Sustainability and Sustainable Building Solutions from ASSA ABLOY

ASSA ABLOY Sustainability Commitments

United States Green Building Council Information

LEED and High Performance Door and Hardware Contributions

LEED Case Studies from ASSA ABLOY Group Brands

High Performance Doors & Hardware for Energy Efficient Buildings

Additional Information
ASSA ABLOY Sustainability Commitments

ASSA ABLOY Global Sustainability Philosophy
Certified Green Building Space Projected Growth
Sustainability Reports & Global Reporting Initiative
Sustainable Innovation Process
Sourcing and Suppliers
Certified Environmental Management Systems
Carbon Disclosure Project
UN Global Compact
Regenerative Network
Habitat for Humanity
Global Recognition from Stakeholders

United States Green Building Council Information
LEED and High Performance Door and Hardware Contributions
LEED Case Studies from ASSA ABLOY Group Brands
High Performance Doors & Hardware for Energy Efficient Buildings
Additional Information

ASSA ABLOY
The global leader in door opening solutions
ASSA ABLOY is committed to providing products and services that are environmentally sound throughout the entire production process and the product life-cycle.

Our unconditional aim is to make sustainability a central part of our business philosophy and culture, but even more importantly is the job of integrating sustainability into our business strategy.

Source: ASSA ABLOY Sustainability Policy
Certified Green Building Space Projected Growth

Existing Commercial

New Commercial

Projected 47 Billion square feet by 2020

10 Billion square feet currently
Sustainability Reports & Global Reporting Initiative

ASSA ABLOY has completed a comprehensive Sustainability report since 2005–2006 utilizing the Global Reporting Initiative and submitting each subsequent report to the United Nations for review.

- Global Reporting Initiative (GRI) is a network-based organization that has pioneered the development of the world’s most widely used sustainability reporting framework and is committed to its continuous improvement and application worldwide.
- GRI has 6 main sections: environmental, human rights, labor practices, society, product responsibility and economic.
- Since the programs start in 1999, it has rapidly become the world leader among voluntary sustainability reporting systems.
- Currently, over 1000 corporations participate.
- ASSA ABLOY has been a GRI participant since 2006 and is level C, third-party checked.
ASSA ABLOY Sustainable Innovation Process

Delivering world-class innovation requires a process that takes into account customer needs, and that can meet them with value-adding solutions in an efficient and sustainable way. The environmental impact of ASSA ABLOY’s products and the processes in which they are produced, are decided mainly in the development phase. Material choice and quantity, manufacturing process, energy savings and other sustainability aspects are all decided on during the products’ development. Group companies use the Group’s Product Innovation Process and environmental checklist for all new product development.
Sourcing Process and Supply Chain

Sustainability is a vital factor in our sourcing process. For ASSA ABLOY, auditing and improving its supplier base is a continuous task.

Supplier quality process
The Group’s sustainability approach is integrated into the ASSA ABLOY supplier quality process, which ensures that the right suppliers are selected by using standardized criteria and requirements for both quality and sustainability compliance.

There are three steps in the Group’s sustainability audit process:

1. Supplier self-assessment – this allows the supplier to assess its ability to maintain ASSA ABLOY’s standards early in the process.

2. On-site audit – the Group’s sustainability screening audit process (introduced in 2008) is used to evaluate how well a potential supplier meets set requirements.

3. Extended sustainability audit – this is a complement to the standard sustainability screening audit.

Screening audit process
A Sustainability screening audit process is the main tool used for an on-site audit to evaluate how well a potential supplier meets set requirements. ASSA ABLOY has carried out standardized audits on suppliers with regard to sustainability since 2006.

The number of sustainability audits in low cost countries increased to 376 compared to 188 in 2009. At the year end 288 active suppliers had satisfied the minimum standards for quality and sustainability and were classed as reliable.
Certified Environmental Management Systems

All factories with significant environmental impact should be certified according to the environmental management standard ISO14001 or another certifiable environment management system. By the end of 2010, 69 of the Group’s production units had implemented such a system. The number of units that are ISO14001 certified has increased from 39 in 2009 to 47.

