction footprints and limited late-phase modifications. To accurately record and comprehend a project's program needs, all design projects will generate a Basis of Design (BOD) document of energy using systems relevant to the project scope.

Shadow Studies and Program Specialization

Our work is primarily specialized in energy intense buildings. While much efficiency can be gained through improved mechanical technologies, a greater return is found through efficient space planning to customize building use. This, however, requires balance with short and long-term flexibility over the building's intended lifespan.

Our practice is based on an unparalleled understanding of how people really use the types of spaces we design. Beyond normal programming activities, we use shadow studies as an important means to deepen this knowledge.

Shadow studies entail staff members following building occupants over the course of one or more days, through their routine activities, to see first-hand what they do and how they work. This is instrumental in uncovering institutional or group-specific idiosyncrasies to improve the space program. By advocating system level customization, we can optimize energy consumption and efficiency. This effort is optional based on project size and functional program.

Site-Specific Analysis

Much like we tune building interiors and systems to individual client needs, our practice carefully adapts each building to its site. All major projects will conduct climate, geological and vegetation analysis of their sites, and often extend to cultural, economic and traditional construction method research. The significance of site-specific analysis lies in the systematic discovery of local constraints that influence overall design and ultimately lead to project benefit.



Columbia University, Gary C. Comer Geochemistry Building at the Lamont-Doherty Earth Observatory, Winner of the Boston Society of Architects, AIA/New York and EPA Award for Sustainable Design in 2009 and a Merit Award for Excellence in Sustainable Design and Development from IDID in 2010. LEED Silver Certified.

Energy and Performance Modeling

Payette projects are required to complete an early stage energy model to assist with conceptual design decisions. While mandated for LEED or some energy code submissions, we extend this requirement to all projects regardless of size that included at a minimum HVAC system or substantial envelope modifications. An emphasis is placed on utilization early in the design process. For enhanced decision-making, we provide in-house tools in conjunction with the skills of our Building Scientist. The results of these models will be useful to document compliance with 2030 targets and help inform our design decisions and enable pursuit of more aggressive energy savings.

We continue to pursue fine-tuned studies such as “shoe-box” or partial models to quickly demonstrate the relative impact of design considerations, as an alternative to whole-building energy models early in design. We also use programs like THERM, CFD analysis, Daysim and Radiance for more targeted investigations such as the effects of thermal bridging, air flow and daylight performance.

Life Cycle Cost Analysis

Preparing clients for their decision-making process includes developing an understanding of the financial repercussions of operating expenses. Working with cost and engineering consultants, we develop life cycle cost models to compare alternates. As with the energy modeling, this is an early-stage design activity to yield maximum impact.

There is no set formula for which systems should be analyzed, but typically strong candidates are the envelope, mechanical and lighting systems. For larger projects, at least one such investigation will be completed during Schematic Design.



Harvard University, Sherman Fairchild Center for Stem Cell and Regenerative Biology: The laboratory developed a novel approach to reducing the energy profile by utilizing LED lighting and chilled beams for supplemental cooling. LEED-CI 3 Platinum Certified with the highest number of LEED-CI points (95) achieved by any LEED-CI lab in the world to date.

Embodied Energy and Construction Impact

While the focus of the 2030 Commitment is on carbon impact through operation, our practice is also concerned with the carbon impact of our construction activities or the embedded energy. To that end, we task our teams with understanding the impact of decisions such as the carbon resulting from the deployment of large quantities of concrete or from shipping substantial materials over long distances. We have not yet reached the point of establishing targets, but the goal is to ensure that teams are evaluating their design decisions with an awareness and preference to mitigating embodied energy and carbon footprint.

Post Occupancy Evaluations

We have established a tiered post occupancy evaluation process to learn how successfully our projects respond to project needs over time. All projects are required to complete some form of post occupancy study depending on the nature of the project and its level of complexity.

- Close-Out Interview: This is the most basic form of evaluation and it is performed at or near the close-out of the project. Typically, the interview is completed by senior project leadership and entails meeting with key stakeholders to understand any concerns or thoughts they may have upon moving into the space. Documented and published as part of the internal blog for the benefit of the firm, the interview may result in our recommending some modifications to the Owner.



