CHAPTER 1

why be sustainable?

Photo courtesy of Mithun Architects. Architect: Mithun

There is no greater potential for personal expression than building one's own shelter. For this reason alone, every effort should be made to enable new home construction to be sustainable for generations to come. Today, we realize that to be truly sustainable, it is not enough to imagine methods of minimizing damage to the environment; instead the results must have a net positive impact on it.

—DENNIS WEDLICK, AIA

The answer to the question why, as residential designers, we should be sustainable is simple: There is only one planet Earth that sustains all life, and if we destroy its ability to do so, we will no longer have life on our planet. Numerous speeches have been made and publications written by credible sources who, over the past decades, have been leading the market transformation in the building industry. This book will share knowledge and provide motivation from a different perspective, specifically that of the residential interior design community.

Through our experiences and the information that we have gathered and organized, we will demonstrate to residential design professionals that it is absolutely possible to build a home that is beautiful, pleasing, functional, healthy, affordable, *and* life-sustaining. The time is now to become a catalyst for change within the residential design community and to accelerate the integrated practice of sustainable residential design.

Designers have much to teach the world. Of all people, designers understand that there is never only one right way to design anything. Searching for new solutions, creatively adapting what we know into what we need and solving problems are what designers do. Perhaps, then, we as designers need to expand our vision to include sustainability and start showing ordinary people how to look at the world from a green design point of view.

—DANIEL QUINN, *ISHMAEL*

Interior designers are resourceful beings; they are information-gathering, solution-seeking, innovative creatures—ideal characteristics for promoting the change to sustainability. Our profession as a whole is a natural for revolutionizing the industry by transforming environments. It is, after all, what we do daily. By focusing our creative energy and adopting sustainable design, we become positive instruments of change. If we have clear intentions, coupled with the belief that each positive action makes a difference, our contribution to a healthy planet will be assured.

Before us lies a remarkable opportunity to connect with where we are and where we have been and to be mindful about where we're going. Creating healthy, life-enhancing design is an invigorating prospect. Is it challenging? Absolutely! But it is the right thing to do.

As we set out to meet this challenge, it is instructive to ask why everything that is considered good for us is termed an "alternative"—alternative health care, alternative medicine, alternative food. Sustainable design should no longer be considered an alternative; it is, simply, the responsible way to conduct good business. It benefits us all to work together toward better solutions that "respect all of the children of all of the species, for all times," to quote renowned architect William McDonough, principal and founder of William McDonough + Partners and MBDC.

Sustainability is transforming the building industry, and expertise in sustainable design is becoming highly regarded and regularly sought after on projects. Clients, architects, and contractors value the knowledge and skills that we bring to the table as part of the professional services team. As designers, we can offer the team numerous possibilities for creating eco-friendly homes. The finishes in a home can exemplify environmental responsibility, as well as reflect the inherent beauty of design. By combining materials in a unique and environmentally responsible way, we have a rich opportunity to make a difference on projects.

As interior designers and architects we have the power to create, a gift and a unique responsibility for sustaining life on the planet. The methods that we employ, often beyond the realm of other professions, compel us to practice sustainable design. By doing so, we are, as defined by the Brundtland Commission in 1987, "meeting the needs of the present without compromising the ability of future generations to meet their own needs."

Countless options are available that enable us, as design professionals, and those we work with to make a significant difference. Green building practices, coupled with emerging technologies, are changing our industry, hence the buildings that we live and work in. By making conscious decisions to utilize principles and practices that sustain our natural resources, we can actively support the continuation of a healthier life on our planet for those who follow.

As we all were taught, for every action there is an equal reaction, and for every choice we make there is a consequence. As designers, we can play a major role in accelerating change in our industry by gathering information, learning new strategies, attending conferences, questioning the status quo, sharing information, and aligning with like-minded individuals, project teams, and clients.

Market transformation begins with individuals who integrate sustainability into the core of their interior design process, one step at a time, one material at a time, one project at a time, and one question at a time. We can and do make a difference. (See the sidebar on Ray Anderson, page 7).

What Are "Green Buildings"?

The American Society for Testing and Materials (ASTM) describes green buildings as structures that are designed, constructed, renovated, operated, and reused in an environmentally and energy-efficient manner. Green buildings, including green residences, exhibit a high level of environmental, economic, and engineering performance including:

- Energy efficiency and conservation
- Indoor environmental quality
- Resource and materials efficiency
- Occupant health and productivity
- Transportation efficiency
- Improved environmental quality including air, water, land, limited resources, and ecosystems

The U.S. Green Building Council states that the built environment is growing globally at a rate that is three times faster than the growth rate of the population. Buildings have a major impact on the environment as a whole, in that they:

- Consume between 30 to 40 percent of *all* energy used.
- Add 30 to 40 percent of *all* emissions into the atmosphere.
- Use up to 30 percent of *all* raw materials.

In addition, statistics show that the United States, though it comprises less than 6 percent of the world's population, consumes 25 percent of the world's energy, and its citizens own 32 percent of the world's automobiles. Our ecological footprint is enormous

compared to that of other countries. If everyone in the world were to have access to the standard of living that we enjoy in this country, we would need four Earths to support us!

Buildings account for nearly half of the global output of the greenhouse gas carbon dioxide, as well as half of the output of sulfur dioxide and nitrogen oxide, both agents of acid rain. We must, therefore, recognize that the building industry shares the responsibility for environmental disasters related to energy production, such as oil spills, nuclear waste, the destruction of rivers by hydroelectric dams, the runoff from coal mining, the mercury emissions from burning coal—the list goes on and on.

This is motivation enough to rethink the way that we practice design. By designing and adapting the places where we live in an ecologically responsive style, we can contribute to the well-being of our planet and its limited natural resources. To encourage, inform, and assist you in navigating through it all, we have assembled some of the most compelling reasons to be sustainable in the key areas where residential interior designers can actively improve the current state of the industry and the planet—before it is too late and the damage to the planet and its ecosystems become permanent.

- Environmental stewardship and the improved environmental quality of the planet, including air, water, and land, protecting limited resources and ecosystems
- Personal responsibility to do good business equals a successful business
- Good design, supported by the Council for Interior Design Accreditation and the American Institute of Architects (AIA)
- Natural resource and materials conservation, minimizing the use of nonrenewable natural resources and building with low-impact materials
- Improved indoor air and environmental quality
- Energy efficiency, lower energy consumption, and promotion of renewable energy sources
- Water efficiency and conservation
- Waste reduction and management
- Optimized operational and maintenance practices
- A healthy planet for future generations

ENVIRONMENTAL STEWARDSHIP

For the children and the flowers are my sisters and my brothers, come and stand beside me, we can find a better way.