<table>
<thead>
<tr>
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<th>07</th>
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<tr>
<td>Certifiable Systems</td>
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<td>Total</td>
<td>68</td>
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1 The change is due in part to the closing of units in the restructuring program, while some new units have been certified.
ASSA ABLOY has participated in the Carbon Disclosure Project (CDP) since 2007. The CDP is an international initiative to assess companies' preparedness with regard to risks and opportunities associated with climate change. ASSA ABLOY currently reports on Scope 1 and Scope 2 emissions.
UN Global Compact

- ASSA ABLOY supports the United Nations Global Compact and its 10 principles, which cover human rights, labor standards, business ethics and the environment.
- As a participant, ASSA ABLOY is committed to promoting the 10 principles in its daily operations around the world.
- To report on ASSA ABLOY’s sustainability work, ASSA ABLOY has submitted every year since 2008 to the UN Global Compact organization.
Regenerative Network

Partnership augments company’s core sustainability strategy

The global leader in door opening solutions is teamed with dynamic green build business consortium to continue meeting the industry’s demands for products and solutions that deliver safety, security, convenience and sustainability.

The Regenerative Network, the business consortium of leading global and venture-backed green building product manufacturers and service providers, welcomes ASSA ABLOY as the 25th member of the prestigious Network and the exclusive member of their industry category.
For the last 10 years, ASSA ABLOY has donated locksets with a total value of $11 million to all Habitat for Humanity homes built in the United States and has further supported the annual Jimmy Carter Work Project in various North American locations. Many ASSA ABLOY Group brands have supported local Habitat for Humanity chapters with build support as well as in-kind services.

The ASSA ABLOY Group and Yale Locks & Hardware joined Habitat’s affordable housing work in 2001 with a commitment of $5 million in interior and exterior locksets and complimentary technical advice to Habitat affiliates regarding use and installation. Yale renewed this commitment in 2006, exceeding its second $5 million pledge by nearly $1 million. The company also supports Habitat house construction through employee volunteerism on build sites near Group locations that include Mason City, IA; New Haven, CT; Charlotte, NC; Roanoke, VA; and New York City.
ASSA ABLOY Sustainability

Global Recognition from Stakeholders

ASSA ABLOY has received global recognition by governments, non-governmental organizations and investors for our social and environmental performance. Several have evaluated the Group's performance during 2009.

ASSA ABLOY benefits from regular and open dialog on sustainability with investors and analysts.
USGBC’s LEED Drives Sustainable Building

The U.S. Green Building Council (USGC) is a Washington, D.C.-based 501(c)(3) nonprofit organization committed to a prosperous and sustainable future for our nation through cost-efficient and energy-saving green buildings. USGBC works toward its mission of market transformation through its LEED green building certification program, robust educational offerings, a nationwide network of chapters and affiliates, the annual Greenbuild International Conference & Expo, and advocacy in support of public policy that encourages and enables green buildings and communities.
ASSA ABLOY Memberships in US and CaGBC

Membership in the USGBC and CaGBC demonstrates ASSA ABLOY’s commitment to best practices for sustainable construction, operation and maintenance for all buildings and the products that we provide them.
USGBC Drives Leadership in Energy and Environmental Design (LEED)

The LEED® green building certification program is a voluntary, consensus-based national rating system for buildings designed, constructed and operated for improved environmental and human health performance. LEED addresses all building types and emphasizes state-of-the-art strategies in seven areas: sustainable sites, water efficiency, energy & atmosphere, materials & resources, indoor environmental quality, innovation in design and regional priority.
The Sustainability Continuum for Green Buildings

As the built environment strives to be as energy efficient and green as possible, high performance commercial doors and hardware play a larger supporting role.
LEED Professionals in the Ranks of ASSA ABLOY

LEED professional credentials recognize professionals who have demonstrated a thorough understanding of green building techniques, the LEED green building rating systems and the certification process. ASSA ABLOY has LEED Accredited Professionals (AP) and Green Associates (GA) that can help green your specifications.
The LEED Rating Systems contain 7 categories:

- Sustainable Sites
- Water Efficiency
- Energy & Atmosphere
- Materials & Resources
- Indoor Environmental Quality
- Innovation & Design Process
- Regional Priority Credits
How ASSA ABLOY Products Contribute to LEED Credit for Buildings

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ is the nationally accepted benchmark for the design, construction, and operation of high performance green buildings. LEED promotes a whole-building approach to sustainability by recognizing performance in seven key areas of human and environmental health: sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, innovation in design and regional priority credits.