Duke University, Environment Hall, The Nicholas School of the Environment: One of the primary goals was to express the School's pedagogical mission by employing sustainable building systems that optimize energy use and water conservation while serving as a teaching tool for the school and its community. Pursuing LEED Platinum Certification.

- Post Occupancy Survey: We have set a goal to complete post occupancy surveys for at least 25% of our projects that were completed in 2012. In conjunction with the Owner and using prepared templates, the team will administer an online survey to select participants. Survey questions are tailored to the project and focus on issues such as functionality, personal comfort and general satisfaction. Certain energy-related issues such as lighting and temperature settings are tracked for most, if not all projects so that they can be tracked in a master database for general satisfaction by building and use type.
- Independent Post Occupancy Interviews: In addition to the surveys, certain large projects are targeted for detailed, personal Post Occupancy Interviews. In these cases, a senior staff member who was not involved in the project is tasked with meeting personally with stakeholders to review the OPR and how the project has, or has not, met these requirements. In some cases, the interviews lead to follow-up shadow studies where staff members monitor use of the building or project over the course of several days to better understand how the building occupants actually use the facilities. The end-product of these investigations includes a detailed report which is published on our internal blog coupled with a lunch-time educational presentation.
- Building Performance Monitoring: For projects that are individually metered or where new technologies or solutions have been deployed as part of an energy savings plan, it is often possible to monitor how the building is actually performing. In this case, where possible, we will work with our clients to collect and analyze performance data on some interval usually over the course of several years. Measuring actual operating parameters to validate or refute design assumptions is critical to fine tuning our process and future project success. Frequently, this approach requires a commitment from the Owner, and may require the support of others from the project team.

Operational Goals

As a firm we recognize that while the largest part of our influence can come from our project work, or what we do, we also have a responsibility to reduce the environmental impact of our workplace and how we operate. We have identified a series of short-term and long-term operational goals that will be implemented by our staff under the leadership of the Sustainability Action Plan.

Short-Term Implementation (Current and Three Year Range)

Transportation

- Promote video and web conferencing for consultant coordination and client meetings as applicable.
- Further promote our hybrid car-sharing (Zipcar) program, implement a bicycle-share (Hubway), and encourage public transit use for local travel.
- Sponsor and promote a preferential public transit and/or ride-share program for commuters to reduce single person vehicle commutes.
- Publish an annual “get to work” survey to track modes of commutes.



Payette commuters participating in the MassCommute Bicycle Challenge



Energy Use

- Complete implementation of automatic computer and monitor shut-downs.
- Continue to upgrade servers and printers to higher efficiencies.
- Track and record per-capita energy usage.
- Track experimental temperature comfort range extension in winter/summer seasons to reduce utility consumption.
- Explore options for low-energy use computers through cloud-sourced server based computing.

Resource Consumption

- Aim for a 50% reduction in internal paper consumption.
- Mandate double-sided, black and white printer settings for in-house documents where applicable.
- Mandate reduced size drawings for progress prints. Supplement capacity with additional large format team monitors in select pin-up areas for team reviews and presentation.
- Mandate electronic only agenda and minutes for all in-house meetings and client meetings as applicable.
- Eliminate disposable plastic utensils and paper cups from the office through purchase of reusable cutlery, mugs and glassware and dishwasher usage.
- Reduce individual water consumption by implementing daily dishwasher usage in lieu of handwashing.
- Promote locally sourced, seasonal agriculture for catered events with vegetarian options; this includes events sponsored by outside vendors.

*Long-Term Implementation
(Three to Five Year Range)*

- Institute carbon footprint tracking
- Purchase renewably sourced electricity (wind/solar/hydro)
- Reduce paper consumption by 75% over the next five years
- Increase transit use incentives by 25%
- Explore additional large-format / touch-screen monitors to further reduce printing.



Staff Development

Payette is committed to provide access to resources in order to further individual's professional development and to promote positive engagement in our professional community and the community at large.

A major component of our firm's environmental awareness is due to the volunteer efforts of the Grassroots Green Initiative. Payette will continue to support and recognize individuals for their organizational and volunteer efforts.