—JOHN DENVER, CO-FOUNDER, WINDSTAR

Nature is the precious source of life. As such, living in and engaging with nature should be treated as a privilege. All Earth's citizens must develop a broader perspective and become stewards of our planet. If we do not, the results promise to be disastrous. The evidence is mounting, for example, that we are headed toward the dire consequences of global warming. We would be foolish to wait for a calamity, such as disappearing coastlines, to take action.

How Did the Ecology Movement Begin?

Over 100 years ago, John Muir wrote to the editor of *Century Magazine,* "Let us do something to make the mountains glad." So they founded the Sierra Club, the first major organization in the world dedicated to using and "preserving" wild nature. It is from this act that the modern ecology movement was born.

Throughout his life, Muir was concerned with the protection of nature both for the spiritual advancement of humans and, as he said so often, for nature itself. This dual vision still informs the ecology movement and inspires millions to reform their thoughts and minds and to orient themselves as part of nature. Though the arguments in favor of ecological thinking are often couched in scientific terms, the basic impetus remains as Muir stated it: "When we try to pick out anything by itself, we find it hitched to everything in the universe" (www.ecotopia.org/ehof/muir/index.html).

How Did the Environmental Movement Begin?

When, in 1962, Rachael Carson wrote the book *Silent Spring,* the public at large became aware that nature was vulnerable to human intervention. In it, she made a radical proposal: that, at times, technological progress is so fundamentally at odds with natural processes that it must be curtailed. Prior to the book's publication, conservation had never before raised much broad public interest, for until then few people had worried about the disappearing wilderness. But the threats Carson outlined—the contamination of the food chain, cancer, genetic damage, extinction of entire species—were too frightening to ignore. For the first time, the need to regulate industry in order to protect the environment became widely accepted, and environmentalism was born.

Carson was well aware of the larger implications of her work. Appearing on a CBS documentary about *Silent Spring* shortly before her death from breast cancer in 1964, she remarked, "Man's attitude toward nature is today critically important simply because we have now acquired a fateful power to alter and destroy nature. But man is a part of nature, and his war against nature is inevitably a war against himself . . . [We are] challenged as mankind has never been challenged before to prove our maturity and our mastery, not of nature, but of ourselves."

The message of *Silent Spring,* one of the landmark books of the twentieth century, continues to resonate loudly today, more than four decades after its publication. Equally inspiring is the example of Rachel Carson herself. Against overwhelming difficulties and adversity, and motivated by her unabashed love of nature, she rose like a gladiator to its defense. (Reprinted with permission from the Natural Resources Defense Council)

The more clearly we can focus our attention on the wonders and realities of the universe about us, the less taste we shall have for destruction.

—RACHEL CARSON (© 1954 REPRINTED WITH PERMISSION FROM THE NATURAL RESOURCES DEFENSE COUNCIL, WWW.NRDC.ORG/HEALTH/PESTICIDES/HCARSON.ASP)

What Is Environmental Stewardship?

How does it relate to sustainable design? Sustainability is a concept with many definitions that vary across national borders and over time, but most agree that at its center is the advancement of societies in a way that balances the social, economic, and environmental needs of current and future generations. Here are two examples:

- The Office of the Federal Environmental Executive (www.ofee.gov/sustain/sustainability.htm#sustain) definition of sustainable environmental stewardship

includes those concepts, strategies, tools, practices, and approaches that lead to environmental improvement in a manner that is sustainable over time; that considers the long-term effects as well as the shorter-term, more immediate effects; and that contributes positively, even if indirectly, to the social and economic condition.

- The Energy Alternative (www.theenergyalternative.com/glossary.html) defines environmental stewardship as the "wisest use of both finite and reusable energy resources to produce the most work guided by a principle of causing the least known harm to the environment and driven by a desire to aid in the restoration of a healthier environment."

PERSONAL RESPONSIBILITY

Never doubt that a small group of thoughtful committed people can change the world: indeed it's the only thing that ever has!

—MARGARET MEAD

As interior designers, we must make a personal commitment to become environmental champions. The most important factor for achieving success is the human element, and a person who makes things happen and gets things done can make a significant difference in the world.

Change occurs by the actions we take and the choices we make. We can be change agents who set an example by demonstrating environmental responsibility through our work and business practices. We, collectively, have the power to drive change within our industry. By specifying interior finishes that include recycled content, selecting woods that are responsibly harvested, and ensuring that the materials that we specify do not contribute to out-gassing and exacerbate human health problems, we can reshape our industry's traditions at the same time we accelerate acceptance and implementation of environmental principles and practices. As environmental champions, we can accept the challenge to be innovative risk takers, and push the boundaries of the status quo. We may experience an occasional setback, but if we continue to challenge the industry we can help to raise it to the next level of environmental performance.

By seeking reliable information and surrounding ourselves with like-minded people, we nurture our environmental aspirations. But first we need to recognize how directly our actions as residential interior designers affect the environment, either positively or negatively. Then we must acquire the skills we will need to move forward, one step at a time, to further develop our expertise as well as our personal commitment to improving the environment.

On a personal level, identify what inspires you to "take on" environmental issues and to make change happen. Then, with proactive leadership, and in respectful cooperation and with enthusiastic energy, be tenacious in your personal pursuit to sustain the environment. Influence others through your involvement with professional organizations such as the American Society of Interior Designers (ASID), the International Interior Design Association (IIDA), the American Institute of Architects (AIA), the AIA Committee on the Environment (AIA COTE), Architects, Designers, and Planners for Social Responsibility (ADPSR), and the U.S. Green Building Council (USGBC). As part of the whole, always greater than the sum of its parts, you will serve to integrate environ-

Environmental Champion: Ray Anderson

One of the greatest examples of an environmental champion in the interior design industry is Ray Anderson, who made a strong personal commitment and, as a result, made great strides in changing the floor-covering industry. In 1994, as CEO of Interface, the world's largest commercial floor-coverings producer, Anderson was invited to give a keynote address to Interface's newly formed environmental task force. He was reluctant to accept because he didn't have an environmental vision beyond obeying the law. Then he happened to receive a book, Paul Hawkens' *The Ecology of Commerce* (1994). Anderson recalled, "I read it, and it changed my life. It hit me right between the eyes. It was an epiphany. I wasn't halfway through it before I had the vision I was looking for . . . and a powerful sense of urgency to do something." After this chance introduction to environmental issues, Anderson embarked on a mission to make Interface a sustainable corporation by leading a worldwide war on waste and by pioneering the processes of sustainable development within his company and beyond.

mental consciousness at all levels, both personally and professionally. Make a very personal decision to take moral responsibility for what you do as a designer of the built environment, and then put that commitment into action on all projects.