ASSA ABLOY Group brands can contribute credit in energy and atmosphere, materials and resources, indoor environmental quality and innovation in design.
EA Prerequisite 2
Minimum Energy Performance

Establish the minimum level of energy efficiency for the proposed building and systems to reduce environmental and economic impacts associated with excessive energy use. ASSA ABLOY Group brands can offer customers exterior Establish the minimum level of energy efficiency for the proposed building and systems to reduce environmental and economic impacts associated with excessive energy use.

Demonstrate a **10%** improvement in the proposed building performance rating for new buildings, or a **5%** improvement in the proposed building performance rating for major renovations to existing buildings, compared with the baseline building performance rating.

Calculate the baseline building performance rating according to the building performance rating method in **ASHRAE Standard 90.1-2007** using a computer simulation model for the whole building project. ASSA ABLOY Group brands can offer customers exterior door openings that save 10% or more in improved energy efficiency.

**Primary Air Infiltration Locations**

**Energy Standard for Low Rise Residential Buildings**

<table>
<thead>
<tr>
<th>ASHRAE 90.1 – 2007</th>
</tr>
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<tbody>
<tr>
<td><strong>Climate Zone 1-6</strong></td>
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<tr>
<td>Opaque Swinging Doors Minimum U-Factor</td>
</tr>
<tr>
<td>Air Infiltration</td>
</tr>
</tbody>
</table>
EA Credit 1
Optimize Energy Performance

Achieve increasing levels of energy performance beyond the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use. ASSA ABLOY Group brands can offer customers exterior door openings that save 10% or more in improved energy efficiency.

<table>
<thead>
<tr>
<th>LEED and High Performance Door and Hardware Contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Term Goals of Sustainable Buildings</td>
</tr>
<tr>
<td>LEED Professionals in the Ranks of ASSA ABLOY</td>
</tr>
<tr>
<td>Sustainable Door Openings in LEED</td>
</tr>
<tr>
<td>How ASSA ABLOY Group brands Contribute to LEED Credit for Buildings</td>
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<tr>
<td>LEED for Schools</td>
</tr>
<tr>
<td>LEED EBOM</td>
</tr>
<tr>
<td>LEED Statements</td>
</tr>
</tbody>
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### ASHRAE 90.1 – 2007

<table>
<thead>
<tr>
<th>Improvement</th>
<th>Climate Zone 1–6</th>
<th>Climate Zone 7–8</th>
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<tr>
<td>5% Improvement for LEED EBOM</td>
<td>.675 and .38 cfm/sf²</td>
<td>.475 and .38 cfm/sf²</td>
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<tr>
<td>10% Improvement for new LEED projects</td>
<td>.63 and .36 cfm/sf²</td>
<td>.45 and .36 cfm/sf²</td>
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<tr>
<td>48% Improvement for high performance LEED projects</td>
<td>.364 and .21 cfm/sf²</td>
<td>.26 and .21 cfm/sf²</td>
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</tbody>
</table>
MR Credit 1.2
Building Reuse—Maintain Existing Interior Non-Structural Elements

Extend the lifecycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport. The longevity and durability of openings constructed with products from ASSA ABLOY Group brands should allow re-use on LEED projects and help in the attainment of this credit.
Increase demand for building products that incorporate recycled content materials, thereby reducing impacts resulting from extraction and processing of virgin materials. Use materials with recycled content such that the sum of postconsumer recycled content plus ½ of the preconsumer content constitutes at least 10% or 20%, based on cost, of the total value of the materials in the project. The recycled content value of a material assembly is determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value. Almost all products from ASSA ABLOY Group brands contain recycled content and contribute toward this credit.
Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation. Use building materials or products that have been extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site for a minimum of 10% or 20%, based on cost, of the total materials value. Manufacturing facilities for ASSA ABLOY Group brands are located throughout North America and can assist your LEED CI projects in earning this credit. See individual brand LEED statements for manufacturing locations.
MR Credit 6
Rapidly Renewable

