Keeping a Building Green Goes Beyond LEED Certification: The Green Office Move

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Introduction

Global warming and the environment continue to be the pre-eminent buzzwords of the new millennium. The importance of proper stewardship for Planet Earth is understood and nurtured by the youngest child to the most elderly senior citizen.

Within the real estate development community, the environmental buzzwords are green technology and LEED certification. Far-thinking architects and developers are integrating green building techniques into their designs in the hope of obtaining the much-desired LEED certification.

However, because a building earns the LEED certification doesn't mean the work to stay green stops. LEED certification is just the first step in what should be a continuing process during a building's green operation. Much more can still be done to keep a building's operations green.

Some companies might think a green building philosophy is cost-prohibitive, but going green ultimately saves money for the building's owner.

In today's corporate world, there are many ways of greening an operation. From light bulbs to roof gardens, there's a new active focus on the built environment and how it impacts the environment.

This paper will explain how even a seemingly mundane task, such as an office relocation, can be LEED-certified and green-friendly. This paper will also show how a green office move, using CrateXpress green products such as Samson Carts, Samson Dollies and Tyga Boxes, can elicit huge cost savings.

Going Even Greener Beyond LEED Certification

Let's examine a typical office move. Typically, the facility manager hires the lowest bid move consultant, who then hires the lowest price moving company to get everyone moved in as quickly as possible. Little thought is given to the move's environmental considerations.

Relocation activities, whether floor-to-floor or building-to-building, are often overlooked as a means to reduce a company's carbon "footprint" on the environment. A proper relocation, however, can have a substantial positive impact on the environment, if properly planned.

Industry Products

Currently, the marketplace offers a variety of mobile material handling carts and crates made of plastic, wood or metal. These carts were created because of identified needs and have functioned very well for many years.

Let's examine industry products used in an office move: plywood carts, wood dollies, diesel trucks and cardboard boxes, their impact on the environment, and compare the experience with using CrateXpress green plastic products.

Plywood

The Potlatch Corporation, maker of plywood, estimates 150 board feet of plywood is made per tree. That's 18 sheets, or 560 square feet of plywood, per tree. In other words, that's 3.57 million trees used for plywood each year!

A typical 48" four-shelf plywood cart contains 2.5 sheets of plywood, one gallon of paint, screws and glue. If we use the 2001 U.S. Census numbers, there are almost 13,000 moving companies in the U.S. Conservatively estimating a typical mover buys an average of five plywood carts per year, that's 162,500 sheets of plywood - or 1.3 million board feet - or 8,667 trees! (roughly seven plywood carts is equivalent to one tree).

What does that mean for the environment? One tree absorbs 700 pounds of CO^2* from the atmosphere. That's approximately 3,033.45 tons of CO^2 left in the air each year as a result of tree reduction (lost carbon sequestration) for plywood use in moving carts. That does not include the carbon introduced into the atmosphere during the life-cycle of producing the plywood, nor the methane and greenhouse gases emitted at the end-of life in landfills.

To produce 1.0 m3 (or to produce 1.0 MSF) of plywood in the Pacific Northwest, the mills needed 917 kg (1,788 lb) of wood in the form of logs, and 10.6 kg (20.6 lb) of purchased veneer, for a total wood need of 927 kg. These inputs yielded 470 kg (916 lb) of oven-dry plywood (wood only).

TABLE 2. *Wood mass balance for production of a unit of plywood. All weights are reported on an oven-dry basis.*

	PNW plywood		SE plywood	
	kg/m^3	lb/MSF	kg/m^3	lb/MSF
Inputs				
Logs without bark[1]	917	1,788	1,066	2,080
Purchased dry veneer	3.1	6	4.20	8.07
Purchased green veneer	7.2	14	5.30	10.40
Total	927	1,809	1,075	2,098
Outputs				
Plywood (wood only)[2]	470	916	541	1,055
Wood chips	218	425	331	645
Peeler core	49	95	57	112
Green clippings	16	31	89	173
Veneer downfall	1.7	3.4	0	0
Panel trim	55	107	31	61
Sawdust	4.9	9.6	2.2	4.2
Wood waste to boiler	0.13	0.25	16	30
Sold wood waste	11	21	11	21
Sold dry veneer	32	63	0	0
Unaccounted wood[3]	70	137	−1.4	−2.64
Total	927	1,809	1,075	2,098

[1] The weights are based on survey log volumes and the average species density of wood.
[2] Based on the weight of plywood minus the survey reported amount of resin.
[3] Used to balance the input and output wood flow for mills.

