

**LEED®**

**Setting a Higher Standard for Retail  
Facility Design & Operation**

July 2009



**EMERSON™**  
Climate Technologies

# Overview

## Objective

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This white paper is intended to educate retail building owners and operators about LEED® and sustainable building design principles, as well as the value of these principles in terms of overall building cost and operation. It also introduces several programs similar to LEED that are used around the world.

Emerson Climate Technologies has long understood the value of energy savings to retailers. Its Retail Solutions division is dedicated to developing new methodologies and technologies that enable small and large retailers to reduce energy consumption, minimize maintenance costs, improve asset management, and stay compliant with all relevant legal codes and statutes. Emerson’s consulting engineering expertise in designing efficient buildings; energy management systems; commissioning services; remote monitoring; and energy efficient building components drives sustainability throughout the retail market.

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## Executive summary

### Greening the future

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With growing concern about global warming and rising energy prices affecting the retail industry, high-performance buildings and sustainable development are becoming increasingly important to businesses around the globe. To achieve this, buildings must be optimized both in terms of performance and materials. A holistic approach to design and development is required to achieve a reduction in the environmental footprint of a development.

LEED provides this much-needed holistic approach. It promotes a whole-building approach to sustainability through the principles of green building and integrated building design. There is a conscious effort to systematically integrate the design of building systems, such as HVAC, refrigeration, lighting, water management, and other mechanical systems with the building design itself, so as to achieve higher levels of performance.

This paper describes the need for integrated building design and the importance of its application in the retail industry. It also explains how the retail industry is embracing the current trend towards more sustainable and environmentally-friendly construction that enhances occupant comfort while reducing environmental impact.

### Greening for retail

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Growing environmental awareness and the economic impact of energy savings on operational profit have helped spur the adoption of sustainability concepts in the retail sector. The trend towards green design has also been influenced by demands for healthier work environments and concerns about poor indoor air quality or “sick building syndrome.”

Other factors driving the commitment of retail companies are improved brand equity, changing consumer expectations, and employee retention. Such concerns are of special relevance to retail store owners, since they understand that providing a more pleasant retail environment can influence employee retention as well as improve worker health and productivity. These values are being realized through efficiency in the design and construction stages.

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# Green building, sustainability and integrated building design and their relevance to retail

## What is green building?

Because of the energy and environmental impacts, it is critical that the building industry develops in a way that is environmentally sustainable over the long term. Green building is a powerful methodology that can be used to achieve this goal.

The building industry has become a major economic driver. In China alone, it is one of the biggest sectors of the economy, contributing more than 16% to its GDP in 2005. At the same time, growth in the building industry is causing a major impact on energy consumption and natural resources.

In the United States, buildings account for:

- 72% of electricity consumption
- 39% of energy use
- 38% of all carbon dioxide (CO<sub>2</sub>) emissions
- 40% of raw materials use
- 30% of waste output (136 million tons annually)
- 14% of potable water consumption.<sup>1</sup>

Green building is the practice of increasing the efficiency with which buildings use resources — energy, water, and materials — while reducing building impacts on human health and the environment during the building's lifecycle. This is achieved through better site selection, building orientation, design, construction, operation, and maintenance.<sup>2</sup>

An effective model for green building will not only benefit the bottom line, but will also address environmental issues, such as global warming, water scarcity and depletion of natural resources. Hence, effective green building can lead to:

- Reduced operating costs through a decrease in energy and water consumption
- Better public and occupant health due to improved indoor air quality
- Reduced environmental impacts by lessening storm water runoff and heat island effect, as well as other environmental concerns

## Green building trend

The green building trend is picking up remarkable momentum on both the commercial and residential fronts. In fact, the growth of green building is not only being fueled by demand, as more owners become convinced of the benefits of green buildings, but also by mandates. The U.S. Green Building Council (USGBC) — a non-profit organization that promotes sustainability through building design, construction, and operation, notes that as of February 1, 2008, Leadership in Energy and Environmental Design (LEED) initiatives including legislation, executive orders, resolutions, ordinances, policies and incentives were found in 75 cities, 23 federal agencies, 10 public school jurisdictions and 36 institutions of higher education across the United States.

## Driving sustainability

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Despite its growing popularity, the concept of sustainability is only recently becoming understood. A key point here is that it is useless to promote green building practices if the drive towards sustainable development is poorly understood or not appreciated.

According to the United Nations Bruntland Commission Report:<sup>3</sup>

*“Sustainable development is development which meets the needs of the present without compromising the ability of future generations to meet their own needs.”*

When applied to human impact on the environment, the above definition will most likely pertain to a facility whose operation will be on a long-term basis, yet its presence and operation will not adversely affect the natural environment that is necessary to support future human activities. Hence, it would simply mean that to drive sustainability, a building that is to be constructed, currently in operation, or is in disposal should not consume non-renewable energy and materials unless they can be easily and harmlessly extracted, used, and returned to nature. Bio-diversity or bio-mass should be employed. Damage to the natural habitat should be avoided, and releasing pollutants of a type or quantity that cannot be harmlessly broken down by natural systems should be limited.

It can be very difficult to meet these criteria. In order to do so, many aspects of human activity must be changed, including the ways materials are produced and processed. Regardless of the challenges, green building and sustainability is forging ahead. Hundreds of successful case studies exist for all types of buildings — both new and existing buildings including retail stores. Likewise, LEED can improve the current standards related to green building and sustainability by defining thresholds of performance in relation to sustainable sites, water efficiency, energy and atmosphere, indoor environmental quality, and material resources. The core mission of LEED is to encourage and accelerate global adoption of sustainable green building practices through the development and implementation of universally understood and accepted standards, tools, and performance criteria.

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## Integrated building design

Integrated building design is a process that includes integrating green building strategies into conventional design criteria for building form, function, performance, and cost. The goal is to achieve high performance and multiple benefits at a lower cost than the total for all the components combined. It is during this phase when many of the building's systems are identified and when complimentary technologies are used to reduce overall energy consumption that will impact the building throughout its operational life.