GOOD DESIGN

Good design and sustainable design are one and the same, synonymous with each other. Integrating sustainable design principles and practices is creative and rewarding, opening doors to vast possibilities for personal expression and personal growth for the designer, the client, and the project team.

—ADAPTED FROM DENNIS WEDLICK, AIA, DENNIS WEDLICK ARCHITECT, LLC

As conscientious creatures, by habit and training, we accept responsibility for creative design solutions in each interior circumstance. Along with this, our professional organizations provide codes of ethics that specify our responsibilities as designers with regard to function, safety, codes, and aesthetics. We are required to find solutions to design questions and to prepare drawings and specifications that illustrate how we intend to implement these solutions. But until recently, the subject of sustainability had not yet been fully addressed within the field of interior design. This is now changing.

Effective January 1, 2006, the board of directors for the Council for Interior Design Accreditation (formerly FIDER) adopted revisions to its professional standards. All interior design programs undergoing its accreditation process in 2006 and in the future will be reviewed under these revised standards. This will have immediate and far-reaching effects for interior design education and professional practice.

These revisions focus primarily on strengthened expectations for student learning in sustainability and communication. The new standards maintain that every student who graduates from a Council for Interior Design Accreditation school must demonstrate his or her understanding of the principles and theories of sustainability.

These standards are supported by the AIA. In December 2005, the AIA board of directors adopted position statements to promote sustainable design and resource conservation. To achieve, by the year 2010, a minimum reduction of 50 percent of the current consumption level of fossil fuels used to construct and operate buildings, and to reduce that amount an additional 10 percent in each of the following five years, which would result in a 70 percent reduction from current levels by 2015. To accomplish this goal, the AIA will collaborate with other national and international organizations, the scientific research community, and the public health community. As part of this initia-

Council for Interior Design Accreditation Standards Pertaining to Sustainability

Standard 2: Professional Values

The program leads students to develop the attitudes, traits, and the values of professional responsibility, accountability, and effectiveness.

The program *must* provide learning experiences that address:

- *Environmental ethics* and the role of *sustainability* in the practice of interior design . . .
- A *global perspective* and approach to thinking and problem solving (viewing design with awareness and respect for cultural and social differences of people; understanding issues that affect the *sustainability* of the planet; understanding the implications of conducting the practice of design within a world market).

Standard 3: Design Fundamentals

Students have a foundation in the fundamentals of art and design; theories of design, *green design,* and human behavior; and discipline-related history.

- Students work *must* demonstrate understanding of principles and theories of *sustainability.*

Standard 6: Building Systems and Interior Materials

Students design within the context of building systems. Students use appropriate materials and products.

- Students *must* demonstrate understanding of the concept of *sustainable building* methods and materials.

Standard 7: Regulations

Students apply the laws, codes, regulations, standards, and practices that protect the health, safety, and welfare of the public.

- Students *must* demonstrate understanding of the impact on health and welfare of . . . *indoor air quality* . . . noise . . . lighting.

These educational standards will substantially raise the bar of knowledge, credibility, and responsibility regarding protection of the environment within the interior design community.

tive, the AIA will also develop and promote the integration of sustainability into the curriculum for the education of architects and architecture students, so that this core principle becomes a guide for current and future architects (www.aia.org).

The AIA recognizes a growing body of evidence that demonstrates current planning, design, construction, and real estate practices contribute to patterns of resource consumption that seriously jeopardize the future of the Earth's population. Architects will now accept responsibility for their role in creating the built environment and, consequently, alter the actions of the profession. By encouraging our clients and the design and construction industries to join with us, we can change the course of the planet's future. This is great news for the entire built community!

The AIA's goals, itemized in the table on page 8, are to alter the current practices of design and construction to achieve significant reductions in the use of natural resources, nonrenewable energy sources, and waste production, and promote regeneration of natural resources. The association acknowledges that this will require a multiple-year effort, one that must be undertaken in conjunction with clients, industry partners (that's us), and other concerned organizations.

Through ingenuity, drive, and commitment, we can make sustainability and design ideal partners. Coupled with the undivided support of the higher educational system, the accelerated adoption and implementation of sustainable interior design are absolutely certain. (See table, "High-Performance Building Position Statements," page 11)

LOW-IMPACT BUILDING MATERIALS

Mountain men left no physical trace of their lives upon the western landscape—they moved so lightly upon the world that only the land and the river remain a witness to those shining times.

—1838 RENDEZVOUS ASSOCIATION

The AIA is now requiring the reduced use of nonrenewable natural resources through the reuse of existing structures and materials, reductions in construction waste, promotion of recycled content materials, and use of materials independently certified as from sustainable sources. This strong stance will change how every building is created from this moment forward and, because we work so closely with architects, it will likewise change the approach we take to projects.

Conventional building practices consume large quantities of wood, stone, metal, and other natural resources that unnecessarily lead to their depletion. Wood, for example, one of the most frequently used building materials, is often inefficiently utilized on projects. Reports indicate that we have already harvested 95 percent of this nation's old-growth forests. Plainly, this practice cannot go on.

According to the Worldwatch Institute and the USGBC, buildings have a significant measurable impact on the environment.

- As much as 10 percent of the global economy is dedicated to buildings, their construction, operation, and the equipping of these homes and offices.
- Buildings account for 40 percent of the materials entering the global economy each year. Three billion tons of raw materials are turned into foundations, walls, pipes, and building finishes.

- Buildings consume enormous resources: one-sixth of the world's freshwater withdrawals, one-quarter of the world's wood harvest, and two-fifths of the world's material and energy flows.
- Residential construction represents roughly half of all construction activity in the building industry, as measured in dollars spent.
- There are nearly 2 million new housing units built each year, approximately 80 percent of which are single-family homes.
- It takes 1-1/4 acres of forest to construct the average U.S. home.

Products specified for the design and construction of homes consume resources and energy, and produce air and water pollution and solid waste during manufacturing. The availability of some raw materials, such as granite and marble, is declining and, therefore, prices for some of these products are rising faster than inflation. Following installation, these products also require maintenance and periodic replacement; and when the building is demolished, these products and materials are usually disposed of in landfills.

The point is that resource efficiency must now become common practice. Building materials that minimize the use of natural resources and that are durable or reusable contribute to sustainable building practices. Consider the following overarching criteria when selecting and specifying materials.