Reduce the use and depletion of finite raw materials and long-cycle renewable materials by replacing them with rapidly renewable materials. Use rapidly renewable building materials and products for 2.5% of the total value of all building materials and products used in the project, based on cost. Rapidly renewable building materials and products are made from plants that are typically harvested within a 10-year or shorter cycle. Graham and Maiman offer an agrifiber core made of wheat stalks that can help projects qualify for this credit. Bamboo veneer products can also help contribute to this credit.
Encourage environmentally responsible forest management. Use a minimum of 50% (based on cost) of wood-based materials and products that are certified in accordance with the Forest Stewardship Council's (FSC) principles and criteria, for wood building components. These components include at a minimum, structural framing and general dimensional framing, flooring, sub-flooring, wood doors and finishes. Graham and Maiman have FSC certified products across their product lines. Many of our distributors have FSC COC to help projects qualify for this credit.

GRAHAM | MAIMAN
IEQ Prerequisite 2

Environmental Tobacco Smoke (ETS) Control

Prevent or minimize exposure of building occupants, indoor surfaces and ventilation air distribution systems to environmental tobacco smoke (ETS). Weatherstrip all doors in the residential units leading to common hallways to minimize air leakage into the hallway. Pemko can assist LEED projects in achieving this credit.

Pemko
IEQ Credit 4.1 & 4.2
Low-Emitting Materials—Adhesives & Sealants, Paints & Coatings

Reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants. This credit only applies to materials applied within the weatherproofing system. ASSA ABLOY Group brands, however, offer solutions including pre-finished door openings and pre-installed glazing. This allows LEED projects to avoid applying materials onsite.
IEQ Credit 4.4
Low-Emitting Materials—Composite Wood & Agrifiber Products

Reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants. Composite wood and agrifiber products used on the interior of the building (i.e., inside the weatherproofing system) must contain no added urea-formaldehyde (NAUF) resins. Graham and Maiman have NAUF and CARB 1 & 2 certified products available across their product lines. Additionally, our Door Group brands have been tested to meet California 01350 and GREENGUARD Children & Schools standards.
IEQ Credit 5
Indoor Chemical & Pollutant Source Control

Minimize building occupant exposure to potentially hazardous particulates and chemical pollutants. Sufficiently exhaust each space where hazardous gases or chemicals may be present or used (e.g., garages, housekeeping and laundry areas, copying and printing rooms) to create negative pressure with respect to adjacent spaces when the doors to the room are closed. For each of these spaces, provide self-closing doors and deck-to-deck partitions or a hard-lid ceiling. Door closers and gasketing from ASSA ABLOY Group brands should be specified on all openings where hazardous particulates and chemical pollutants may be present.
IEQ Credit 8.1 & 8.2
Daylight & Views

Provide building occupants with a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied areas of the building. Adding glazing and sidelights to openings built with products from ASSA ABLOY Group brands will assist projects in achieving this LEED credit.

LEED and High Performance Door and Hardware Contributions

Long Term Goals of Sustainable Buildings

LEED Professionals in the Ranks of ASSA ABLOY

Sustainable Door Openings in LEED

How ASSA ABLOY Group brands Contribute to LEED Credit for Buildings

LEED for Schools

LEED EBOM

LEED Statements

LEED Case Studies from ASSA ABLOY Group Brands

High Performance Doors & Hardware for Energy Efficient Buildings

Additional Information
LEED for Schools

The following credits apply specifically to the LEED for Schools rating system.
IEQ Credit 9

Enhanced Acoustical Performance

Provide classrooms that facilitates better teacher-to-student and student-to-student communications through effective acoustical design. Design the building shell, classroom partitions and other core learning space partitions to meet the Sound Transmission Class (STC) requirements of ANSI Standard S12.60-2002, Acoustical Performance Criteria, Design Requirements and Guidelines for Schools, except windows, which must meet an STC rating of at least 35. ASSA ABLOY offers a wide range of STC door solutions that can help LEED projects gain credit for Enhanced Acoustical Performance.
IEQ Credit 10
Mold Prevention

Reduce the potential presence of mold in schools through preventive design and construction measures. Products from ASSA ABLOY Group brands offer MicroShield® antimicrobial coatings. This natural antimicrobial coating can be applied to doors and hardware and act as an additional preventative measure to assist school projects in achieving this credit.