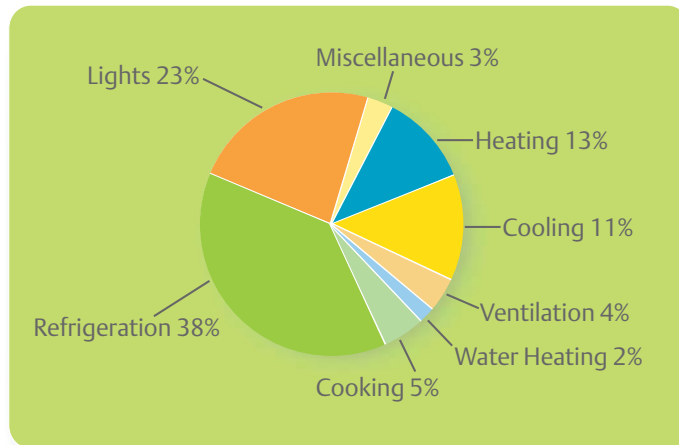
Generally, a building's largest points of energy consumption are located inside the structure. It is therefore important to pursue the integration of these systems into a high-performance building design. However, the complexity of such a design has to consider the end-user's needs and expectations as well.

In retail, store owners have specialized needs that differ from those of corporate buildings. Supermarkets, for example, require higher utilization of refrigeration systems to preserve and safeguard food products. The way in which these systems operate has an impact on the energy bill. In retail buildings that do not use refrigeration, such as apparel or department stores, air-conditioning and lighting accounts for a larger part of the overall energy consumption.

As shown in Figure 1, refrigeration and lighting represents the heaviest areas of demand in retail buildings, particularly in grocery and convenience stores. If not carefully engineered and maintained, commercial refrigeration systems can have an impact on the building's operational costs.

Figure 1

### Typical energy consumption outlay<sup>4</sup>



To reduce energy bills, energy consumption must be controlled. But how can it be possible to unify so many diverse and complex components into one cohesive system? While decisions made throughout a building's useful life influence the impact it can have on the environment, the critical time to employ green building principles is during the design process. Integrated building design is an important tool for significant energy efficiency and cost savings to retail operators and developers.

## Stewardship in the state and local public sector

### Adoption of green building standards

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Since the inception of green building practices and sustainability, the private sector has responded positively, often establishing green design standards for others to follow. In the United States, federal, state, county, and municipal governments have begun to incorporate green building into construction standards. Together with a proactive federal government, they are starting to transform conventional practices in the building industry into an approach that reduces the environmental impact of construction-related activities, while producing meaningful savings to the taxpayer.<sup>5</sup>

States including New York, Washington, and Oregon have adopted green building requirements, and Maryland has officially adopted the LEED system for all new state construction and renovations larger than 7,500 square feet. California, on the other hand, adopted a new building code aimed at improving energy efficiency and water consumption in all new construction projects across the state. With this, the California Building Standards Commission said the new building code would reduce the carbon footprint of every new structure in the state.

Local governments, headed by mayors and governors, are supporting the green building and sustainable development movement through ordinances and executive orders that pledge their influence to encourage building green. They have begun to incorporate the concepts of green building and sustainability into their public works programs. These initiatives can be voluntary or compulsory, while others offer building owners and developers attractive financial incentives such as tax credits programs.

- The city of Chicago, Illinois, for example, created a Chicago Standard, which was announced on June 10, 2004. This revised set of construction standards guides the design, construction, and renovation of all city buildings to conserve energy and reduce operating costs by achieving LEED certification.
  - A number of towns in Massachusetts have implemented or are developing policies that include specific goals relating to sustainable energy technology. In particular, the Green Building Task Force is leading Boston's efforts to establish sustainable design and high-performance construction as a norm. It includes representatives from a wide range of building and development interests, community groups, and municipal departments. In November 2004, the city mayor announced that the LEED Silver standard will represent the goal for all city-owned buildings, and that applicable codes and standards will be modified to require that city-supported developments and large projects built within the city's borders meet green building standards.
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## Asia and Europe

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In Asia and Europe, there is an ongoing trend towards implementation of energy-efficient building initiatives. Both private and public sectors have created various initiatives to promote green building practices and drive sustainability. Europe and Scandinavia are far more advanced in LEED standards than North America. Countries in Asia are adopting stricter guidelines and requirements for building energy efficiency, including sophisticated energy policies.

To encourage everyone to implement green building practices and sustainability, governments in Asia and Europe have created several financial incentives such as grants, subsidies, tax rebates, product rebates, and loans. These are now being implemented in Japan, Singapore, Korea, and Hong Kong.

In Europe, the European Union's main goal is to transform itself into a low-carbon, high energy-efficiency economy. Governments across the world have introduced measures to limit emissions of carbon dioxide and other greenhouse gases (GHG). With this, the European Parliament has mandated all building owners submit an official estimate of their carbon footprint or the total set of greenhouse gas emissions. Once the size of a carbon footprint is known, a strategy can be devised to reduce it.

As for LEED, it is expected that LEED-NC 3.0 will include a requirement for a carbon footprint and a significant reduction of greenhouse gases beyond a baseline level.

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## Integrating green building into design

### Why refrigeration design?

Preservation of food products using modern refrigeration techniques is an accepted method in developed countries and is mandated in most regions. The way in which the refrigeration system is operated can have a big impact on the energy bill.

In some businesses, particularly in the food service segment, refrigeration is the largest single energy load ; about 38% of the energy consumed is for refrigeration. To reduce energy bills, energy consumption must be controlled. But how do you control energy consumption?

Understanding cold distribution in refrigeration systems enables energy savings. However, it takes more than simply learning how to simulate flow and heat transfers within the system. Several studies show that poor design is a primary cause of increased energy consumption. Inefficient refrigeration designs can lead to a number of problems which can directly affect energy consumption: pressure drop from improper valve/pipe sizing, undetected open doors, inefficient cold distribution and other system flaws.

### Why HVAC design?

Excellence in air-conditioning goes far deeper than simply providing the capacity to keep an interior environment comfortable through all seasons. It must be extraordinarily precise, responding quickly to changing load demands while minimizing power usage.