Reduced Resource Quantity

A fundamental strategy for resource-efficient building is to build less square footage and use smaller quantities of materials in the construction process. The most cost-effective conservation strategy is to buy fewer products, and use the products more efficiently.

Reused Materials

Many durable products such as doors, cabinets, and other easily removed millwork, and some architectural metals and glass, can be readily salvaged and reused. This practice has typically been limited to restoration work, but deconstruction is becoming more common in building and renovation projects. Salvaging does require extra time and effort, but the quality of materials—such as old-growth hardwood flooring—and the cost savings can be considerable. The additional labor cost is often entirely or partially offset by savings on new materials, transportation, and landfill-tipping fees.

Recycled Content

Using recycled content products keeps materials out of the waste stream. Although many building products are now available with a high content of recycled materials, there is confusion about the definition of the term. There are at least three types of recycled content materials:

- *Postconsumer material,* generated by commercial, industrial, and institutional facilities or households, which can no longer be used for its intended purpose, such as paper.

High-Performance Building Position Statements

Sustainable Architectural Practice Explanation

The AIA recognizes a growing body of evidence that demonstrates current planning, design, construction, and real estate practices contribute to patterns of resource consumption that seriously jeopardize the future of the Earth's population. Architects need to accept responsibility for their role in creating the built environment and, consequently, believe we must alter our profession's actions and encourage our clients and the entire design and construction industry to join with us to change the course of the planet's future. Altering current practices of design and construction to realize significant reductions in the use of natural resources, nonrenewable energy sources, and waste production, and promote regeneration of natural resources will require a multiple-year effort in conjunction with clients, industry partners, and concerned organizations. To achieve these changes, the AIA will act through all its Board Committees, Knowledge Communities, Task Forces, Working Groups, and related activities to:

1. Promote sustainable design, including resource conservation to achieve a minimum 50 percent reduction from the current level of consumption of fossil fuels used to construct and operate new and renovated buildings by the year 2010, and promote further reductions of remaining fossil fuel consumption by 10 percent or more in each of the following five years;
2. Collaborate with other national and international organizations, the scientific research community, public health community, and industry leaders engaged in issues related to sustainable/restorative design to facilitate the dialogue, share knowledge, and accelerate the rate of change for all those seeking to improve the industry's current practices and utilize integrated approaches to achieve a sustainable future;
3. Develop and promote the integration of sustainability into the curricula for education of architects and architectural students to enhance their design skills;
4. Develop standards for the architectural profession that incorporate greater sustainability into design, education, management, and licensure standards, and provide resources to assist integrating these standards into the daily practices of all architects;
5. Promote documentation of the measurable contributions resulting from implemented sustainable design and construction approaches to the health of humankind and the planet to promote the value and achievements of increased use of sustainable design;
6. Promote research by industry, scientific, and governmental entities to provide the design and construction industry with full life-cycle assessment data for all products and assemblies used in the construction of the built environment at every scale in order to facilitate decision making and communicate benefits to all;
7. Promote the AIA's building performance design targets to local, state, and national governments;
8. Communicate possible beneficial economics of environmentally responsible design to both public and private sector clients; and
9. Assume a global role as advocates for sustainable design, freely sharing knowledge and actively promoting sustainable practice throughout the world.

Source: American Institute of Architects, Washington, DC; www.aia.org.

- *Recovered industrial process waste* that cannot be reused in the same process, such as slag from metal and mineral smelting.
- *Materials that are internally recycled* within a manufacturing plant, such as scraps from trimming and rejected or substandard product.

Renewability and Use of Sustainable Management Practices

Renewable materials include wood, plant fibers, wool, and other resources that are potentially replaceable within a limited time period (a few decades or less) after harvesting. Information on wood harvested through sustainable management practices is becoming more readily available, including certification programs and standards such as the Forest Stewardship Council (FSC).

Life-Cycle Cost

Over the useful life of a building, which could be 100 years or more, most materials will require maintenance and replacement more than once. When the full range of costs is considered, materials that are more costly upon initial purchase may be justified in terms of "avoided future costs." The higher initial cost may be justified if the product compares favorably with others over their entire life cycle.

Regionally Appropriate Materials

Some types of construction and materials are more appropriate in one region than another, due to climatic differences. It is well known, for example, that utilizing thermal mass in building design has important energy and comfort benefits in the Southwest, where daily temperature swings can be extreme. In a hot, humid climate, like that of the Southeast, lightweight construction and high ceilings may be more beneficial.

Local Content

Specifying products made with local materials and labor can contribute to lower embodied energy consumption, eliminating or reducing transportation costs.

Resource Recovery and Recycling

Once a material has completed its initial service in a home, it potentially has additional use as a resource that can later be recovered and recycled. The potential recyclability of metal, plastic, glass, wood, and masonry are as follows:

- Metals are recyclable if they can be separated by type. Steel and aluminum building elements, particularly, have a high recycling value. Approximately 50 to 70 percent of the energy and pollution from steel production can be avoided by current recycling technology. Up to 85 percent of the energy and pollution from aluminum manufacturing can be avoided by remelting.
- Most plastics are recyclable, but the current rates of recycling are not high because the wide variety of plastics in use makes them difficult to separate. Some plastics, such as pure polyvinyl chloride (PVC), would be recycled from buildings

more often if they were designed for easy removal. Additives, coatings, and colorants make recycling difficult.

- Glass products are recyclable if separated and uncontaminated; however, little recycling of glass building products now occurs. Recycled glass products are made with consumer container glass salvaged from the waste stream. Although remelting glass offers only marginal energy and pollution reduction, it saves on virgin materials.
- Heavy timber is recyclable by salvaging and resawing. Engineered structural wood products, wood panels, and millwork are candidates for salvage and reuse, particularly if they are fastened in such a way that they can be more easily removed.
- Concrete, clay, ceramics, and other masonry products are examples of materials that are usually difficult to salvage and reuse. Some recycling of these products occurs by crushing them for use as granular fill in road and sidewalk bases.
- Furniture, area rugs, and artwork fall into the category of resource recovery and recycling. Most quality casework pieces, although a substantial up-front investment, become collectibles as decades pass.

Ecologically minded design requires that we consider the environmental impact of a product. By conserving natural resources, we will begin the rebuilding and restoration of our natural capital—the natural resources and ecological systems that provide vital life-support services to our planet.

INDOOR AIR QUALITY

A nation that destroys its soils destroys itself. Forests are the lungs of our land, purifying the air and giving fresh strength to our people.

