
LEED EB[®] Cast Study: Achieving Platinum and the Energy Star[®] Label for Corporate Headquarters

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ABSTRACT

Most global businesses recognize the impact of their behaviors on the environment. Many have established environmental sustainability commitments and policies which are integrated into their company's overall business strategy. These initiatives are becoming more heavily marketed and important to customers worldwide.

The building construction industry has embraced "Green Buildings" as the emerging standard for new construction. Armstrong World Industries, Inc. is a global leader in the design and manufacture of floors, ceilings, and cabinets for residential and commercial buildings. Armstrong has strong environmental positioning through its products and environmental sustainability programs.

During 2006, Armstrong initiated the process to pursue the LEED EB (existing building) certification for the corporate headquarters building in Lancaster, Pennsylvania. This building was constructed in 1998 as the LEED rating system was being developed. The building's overall design actually helped create some of the performance criteria within the initial "LEED for New Construction" standards and the formal application requirements.

A LEED EB *Platinum* rating was approved for the building by the U.S. Green Building Council in April 2007. This award—the USGBC's highest level of recognition—is only the fifth given nationwide for an existing building—and the first outside the state of California. As part of the LEED EB application process, minimum energy performance standards were evaluated, earning an ENERGY STAR[®] label for the building during the

2006 performance period. This article describes the project that achieved both significant distinctions for the corporate headquarters building.

COMPANY AND ORGANIZATION

For 2006, Armstrong's net sales totaled just under \$4 billion. Founded in 1860 and based in Lancaster, Pennsylvania, Armstrong currently operates 39 manufacturing plants in 10 countries with approximately 13,000 employees worldwide. Armstrong's campus center and corporate headquarters is located in Lancaster, Pennsylvania. Campus facilities are sited on a 625-acre plot, with approximately 225 acres of developed property including buildings, roadways, and parking areas. There are 28 buildings, enclosing about 1,000,000 square feet of conditioned space for about 1,500 employees. The buildings range in age from those initially constructed in 1950 to the newest corporate headquarters building, #701, completed in Dec., 1998. The campus spends more than \$2 M annually for energy, mostly for electricity and natural gas.



The facilities management organization supports business unit staff requirements and manages corporate facilities at the campus center. Services provided include building and equipment maintenance, HVAC management, capital improvements, mail and copying, and security. The organization's goal is to meet and exceed campus customers' needs in support of business unit and corporate goals.

PROJECT BACKGROUND

Armstrong's global headquarters building is situated in the center of a sprawling 625-acre campus in Lancaster County. This 3-story, 127,000-square-foot glass and steel structure serves as the corporate headquarters

for Armstrong World Industries, the country's largest manufacturer of resilient and hardwood flooring and acoustical ceiling systems.

Constructed in 1998, the building houses 235 occupants and consolidates corporate staff that was previously scattered throughout three separate locations in the county. It consists of two wings that are visually united in height and materials, but differ in the form of their facades. The east wing is curved while the west wing is rectilinear. The three-story, light-filled atrium unites the two wings.



Figure 2. Wing Construction and Atrium.

The building was designed based on green building principles, including high energy efficiency, extensive use of natural lighting, and zoned control of work space environments. A campus-wide building automation control system allows centralized and optimal building operation. The advanced HVAC systems incorporate energy efficient motors for all air handlers and pumps, VFDs on these devices, and variable air volume (VAV) boxes and controls in all conditioned spaces. Lighting system technologies include compact fluorescents, day lighting, LEDs, electronic ballasts, T8 lamps, and occupancy sensors. These occupancy sensors control both space lighting as well as VAV box operation when spaces are occupied. Dual level lighting (twin ballasted fixtures) further minimizes the use of artificial light and related heat gains in many offices and all conference rooms.