The key considerations for efficiency in HVAC system designs are:

1. Optimized engineering for the right amount of cooling capacity, considering:
  - Infiltration
  - Building shell
  - Building envelope
  - Outdoor ambient conditions
  - Occupancy
  - Fresh air requirements
  - Gains from lighting
  - Gains/losses from equipment
2. The effect of refrigeration, if any (as in the case of supermarkets), on the cooling system
3. Proper selection of sub-system components
  - Fans
  - Compressors
  - Variable frequency drives or VFDs

Another important factor for HVAC design in building spaces is humidity. When a refrigerated display case operates in the supermarket environment, it exchanges heat and moisture with this environment. The moisture exchange between the display case and the store environment is the most troublesome because it causes the energy requirements for maintaining a satisfactory temperature within the display case to be high, detracts from the aesthetic display of refrigerated products, and deters the proper protection of the product.

Humidity control in supermarkets is necessary. Operating a supermarket's refrigerated cases, for example, at reduced store humidity levels can generate significant kWh savings. Hence, it is important to come up with an efficient, high performance HVAC design that will help maintain lower relative humidity in order to save more energy.

### Lighting design considerations

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Lighting efficiency is another essential factor in developing high-performance buildings. Like HVAC, several elements drive its impact on building operations:

1. Quality of lighting
2. Aesthetics
3. Energy efficiency
4. Maintenance
5. Life cycle cost
6. Capital cost
7. Sustainability

Through the concept of daylight harvesting and dimming, lighting controls help retail operators achieve sustainable development through energy savings, greater flexibility, and improved worker satisfaction. Daylight harvesting refers to the controlled admission of natural light into the space with the intent of limiting or eliminating the need for electrical lighting. It occurs when a light-level sensor measures an area's illumination, communicating with a controller that adjusts the lighting output to maintain a desired light level. Daylighting, if done correctly, introduces far less heat into the building than conventional lighting (see Figure 2).

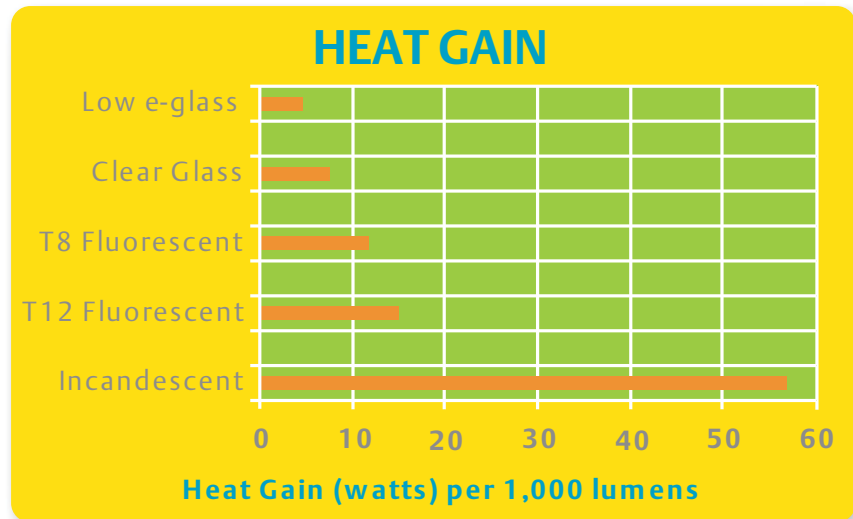
Combining results from time schedules, light-level sensors, and override buttons, controllers can easily determine when lights need to be on and when lights can be off for maximum savings. With advanced lighting designs, utilization of available daylight can also enable energy savings — approximately 50% in existing buildings and 35% in new construction. Moreover, peak-demand charges may also be reduced, according to the New Buildings Institute, a nonprofit organization that works with national, regional, state and utility groups to promote improved energy performance.

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## Heat gain

The need to incorporate natural light into building design has become a balancing act for designers and industry partners. Daylight harvesting must be designed in such a way that challenges like glare and solar heat gain can be managed.

Figure 2



Based on ENERGY STAR® studies, retailers can gain several benefits by incorporating daylight harvesting into the building design, including enhanced public image, increased profitability, reduced energy usage, and greater customer retention.<sup>6</sup>

**Regulatory instruments and policies around the world**

The concept of sustainability covers a broad spectrum of systems and approaches to building design, construction, and operation. Buildings that utilize green building principles, such as water conservation or energy efficiency, cannot automatically be classified as green buildings. It is therefore understandable that there should be a system that can scientifically measure every claim of a green building through an objective tool or method. This method should be able to measure the building’s adherence to a rigorous and systematic best practices that are transparent, public, and globally-accepted; and when achieved, may be used to lay claim to a clear and recognizable benchmark.

Many countries have developed their own standards of energy efficiency for buildings. In recent years, different countries have developed concepts and rating systems related to green building. Some of these rating systems and their corresponding characteristics are summarized in Table 1.

*Table 1*

Green Building Rating Systems	Country	Characteristics
National Australian Built Environment Rating System (NABERS)	Australia	<ul style="list-style-type: none"> <li>• Puts information into context using a 5-star scale, across poor performance, average, and market-leading performance</li> </ul>
Green Mark	Singapore	<ul style="list-style-type: none"> <li>• Buildings are required to have triennial assessment to ensure that the Green Mark building continues to be well-maintained</li> </ul>
LEED	Global	<ul style="list-style-type: none"> <li>• Most recognized program</li> <li>• Prescribed elements with varying degrees of implementation</li> <li>• Up to the building owner/operator to determine level of certification they want to attain</li> <li>• Certification is optional but building owner/operators can still take advantage of prescriptive measures</li> <li>• Design standards developed for the retail market</li> </ul>
Green Globes	Global	<ul style="list-style-type: none"> <li>• Delivers an online protocol, rating system, and guidance for green building design, operation and management</li> </ul>
BREEAM	UK, Netherlands	<ul style="list-style-type: none"> <li>• Encourages effective building operation by requiring best practice commissioning; policies implemented at top level management; effective, used and maintained operating manuals; and operational environmental management system</li> </ul>

## LEED green building rating system

### LEED - Leadership in Energy and Environmental Design

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In 1993, following the formation of the United States Green Building Council (USGBC), the membership quickly realized that a priority for the sustainable building industry was to have a system to define and measure green buildings. To establish minimum criteria and methods by which sustainable developments can be measured, the USGBC developed the Leadership in Energy and Environmental Design (LEED) Green Building Rating System. Today, LEED is an internationally recognized benchmark for the design, construction, and operation of high-performance green buildings.