ADAMS RITE | BARON | CECO DOOR | CORBIN RUSSWIN | CURRIES | GRAHAM | MAIMAN MARKAR | McKinney | MEDECO | ROCKWOOD | SARGENT | SECURITRON | YALE
LEED EBOM

The following credits apply specifically to the LEED for Existing Buildings: Operations and Maintenance rating system.
MR Credit 3
Sustainable Purchasing—Facility Alterations & Additions

Reduce the environmental and air quality impacts of the materials acquired for use in the upgrade of buildings. Maintain a sustainable purchasing program covering materials for facility renovations, demolitions, refits and new construction additions. Products from ASSA ABLOY Group brands can help sustainable purchasing programs meet many of the requirements to obtain this credit.

ADAMS RITE | BARON | CECO DOOR | CORBIN RUSSWIN | CURRIES | GRAHAM | HES MAIMAN | MARKAR | McKinney | MEDECO | NORTON | PEMKO | ROCKWOOD | SARGENT SECURITRON | SMP SPECIALTY DOORS | YALE
MR Credit 9

Solid Waste Management—Facility Alterations & Additions

Divert construction and demolition debris from disposal to landfills and incineration facilities. Redirect recyclable recovered resources back to the manufacturing process and reusable materials to appropriate sites. Many products from ASSA ABLOY Group brands can be recycled (in the case of our metal products, potentially infinitely) and reused. We strive to make durable sustainable products that can assist projects in attaining this credit.

ADAMS RITE | BARON | CECO DOOR | CORBIN RUSSWIN | CURRIES | GRAHAM | HES MAIMAN | MARKAR | McKinney | MEDECO | NORTON | PEMKO | RIXSON | ROCKWOOD SARGENT | SECURITRON | SMP SPECIALTY DOORS | YALE
LEED Statements

To view all our LEED Statements by ASSA ABLOY Group brand, please visit www.assaabloydss.com/sustainability
LEED Case Studies

ASSA ABLOY Group brands are used everyday in buildings around the world and are found in some of the most cutting edge green buildings around the country. Through a few real examples, we hope to show you why customers that value Sustainability choose ASSA ABLOY Group brands.
LEED Gold Fairmont Pittsburgh  
Pittsburgh, PA

Widespread use of sustainable construction practices and building products made with recycled content and other “Green” materials enabled the Fairmont Hotel and Resort in Pittsburgh, Pennsylvania to achieve LEED Gold certification. Included in this hotel are numerous products from ASSA ABLOY Group brands ADAMS RITE, CECO DOOR, HES, McKinney, Norton, PEMKO, Rixson, Rockwood and Sargent to go along with GRAHAM Sketch Doors made with agrifiber cores.

More than 500 of the roughly 800 openings are equipped with the GRAHAM eco-friendly wood doors.

One of the many goals of LEED and other green building standards is to curb depletion of long-cycle renewable materials by encouraging the use of building products made with rapidly renewable materials, generally defined as plants with a maximum ten year planting-to-harvest cycle.

GRAHAM agrifiber core doors are made largely from agricultural by products associated with normal farm production of wheat and other crops that are planted and harvested within a year, easily fitting the rapidly renewable classification. Agrifiber offers the added benefit of having no added urea formaldehyde and hold the distinction as one of the few building products with a favorable carbon balance score.

The GRAHAM Sketch Door constructed with an agrifiber core addresses green building challenges while still offering the same aesthetic and durability properties as wood fiber doors. By mixing and matching different wood species and grain directions, Sketch Doors provide high-end visual appeal at a more economical price compared to traditional stile and rail doors. The architects of the Fairmont Pittsburgh chose a Rift Oak custom design featuring a Walnut inlay and a dark custom color finish for openings throughout the hotel.