ENERGY STAR®

ENERGY STAR® is a federal government program administered by the U.S. Environmental Protection Agency (EPA) and the Department of Energy (DOE). The program helps businesses and building owners pro-

tect the environment through superior energy efficiency. A key element of ENERGY STAR is EPA's National Energy Performance Rating System for buildings, introduced in 1999. This online benchmarking tool, Portfolio Manager (PM), permits building owners and facility managers to enter specific data (energy consumption, operating hours, occupancy, geographic location) and compare a building's energy performance against the performance of similar buildings across the country. The building receives an ENERGY STAR rating from 1 to 100 based on one year's energy consumption. EPA awards a STAR label to owners of buildings whose performance score is among the nation's top 25 percent—equal to an energy performance score of 75 or greater on a 1 to 100 scale—while maintaining a healthy and productive indoor air environment.

Energy Star® Rating Requirements

There are eligibility rules for rating facility spaces used for general office, professional, and administrative purposes. The total gross floor area should include all supporting functions such as kitchens used by staff, lobbies, atria, conference rooms and auditoria, fitness areas for staff, storage areas, stairways, elevator shafts, mechanical rooms, etc.

To be eligible to receive an energy performance score as a qualifying office space using EPA's Portfolio Manager, several criteria must be met which are described in detail on the web site. These include:

1. 50 percent of the facility gross floor area must be eligible office space (excluding parking areas).
2. Gross floor area $5,000 \leq 10,000,000$ square feet.
3. Facility must operate at least 35 or more hours weekly.
4. Minimum of 75 percent occupancy.
5. Minimum of 11 full consecutive calendar months of user-entered energy data for all active energy meters.

The last requirement is significant because it also becomes a requirement for the Energy and Atmosphere credits in the LEED EB application. If the facility doesn't incorporate energy metering (or sub-metering) for all utility sources, EPA-approved modeling software must be utilized for estimating energy usage.

To obtain an energy performance score, building attributes and energy data are entered into Portfolio Manager after the user establishes an account on the website. Gross floor area, number of occupants, personal computer count, and weekly operating hours are required for the score

Portfolio Manager - Edit Meter Entries - Microsoft Internet Explorer

Address: https://energystar.gov/enter/insert/index.cfm?function=energy_edit_meter_entries_form_id=1246206

PORTFOLIO MANAGER

Home > My Portfolio > Armstrong World Industries, Corporate Headquarters > Edit Energy Use

Edit Energy Use: Square D Device #17, Building 701

Meter Information [Edit](#)
 Fuel Type: Electricity (kWh (thousand Watt hours))
 Space(s): Building 701

Please enter the energy use for each meter entry below. Portfolio Manager requires that entries are for consecutive time periods; only one day of overlap or one day of gap can exist between meter entries to be eligible to generate an Energy Performance Rating.

If you are accounting for "sold" energy, indicate this by entering a negative energy use for the appropriate time period.

[Download Meter Data in Excel](#)

6/8 Pages | 1 Entries

Add Meter Entries

Remove Entry	Start Date (mm/dd/yyyy)	End Date (mm/dd/yyyy)	Energy Use (kWh (thousand Watt-hours))	Cost - US Dollars (optional)	Last Updated By
<input type="checkbox"/>	03/01/2007	03/31/2007	113397.00	\$6,566.00	DAEBERLY
<input type="checkbox"/>	02/01/2007	02/28/2007	102617.00	\$6,625.00	DAEBERLY
<input type="checkbox"/>	01/01/2007	01/31/2007	93077.00	\$6,294.00	DAEBERLY
<input type="checkbox"/>	12/01/2006	12/31/2006	106864.00	\$6,699.00	DAEBERLY
<input type="checkbox"/>	11/01/2006	11/30/2006	109169.00	\$6,513.00	DAEBERLY
<input type="checkbox"/>	10/01/2006	10/31/2006	117740.00	\$6,740.00	DAEBERLY
<input type="checkbox"/>	09/01/2006	09/30/2006	111434.00	\$6,403.00	DAEBERLY
<input type="checkbox"/>	08/01/2006	08/31/2006	120249.00	\$6,963.00	DAEBERLY
<input type="checkbox"/>	07/01/2006	07/31/2006	116314.00	\$6,435.00	DAEBERLY
<input type="checkbox"/>	06/01/2006	06/30/2006	116102.00	\$6,183.00	DAEBERLY
<input type="checkbox"/>	05/01/2006	05/31/2006	117800.00	\$6,574.00	DAEBERLY
<input type="checkbox"/>	04/01/2006	04/30/2006	115081.00	\$6,431.00	DAEBERLY
<input type="checkbox"/>	03/01/2006	03/31/2006	126543.00	\$6,692.00	DAEBERLY

Figure 3. Portfolio Manager Input Data.



