



Building a Green Future

A Case Study of EPA Region 10's Building Renovations



Leaders inspire and model behaviors and actions they expect of others. EPA, Region 10, Seattle, saw a planned remodeling of its executive offices as a unique opportunity to provide leadership to the federal community and the private design and build community by creating a showcase for "green construction" using environmentally responsible practices and materials. "EPA is committed to creating a model to demonstrate environmentally sustainable construction concepts to building managers, contractors, architects, designers and others who might be interested in adopting these practices," according to Chuck Clarke, Regional Administrator of Region 10.

The project, completed in April 1999, parallels EPA's new way of doing business — using market influence as well as

regulatory means in the private sector to create environmental improvement. EPA hopes that tours of the renovated space and documentation of the project's success in publications, such as this one, will make it easier for others to follow its example.

EPA is also providing leadership to the federal community as it implements a series of Presidential Executive Orders that direct federal agencies to incorporate waste prevention, reduction and recycling, environmentally preferable purchasing, and pollution prevention in all agencies' daily operations and management so as to increase and expand markets for recovered materials. The most recent is Executive Order 13101-- *Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition*.

Pollution Prevention

The Pollution Prevention Act of 1990 made pollution prevention (P2) the national environmental policy of the United States. At EPA, pollution prevention means source reduction -- preventing or reducing waste where it originates, at the source -- including practices that conserve natural resources by reducing or eliminating pollutants through increased efficiency in the use of raw materials, energy, water, and land.

Region 10 prevented pollution on several different fronts during this project by:

- Re-using and recycling materials.
- Using energy-saving technologies such as compact fluorescent lighting and occupancy sensors.
- Purchasing modular wall units and carpet tiles that can be re-used.
- Purchasing materials made from recycled products.
- Purchasing materials that were manufactured without the release of carcinogens, persistent toxic chemicals, heavy metals, and toxic substances.

The Project, People and Practices

The 14th floor of the EPA offices in downtown Seattle, which includes the Regional Administrator's Executive Suite, needed reconfiguration to accommodate more people and work space. The executive suite occupied 2085 square feet of the floor, which included a 400 square foot office for the Regional Administrator and an under-used conference room. The executive suite was a 20 year old design that featured over-sized offices, a dark paneled interior space that housed the administrative staff, and a hodge-podge of old furniture (including old doors serving as desk tops) with no cohesive functional system of storage.

A new design for the suite shrank it to 1930 square feet and the executive offices to 225 square feet each, and includes a well-used conference room, more informal meeting space, and daylight and outside views for the administrative staff. Systems furniture was installed to save valuable floor space and provide systematic, functional storage space for both the administrative and executive staff.

Driven by the complex needs of this project, the EPA facilities staff tried a new way of working. They kicked off the project with

the creation of a large "Green Team" made up of EPA specialists from the air, water and waste programs, the building management, the General Services Administration, and the Seattle Chamber of Commerce's staff expert on construction and waste recycling. These individuals and organizations became the resource people that a small core project team - deemed the Green Futures Group - called on for assistance. The Green Futures Group consisted of the EPA facilities staff and the designer, Stieg Design Associates. The Group led the project through months of research, designing, planning, management briefings, specification writing, purchasing, people relocation, and construction.

Before this project, EPA Region 10 had incorporated several environmentally responsible practices into its regular construction practices such as using only low or no VOC (volatile organic compounds) paints and ensuring high quality indoor air during and after construction. With this project, however, EPA is demonstrating several new and innovative practices that reflect the Agency's increasing focus on sustainability:

- using certified wood products
- selecting resource efficient materials
- minimizing construction and demolition waste
- designing sustainable space.

Using Certified Wood Products

"Independently certified forest products" refers to those products originating in forests that have been certified as sustainably well-managed by an independent, third-party certification organization. Forest certification is site-specific, and validates on-the-ground operations as employing the best management practices to ensure the long-term health of the forest ecosystem.

News reports over the past 20 years have heightened awareness of the declining health of the world's forests and the consequences of this loss for biological diversity, climate stability, and for the communities that depend on forest resources for their livelihood. Attempts to protect forests through government initiatives and regulation have had limited success. Forest certification is a promising non-regulatory solution. Instead of penalties for irresponsible management, certification offers market rewards for sound forest management practices.