The LEED Green Building Rating System is a voluntary, consensus-based,<sup>7</sup> market-driven building rating system based on existing proven technology. It defines and promotes green designs, and rewards organizations that adopt some or all of its principles towards green or integrated building design. LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: sustainable sites, water efficiency, energy and atmosphere, materials and resources, and indoor environmental quality.

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## LEED for retailers

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Retail facilities have unique concerns, compared to other building types. Display lighting, for example, may cause greater energy consumption in department stores. Retail projects have a broader spectrum – supermarkets, boutique establishments, and restaurants, etc. – where energy consuming systems are at the heart of operations.

Considering these various types of buildings in the retail industry, the USGBC has created a program designed to address the specific needs of retail facilities. The USGBC and several project teams collaborated to create two rating systems for retail operators to use:

1. LEED for Retail - New Construction (NC) for new and newly renovated standalone buildings
2. LEED for Retail - Commercial Interiors (CI) for retail spaces in shopping centers, malls, or other adjoined spaces

LEED for Retail developed application guidelines for these two new rating systems. In contrast with the existing LEED Green Building Rating System, LEED for Retail-NC and LEED for Retail-CI credits were slightly modified and defined more clearly to suit the needs of retail spaces. For instance, along with the original green design categories required to attain LEED certification, other factors that are clearly required for the retail market were considered:

- Process loads – the use of equipment with high energy consumption such as refrigeration units, lighting power, daylight controls, and kitchen equipment. The retail industry provides a unique, yet challenging, opportunity for energy conservation due to its large process loads.
  - Waste stream audit – for collection and storage of recyclables
  - Furniture defined for retail – made from recycled materials or from 95-100% renewable materials
  - Regularly occupied spaces defined for retail – minimize the number of enclosed spaces and incorporate windows
  - Parking issues were addressed – designated preferred parking spots for low-emitting and/or fuel-efficient vehicles
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## LEED portfolio program

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Most retail operators have a large number of the same building prototype. They also have limited capital and human resources.

In order to support the improvement and sustainability of their entire portfolio as quickly and efficiently as possible, “the USGBC developed the Portfolio Program, which enables companies and building owners to integrate LEED into their new and existing building projects using a cost-effective, streamlined certification process.”<sup>8</sup>

The main goal of this program is to find ways to make it easier and more cost-effective for companies to improve the performance of their entire building portfolio, while demonstrating environmental and social responsibility, and streamlining the LEED Green Building certification process in a way that more efficiently supports that goal.

New construction, especially in terms of volume building in industries such as retail, also offers an important opportunity for improving the speed and scale of green buildings. This is especially true of the certification process surrounding multiple iterations of the same design.

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## What is a LEED credit?

The LEED certification program offers property owners a very clear connection between increasing energy efficiency and cost savings. Boosting the efficiency of existing buildings creates a large return on investment, especially when deployed across a chain of properties.

There are many benefits to LEED certification; however, the key underlying theme is savings associated with:

- Lower operating costs and increased asset value
- Reduced waste sent to landfills
- Conservation of energy and water
- A healthier and safer work area for employees
- Reduction in harmful greenhouse gas emissions
- Attractive tax rebates, zoning allowances and other incentives in hundreds of cities
- Demonstrated commitment to environmental stewardship and social responsibility
- LEED reduces technical and administrative uncertainties because of the holistic process
- Often required by local codes and building standards
- LEED already has tremendous momentum. The growing number of public-private partnerships with federal, state and local governments enhances LEED's credibility

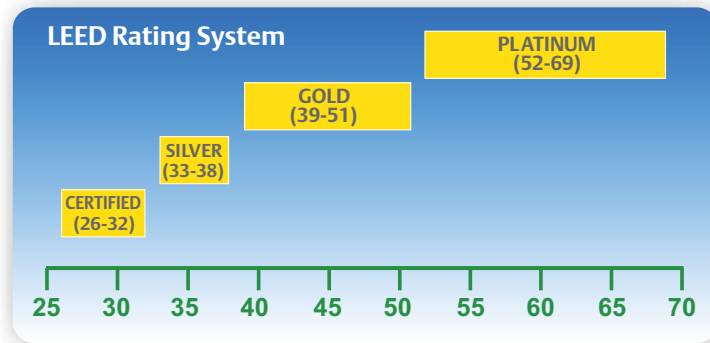
LEED works so well because it is intuitive to understand. LEED is divided into six categories related to siting, water conservation, energy, materials, indoor environmental quality, and innovation and design. There are 69 possible credit points divided among the six green design categories. Each category contains a specific number of credits; each credit carries one or more possible points (see Table 2).

**Table 2**

LEED Category	Points
Sustainable Site (SS)	14
Water Efficiency (WE)	5
Energy & Atmosphere (EA)	17
Materials & Resources (MR)	13
Indoor Environmental Quality (IEQ)	15
Innovation & Design Process (ID)	5
<b>TOTAL</b>	<b>69</b>

As shown in Figure 3, a project that earns enough points (26) can become LEED certified. Additional points earn higher certification levels, including Silver (33), Gold (39), and Platinum (52 or more). Some categories have prerequisites that must be met or points cannot be earned in that category. Every credit consists of a description of intent, requirements and documentation submittals.

*Figure 3*



## LEED categories

### 1. Sustainable sites

Creating sustainable buildings starts with proper site selection, including consideration of the reuse or rehabilitation of existing buildings. Location, orientation, and landscaping of a building affect the local ecosystems, transportation methods, and energy use.

There are three components of sustainability:

- Socially equitable
- Environmentally sound
- Economically feasible

Through initiatives on green building and sustainable development, natural and man-made systems work together to protect and enhance the ability of the landscapes to regulate climate, provide clean air and water, and improve occupant quality of life.

## 2. Water efficiency

Reducing water consumption and protecting water quality are key objectives of sustainable design. In the United States alone, it is estimated that expenditures for water and sewer run between \$0.5 billion and \$1 billion annually. Fresh water is increasingly becoming a scarce resource. Through green building practices and sustainability, buildings should be able to lessen or manage site-runoff, or recycle water for on-site utilization whenever possible.