*Resources: Potlatch Corporation; USDA Forest Products laboratory.

A Brief Word on Wood Dollies

Wood dollies come in a variety of configurations for several relocation uses and even region specific preferences. Wood dollies are used to move furniture, cardboard moving boxes and even as bases for plywood carts. But that's where the benefit ends. For the most part sheets of plywood can usually be traced to the Pacific Northwest or the Southeast regions of the U.S. whereas wood dollies frequently are made overseas. The imported wood dollies largely come from Asia and occasionally Eastern Europe.

The problem lies in the origin of the wood used. Sustainable forestry and certified wood use has not taken root yet in Asia so the potential for mass uncontrolled deforestation and reduced carbon sequestration is dramatically increased in a region of the world where industrialization is growing at breakneck speed.

Diesel Emissions

Typically, a mover brings those plywood carts to a facility in a diesel truck. If the facility is in a metropolitan area with the usual traffic patterns, and there's a typical wait time at the facility dock to unload the carts, a significant air quality impact comes into play for that sample office move.

Many substances in diesel exhaust are listed by the California EPA as toxic air contaminants. California Health and Safety Code section 39655 defines a "toxic air contaminant" as "an air pollutant which may cause or contribute to an increase in mortality or in serious illness, or which may pose a present or potential hazard to human health."

Diesel exhaust from heavy-duty diesel engines contains between 100 to 200 times more small particles than gasoline engine exhaust. As a result, diesel engines account for an estimated 26 percent of the total hazardous particulate pollution from fuel combustion sources in our air, and 66 percent of the particulate pollution from on-road sources. Diesel engines also produce nearly 20 percent of the total nitrogen oxides (NOx) in outdoor air and 26 percent of the total NOx from onroad sources. Nitrogen oxides are a major contributor to ozone production and smog.

How much pollution is generated by an idling truck? Each of the 500,000 trucks operating in the U.S. emits about 169 pounds of particulate matter per year while idling, resulting in 42,250 tons of particulate matter ejected into the air per year. Source: Illinois Sierra Club.

Ozone exposure causes a range of human pulmonary and respiratory health effects, including chest pain, coughing, and shortness of breath. In addition to ground-level ozone, the secondary impacts of NOx include the formation of nitrate PM, acid rain, and the eutrophication of coastal waters. Therefore, reductions in NOx emissions will have considerable benefits to both public health and the environment. (Source: U.S. EPA).

The Economics of Cardboard Boxes

Most office items are placed in cardboard boxes during a move. There are many choices and the costs vary. There is the standard Banker box typically used for records storage. The mover will typically sell a 1.5 cubic foot box. This size box is most widely accepted as the safest weight capacity cardboard box. They may be recycled, but are often discarded.

Cardboard is possibly the largest single constituent of municipal solid waste (MSW) according to the U.S. EPA who estimated that approximately 30.2 million tons of cardboard waste was generated in 2000 representing 13 percent of the nation's MSW.

As we can see, a typical office move is a strong contributor to air and land pollution. Is the equipment described here the best the market has to offer? Are there alternatives to plywood carts, diesel emissions, cardboard boxes and adding to the waste stream? Alternatives that are not only more environmentally friendly, but more cost efficient? What products answer corporate America's demand to facility managers to work "outside of the box" to drive down the costs?

Samson Carts, An Economic, Greener Alternative

Moving companies, facility managers and building tenants who want to use green products and save money in the office move process have choices. There are viable alternatives to having cardboard boxes and plywood carts take up valuable landfill space.

The Samson Cart, a product I developed is ideal for transporting large quantities of materials such as books, equipment and other packages. It folds neatly into a movable cabinet that can be stored in small places. The cart transforms from 25'' wide to less than 13".

Samson provides reusable plastic carts (trolleys) for material handling as an alternative to plywood (or other wood product) and metal carts. The Samson Cart philosophy, by its very nature, eliminates plywood and metal waste and promotes the concepts of reduce-reuse-recycle. Even the Cart manufacturing process is an environmentally-friendly alternative to plywood. Utilizing natural gas, the plastic manufacturing process is so energy-efficient that it actually uses less fossil fuel per pound and emits significantly less airborne pollutants than laminated wood production.