EPA Region 10 is one of the first federal offices to use certified wood products. The Agency purchased doors, moveable wall trim, and furniture which were fabricated with certified wood veneers. The moveable walls

were manufactured by SMED International and the office furniture was manufactured by Steelcase Design Partnership. While the use of certified wood products is growing rapidly, it is not yet commonplace and neither company had ever had third-party certified wood specifically requested in an order. The manufacturers worked closely with the EPA Green Futures Group and the Certified Forest Products Council (CFPC) to understand the technical details of EPA's requirements for certified veneers. CFPC is a not-for-profit, voluntary business initiative committed to promoting responsible purchasing practices in an effort to improve forest management worldwide.

Initially, both companies expressed some skepticism, either about working with a new wood supplier or about the technical specifications of the certified veneer itself. Both manufacturers were pleased with the quality of the certified veneer, however, and did not encounter any manufacturing problems. "From a procurement and manufacturing standpoint, this went very smoothly," according to Brenda Pratt of Steelcase's Wood Division. Both SMED and Steelcase would readily work again with the third-party certified veneers.

.....

Selecting Resource Efficient Materials

In addition to using the certified forest products, the EPA Green Futures Group identified and selected other resource efficient or environmentally preferable materials and products. Environmentally preferable materials and products are those that minimize the content of toxic or harmful substances, release minimal amounts of VOCs or CFCs into the environment during manufacturing or use, contain significant amounts of post-consumer recycled materials, are reusable or recyclable, are produced, transported and installed in a resource efficient manner and do not impact rare or endangered natural resources. While it is often impossible or impractical to find a product that has all of these characteristics, the EPA Green Futures Group selected products and materials that have some of these benefits.

The panel and upholstery fabrics were manufactured from 100% recycled PET (polyethylene terephthalate) from soda bottles or from a new line of fabrics described as "sustainable." Both fabrics were manufactured by DesignTex. To make the sustainable fabrics, DesignTex worked with a small Swiss textile mill and a large chemical company (Ciba-Geigy) to redesign the entire manufacturing process so that no pollutants were created during the process. In addition, DesignTex used only

100% compostable natural fibers (wool from free-ranging sheep and organically raised ramie) and used dyes manufactured without the release of carcinogens, persistent toxic chemicals, heavy metals or other toxic substances.

The Green Futures Group identified and evaluated several choices for carpeting based on its environmental characteristics as well as its function, cost and availability. The designer created and distributed a product questionnaire to several carpet manufacturers known for their environmental leadership. She requested information about material content and manufacturing processes, recyclability, and installation requirements including required adhesives. EPA selected a carpet tile made by Milliken, primarily because the carpet tiles are specifically manufactured for renewal and reuse. Through their Earth Square process, Milliken takes back their used carpet and puts it through a renewal process that supercleans, retextures, and updates the carpet with new colors and graphics.

Finally, EPA specified a reception counter be constructed from Environ, a material that looks like granite but is a biocomposite of 40% recycled newspaper, 40% soy flour, and 20% other ingredients: mostly colorants plus a water-based catalyst that converts the soy flour into a resin.

Independent Forest Certification

Independent, third-party forest certification is a voluntary process for identifying forests that are well managed. The process resembles that which is used in the organic food sector. Independent, accredited certifiers assess the forest practices of landowners against a comprehensive set of environmental and social performance standards. If the forestry operation meets these general standards, as well as the specific needs of that particular site and ecosystem, then it earns the right to display a certification label in the market place.

Today, the only standards available in the marketplace that meet the criteria established by the Certified Forest Products Council are those of the Forest Stewardship Council (FSC). FSC is the only independent, not-for-profit, membership organization that advances forest stewardship through certification of forest management. FSC standards are based on a set of international principles, and are adapted at the regional level by individuals from local environmental and conservation groups, the timber industry, community and economic development organizations and the general public. A forestry operation that meets FSC standards protects forest ecosystems, water quality, wildlife habitats and local communities. Operations that meet FSC standards can be certified by an independent certifier, and their forest products can carry the FSC label.

The FSC principles state that in order to be certified, a forest operation will:

- Meet all the applicable laws.
- Have legally established, long term forest management rights.
- Recognize and respect the rights of indigenous peoples.
- Maintain the economic and social well-being of local communities.
- Conserve the forest's economic resources.
- Protect the biological diversity.
- Have a written management plan.
- Engage in regular monitoring.
- Conserve primary forests and well-developed secondary forests.
- Manage plantations so as to alleviate pressures on natural forests.