Very few structures are designed to make efficient use of available water supplies. As more sources of water become polluted, and aquifers are emptied, water conservation becomes a greater concern. Retailers should plan on using features that save water. These can include installation of ultra-low flow toilets and showers, faucet aerators and high-efficiency showerheads, efficient heating and cooling systems, and use of air-cooled equipment instead of water-cooled.

Another way to conserve water is through gray water systems and/or rainwater harvesting. Gray water refers to all water consumed except water from toilets. Water from baths, showers, washing machines,

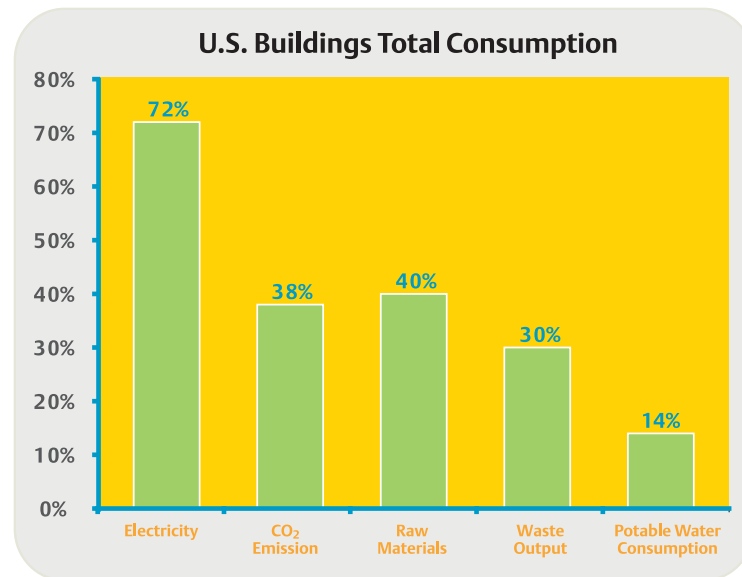
and sinks comprise 50-80% of residential waste water. Gray water can be reused, after on-site water purification and treatment to tertiary standards, for irrigation and other water conservation applications.

Rainwater harvesting is the process of intercepting storm-water runoff and putting it to beneficial use. Normally, rainwater is “harvested” or collected from concrete patios, rooftops, driveways, and other rigid surfaces. Typically, rainwater harvesting is simple. It consists of gutters, downspouts, and storage containers. Directing rainfall to plants located at low points is the simplest rainwater harvesting system.

### 3. Energy & atmosphere

Buildings in the United States account for 39% of total energy consumption, 72% of all electricity consumption, 38% of all carbon dioxide (CO<sub>2</sub>) emissions, 40% of raw materials use, 30% of waste output, and 14% of potable water consumption (see Figure 4). These figures can be alarming since the vast majority are produced from rapidly declining non-renewable, fossil-fuel resources. Therefore, it is important to lower energy consumption and increase efficiency associated with building systems.

Figure 4



To facilitate enhanced energy efficiency, a building's operation must be modeled on a computer before construction begins. It is the key to designing cost-effective envelopes and HVAC systems. It is also an important tool for the study of energy efficiency in buildings. Computer simulation programs are effective analytical tools for building energy research and evaluation of architectural design. However, to create accurate simulations, retail operators need extensive, hands-on experience in the design, implementation, and commissioning of projects.

The commissioning process is a highly effective method to improve the performance of building systems and equipment. The USGBC recognized the effectiveness and benefits that commissioning would provide in green buildings, and decided to include commissioning in the LEED system. Therefore, LEED not only includes building commissioning as a way to earn credit, but also requires it. This is accomplished by splitting the commissioning process into two levels, in the Energy and Atmosphere categories.

#### 4. Materials & resources

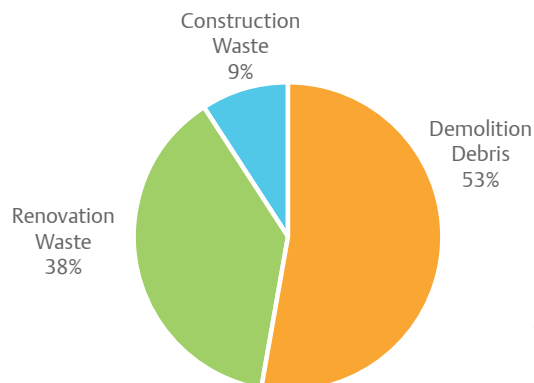
The composition of materials used in a building is a major factor in its environmental impact life-cycle. Environmentally-preferable products, as defined by the United States federal government in Executive Order 13101, are those that have “a lesser or reduced effect on human health and the environment when compared to competing products that serve the same purpose.”

As the growing global economy expands the demand for raw materials, it is no longer sensible to throw away much of what is considered construction waste. Using a cradle-to-cradle approach, waste becomes a raw material, resulting in fewer materials ending up in landfills.

In a 2003 update, the U.S. EPA estimated that 164 million tons of building-related waste is generated annually. 9% is construction waste, 38% is renovation waste, and 53% is demolition debris (see Fig. 5).<sup>9</sup> Construction waste triggers a sequence of adverse effects that are not always evident to building professionals. These include wasted materials and embodied energy, greenhouse gas generation, and environmental stressors associated with producing new materials instead of using existing materials.<sup>10</sup>

Responsibly managing construction waste is an important factor of sustainable building. It must be lessened or used as a raw material.<sup>11</sup> One way to lessen construction waste is to apply the concept of building modeling. Through integrated software, an “intelligent” digital model is created. This process combines data and geometry, including spatial relationships, geographic information, and quantities and properties of building components, in order to generate and manage building data during its life cycle.

**Figure 5**  
**U.S. EPA estimate of waste in landfills (2003)**



source: [www.wbdg.org](http://www.wbdg.org)

## 5. Indoor Environmental Quality (IEQ)

IEQ encompasses Indoor Air Quality (IAQ), which focuses on airborne contaminants, as well as other health, safety, and comfort issues such as aesthetics, potable water surveillance, ergonomics, acoustics, lighting, and electromagnetic frequency levels.