In addition to answering security and life-safety needs, the locks and hardware used in the hotel are also constructed with large percentages of recycled material that exceed the minimum requirements in the LEED Materials & Resources guidelines.
The world’s first green convention center was awarded a LEED Gold certification for its excellence in building environmental performance. The David L. Lawrence Convention Center incorporates many green technologies, including the use of natural ventilation, daylight sensors and carbon monoxide sensors, a water reclamation system that reduces potable water use by 60 percent along with roof skylights and walls of glass that produce diffused lighting and uniform temperature. The shape of the building captures natural airflow from the Allegheny River to help ventilate and cool the building. All of the green features incorporated into the 1.5 million square-foot building help reduce energy usage by 35 percent.

**Statistics**
- 1.5 million square ft. (total size)
- 313,400 square ft. exhibit space
- 53 meeting rooms
- 31,600 square ft. ballroom
- Cost - $385 million

**Architectural Team**
- Rafael Vinoly Architects
- Burt Hill Kosar Rittelmann Associates

**General Contractor**
- Turner/P J Dick/ATS Joint Venture

**SARGENT Products**
- 8200 Lever Lock
- 281 Series Powerglide door closer
- 80 Series exit device
The college’s stature as a cradle of innovation is evident in the newly constructed 41 Cooper Square, a technologically advanced academic facility that attained LEED Platinum certification. In keeping with the school’s goal to create a high performance building, openings throughout 41 Cooper Square are constructed with door and hardware products from ASSA ABLOY Group brands.

A blend of doorway security, life-safety, aesthetics and sustainability is achieved with CURRIES hollow metal 707 doors and McKinney three-knuckle hinges along with 8200 Series mortise locks, 80 Series exit devices and 351 Series door closers from SARGENT. PERSONA technology was used to integrate the card locking system.

The doorways feature a mix of mechanical and electromechanical locks that provide balanced security throughout the building, enabling facility personnel to set access privileges according to their needs. Each opening is also carefully tailored to fit the design motif set forth by project architect Thom Mayne of Morphosis.

From a sustainability perspective, all of the doorway products are constructed with percentages of recycled material that contribute to LEED Materials and Resources credits, and when used together as a complete assembly, the openings can help improve building envelope thermal and air leakage performance.

The 175,000 square-foot building, located on the east side of Third Avenue between 6th and 7th Streets, features laboratories, studios, classrooms, lounges, offices and several public spaces. The facility is 40% more energy efficient than a standard building of its type and is built with renewable, recycled and low emission materials.
As the final construction beam was raised, the local ironworkers attached a small figurine of William Penn to the beam in homage to the statue atop Philadelphia City Hall. Rising to a height of 975 feet, Comcast Center was designed by Robert A.M. Stern Architects, LLP.

The structure has 57 floors—56 rentable—with 1,248,000 square feet of office space and about 23,000 square feet of retail space. The building’s footprint obliterated a one-block section of Cuthbert Street and is situated between Arch Street, 17th and 18th Street and John F. Kennedy Boulevard.

**Architectural Team**
- Robert A.M. Stern Architects, LLP

**SARGENT Products**
- Signature Series cylinders
- 8200 Lever Lock
- 351 Series Powerglide door closer
- 80 Series exit device
Other LEED Projects from ASSA ABLOY Group Brands

To stay updated on the latest ASSA ABLOY case studies, please visit www.assaabloydss.com/sustainability/case-studies
High Performance Doors and Hardware for Energy Efficient Buildings

Why It is Important

Envelope Design

USGBC Energy & Atmosphere

Calculated vs. Operable Values

Meeting New Codes

Standards

Components of an Energy Efficient Opening

Thermal Break Frames

Kerf Frames

Insulated Doors

Gasketing

The Importance of Door Closers

Automatic Operators

Revolving Doors

Vestibules

A Sealed Building

BIM

Additional Information
Why it is important

According to the United States Green Building Council (USGBC):

In the United States alone, buildings account for:

- 72% of electricity consumption
- 39% of energy use
- 38% of all carbon dioxide (CO2) emissions