—FRANKLIN ROOSEVELT

Healthy interiors are organic by nature. They feel good, live well, look great, and are sustaining for all. We are all part of the integrated system called "nature," and more than any other species, what we do affects the health and longevity of life on the planet.

According to the American Lung Association, August 1999, air pollution contributes to lung disease, including respiratory tract infections, asthma, and lung cancer. Poor indoor air quality can cause or contribute to the development of chronic respiratory diseases, as well as cause headaches, dry eyes, nasal congestion, nausea, and fatigue. Some of the most common indoor air pollutants in our homes are asbestos, biological contaminants, chemicals, combustion, formaldehyde, lead, ozone, particulates, pesticides, radon, tobacco smoke, and volatile organic compounds (VOCs).
(*Source:* Minnesota Indoor Air Quality Consortium, University of Minnesota www.dehs.umn.edu)

In our efforts to build energy-efficient homes that are tightly constructed, we have inadvertently created indoor air problems due to poor ventilation and the use of toxic materials and finishes. Exacerbating the situation, statistics indicate that we now spend 90 percent or more of our time indoors, further heightening our concern over indoor air quality. The consequence of polluted indoor environments is an overall deterioration in health and well-being. The United States Environmental Protection Agency (EPA) reports that the air in new homes can be 10 times more polluted than outdoor air; and the World Health Organization (WHO) reports that as many as 30 percent of our buildings exhibit signs of what is referred to as sick building syndrome (SBS). According to the New England Journal of Medicine, 40 percent of children will develop respiratory disease, in part due to the chemicals in their homes. Poor indoor air quality (IAQ) is caused by the offgassing of chemicals found in many building materials, as well as mold and mildew that build up in poorly designed and maintained heating and cooling systems.

In light of these facts, there can be no question that the choices we make in designing homes and materials we use have a long-term effect on the indoor environment. Interior designers can, simply, contribute positively to making a safer, healthier environment. Good indoor air quality, then, must be an important environmental consideration throughout the design process. As designers, we have the responsibility to improve the air quality of the homes we design.

Fortunately, good IAQ is a top priority for clients, once they understand that a home that provides a healthy environment for their family is an attainable goal. Delivering an indoor environment that will not cause headaches, watery eyes, or raspy throats, and that ensures children with allergies and asthma can breathe a little easier, is paramount to good design. By paying close attention to the products that we specify, we can produce a healthy environment that supports good air quality.

In addition to IAQ, we must also consider indoor environmental quality (IEQ), which also has a significant impact on the health, comfort, and productivity of a home's

Common Factors That Affect IAQ

- People (exhalation, body odors, diseases)
- Human activities (work such as cleaning; using correction fluids, carbonless paper, pest control products; and personal activities such as wearing fragrances and smoking)
- Technology (photocopiers and laser printers)
- Furnishings (furniture, draperies, floor coverings)
- Finishes (paint, varnish, vinyl wall coverings)
- Building materials (caulking compounds, adhesives, wood laminates)
- Outdoor air quality
- Inadequate or contaminated air-handling units
- Inadequate cleaning practices

(*Source:* Carpet & Rug Institute, www.carpet-rug.org)

inhabitants. Among the attributes of IEQ, a sustainable building should maximize daylighting; provide appropriate ventilation and moisture control to minimize the opportunity for microbial growth; avoid the use of materials with high-VOC emissions; and provide adequate fresh air supply.

One of the most common indoor pollutants is formaldehyde, a common VOC and a probable human carcinogen (per WHO). When combined with urea, an organic compound, it becomes a toxic emitter of VOCs at room temperature. Common culprits include kitchen cabinets, countertops, shelving, and furniture, all typically constructed from particleboard held together by formaldehyde-based adhesives. The formaldehyde continues to be released into the home for years after these products have been installed, and it is known that these emissions have a damaging effect on human health. These emissions are also easily absorbed by soft materials, including carpets and fabrics, reemitting toxic VOCs at a later time, thereby prolonging their exposure.

Paints, finishes, solvents, and adhesives also contain unhealthy VOCs. What is commonly called a "new house smell" is caused by the off-gassing of these volatile compounds, and a good indication that harmful chemicals are present in the indoor environment. Children are at a greater risk than adults, as their bodies and minds are still developing, hence more susceptible to damage from these chemicals.

Potentially harmful substances come from every room in the home, including, but not limited to, finishes and furnishings, household cleaning agents, personal toiletries, paints, solvents, pesticides, and herbicides, all products that we use every day.

Fortunately, the building products industry is rising to the challenge of improving indoor air pollution by developing alternative adhesives, paints, and finishes. One alternative to traditional particleboard (made with urea formaldehyde resin) is a medium-density fiberboard (MDF) that uses a formaldehyde-free resin. MDF is typically made with wood sawdust or with straw, recyclables now finding a niche market.

As an overall course of action, we designers must practice "cautious prevention" when dealing with chemicals in building materials. It is known that many of these chemicals range from extremely to somewhat unhealthy and, when combined, can create a veritable "chemical soup." From an economical point of view, it is far easier—and less costly—to prevent indoor contamination from the outset. This means including strategies for good IAQ within the design and construction process, which will also serve to reduce the need for mitigation (cleanup), and lower the risk of potential liability issues. (See table, "Understanding IAQ," pages 16–18)

By designing responsibly—following a set of guidelines for good indoor air quality and using low-emission materials and pollutant source control—we can deliver healthy, clean, nontoxic homes.

CONSERVATION OF ENERGY AND WATER

Energy

I believe that the average guy in the street will give up a great deal, if he really understands the cost of not giving it up. In fact, we may find that, while we're drastically cutting our energy consumption, we're actually raising our standard of living.

—DAVID R. BROWER

Understanding IAQ

Indoor Air Quality Sources

The quality of indoor air results from the interaction of many complex factors, each contributing different effects. With potentially hundreds of different contaminants present in indoor air, identifying indoor air quality (IAQ) problems and developing solutions is difficult. The ways in which these factors contribute to IAQ are summarized as follows:

Construction Materials, Furnishings, and Equipment

These items may emit odor, particles, and volatile organic compounds (VOCs), and absorb and desorb VOCs. Individual VOCs from a specific material may combine with VOCs from other materials to form new chemicals. VOCs and particulates can cause health problems for occupants upon inhalation or exposure. In the presence of adequate heat and moisture, some materials provide nutrients that support the growth of molds and bacteria, which produce microbial volatile organic compounds (MVOCs).

These organisms can affect occupants adversely if fungal spores containing mycotoxins and allergens or the MVOCs are inhaled. A great deal of research remains to be done to identify individual metabolic gases, their odors, the microbes that produce them, and the human response to molds and fungi.