Among other attributes, a sustainable building should maximize daylighting, have appropriate ventilation and moisture control, and avoid the use of materials with high-volatile organic compounds (VOC) or toxic emissions. Additional consideration must now be given to ventilation and filtration to mitigate chemical, biological, and radiological attack.

## 6. Innovation & design process

The USGBC recognizes that design teams may develop innovative solutions and achieve performance above requirements indicated in the LEED Rating System and/or in areas not addressed by the LEED Rating System.<sup>12</sup> Design teams from the engineer or architect may apply for extra points for these innovative design approaches through the innovation and design process to exceed the LEED requirements or, in some instances, double the requirements.

In many cases, there are referenced standards and credit calculation procedures. Credit requirements are accompanied by descriptive information about economic, environmental, and community issues related to the credit.

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### LEED in existing facilities

LEED does not have to be for new buildings only. It could also be applied to an existing facility that is renovated and made more efficient. A remodeled store in an existing location may require a check with local leaders to explore the benefits from remodeling a vacant building, thereby reducing the carbon footprint of the development.

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### Technologies applied to existing facilities & associated ROI

The complexity and individual design selections made for buildings under a LEED program make it virtually impossible to define a single Return On Investment (ROI). However, different building systems that are part of LEED do carry substantial value to the building owner. The following approximations, as shown in Table 3, are given for LEED components in a standard 46,000 square foot supermarket.

**Table 3**

Green Strategy	Annual Savings*
Daylight Harvesting (Skylighting)	\$15,000 - \$20,000
Energy Management System	\$48,000 - \$72,000
Commissioning	\$5,000
Facility Monitoring	\$35,000
Efficient System Components	\$8,000
HVAC System Components	\$8,000

\*Approximate savings in a standard 46,000 square foot supermarket

*Daylight harvesting (skylighting)* – Savings of \$15,000 to \$20,000 when combined with an energy management system to control store lights when available natural lighting is sufficient.

*Energy management systems* – Savings of \$48,000 to \$72,000 a year, or 12-18%, when deployed to optimize HVAC, refrigeration, and store lighting systems.

*Commissioning* - Savings of \$5,000, or 8%, of energy savings can be attained when stores are commissioned after opening. This process returns a store to optimum operating conditions.

*Facility monitoring* – Reduce store operating costs by as much as \$35,000 per year.

*Efficient system components* - Savings of \$8,000 in energy costs through tighter temperature control of refrigerated products via equipment like Copeland® compressors and electronic stepper valves.

*HVAC system components* - Save up to \$8,000 per year in energy costs by operating HVAC fans at less than full capacity via equipment like variable frequency drives.

Other technologies with reasonable ROI are shown in Table 4.<sup>12</sup>

**Table 4**

Technology	Energy Savings	ROI
Lighting	27 - 87%	236%
Daylighting	22 - 60%	185%
Commissioning	2 - 27%	115%
Mixed-mode A/C	47 - 79%	120%
Cool Roofs	2 - 79%	11 - 15%
Underfloor A/C	5 - 34%	115%

## Emerson's role in delivering sustainability for retail

### Retail Solutions

Emerson Climate Technologies Retail Solutions provides a range of services that are tailored for retail customers around the world. Wherever and whatever the challenge, Retail Solutions helps retailers make better decisions and improve their bottom line.

Retail Solutions' products and services are specifically designed with the retail industry in mind. Focusing their expertise on the multiple areas that drive a store's operating performance, Retail Solutions' expertise includes store design, energy management, energy commissioning, integrated store controls, and total facilities management.

### Consulting engineering

Clive Samuels & Associates, Inc., part of Emerson Climate Technologies, is one of the most respected MEP consulting engineering firms in the industry. Combining years of experience with the latest technologies and tools, the firm provides supermarkets, mixed-use developments, commercial, and industrial buildings with customized solutions designed to meet their most difficult operational challenges. The firm's engineering services ranges from conceptual design and energy analysis; to detailed HVAC, electrical, plumbing, and refrigeration systems design.

Clive Samuels & Associates has numerous LEED Accredited Professionals (AP's) on staff in all offices. These professionals are experts in both engineering design and LEED compliance. These unique qualifications enable Clive Samuels & Associates to balance the requirements of a LEED facility with the integration of key technologies to optimize facility performance. LEED Professional Accreditation distinguishes building professionals with the knowledge and skills to successfully steward the LEED certification process. From offices within the United States, India, and the United Kingdom, Clive Samuels & Associates currently provides services throughout North America, Asia, and in Europe.

### Energy management systems

By utilizing Facility Management from Retail Solutions, retailers have everything they need to control and monitor critical equipment and enhance the quality of the products sold to customers.

The system includes of a variety of time-tested capabilities, including:

- **E2 controller** - the heart of the system that communicates via telephone or Ethernet
- **Facility management system panel** - relay boards that switch equipment on or off and receive information from sensors throughout the store
- **Anti-condensate controllers** - installed on glass door reach-ins and walk-in units to control door heaters
- **Sensors** - collects critical system information, such as HVAC temperatures, outside temperature and light levels. These also replace mechanical controls in refrigerated cases and other equipment.

## Commissioning

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Typically, energy savings of eight percent can be attained when stores are commissioned after the operation commences. Retail Solutions' commissioning services investigate a retailer's mechanical systems to determine whether they are operating optimally. Reports help operators understand areas where deficiencies exist and/or systems can be enhanced to deliver additional operational savings.

- **E-Commissioning™** is the process of setting equipment in an existing store to setpoints that save energy while preserving food quality and occupant comfort. Emerson's patented E-Commissioning reduces energy usage in existing stores by optimizing HVAC, refrigeration and lighting systems operation. This service also identifies existing and potential maintenance issues, and makes recommendations to further enhance store performance. Through E-Commissioning, retail owners clearly understand current operating conditions, and gain the necessary knowledge to make the right changes at the right time.
- **N-Commissioning™** is the process of starting up equipment in a new store. Emerson's patented N-Commissioning™ service for new or remodeled facilities carefully inspects mechanical, electrical and plumbing (MEP), refrigeration, and building control systems to make sure they are ready for service. N-Commissioning helps retail owners identify construction issues to make swift, sound decisions and improvements prior to store opening.