Approx 40% of all air infiltration comes from the building envelope*

- Floors, Walls & Ceilings – 31%
- Windows - 10%
- Doors - 11%

*Tony Woods, Air tight buildings, 2005
Envelope Design

- High-performance doors and hardware play an important role in enhancing building energy efficiency
- A few basic measures can be taken to improve the thermal integrity of doorways in the building envelope
USGBC Energy & Atmosphere

- United States Green Building Council (USGBC) LEED NC 2009 Energy & Atmosphere (EA) Section
  - EAp2 – Minimum Energy Performance –
  - EAc1- Optimize Energy Performance
  - Option 1 - requires whole building energy simulation using a computer model. Your project must reduce energy cost by a minimum of 10% (5% for an existing building) to meet the prerequisite, EAp2. Under EAc1 you can earn one point for each additional 2% of energy cost reduction from the ASHRAE 90.1-2007
  - 2009 IECC also uses 90.1-2007
  - Air leakage < .4 cfm/sf^2

- IGCC 2012 & ASHRAE 189.1 –
  - Standard 189.1 is a set of technically rigorous requirements, which like the IGCC, covers criteria including water use efficiency, indoor environmental quality, energy efficiency, materials and resource use, and the building’s impact on its site and its community
  - 30% improvement over 2006 IECC
  - 189.1 Adopted by US Army Corps of Engineers
  - Reflects the AIA 2030 Commitment
  - Requires increased insulation, better fenestration
  - Air infiltration allowance at .2 cfm/sf^2
Calculated vs. Operable Values

- Manufacturers have traditionally promoted the calculated R and U values for their products
  - Determined by a formula, rather than performance test
  - Calculated core not indicative of real-life performance
- Operable value gives a more realistic estimate of product performance
  - Determined by performance testing
  - ASTM C1363 is the most current test standard for operable thermal transmittance, replacing ASTM C236
  - ASTM E283 is the most current test standard for operable air infiltration

Example of differences in calculated and operable R and U values

<table>
<thead>
<tr>
<th>Door Series / Core</th>
<th>Test Method: ASTM C518 Calculated</th>
<th>Test Method: ASTM C1363* Operable</th>
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<tr>
<td></td>
<td>U-Factor</td>
<td>R-Value</td>
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<tr>
<td>Trio-E / Polyurethane &amp; Steel Stiffened</td>
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<tr>
<td>Imperial / Polyurethane</td>
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<td>Regent / Honeycomb</td>
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<tr>
<td>Medallion / Steel Stiffened</td>
<td>0.62</td>
<td>1.6</td>
</tr>
</tbody>
</table>

*Tested with hardware from other ASSA ABLOY Group brands including CORBIN RUSSWIN, PEMKO, MCKINNEY, SARGENT and YALE in a CECO DOOR Thermal Break Frame.

**Tested with Weather Kerf Frame.
Meeting New Green Building Codes

Why It is Important

Envelope Design

USGBC Energy & Atmosphere

Calculated vs. Operable Values

Meeting New Codes

Standards

Components of an Energy Efficient Opening

Thermal Break Frames

Kerf Frames

Insulated Doors

Gasketing

The Importance of Door Closers

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Additional Information
Thermal Resistance & Air Infiltration – Commercial Construction

**Non Residential: Building Envelope Climate Zones**

<table>
<thead>
<tr>
<th>Zone</th>
<th>Climate Zone 1–6</th>
<th>Climate Zone 7–8</th>
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<tr>
<td>2</td>
<td>0.6</td>
<td>0.4</td>
</tr>
<tr>
<td>3</td>
<td>0.5</td>
<td>0.3</td>
</tr>
<tr>
<td>4</td>
<td>0.4</td>
<td>0.2</td>
</tr>
<tr>
<td>5</td>
<td>0.3</td>
<td>0.1</td>
</tr>
<tr>
<td>6</td>
<td>0.2</td>
<td>0.1</td>
</tr>
<tr>
<td>7</td>
<td>0.1</td>
<td>0.1</td>
</tr>
</tbody>
</table>