Figure 4. Energy Star and LEED Plaques.

calculation. A rating is displayed immediately upon completing the required entries, and Energy Star label eligibility is indicated.

If the facility is eligible for a label (score ≥ 75), the building owner must also provide a Statement of Energy Performance (SEP) for the building. A licensed Professional Engineer must certify that the facility's indoor environment meets industry standards for lighting (IESNA illuminance levels), ventilation, and indoor air pollution (ASHRAE Standard 62), and thermal comfort (ASHRAE Standard 55). An approved SEP, which includes the building energy performance rating, is then submitted to the EPA for Energy Star consideration. The evaluation and review process takes about three weeks.

The facility received a 76 score for the time period, which included the required LEED performance period. This score contributed 4 points to the LEED EB credit score.

WHY LEED EB CERTIFICATION?

The acceptance of Leadership in Energy & Environmental Design for New Construction (LEED NC[®]) or Existing Buildings (LEED EB[®]) by government agencies, and more recently, by significant numbers of businesses, has established new standards for new construction and for "Green Buildings." Building owners and buyers want or require "green," environmentally friendly buildings that have been certified by the U.S. Green Building Council (USGBC) through LEED. Green buildings are found and desired in many business sectors including schools, health care, colleges, manufacturing, and commercial office spaces.

The US Green Building Council states "certification provides an independent, third-party verification that a building meets the highest performance standards. The LEED plaque itself is recognized nationwide as proof that a building is environmentally responsible, profitable, and a healthy place to live and work." Specific to the existing building criteria, the certification and rating provides "a recognized, performance-based benchmark for building owners and operators to measure operations, improvements, and maintenance activities on a consistent scale." To business suppliers and customers, it demonstrates the owner's commitment and leadership in environmental stewardship and social responsibility. On a global scale, it provides the opportunity for owners to meet environmental sustainability goals.

IMPLEMENTING THE LEED EB[®] PROCESS

Justification to pursue the LEED rating was a matter of identifying the benefits, and communicating them to the business stakeholders. While many of the benefits could not be quantified before undertaking the project, “green” starting/talking points were identified:

Potential Business Benefits

- Lower energy and water costs.
- Lower waste disposal costs.
- Lower environmental/emissions costs.
- Lower operating and maintenance costs.
- Increased productivity of building occupants.
- Positive impacts on the local environment.
- Establish goals for facilities management’s building operations to incorporate in future campus building improvements or new construction.

Corporate Benefits

Armstrong customers, which include architects, designers, property developers, and building owners, would be provided the opportunity to see a “living” example where innovative building products have a positive impact.

- Enhancements that provide improved sustainable practices and operating procedures.
- Creation and formalization of sustainability policies and practices.
- Recognition from the building industry, the USGBC, that Armstrong has a sustainable building.
- Serves as an educational tool to the local community and the building industry (future management?).

Overall, the corporate, business, and marketplace motives for pursuing LEED EB are significant. There are benefits to the company, employees, and stakeholders. Achieving certification publicly affirms corporate leadership in reducing environmental impacts, achieving sustainability

goals, and driving long-term cost savings over the life of the building.

Achieving Certification

The LEED EB rating system is a set of voluntary performance standards for the sustainable upgrades and operation of buildings *not* undergoing major renovations. It promotes improved practices in building site maintenance, efficient/optimized use of water and energy, purchasing environmentally preferred products, waste stream management, and indoor environmental air quality IEQ. It also provides sustainable guidelines for these elements.