Samson Carts also significantly reduces diesel fuel emissions by reducing the number of trucks on the road when used by moving companies, or when used as part of a "Returnable Shipping Container" program.

Samson Carts enjoy an estimated life span of 15+ years during which one cart can potentially eliminate 12 plywood carts and trolleys from landfill waste. Additionally, Samson Carts are modular in design, so if a part is damaged, it can be replaced quickly without glues or paint.

The Tyga Box moving system is based on the same environmental design criteria as Samson Carts and enjoy a life span of at least 15 years.

For facility managers who have been told to "think outside of the box", using Samson Carts and Tyga Boxes is not only environmentally sound, but shows appreciable savings.

The following financial analysis illustrates a real project and the hard cost savings of a more strategic approach – using CrateXpress' Samson Carts - for equipment rental.

Case Study Summary:

The customer is a Fortune 150 law firm in downtown Chicago. The firm is relocating 425 employees and a 900 linear foot library to a new building. Their move schedule begins on November 11 and runs through December 26, with anticipated business operations up and running for January 2. There will be six moves in this time period, several occurring weeknights as well as weekends.

Project Analysis Key Points:

- Due to the building dock configuration, a standard 24' straight truck is required for pickups and deliveries of the equipment.
- The equipment rental contract is separate from the Mover contract.
- There is only one (1) Freight Elevator available at each site.
- One person to load the elevator, one person to unload the elevator at destination, and the elevator is shared with other vendors.
- Mover rate of $48.00/hr., a driver and a truck are $98.00/hr.
- Average wait time for the elevator is 10 min. per load.
- Travel time to jobsite = 1 hr. (each way).

CrateXpress Methodology:

CrateXpress relies on its internal Facility Management experience to:

- Perform an outbound and inbound time study.
- Anticipate physical limitations of the facilities, the one being left and the new location.
- Critical path project processes.
- Business disruption/downtime.
- Project bottlenecks.
- Potential facility-related issues that impact a project (i.e. freight elevator bottlenecks).
- Maximizing efficiencies to reduce project time and labor costs.

Case Study Economics

# of Employees	# Lnr.Ft. Storage/Emp.	# 1.5 C.F. CB Boxes		# 3.0 C.F. Pl. Crates (Tyga Box)	
425	14	4356		2869	
Number of Offices	319	3825		2550	
Number of Workstations	106	531		319	
# per Stack/Dolly		3		5	
# of Stacks for Move		1452		574	
# of Stacks/Elev. Trip		6		6	
# Elevator Trips Req'd.@ Origination & Destination		484		191	
Time per elev. Trip (min)		10		10	
Time to load/unload contents (Hours)		81	*	32	*
$/Hr. (Labor) 4 Men @ $48.00/hour		$ 192.00		$ 192.00	
Number of Truck Trips Needed to Transport		35		13	
Truck Costs @ $98/Hr. (Driver & truck)		$ 7,905.79		$ 3,123.75	
Total Labor Costs for Staff Relo only.		$ 38,754.68		$ 24,603.75	
Total Avg. Cost per unit for Buy/Assembly/pack.		$ 8.00	**	$ 4.40	
Hard/Soft Costs per Type of Container		$ 34,850.00		$ 12,622.50	
Disposal Costs @ $0.65/box		$ 2,831.56		**$** -	
Total Project Costs for content Relocation: labor, materials and disposal.		**$ 76,436.24**		**$ 37,226.25**	
Total Cost Reduction				**51%**	
Average Cost per employee for relocation.		**$ 179.85**		**$ 87.59**	
Savings				**51%**	

*** Does not include staging or wait time for elevators.**

****Includes Rental Costs, Emp. Cost to assemble.**

Assumptions

1.5 c.f. box = 2' linear feet of storage

2.3 c.f. box = 2' linear feet of storage.