Building Envelope

The envelope controls the infiltration of outside air and moisture, and may include operable or inoperable windows.

Ventilation Systems

Acoustical materials in heating, ventilating, and air conditioning (HVAC) systems may contribute to indoor air pollution in the same way as construction materials, mentioned above. Ventilation systems also control the distribution, quantity, temperature, and humidity of air.

Maintenance

Lack of maintenance allows dirt, dust, mold, odors, and particles to increase. The use of high-VOC cleaning agents pollutes air.

Occupants

The number of occupants and the amount of equipment contribute to indoor air pollution. People and pets are major sources of microorganisms and airborne allergens in indoor environments. Occupant activities also can pollute the air.

Electric and Magnetic Fields (EMF)

The possible health effects of electric and magnetic fields generated by power lines and electric appliances are not well understood at this time. There is considerable debate regarding possible health effects of these sources. More research is required.

Understanding IAQ *(Continued)*

Health and Indoor Air Quality Issues

Poor indoor air quality can cause human illness. Health problems that can result from poor indoor air quality may be short term to long term, and range from minor irritations to life-threatening illnesses. They are classified as follows.

Sick Building Syndrome (SBS)

SBS describes a collection of symptoms experienced by building occupants that are generally short term and may disappear after the individuals leave the building. The most common symptoms are sore throat, fatigue, lethargy, dizziness, lack of concentration, respiratory irritation, headaches, eye irritation, sinus congestion, dryness of the skin (face or hands), and other cold, influenza, and allergy-type symptoms.

Building-Related Illnesses (BRI)

BRIs are more serious than SBS conditions and are clinically verifiable diseases that can be attributed to a specific source or pollutant within a building. Examples include cancer and Legionnaires' disease.

Multiple Chemical Sensitivities (MCS)

More research is needed to fully understand these complex illnesses. The initial symptoms of MCS are generally acquired during an identifiable exposure to specific VOCs. While these symptoms may be observed to affect more than one body organ system, they can recur and disappear in response to exposure to the stimuli (VOCs). Exposure to low levels of chemicals of diverse structural classes can produce symptoms. However, no standard test of the organ system function explaining the symptoms is currently available.

Typical Indoor Air Pollutants

Poor indoor air quality is caused by outdoor and indoor sources of gaseous and particulate air pollutants that exceed the capacity of the building's ventilation and filtration equipment to dilute or remove them to an acceptable level. Although many pollutants originate outdoors or from occupant activities, equipment, and processes, other pollutants are generated from materials.

The various types of indoor air pollutants are:

- Volatile organic compounds (VOCs) emitted by interior materials and their components
- VOCs emitted by cleaning and maintenance products periodically used with those materials
- Fiber shed from textiles, insulation, and panel products
- Soil, biological materials (e.g., fungi and bacteria), and gases released by biological activity
- Dust and other particulates from spraying, sanding, or finishing

These material-based pollutants may affect the health and productivity of building occupants, maintenance personnel, and construction tradespeople.

Understanding IAQ *(Continued)*

Emission Levels

Review emission levels from building products at the following stages:

- *Installation.* Exposure among tradespeople and building occupants during construction or renovation. Information on potential hazards during the installation period is documented in manufacturers' material safety data sheets (MSDSes). These sheets are a requirement by law for any material that may have health risks; however, they typically do not disclose a full list of contents. Additional information is available from the Occupational Safety and Health Administration (OSHA).
- *Building occupancy.* To prevent exposure of building occupants to emissions from materials during building use. Information on risks of occupant exposures (typically those risks extending more than a few weeks after construction) is difficult to determine, because emissions data are difficult to obtain or unavailable from manufacturers. This information will become more available in the next few years as standards are developed for accurately measuring and interpreting such data.
- *Maintenance and removal.* To prevent exposure of building occupants and tradespeople during maintenance procedures and removal or demolition. Maintenance and removal risks are reasonably well known for many conventional materials.

Consider these additional materials issues and effects:

- *Sink effect.* Rough and porous materials may contain microscopic planes and cavities that can absorb airborne molecules. These molecules, which may be pollutants, can be released ("desorbed") from the material after several hours or days. This "sink" effect of materials can be quite significant when pollutant molecules are absorbed. Hard, smooth, and nonporous surfaces typically have a low sink effect.
- *Moisture and temperature.* Moisture and heat in materials increase their deterioration and increase emissions of pollutants. Moisture also supports microbial growth.
- *Soiling and cleaning.* Improper cleaning practices may disturb soil and introduce exposure to chemicals in cleaning products. Soft floor coverings such as carpet are susceptible to this improper practice. Nonporous flooring with minimal seams and low-maintenance coatings are less prone to this occurrence.
- *Natural materials.* There is a common perception that "natural materials" are better environmental choices and less of a health risk than man-made "synthetic materials." Toxicity and emissions testing of products should help clarify which is the better choice with regard to health risk; however, predicting all potential health effects is not always possible.

Source: U.S. Environmental Protection Agency, www.epa.gov.

The United States, home to only 6 percent of the world's population, consumes 25 percent of the world's energy and generates 25 percent of global warming pollution—six times that of the automobile. In 1990, American households consumed $110 billion worth of energy alone. The United States is also the largest contributor to CO_2 emissions and, therefore, to global warming.

As members of the construction and design industry, we residential interior designers also have a serious responsibility to promote change in the key areas of high-efficiency appliances and lighting.

AIA: Press Release: January 2006

"Buildings account for 48 percent of U.S. energy consumption and generate far more greenhouse gas emissions than any other sector," said R. K. Stewart, FAIA, facilitator of the AIA Sustainability Summit Task Force. "As architects, we must accept responsibility for our role in creating the built environment. We feel it is incumbent upon the architecture profession to alter our actions and encourage both our clients and the entire design and construction industry to join us in plotting a course of measurable changes that will improve the quality of life for everyone." (Go to www.aia.org for more information.)

The goal of reducing fossil fuel use by 50 percent was inspired, in part, by recent work by Santa Fe, New Mexico, architect Ed Mazria, AIA, who modified some standard assumptions made in analyzing U.S. energy use by (economic) sector. Including the energy embodied in building materials and some other adjustments, Mazria found that the share of energy use attributable to buildings grows dramatically, from 27 percent to nearly 50 percent. Mazria argues that, to avoid a global catastrophe, it is necessary to cut global fossil fuel use immediately by 50 percent, and to reduce emissions much further by 2030. Other actions on the list include collaborating with other organizations to integrate sustainability into architecture curricula, documenting the contributions to humankind and the planet from sustainable design practices, and advocating globally for sustainable design. (Go to www.architecture2030.org for more information.)