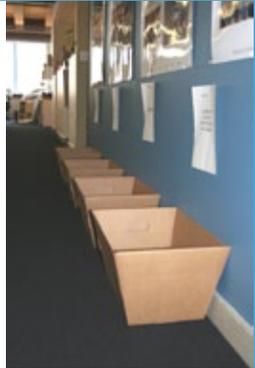
Sample Recycling

Grassroots GREEN

As part of the office cleanup this week, and in conjunction with the Boston Sample Drop/Shop, Grassroots Green has arranged placing 4 new recycling bins on each floor near the printing stations. The following list indicates the 4 bin types and the materials that can be placed in each bin.

- Vinyl**
 - Wallcoverings (removed from books)
 - Flooring
- Carpet**
 - Samples (removed from books)
 - Tile or Broadloom
 - Backed (vinyl, moisture guard, cushion)
- Aggregates**
 - Brick
 - Stone
 - Grout
 - Ceramic or Porcelain Tiles
- Textiles**
 - Memo Samples
 - Panel, Wall, and Upholstery Fabrics

Papers and other misc. items are already recyclable in the blue and green recycling bins.



These bins will be on the floor **this week only**. All materials collected will be transported to the Boston Design center at the end of the week. On Friday and Saturday the "Shop" phase will be held at the Boston Design Center; this is when the community is invited to go and shop for free from the collection. For more information please visit the Boston Sample Drop/Shop Website <http://www.greengoat.org/dropshop/index> or see the iThreads article posted last week entitled Boston Shop/Drop. Grassroots Green thanks you in advance for helping in this cause.

If you have any further question please contact Jeff Minard, Diana Tsang, or Seth Holmes.



Payette won first place in Best Green Practices from SMPS Boston's Recognizing Outstanding Communications Awards program for our conscious choice to use recycled materials in marketing efforts, our Grassroots Green programs as well as our commitment to sustainable architecture.

To that end, and in support of broadening our presence within the environmental community, the following programs are ongoing or will be implemented with the next three years:

Education

- A bimonthly series of in-house lunchtime education seminars is planned in conjunction with our Building Scientist and the Grassroots Green Initiative. These focus on current project work, research and industry best practices. They are open to all staff and registration for continuing education credits is provided. A summary record of each presentation is also made available through our internal blog.
- Educational training sessions will be provided for the comprehension and basic use of advanced energy modeling software. The sessions will be made available to interested individuals who will be able to apply the training to ongoing and future project work.
- An in-house research initiative is underway around a series of topics related to building energy use. Over a six month period, a select group of junior to mid-level staff is paired with senior level staff to prepare research white papers for presentation in the above education sessions and for the general education of the firm. Topics include thermal bridging, solar shading, heat recovery, fume hood usage, etc.
- The firm will explore the option of providing staff with the means to transfer sponsorship of extramural educational events across venues. For example a typical sponsorship for two workshops at the ABX (ArchitectureBoston Expo) symposia could be used toward attendance at environmentally focused events such as Labs21, NESEA or Greenbuild.

Accreditation

- The firm will continue as member organization of the USGBC and will continue to subsidize individuals for biannual GBCI credential maintenance.
- The firm will provide resources to individuals or groups to assist in preparation for accreditation examinations through its library and online subscriptions.
- Similar to its support of professional licensure, the firm will continue to provide reimbursement for successful completion of USGBC accreditation examinations.

Community Service

- Payette strongly encourages individual participation in professional service organizations and provides reimbursement for membership in the Boston Society of Architects (BSA). To that end, we will provide representation from the firm at the BSA's monthly Committee on the Environment meetings and the USGBC Massachusetts Chapter, and promote the sharing of resources and information across the profession.
- Recognizing our place in the larger community and our professional role to strengthen and support a spirit of volunteerism, we will continue to encourage individuals to engage in volunteer activities outside of the office. This includes participation in a selection of annual events such as the MassCommute Bicycle Challenge, Rebuilding Together, the 1% program of Public Architecture, Architecture for Humanity and the Charles River/Earth Day Cleanups.