1 Tyga Box = 30 INCHES.

Avg. workstation requires 5 CCB or 3 Tyga-Boxes

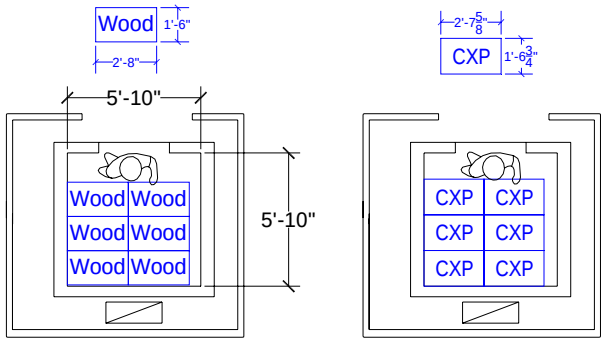
Avg. office requires 12 CBB or 8 Tyga-Boxes.

Labor costs for movers is only for transport of boxes/crates.

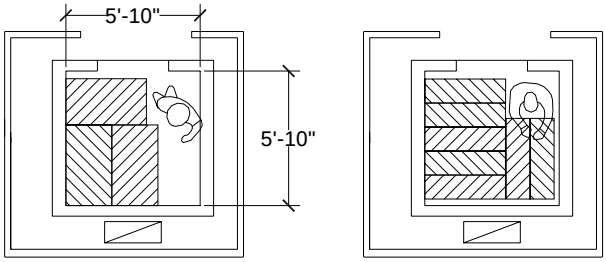
Estimated Corporate employee cost/Hr. = $12

Mover Rate: $48//hr/man - Supervisor. $60/hr/man

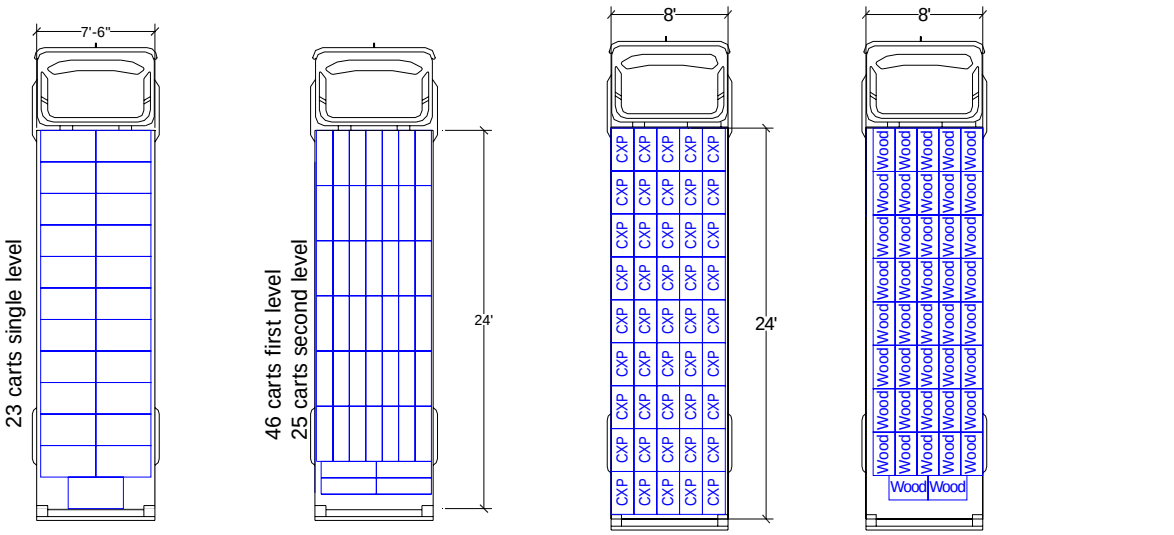
The net cost difference for the staff relocation is $ 39,210.00



Wood Dolly vs. Tyga Box Diagram



Plywood Cart vs. Samson Cart Diagram



Transportation Diagrams

Law Library Project Economics:

The economics of the original preliminary project plan as contemplated by the customer is highlighted in tan while the CrateXpress Samson Cart proposal is highlighted in blue:

Samson Carts Time Study:

Project Time Analysis - Plastic (Samson Carts) vs. Plywood Carts

Cart Move/Time Analysis

Staging	Number of Elevator Car Trips (Staging)	# Carts per Car load	Estimated time to deliver (Hours)		Number of Elevator Car Trips (Staging)	# Carts per Car load	Estimated time to deliver (Hours)
Inbound	**Samson**				**Wood Fixed Shelf**		
# of Carts				**# of Carts**			
45	6	8	0.94	47	12	4	2
Est. Cost			**$ 90.00**				**$ 189.47**