This information provided by The Environmental HomeCenter, Seattle, WA. 1-800-281-9785

Materials Reused

The contractor took initiative to reuse as many materials as possible. For example, old door frames were reused to make relite frames (frames that surround interior glass). A standard entry door was cut and finished into a new bi-fold closet door. Reused materials include:

- wood doors (40%)
- wood door frames (60%)
- insulation (100%)
- sink and faucet (50%)
- signage (100%)
- card reader system (100%)

Materials Salvaged

Materials that could not be re-used on site were either stored for future use in the building or sold or donated for re-use on other sites. Salvaged materials include:

- wood doors (60%)
- wood door frames (40%)
- finish hardware (100%)
- toilets (100%)
- sink and faucets (50%)

Materials Recycled

Over six tons of drywall were recycled. While the fee for recycling was \$50/ton, the landfill cost of \$80/ton was avoided, resulting in overall savings of \$180. Recycled materials include:

- drywall (100%)
- metal framing (100%)
- carpet (100%)
- acoustic ceiling tile (100%)
- glass (100%)

Materials Landfilled

Small quantities of materials that could not be reused, salvaged, or recycled were sent to the landfill. Land filled materials include:

- rubber base cover
- vinyl floor tile

Minimizing Construction and Demolition Waste

Construction and demolition activities generate over 136 million tons of waste annually in the U.S. according to a 1998 EPA report (EPA document #530-R-98-010). Most of this waste ends up in landfills. Depending on the job and the location, it is estimated that up to 80% of this waste could be diverted from landfills (*Waste-Spec*, Triangle J Council of Governments). Used doors, windows, insulation, hardware and fixtures, and new material scraps are all examples of “waste” materials that are potentially recoverable. One of EPA’s primary goals for this renovation project was to demonstrate how waste could be nearly eliminated.

By building waste minimization goals into every phase of project planning, especially in the design and bid phase, the contractor was able to reuse, recycle, or salvage over 95% of the materials that were generated. EPA requested that interested contractors be required to include a Waste Management Plan up-front in their bids. (EPA Region 10 leases its space, therefore the remodeling work was performed under a contract let by the building owner, Benaroya Capital Company. EPA then reimbursed

On site source separation of demolition materials was critical to a high diversion rate.



Benaroya for the work.) The request for bids made it clear to interested bidders that the Plan would be a key component in the contractor selection process.

The Green Futures Group established a hierarchy of waste handling methods. Wherever possible, the contractor was to reuse materials on site. If this was not practical, the contractor was to salvage the material for reuse off-site. Materials that could not be reused were to be recycled or reclaimed. The last resort was disposal in a landfill. Over 95% of the materials that could have ended up as waste were reused, salvaged, or recycled.

Good planning was essential to achieving the high diversion rate. Identifying *in the specifications* the materials for re-use or recycling and the local outlets for the materials was a key step to success. Fortunately, the Seattle area has options for most materials. Lack of these facilities in a project area may make reuse or recycling of some materials expensive and/or impractical. The planners of any project must weigh the economics of transporting materials long distances against local disposal.

.....

Designing Sustainable Space

EPA's focus on sustainability is reflected in the project's integration of "sustainable space."

This innovative concept expands thinking beyond waste prevention and materials selection. Designing for sustainable space focuses on minimizing the environmental impact of the space, including the materials used, over the life of the building. To that end, EPA chose smaller, more flexible offices that will, in the long run, minimize consumption of natural, financial, and infrastructure resources.