Energy efficiency is one of the cornerstones of any green building project and, for residential designers, high-efficiency appliances and lighting are primary areas to focus on. Generation and use of energy are major contributors to air pollution and global climate change. With the world's supply of fossil fuel dwindling, concerns for energy security increasing, and the impact of greenhouse gases on world climate rising, it is essential to find ways to reduce loads, increase efficiency, and utilize renewable energy.

We can begin by targeting energy savings when specifying appliances for clients. Many manufacturers have made tremendous strides in increasing the energy efficiency of their appliances, aided by the U.S. Department of Energy (DOE) minimum efficiency standards, the federal ENERGY STAR program, and efforts of the Consortium for Energy Efficiency (CEE). These energy-efficient choices can save families approximately a third on their energy bills, while reducing greenhouse gas emissions by a third, as well. Most importantly, we must always meet or exceed ENERGY STAR requirements when

specifying appliances; and when selecting appliances, look for products that are high energy- and water-conserving, durable and easy to maintain, designed for disassembly, and that carry long-term warranties.

When addressing the lighting program within a project, we must specify lamps and lighting controls that will make a difference in the energy loads and operating budget. There are basically three options that meet the needs of residential lighting: incandescent, fluorescent, and halogen. Ideally, we should work to replace incandescent bulbs with compact fluorescents (CFLs). This will initially cost more, but these lamps will last 8 to 10 times longer and save up to 50 to 80 percent in energy costs.

It's also important to engage with and challenge the client and project team in a discussion regarding alternative energy sources. Consider wind power, geothermal and photovoltaic, with a goal of zero-energy usage. This will be a valuable contribution to the project's discussions and goal. That said, there are different definitions of zero energy. The Net-Zero-Energy Home Coalition, a multistakeholder group in Canada, comprising corporations and nonprofit organizations, defines a zero-energy home as follows:

> A net-zero-energy home at a minimum supplies to the grid an annual output of electricity that is equal to the amount of power purchased from the grid. In many cases the entire energy consumption (heating, cooling, and electrical) of a net-zero-energy home can be provided by renewable energy sources.

Water

For many of us, water simply flows from a faucet, and we think little about it beyond this point of contact. We have lost a sense of respect for the wild river, for the complex workings of a wetland, for the intricate web of life that water supports.
—SANDRA POSTEL, *LAST OASIS: FACING WATER SCARCITY* (2003)

In many parts of this country and around the globe, freshwater has become a limited resource. Current studies indicate that the building industry consumes one-sixth of the world's freshwater supply, per the USGBC and Worldwatch Institute. A sustainable building aims to reduce, to control, or to treat site runoff; use water efficiently; and reuse or recycle water for on-site use whenever feasible.

How much water is used in a typical home? Per the New York City Department of Environmental Protection:

- National average indoor residential water use per day per person is 60 to 70 gallons.
- Fifty to 75 percent of all residential water use occurs in the bathroom.
- The average faucet uses 0.5 to 5 gallons per minute.
- Faucet aerators reduce flow by 1 gallon per minute.
- Standard showerheads use 4 to 7 gallons per minute.
- Low-flow showerheads use 2.5 gallons per minute (or less).
- A dishwasher uses 5 to 15 gallons per load.

To protect and conserve water, designers can begin by recommending the following:

- Low-flow or flow reducers on faucets and showerheads
- Ultra-low or dual flush toilets
- ENERGY STAR laundry appliances and dishwashers
- Chlorine filters on showerheads
- Water filtration units on faucets
- Hot water on-demand systems

The convenience of plumbing fixtures has led to the largest use of water in a typical family home. Therefore, specifying water-conserving plumbing fixtures and fittings is our responsibility. In addition, retrofitting most devices in older buildings is cost-effective and supports water efficiency by reducing water usage and wastewater; these devices will pay for themselves within one to three years from date of installation.

In homes, bathrooms offer the greatest opportunity for water savings. There is no disputing the fact that toilets are the biggest water guzzlers within a household. Per a report from *Environmental Building News* (EBN), January 2004, nearly all flushed water in North America starts as clean, drinkable water. The American Water Works Association (AWWA) Research Foundation examined water use in approximately 1,200 homes in 14 North American cities and found that an average household uses approximately 146,000 gallons of water annually, 42 percent indoors and 58 percent outdoors. In households where water-conserving plumbing fixtures have not been installed, toilets use an average of 20.1 gallons of water per day, or 26.7 percent of total indoor water use. In homes with water-conserving fixtures, toilets use an average of 9.6 gallons per day, or 19.3 percent of the total—though plumbing leaks account for another 10 to 14 percent of water use, and much of that is due to toilets.

Another water-saving device from the world of plumbing is the hot water on-demand system. Running cold water down the drain while waiting for hot water to reach the faucet wastes more than 10,000 gallons each year in an average American household. These hot water on-demand systems rapidly distribute hot water to the faucet while cold water is pumped back to the water heater. A pump attaches easily under the sink, and its heat sensor shuts off the unit when the water is hot.

It is paramount to protect and preserve water. Fortunately, this is now easy to do, as new products are regularly coming onto the market with continued quality improvement. By reducing the gallons per flush (GPF) and gallons per minute (GPM), we can help to achieve dramatic reductions in water use, meaning that less of our clean, clear water will be going down the drain in vain.

WASTE REDUCTION AND MANAGEMENT

The packaging for a microwavable "microwave" dinner is programmed for a shelf life of maybe six months, a cook time of two minutes, and a landfill deadtime of centuries.

—DAVID WANN, *BUZZWORM,* NOVEMBER 1990

A green building includes waste reduction and management from the inception of a project through its completion. The best waste reduction strategy embraces the three Rs: reduce, reuse, and recycle. This is accomplished by incorporating a comprehensive green building approach that includes resource conservation, material reuse, construction and demolition debris recovery, as well as the use of recycled content materials. This strategy is vital to reducing pressure on landfills; saves money by reducing landfill-tipping fees; provides raw materials for future building products; helps the environment; and enhances the economic bottom line.

Instead of defining success as getting the most materials, we need to move to a new standard: getting the most from them. Recycling 60 percent of U.S. solid waste would save the energy equivalent to 315 million barrels of oil each year.