To achieve certification, the facility must meet all prerequisites in the rating system. Under LEED version 2.0, points are awarded when the requirements of a credit are satisfied. Total awarded points determine the level of certification.

LEED EB®: Levels of Certification

Certified	32-39 points
Silver	40-47 points
Gold	48-63 points
Platinum	64-85 points

Distribution of credits by category is shown in Figure 4. More than half the credits come from energy and indoor air quality improvements.

Project Team Representatives

In addition to Armstrong's "in house" facilities group, all critical outsourced maintenance, cleaning, and waste management sub-contractors were represented on the team. Each team member was assigned a set of credits to investigate, gather documentation, and create business practices and/or policies to meet the LEED application requirements, if appropriate.

LEED Process Implemented Changes

- Smokers' stations relocated away from building.
- Installed covered bicycle storage area.
- Added preferred "green" parking spaces for hybrid vehicles.

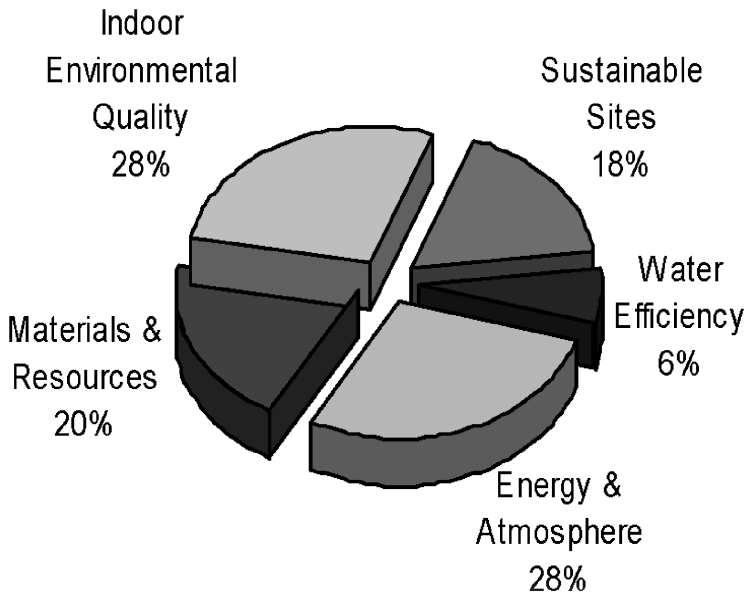


Figure 5. LEED EB Points Distribution.

- Created procurement policies for low-VOC products, low mercury lamps, cleaning materials for the building.
- Lighting—fluorescent lamp change retrofits—to FO28 lamps.
- Reduced waste disposal, increased recycling.
- Installed low-flow toilets, waterless urinals, dual flush valves in women’s toilets.
- 13 percent more energy efficient than similar office buildings in same geographic location (Energy Star Portfolio Manager calculation).
- Achieved Energy Star rating of 76 (out of 100) which improved to 81 since the original performance period.
- Additional energy usage offset through the purchase of renewable, wind certified power.

The Score Card for Platinum

<u>Platinum*</u>	<u>64/85 total</u>
Sustainable Sites	7/14
Water Efficiency	5/5
Energy & Atmosphere	15/23
Materials & Resources	15/16
Indoor Environmental Quality	17/22
Innovation & Design	5/5

Summary of Achieved Benefits

Participating in the LEED EB project and achieving the certification produced a number of meaningful and leverageable benefits for the company. Implemented changes noted above could be combined with this list.

- Energy savings of \$25,000 annually, relative to a similar building designed without energy efficient equipment and energy efficiency measures.
- Documented procedures and practices that result in more than 60 percent recycling of site-generated waste.
- Increased occupant interest and involvement in the environmental aspects of building operation, including all campus buildings.
- Identification and specification of environmentally friendly cleaning products for all campus buildings that save \$4,400 per year, and also promote improved IAQ, free from odors and VOCs.
- Installation of water-saving appliances (dual flush valves, waterless urinals, low-flow aerators) that save 380,000 gal of water/yr.
- Identification (with sub-metering) of fresh water discharge to sewer from humidification systems that save another 28,000 gal of water.
- Continuous CO₂ monitoring that assures adequate airflow in occupied building areas, and stepped alarming that allows prompt response to unusual incidents or conditions.