With evident importance, LEED requires commissioning of green buildings. Both the prerequisite and the additional commissioning credit are included in the Energy and Atmosphere category simply because commissioning is most commonly associated with energy savings, including the fact that commissioning will also positively impact many of the other LEED categories.

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## Facility monitoring

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ProAct™, Retail Solutions' monitoring and facility management software, is specifically designed to cut energy and maintenance costs, while providing easy access to vital enterprise-wide information. The ProAct® Service Center monitors facility alarms and can dispatch repair technicians to retail stores before employees even notice a problem — potentially saving retail operators thousands in lost product or even lost sales.

ProAct provides many benefits to retailers:

- A customized energy setpoint list for post-commissioning verification, which insures optimal operation
  - A fully integrated energy monitoring and tracking solution to help retailers spot areas of inefficiency
  - Custom responses to building, refrigeration, HVAC and environmental alarm conditions, enabling service providers to respond faster and more accurately
  - Software to collect, analyze and monitor data from equipment and systems, generating electronic notifications to customer or third party service providers. A unique dispatch management system bundles notifications to reduce technician's travel expenses and increase productivity
  - Identification of refrigerant leaks, recommendations, methods of correction, and assistance with code compliance
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## Efficient system components

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### **Copeland® compressors**

Since a compressor is the heart of refrigeration and air-conditioning systems used in retail, proper selection of the model, capacity, and performance criteria is essential to the entire system. The choice of compressor-type is critical to building design. Factors to consider are efficiency, performance, comfort, and reliability.

Copeland Discus® semi-hermetic compressors have long set the standard as the industry's most trusted name for air conditioning and refrigeration. Discus compressors offer the highest levels of energy efficiency and reliability for a broad range of applications.

Copeland Scroll® compressors provide the comfort, efficiency and reliability retailers need to keep their business running. With superior efficiency, proven reliability, quiet operation and ease of installation, Copeland Scroll compressors offer the most advanced scroll technology available to support retailers' needs.

### **Variable Frequency Drives (VFD)**

VFD's allow retailers to control and modulate the speed of motors. By slowing the motors down, based on actual load requirements, energy consumption is reduced. The most practical application of VFD's for retail stores is on the air handling unit motor, whether a retailer has a simple rooftop unit or split system.

For specific equipments and services provided by Emerson Climate Technologies, and their potential contribution to LEED points, please refer to Table 5. These points apply specifically to LEED-NC version 2.2.

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Points for LEED-NC version 2.2

Table 5

SERVICES	EQUIPMENT	APPLICABLE LEED CREDITS									
		EA Prereq 2 Minimum Energy Performance (required)	EA1 Optimized Energy Performance (1-10 points)	EA 4 Enhanced Refrigeration Management (1 point)	EA5 Measurement & Verification	EQ1 Air Monitoring (1 point)	EQ 3.2 Air Quality (1 point)	EQ 7.1 Thermal Comfort Design (1 point)	EQ 7.1 Thermal Comfort Verification (1 point)	ID 1 Innovation (4 points)	SS 8 Light Pollution (1 point)
Energy Management	E2 RX	✓	✓		✓				✓		
	E2 BX	✓	✓		✓		✓	✓	✓		✓
Facility Monitoring	Current Transformers				✓						
	ProAct			✓	✓				✓		
	Refrigerant Leak Detection Systems			✓	✓				✓		
	Control Link Case Controls		✓						✓		
Efficient Systems Components	Variable Frequency Drives		✓							✓	
	Copeland Compressors	✓	✓								
	PerformanceAlert										
Commissioning	E-Commissioning			✓							
	N-Commissioning			✓	✓						

## Conclusion

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LEED certification is a powerful tool that enables internalization of the green building process. With the growing demand for energy efficiency in most countries, integrating the key principles of LEED into the whole design process enables designers to create environmentally-friendly solutions that promote energy savings, human comfort, safeguard food, and protect the environment. These are the primary objectives of Emerson Climate Technologies. Retail Solutions provides services that enable customized, scientific, and itemized breakdown of energy usage, delving into all relevant components. Retail Solutions works with retailers on the following:

- Development of drawings for optimized facility design
- Optimized design of HVAC, refrigeration, lighting, and other items
- Equipment selection recommendations
- Plan for water, power, and communication
- Monitor, measure and manage energy usage long after project completion
- Management of the engineering project from start to finish, partnering architectural or contractor companies

Emerson has partnered with its customers around the world, assisting in key decision-making processes. At every step, Emerson supports retail operators with intelligent, informed decisions in acquiring LEED certification.

Green buildings, LEED, and integrated building design will clearly transform the practices of the retail industry. Retail operators will benefit from reduced operational costs, more environmentally sustainable facilities, and improved profitability.

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For more information about Emerson products and services:

Technology	North America	Latin America	Europe	Asia/India
Building Design & LEED Certification	<p><b>Clive Samuels &amp; Associates</b>                      1 Independence Way                      Princeton, NJ 08540  <a href="http://www.CSA-eng.com">www.CSA-eng.com</a>  <b>Ph: 1-609-520-1600</b></p>		<p><b>Oaksmere</b>                      Tomo House                      Greeting Road                      Stowmarket,                      Suffolk IP 14 5AY                      United Kingdom  <a href="http://www.Oaksmere.com">www.Oaksmere.com</a>  <b>Ph: 01449 672732</b></p>	
<ul style="list-style-type: none"> <li>• Facility Management Systems (E2)</li> <li>• Variable Frequency Drives</li> <li>• Store Monitoring (ProAct)</li> <li>• Facility Commissioning</li> <li>• Case Controls</li> </ul>	<p><b>Retail Solutions</b>                      1640 Airport Road                      Suite 104                      Kennesaw, GA 30144                      United States  <a href="http://www.EmersonRetailSolutions.com">www.EmersonRetailSolutions.com</a>  <b>Ph: 1-770-425-2724</b></p>	<p><b>Emerson Comercio Em Tecnologia De Climatizacao, Ltd.</b>                      Av. Embaixador Madedo Soares                      10735 Vila Anastacio                      05095 000                      Sao Paulo, SP-Brazil  <b>Ph: 55 11 36186655</b></p>	<p><b>Retail Solutions</b>                      Pascal Street 65                      52706 Aachen,                      Germany  <b>Ph: 00492 40892 910</b></p>	<p><b>Asia Pacific Headquarters:</b>                      Mr. John McDaniel, Director                      Retail Solutions, Asia Pacific.                      10th Floor, Pioneer Building,                      213, Wai Yip Street, Kwun Tong,                      Hong Kong  <b>Ph: Office: 852-2860 6982</b>  <b>Fax: 852-2520-6227</b>  <b>ANZ:</b>                      Mr. Nick Holt, Manager                      Retail Solutions,                      Australia &amp; New Zealand.                      Emerson Climate Technologies                      Australia                      Pty Ltd. Unit R7, 391, Park Road,                      Regents Park, NSW 2143,                      Australia  <b>Ph: Office: 61-2-9795 2800</b>  <b>Fax: 61-2-9738 1699</b></p> <p><b>India:</b>                      Mr. Chuck Bonam,                      Country Manager                      Retail Solutions, India.                      Emerson Climate Technologies                      1201/1, Ghold Road, Shivaji Nagar                      Pune 411001  <b>Ph: Office: 91-20-6500 2980</b>  <b>Fax: 91-20-2611-3312</b></p> <p><b>China:</b>                      Mr. Jostin Wu,                      Sales &amp; Marketing Manager                      Retail Solutions, China                      16th Floor, Jiu Shi Tower,                      28, Zhong Shan Road (south)                      Shanghai-200 010, China  <b>Ph: Office: 8621-6333 0808 x 362</b>  <b>Fax: 86-21-6333 0516</b></p> <p><b>SEA:</b>                      Mr. CheeHeung Ho,                      Marketing Manager                      Retail Solutions, South East Asia                      Level M2, Block A, Menara PKNS-PJ,                      Jalan Yong Shook Lin,                      46050, Petaling Jaya, Selangor,                      Malaysia  <b>Ph: Office: 603-7949 9332</b>  <b>Fax: 603-7949 9333</b></p>
Copeland® Compressors	<p><b>Emerson Climate Technologies, Inc.</b>                      1675 W. Campbell Rd                      Sidney, OH 45365  <a href="http://www.EmersonClimate.com">www.EmersonClimate.com</a>                      Ref_info@emersonclimate.com</p>			

## Footnotes

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- <sup>1</sup> USGBC, “Green Building Research.” 20 Nov. 2008 <<http://www.usgbc.org/DisplayPage.aspx?cmspageID=1718>>.
  - <sup>2</sup> “Green Building,” 29 Sept. 2008 <[http://en.wikipedia.org/wiki/Green\\_building](http://en.wikipedia.org/wiki/Green_building)>.
  - <sup>3</sup> John Straube, “Green Building and Sustainability,” Building Science Digest 005 24 Oct. 2006, 18 Nov. 2008 <<http://www.buildingscience.com/documents/digests/bsd-005-green-building-and-sustainability>>.
  - <sup>4</sup> Energy Star, “Grocery & Convenience Stores.” 17 Nov. 2008 <[http://www.energystar.gov/index.cfm?c=grocery.sb\\_grocery](http://www.energystar.gov/index.cfm?c=grocery.sb_grocery)>
  - <sup>5</sup> United States, U.S. Green Building Council, Tool Kit – State and Local Government (Washington: USGBC, 2002) 6.
  - <sup>6</sup> Based on 2008 ENERGY STAR Building Manual - Facility Type: Retail
  - <sup>7</sup> “LEED Frequently Asked Questions,” 22 Sept. 2008 <<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1819#LEED>>.
  - <sup>8</sup> USGBC, “Portfolio Program.” 16 Feb. 2009 <<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1729>>
  - <sup>9</sup> “Construction Waste Management,” Whole Building Design Guide, 5 Jan. 2009 <<http://www.wbdg.org/resources/cwmgmt.php>>.
  - <sup>10</sup> Ibid.
  - <sup>11</sup> “Green Building – Innovation & Design Process,” Environmental Services, 20 Nov. 2008 <<http://www.sanjoseca.gov/esd/natural-energy-resources/gb-innovation-design.htm>>.
  - <sup>12</sup> United States, NSF/IUCRC Center for Building Performance and Diagnostics at Carnegie Mellon University Advanced Building Systems Integration Consortium Guidelines for High Performance Buildings 2004.
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#### *About Emerson*

Emerson (NYSE:EMR), based in St. Louis, is a global leader in bringing technology and engineering together to provide innovative solutions to customers through its network power, process management, industrial automation, climate technologies, and appliance and tools businesses. Sales in fiscal 2008 were \$24.8 billion and Emerson is ranked 94th on the Fortune 500 list of America's largest companies. For more information, visit [www.Emerson.com](http://www.Emerson.com).

#### *About Emerson Climate Technologies*

Emerson Climate Technologies, a business of Emerson, is the world's leading provider of heating, ventilation, air conditioning and refrigeration solutions for residential, industrial and commercial applications. The group combines best-in-class technology with proven engineering, design, distribution, educational and monitoring services to provide customized, integrated climate-control solutions for customers worldwide. The innovative solutions of Emerson Climate Technologies, which include industry-leading brands such as Copeland Scroll and White-Rodgers, improve human comfort, safeguard food and protect the environment. For more information, visit [EmersonClimate.com](http://EmersonClimate.com).

#### *About Emerson Climate Technologies - Retail Solutions*

Retail Solutions, a part of Emerson Climate Technologies, is a leading provider of facility management systems and facility services. For more than 20 years, the company has been at the forefront of developing new technology and trends in refrigeration systems, building HVAC, lighting controllers, refrigerant leak detection and more. Retail Solutions provides such valuable programs as turnkey project management, energy reduction and monitoring services as well as E-Commissioning™. Retail Solutions customers include some of the top supermarket, convenience and drugstore chains in the United States, Australia, South America, Europe and Asia. Retail Solutions headquarter is located in Atlanta, Georgia. For more information, visit [www.EmersonRetailSolutions.com](http://www.EmersonRetailSolutions.com).