—WORLDWATCH INSTITUTE, SEPTEMBER 1994

Those in the building industry need to be strongly challenged to incorporate waste reduction and recycling specification language into their projects. To drive the point home, consider these facts: In the United States alone, 32 truckloads of waste are created for every truckload of goods produced. And 90 percent of *everything* made in this country ends up in a landfill within one year. Relative to our industry, nationwide, approximately 4 billion pounds of carpet are sent to the landfill each year. More than 136 million tons of construction and demolition debris, per the EPA, are generated each year. We are in a runaway, throwaway society that is leaving its mark on the Earth for future generations, who will have to clean up after their predecessors.

At a minimum, we must address these materials in the project waste management plan. A measurable goal can be tracked by identifying the types and quantities of materials estimated to be generated at the job site: target recycling of at least 50 percent of the construction and/or demolition debris, and contact local recycling facilities and haulers to identify terms and conditions required for recycling these materials.

Many cities have adopted regulations supporting construction waste management. A stellar example is the City of Chicago, which has adopted new regulations aimed at reducing the amount of construction and demolition (C&D) waste sent to landfills. All contractors are required to recycle at least 25 percent, by weight, of all C&D waste in the city in 2006, according to Chicago's Department of Streets and Sanitation. In 2007, the required recycling rate will double to 50 percent. Look into your projects' local ordinances to see what is available and/or required for construction and waste demolition.

Additionally, we can donate unused materials from the job site. Salvaged materials, such as leftover wood, windows, doors, and other uninstalled items, are ideal for posting on Web sites, donating to organizations such as Habitat for Humanity, local art programs, and design or architecture schools.

C&D debris occupies a large percentage of our landfill space. The continued steady growth of building activities has been cited as a major reason why landfill volumes have been increasing, despite expanding recycling efforts. One example of this is in Alameda County, California, where citizens recycle a high percentage of their waste, yet more than 355,000 tons of construction and demolition materials are still unnecessarily disposed of in county landfills annually.

Landfills are expensive to build and no one wants one "in their backyard." The more we reduce waste, the less need we have for building new landfills. Knowing that waste reduction on the job site ultimately helps the bottom line, a business that practices source reduction and reuse and/or recycling can help reduce expenses. By working with the contractor to develop a waste management plan and developing resources to assist in the diversion of C&D materials, we support environmental stewardship.

OPERATION AND MAINTENANCE

The practice of sustainable design does not end when construction is complete and the homeowners move in. Once the owner occupies the home, it is crucial to ensure that it operates according to design intent. Prior planning, recommended cleaning products, and long-term system maintenance guidelines all determine how well a home will perform over its useful life. Incorporating operating and maintenance considerations into the design of a home greatly contributes to healthy and safe living environments, quality of life, and reduced use of energy and other resources.

To that end, specify materials and systems that are cost-effective and require less maintenance—less water, energy, toxic chemicals, and cleaners to maintain. Providing guidelines that address all aspects of maintaining a home over the course of its useful life will help maintain a well-designed building.

A Pilot Study by Yale and Columbia Universities Ranks the United States 28th in Environmental Performance

The 2006 Environmental Performance Index ranked countries based on 16 indicators related to environmental health, air quality, water resources, productive natural resources, biodiversity, habitat, and sustainable energy. New Zealand scored first among all countries, earning 88 out of 100 possible points. Sweden, Finland, the Czech Republic, the United Kingdom, and Austria also scored 85 points or higher. The United States scored 78.5 points, coming in behind most of Western Europe, Canada, Malaysia, Japan, Costa Rica, Colombia, Australia, Taiwan, and Chile. (The full report is available online at www.yale.edu/epi.)

FOR FUTURE GENERATIONS

We do not inherit the earth from our ancestors; we borrow it from our children.
—NAVAJO PROVERB

I do not believe that the process of human life on this globe has degenerated to a point of no return. I do believe, however, that we are fast approaching that point and we must redirect and correct our course in life to ensure health and a good life for the seventh generation coming. This legacy is passed down not to ensure the present, but to guarantee the future. Thinking of future generations is an enormous responsibility that requires vision.
—CHIEF OREN LYONS, AUGUST 1997

Protecting the environment and preserving the planet for future generations is, without doubt, one of the primary benefits of aligning ourselves with the key areas of

sustainability. Many definitions exist concerning sustainability and what we will pass on to our children's children:

- The ability to provide for the needs of the world's current population without damaging the ability of future generations to provide for themselves. When a process is sustainable, it can be carried out over and over without negative environmental effects or impossibly high costs to anyone involved (www.sustainabletable.org).
- To keep in existence, maintain; meeting the needs of future generations. . . . The ability to provide a healthy, satisfying and just life for all people on earth, now and for generations to come while enhancing the health of ecosystems and the ability of other species to survive in their natural environments (www.earthethics.com).
- Seven-generation sustainability is the tenet that all decisions should be made with consideration for the effect they will have on the next seven generations to follow us (http://en.wikipedia.org).

There are common threads to these definitions. Sustainability requires meeting environmental, economic, and community needs simultaneously. All three are essential to ensure that quality of life continues for living systems and future generations.

What if we, as residential interior designers, embraced the message from Catherine Ryan Hyde in her book *Pay It Forward* (1999)? It is an idea and an action plan within a work of fiction. But does it have to be fiction?

In the book, Reuben St. Clair, the teacher-protagonist, starts a movement with this voluntary, extra-credit assignment: Think of an idea for world change, and put it into action.

Trevor, the 12-year-old hero, thinks of quite an idea. He describes it to his mother and teacher this way: "You see, I do something real good for three people. And then when they ask how they can pay it back, I say they have to Pay It Forward. To three more people. Each. So nine people get helped. Then those people have to do twenty-seven." He turned on the calculator, punched in a few numbers. "Then it sort of spreads out, see. To eighty-one. Then two hundred forty-three. Then seven hundred twenty-nine. Then two thousand, one hundred eighty-seven. See how big it gets?"

This idea, this concept, could create enormous momentum in healing the planet and creating a change in the market. If each of us designers implemented three great things for the environment on each of our projects and then asked project team members to "Pay it forward," the exponential growth would truly be extraordinary!

Conclusion

As we take sustainability seriously to heart, we can be inspired over and over by William McDonough's design challenge:

> We need a new design assignment and we need a new design. In order to do this we need to ask new questions. "How do we love all the children, of all species, for all time?" Please notice that I am not just saying our children; I am saying all of the children. And notice I am not just saying our species, I am saying all species. And notice I am not just saying now, I am saying for all time. When we integrate this question into our designs, wonderful and beautiful things begin to happen.

RESOURCES

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"Shades of Green," Anita Baltimore, FASID, *Interiors & Sources Magazine,* April 2005
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