Job Pull-off	Number of Elevator Car Trips out of Bldg.	# of Carts/carload	Est. Time		Number of Elevator Car Trips into Bldg.	# of Carts/carload	Est. Time
Outbound	**Samson**				**Fixed-shelf wood carts**		
# of Carts				**# of Carts**			
45	6	8	0.94	47	12	4	2
Est. Cost			**$ 90.00**				**$ 189.47**

Assumptions:

1. Estimated Time to load elevator car, travel to dock, unload freight car = 10 minutes.
2. Labor Costs: Two Movers @ 48.00 each.
3. This examines only the travel time required for the number of carts, staging and truck loading time not included.
4. The Samson Cart holds 20 l.f. of goods; a 42" fixed shelf plywood carts hold 19 l.f.

Number of 24' trucks required for Delivery and Pickup

		Samson Carts				Fixed-shelf wood carts		
# of Carts					**# of Carts**			
45		Number of carts per truck	Trucks Required to transport	Cost to Transport	47	Number of carts per truck	Trucks Required to transport	Cost to Transport
Inbound		45	1	$ 147.00		21	3	$ 441.00
Outbound		45	1	$ 147.00		21	3	$ 441.00

Assumptions:

1. Because Samson Carts are only 130 pounds each they can be stacked on a second tier.
2. Labor Costs: A Driver and truck is $98/hour.
3. This examines only the travel time required for the number of carts, staging and truck loading time not included.

Library Move Project Labor

		Number of Elevator Car Trips (Move)	# Carts per Car load	Estimated time to deliver (Hours)		Number of Elevator Car Trips (Move)	# Carts per Car load	Estimated time to deliver (Hours)
Samson Carts					**Wood Fixed Shelf**			
# of Carts					**# of Carts**			
45		12	4	**2.00**	47	12	4	**1.97**
Est. Cost				**$ 192.00**				**$ 189.47**
2 week rental Costs				**$ 1,181.25**				**$ 1,894.74**
Total				**$ 1,373.25**				**$ 2,084.21**

Total Relocation Cost and Impact Summary

	Cardboard and Plywood Eqmt.	Samson Carts and Tyga Boxes
Staff Content Move	$ 76,436.24	$ 37,226.25
Library Move	$ 2,084.21	$ 1,373.25
Library Equipment Delivery & Removal	$ 1,260.95	$ 474.00
Total Estimated Project Costs	**$ 79,781.40**	**$ 39,073.50**
Cost Reduction:		**$40,707.90**

Environmental Impact

Samson Carts instead of plywood

Tons of Plywood Saved:	**4.83**
Tons of CO_2 Reduced	**12.00**

Tyga Boxes instead of Cardboard:

Tons of CO_2 Reduced	**14.22**

Total Project - Tons of CO2 Reduced **31.05**

** Calculations based on data from Environmental Defense Paper Calculator*

By simply using a complete selection of recyclable moving containers and carts this project would have reduced it's carbon footprint by **31.05 Tons of CO2!**

Summary

CrateXpress' recommended solution focuses on preserving the milestone dates of the relocation, which were identified as business critical, by aligning the move dates to relieve congestion in the workplace and reduce the amount of time to perform the move, while reducing the number of containers needed overall for the project and reducing the environmental impact.

Potential Savings:

- Less handling = less labor costs.
- Less damage in transit = cost savings through the use of re-useable plastic products.
- Reduction of space needs.
- Reduced cardboard waste equates to reduced disposal costs and less landfill, a more environmentally friendly alternative.

Customer Benefits:

- Facility Management knowledge base provides a second tier of experience to the project process to further drive costs down for the customer, creating a value-add relationship for the long-term.
- Market tested new product introduction to the Facility Manager, keeping the manager in touch with new trends.

What About the Waste Stream?

In 1994, the U.S. Environmental Protection Agency (EPA) estimated that 50 Tg of paper and 18.6 Tg of wood were discarded in the United States in municipal solid waste (MSW). Approximately 16 percent of all discarded MSW is incinerated (EPA, 1994); the remainder is disposed of in landfills. It has been estimated that 30–40 percent of U.S. landfill volume is taken up by paper; 13 percent by newspaper alone (Barlaz et al., 1990; EPA, 1994; Rathje & Murphy, 1992a; Barlaz et al., 1990; EPA, 1994). This represents a tremendous amount of carbon that is being buried every year.
*Tg = teragram = 1 million metric tons (tonnes). 1 tonne = 1.102 short tons.