Reducing Environmental Impacts and Life Cycle Costs

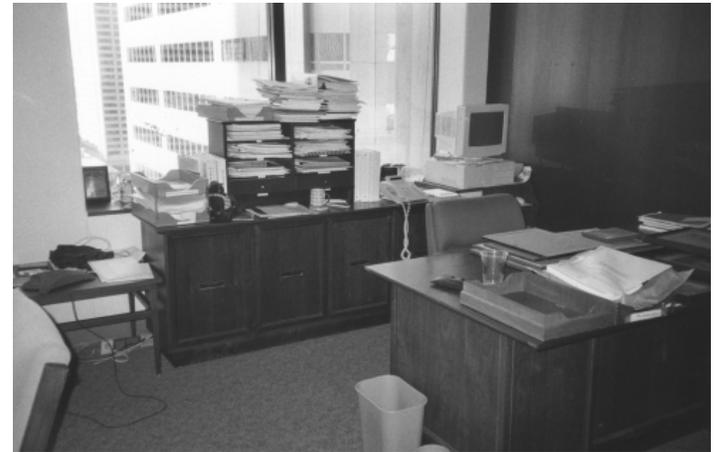
EPA chose to install modular moveable walls, carpet tiles, and modular furniture for the executive suite. The wall system manufactured by SMED International is composed of prefabricated full height panels, which are delivered ready for installation. The built-in flexibility of such a system will dramatically reduce the future impacts of demolition and construction. EPA can easily move walls and furniture without incurring the costs, creating the wastes, and consuming the resources of new construction. For example, the walls are installed directly on top of the carpet and are non-marking; if the walls are moved, the carpeting would need neither patching nor replacement. Walls can be moved or replaced in a fraction of the time of conventional construction, so displacement effects on worker productivity, rent costs on dormant space, and "swing" space are also reduced.

Modular carpet tiles add another element of sustainability. The life of the carpet is greatly increased by its flexibility. As carpet tiles wear out or are soiled (for example, in heavily traveled areas), they can be taken up individually and replaced or rotated from other areas, such as perimeters, that are not visible or heavily used.

Equity and Function

Personnel are EPA's most valuable resource. Creating a work space where staff feel valued was a primary goal of the redesign project. Replacing the dark wood-paneled walls of the executive's perimeter offices with translucent glass wall panels (the bottom 3/4 of the panels is etched and the top 1/4 is clear) provides the administrative staff, who occupy the interior, a visual connection to the outdoors and allows natural sunlight to reach their interior space while providing privacy for the executives. Natural light and visual connections to the outdoors create a healthier environment, which leads to improved staff morale and productivity. In addition, EPA personnel participated in the design process, which both boosted morale and improved the functionality of the design.

Function, a flattened work organization, and group work settings are emphasized over status in the redesigned space. The size of the executives' offices was reduced by approxi-



The executive suite was a 20 year old design that featured over-sized offices, a dark paneled interior space that housed the administrative staff, and a hodge-podge of old furniture (including old doors serving as desk tops) with no cohesive functional system of storage.



Although the executive offices are now smaller, they have been outfitted with furniture that takes advantage of vertical space, provides more storage, and incorporates executive style, and resource-efficient finishes and fabrics.

6



mately 30% from 400 square feet to approximately 225 square feet and the space allocated to administrative functions increased by 30%. Chuck Findley, the Deputy Regional Administrator, is pleased with how well his new office functions. "Even though it is significantly smaller, it is much more functional. I can meet with a surprising number of people in my new office." The executives agreed that their large offices were an inefficient use of space, particularly because they often sit empty due to their busy travel schedules. They also wanted to be leaders in reducing the consumption of infrastructure and natural resources that is associated with larger offices. Their decision freed up space for additional offices on the floor and other functions such as an informal team meeting area.

.....
What About the Cost?

This project cost approximately \$9.00 per square foot more than conventional construction. Other green construction projects may experience a less significant increase. EPA's commitment to make this a model demonstration project, the small size of this project (and therefore no economies of scale), completing the project in three phases due to relocation logistics, and a decision to pay more up-front to save money over the long term

account for many of the extra costs.

There will be long term savings from the up-front investment of the modular walls in the form of reduced construction costs of future projects, reduced costs from shorter staff displacement times and more efficient use of space. The cash and labor investments in the research, planning and specification writing for this project will be recouped by using what was learned in this project in future projects. The facilities team has already recouped some of these costs by using the information compiled for this project on a subsequent remodeling project of 6000 square feet.

The Agency is committed to providing leadership in promoting environmentally responsible purchasing. Market forces are just as important as regulatory forces to bring about environmental improvement. Region 10 hopes that sharing this model with others within EPA, the rest of the federal community, and private sector businesses may prove to increase the market demand for some of the environmentally responsible products and services thereby reducing their costs.

Certified Wood Products

EPA paid a slight premium for the office furniture because the certified veneers were

purchased from a vendor that the manufacturer had not worked with before. There were no additional costs associated with the manufacturing process. For the walls and doors, the order was priced the same as any special order that requires additional tracking throughout the manufacturing process. With repetition and a broader distribution, both of these manufacturers thought the costs would be the same as standard veneers.