Total Costs and Lessons Learned

Total out-of-pocket costs and project savings were documented throughout the project. Internal costs, which are mostly facility associates' and administrative time required, estimated at 2,800 hours, are not shown in Table 1. Estimated return on investment based on utility and operational expense savings is 3.5 years.

Table 1. Project Cost Summary.

<i>Element</i>	<i>Cost (\$000)</i>
Professional Fees	62.1
Maintenance, Expenses	34.5
New, Material Upgrade Expense	23.5
Wind, Renewable Energy Credits	10.9
Service Labor Costs	7.0
TOTAL	\$138,000

To maintain the present level of building performance, and to establish guidelines that would shorten the learning curve for a future project, the project team further documented the following "lessons learned":

1. Employ an LEED AP (accredited professional) to assist the team through the application process.
2. Establish an "in-house" LEED team that "owns" the credits.
3. Designate a LEED project owner to facilitate meetings and manage the overall process.
4. Understand the time commitment and resources required to complete the process.
5. Create a documentation outline and uniform process to manage and store "shared" information.
6. Designate an LEED administrative resource to manage the required documentation.

7. List or publish success stories as they occur.
8. Regularly communicate with executive office staff and the building owner to review progress and successes.
9. Discuss new or ongoing processes that will enable continued measurements, for future LEED EB recertification.

CONCLUSIONS

Both the Energy Star rating system and the LEED EB certification program are important and complimentary programs that enable a building owner or business to demonstrate its commitment to energy efficiency and occupant comfort. The Energy Star program primarily considers energy performance and indoor air quality parameters in its scoring system. LEED EB encompasses both these elements, but also includes environmental sustainability issues in determining a facility's overall performance and environmental impact. If energy and IAQ are an organization's primary concern, the Energy Star evaluation should be an initial first step. If quantifying a business or organization's sustainability performance, the LEED rating system would be more appropriate. In either case, the evaluation and processes to meet the scoring criteria will enhance the facility's environmental performance. Achieving the Star label or an LEED certification provides national recognition that a building is environmentally responsible, efficient, and a healthy place to work.

References

1. Energy Star web site: www.energystar.gov.
2. Environmental Protection Agency web site: www.epa.gov.
3. U.S. Green Building Council, LEED-EB Green Building Rating System, Version 2.0, July 2005, www.usgbc.org.
4. Sidebottom, Ken, 2006, "ENERGY STAR Rating System & LEED EB," Strategic Planning for Energy and the Environment, Vol. 26, No. 1.

ABOUT THE AUTHOR

David A. Eberly, P.E., C.E.M., GBE™, C.S.D.P., is a senior staff engineer in Corporate Facilities Management for Armstrong World Industries,

Inc. At Armstrong for more than 30 years, Dave has held electrical, facility engineering, and energy management positions including corporate energy engineer. In his current position, he implemented a 2,000 kW distributed generation, power curtailment system, reducing corporate campus electricity costs by 25 percent. A trained Green Belt, he implemented Six-Sigma process improvement projects that save more than 12 percent of annualized energy costs at the same campus location. Most recently, as an LEED EB[®] team member, he achieved the Energy Star[®] label for Armstrong's corporate headquarters building in Lancaster, Pennsylvania, which also achieved the prestigious LEED EB[®] *Platinum* rating.

Dave is a graduate of the Pennsylvania State University with a B.S. in electrical engineering and an M.A. in business administration. Dave is a registered professional engineer in Pennsylvania, a Certified Energy Manager (CEM), a Green Building Engineer (GBE[™]), a Certified Sustainable Development Professional (CSDP), a member of ASHRAE (American Society of Heating, Refrigeration, and Air-Conditioning Engineers) and a life member of the AEE (Association of Energy Engineers).

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