The amount of paper and wood stored in U.S. landfills in 1993 alone has the potential of ultimately releasing 5 Tg of carbon into the atmosphere as methane and carbon dioxide. Source: **The Decomposition of Forest Products in Landfills, J. A. Micales & K. E. Skog,** *USDA Forest Service, Forest Products Laboratory, One Gifford Pinchot Drive, Madison, WI 53705, USA*
(Received 3 April 1996; revised version received 25 June 1996; accepted 22 July 1996)

Landfill gas (LFG) is typically 40 to 60 percent methane, with the balance being mostly carbon dioxide. Various trace gases such as hydrogen sulfide, water vapor, ammonia, and a variety of volatile organic compounds (VOCs) are also found in LFG. Usually, gas production begins within a year of waste placement and may continue for as long as 50 years after landfill closure.

Source: LANDFILL GAS EMISSIONS, July 31, 1992
C. David Cooper, Principal Investigator; Debra R. Reinhart, Co-Principal Investigator;
Fred Rash, Research Assistant; Debra Seligman, Research Assistant; Debra Keely, Research Assistant;
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TABLE 11. *Life-cycle inventory results for production of plywood in the PNW region, gives both allocated site and cumulative emissions to air, water, and land.*

	Allocated cumulative		Allocated site	
Substance	kg/m^3	lb/MSF	kg/m^3	lb/MSF
Emissions to air				
Acetaldehyde	6.10E – 03	1.19E – 02	6.10E – 03	1.19E – 02
Acrolein	4.49E – 07	8.75E – 07	2.71E – 07	5.28E – 07
CO	1.07E + 00	2.08E + 00	9.94E – 01	1.94E + 00
CO_2 (biomass)	1.46E + 02	2.85E + 02	1.46E + 02	2.85E + 02
CO_2 (fossil)	3.99E + 01	7.78E + 01	6.15E + 00	1.20E + 01
Formaldehyde	1.92E – 02	3.74E – 02	1.06E – 02	2.06E + 02
Methane	1.09E – 01	2.13E – 01	3.65E – 05	7.13E – 05
Methanol	6.97E – 02	1.36E – 01	6.97E – 02	1.36E – 01
NOx	3.33E – 01	6.50E – 01	1.94E – 01	3.79E – 01
Particulates	1.95E – 01	3.81E – 01	1.92E – 01	3.75E – 01
Particulates (PM10)	1.16E – 01	2.27E – 01	1.14E – 01	2.22E – 01
Particulates (unspecified)	1.29E – 02	2.52E – 02	—	—
Phenol	1.55E – 02	3.02E – 02	4.33E – 03	8.44E – 03
SOx	5.43E – 01	1.06E + 00	9.23E – 03	1.80E – 02
VOC	3.43E – 01	6.69E – 01	3.43E – 01	6.69E – 01
Emissions to water				
BOD	7.38E – 04	1.44E – 03	2.92E – 06	5.69E – 06
C1–	3.20E – 02	6.24E – 02	—	—
COD	8.56E – 03	1.67E – 02	2.50E – 04	4.88E – 04
Dissolved solids	7.07E – 01	1.38E + 00	4.90E – 04	9.56E – 04
Oil	1.26E – 02	2.45E – 02	—	—
Suspended solids	1.68E – 02	3.27E – 02	5.23E – 04	1.02E – 03
Emissions to land				
Solid waste	9.46E + 00	1.88E + 01	6.10E + 00	1.19E + 01

Source: *Wilson and Sakimoto*—LCI OF SOFTWOOD PLYWOOD PRODUCTION
For more in-depth studies see: *GATE-TO-GATE LIFE-CYCLE INVENTORY OF SOFTWOOD PLYWOOD PRODUCTION, James B. Wilson Professor and Eric T. Sakimoto.*

Conclusion

The environmental movement is not a fad. It's here to stay, and the demand for green products will only grow stronger over the years. Forward-thinking property managers and facility managers will do well to examine every possible way to make their properties green. It's not just being green. It's the advantage of being green **and** the advantage of reducing costs.