Waste Minimization The cost per square foot for demolition, including on site separation, onsite re-use, recycling and shipping carpet to the East coast for reclamation, was approximately \$.64 more per square foot than standard demolition and waste disposal practices. The largest single waste minimization cost was transporting the used carpeting to the East coast for recycling, \$1200. (There is a local option available now, however, through Dupont Flooring.)

Overall project costs for waste minimization were about average because of the aggressive recovery of "waste" materials. Project managers estimate that about \$1,000 was saved in the avoided landfill fees and avoided costs to purchase new materials where old materials were reconditioned and reused. This savings, however, was offset by the additional labor time required

for training, materials sorting, and reconditioning of parts to be reused and the costs of transporting the demolished carpet.

Larger scale projects can take advantage of economies of scale to reduce the extra labor costs of on site separation and often save hundreds, even thousands, of dollars on landfill fees. In addition to job size, savings also depend on the recycling facilities available in the project area and landfill fees. In the Seattle area there are many recycling, reclamation and reuse outlets for the materials that could not be reused onsite, and landfill fees in Seattle are relatively high - \$80. a ton.

Moveable Walls The longterm cost savings from using the higher-priced modular walls and designing smaller offices are expected to be considerable. As EPA is faced with budget constraints, the moveable walls will allow the Agency to adapt existing space to fit changing needs with minimal costs and disruption. Smaller offices use EPA's limited and expensive downtown leased space more efficiently. Avoiding future relocation is a substantial cost savings where space is at a premium, such as in a growing urban center like Seattle.

.....
Lessons Learned

Members of Region 10's planning, design and construction

team stressed good communication, planning ahead, asking for help and recognizing that trade-offs must be carefully evaluated in decision-making.

Make a plan.

Create a hierarchy of goals and objectives. This is particularly important in green construction projects. There will be many decisions to make about products, materials and practices - each with their own set of environmental trade-offs. These decisions are easier when the project team knows the goals and how they are prioritized. A plan also allows project planners to evaluate success and to identify weaknesses before the next project. Good planning also identifies products and services with long lead times.

Do your homework.

Research background and technical materials, attend conferences, review case studies, collect specifications, search the internet, and review product literature. Ask questions to distinguish between those manufacturers and vendors just making green marketing claims and those providing an environmentally superior product. Up-front research also expedites the project schedule and makes for a more effective project manager. Cathy Stieg, of Stieg Design Associates, recommends, "If you hear from a contractor or supplier that they can't get it or that it will

delay the project, verify that yourself."

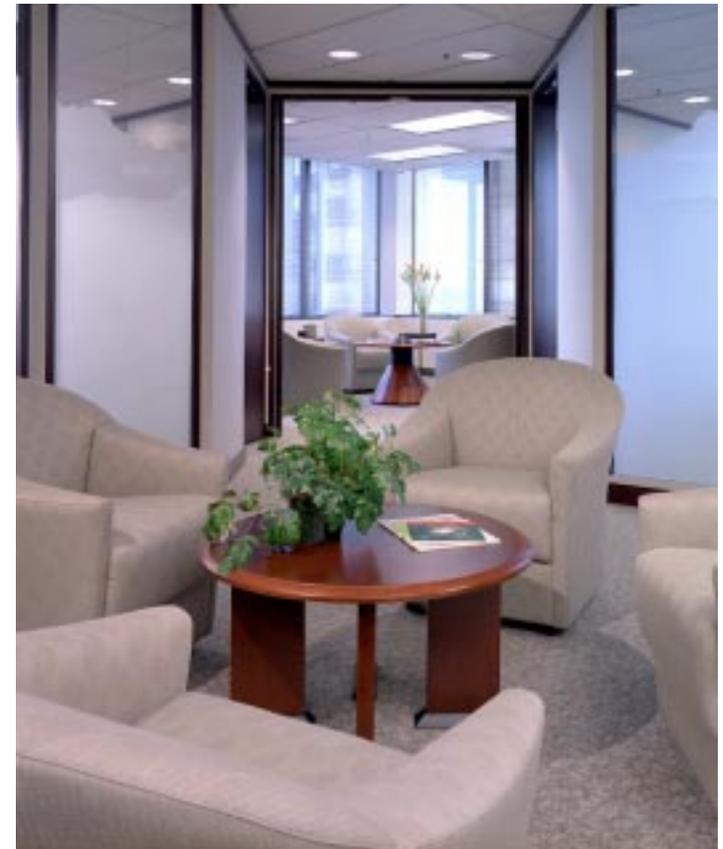
Ask for help.

The most valuable information comes from people who have experience with green design and construction projects. EPA's contacts included project members from both large and small projects and from non-profit and government organizations devoted to providing technical assistance. Rely on experienced and committed designers, specification writers, architects, lighting specialists and builders. Their experiences and assistance will prove invaluable.

Be prepared for trade-offs.

The green products market has grown tremendously and the quality and price of these products now usually matches or surpasses that of standard products. But be prepared to weigh the trade-offs among the cost, aesthetics, long term benefits and the environmental profile of a product or of the manufacturer. Systematically compare materials and products to project goals. A product may be made of all recycled materials but it cannot be recycled or re-used or it has to be transported long distances. Should you re-use a toilet onsite or replace it with a new low flow model and the send the old one to the landfill? Do what you can and know that even small environmental improvements are important.

The design maximizes interior light, and uses modular walls to minimize future modification costs.



Communicate.

Good communication among all parties is essential. All team members must understand the project's goals, their role on the team, and how final decisions will be made. Make sure top management knows about and agrees with all the goals of the project. They must be committed to the project and to the success

of meeting those goals. "To make this work, management must support the project with their mind, staff, and pocket-book," according to Jane Moore, EPA Office of Management Director.

Write clear, precise, comprehensive, well-organized and well-researched specifications.

At a minimum, include a requirement in the bid documents for a pre-construction meeting and a means of regular communication with the general contractor. Communicate with the tradespeople working on the site and make sure that they have read their part of the specifications. Jonell Allamano, EPA Facilities Manager, found

that, "We couldn't just assume the tradespeople knew what the requirements of our job were. We needed to educate them at the beginning of the project and watch them throughout." Be prepared to devote time to on-site project management to ensure all trades follow through with the plans and specifications.

For more information

about this project, visit our web page at:

www.epa.gov/r10earth/innovation.htm

or contact

Judith Leckrone at:

**206-553-6911 or
leckrone.judith@epa.gov.**

8

Product Performance Standards

In addition to the specific building products mentioned, EPA established product performance standards in the contractor specifications. For more details, visit our web site.

Woodwork

Constructed from formaldehyde-free, low VOC (Volatile Organic Compound) materials or permanently sealed to prevent out-gassing. Non-toxic glues and low VOC products should be used in fabrication. Where feasible, previously used materials in good and usable condition should be used first, followed by products with a high percentage of recycled content.

Veneer should be from species harvested and procured in the US or Canada from providers certified as practicing sustainable forest management as recognized by independent forest management certification agency.

Fasteners and Adhesives

All adhesives are to be those with the lowest possible VOC content below 50g/l, contain no formaldehyde and which meet requirements of the manufacturer of the products involved or adhered.

Door and Frame Finishes

Must be water-borne polyurethane that contains no formaldehyde. Total VOCs should be below 200g/L.

Gypsum Board Systems

Must utilize 100% recycled paper and must include the maximum recycled recycled content available. All metal studs shall be manufactured from metals with a minimum of 30% recycled content.

Paint

Product must not contain formaldehyde, aqueous ammonia, crystalline silica, or ethylene glycol. Total VOC must be below 1 g/L.

Project Partners

The EPA Region 10 Green Futures Group gratefully acknowledges the valuable input and support of the organizations listed below. While building a sustainable space, the project has also built sustainable working relationships among project partners, including:

Partner Web site or E-mail	Phone
Business and Industry Recycling Venture www.seattlechamber.com/BIRV	206-389-7304
Certified Forest Products Council www.certifiedwood.org	503-590-6600
Lighting Design Lab www.northwestlighting.com	206-325-9711
Milliken Carpet www.millikencarpet.com	800-241-4826
Paladino Consulting tomp@palcon.com	206-522-7600
SMED International www.smednet.com	206-405-4254
Steelcase Design Partnership www.steelcase.com	206-326-5545
Steelcase Wood Furniture www.steelcase.com	800-227-2960
Stieg Design stiegdes@wolfenet.com	206-624-2313
Turner Construction www.turnerconstruction.com	206-505-6700

This document includes references to specific products and companies that assisted EPA with this project. These references are included to provide additional detail and do not constitute endorsement or recommendation for use. This document was printed using recycled paper and soy inks.

Cover Photo: The Regional Administrator's Suite. A mountain scene in the etched glass reflects EPA's environmental mission.