**Energy Standard for Low Rise Residential Buildings**

<table>
<thead>
<tr>
<th>Opaque Swinging Doors Minimum U-Factor</th>
<th>Climate Zone 1–6</th>
<th>Climate Zone 5–8</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.7</td>
<td>0.5</td>
<td>0.4</td>
</tr>
<tr>
<td>0.6</td>
<td>0.4</td>
<td>0.3</td>
</tr>
</tbody>
</table>

**Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings**

<table>
<thead>
<tr>
<th>Opaque Swinging Doors Minimum U-Factor</th>
<th>Climate Zone 1–6</th>
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</tr>
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<tbody>
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<td>0.5</td>
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</tr>
<tr>
<td>0.6</td>
<td>0.4</td>
<td>0.3</td>
</tr>
</tbody>
</table>

**Thermal resistance standards for residential construction**

**Current (as of 2010)**

<table>
<thead>
<tr>
<th>Glazing Level</th>
<th>U-Factor</th>
<th>SHGC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opaque</td>
<td>≤ 0.21</td>
<td>No Rating</td>
</tr>
<tr>
<td>≤ ½ Lite</td>
<td>≤ 0.27</td>
<td>≤ 0.30</td>
</tr>
<tr>
<td>&gt; ½ Lite</td>
<td>≤ 0.32</td>
<td>≤ 0.30</td>
</tr>
</tbody>
</table>

**Doors**

- **Thermal Break Frames**
- **Kerf Frames**
- **Insulated Doors**
- **Gasketing**
- **The Importance of Door Closers**
- **Automatic Operators**
- **Revolving Doors**
- **Vestibules**
- **A Sealed Building**
- **BIM**

**Assa Abloy Sustainability Commitments**

- **United States Green Building Council Information**
- **LEED and High Performance Door and Hardware Contributions**
- **LEED Case Studies from Assa Abloy Group Brands**

**High Performance Doors & Hardware for Energy Efficient Buildings**

- **Why It’s Important**
- **Envelope Design**
- **USGBC Energy & Atmosphere**
- **Calculated vs. Operable Values**
- **Meeting New Codes**

**Standards**

- **Components of an Energy Efficient Opening**
- **Thermal Break Frames**

**Additional Information**

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- **United States Green Building Council Information**
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**High Performance Doors & Hardware for Energy Efficient Buildings**

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**Standards**

- **Components of an Energy Efficient Opening**
- **Thermal Break Frames**

**Additional Information**
Components of an Energy Efficient Opening

Opening components must be pieced together to create a weatherized opening

- Thermal break frames
- Insulated doors
- Gasketing (weatherstripping)
- Kerf frames
- Hardware (closing and latching)
- Position switches tied into Building Automation Systems
- Automatic Openers, Vestibules and Revolving doors
Thermal Break Frames

Thermal break frames can improve an opening’s U-factor

- Since door frames are made of metal, a thermal break consisting of an insulated material is needed to stop heat transmission
  - Provides a positive thermal break within the frame profile
  - Delivers maximum protection against cold penetration
  - Ideal for openings exposed to extreme cold
- Reduce heat loss
- Prevent frost/condensation
- Weatherstripping easily removable
Kerf Frames

- Specially designed frames feature a groove along the frame section that comes in contact with the door edge
- Simplifies installation of weatherstripping
- Serves as a convenient channel to install weatherstripping without using additional fasteners
- Weatherstripping easily removable
Insulated Doors

- Insulated doors boost the R-factor of an opening
- Hollow metal doors commonly used in building envelope
  - Constructed from sheet metal in 20-18, 16- and 14-gauge thickness
  - Core or interior space can be filled with insulated material (polystyrene/polyurethane)
- Door cores
  - Polystyrene
    - Features an R-factor of roughly 6.4
  - Polyurethane
    - R-factor of about 11 creates an effective thermal barrier
    - Look for non-ozone depleting CFC and HCFC free
Gasketing

- All openings have small gaps and creases, Gasketing is needed to fill these creases
- Gasketing should be used to fill seams around the jambs and door head
- A bottom seal and threshold can eliminate the gap under the door
- Openings with a pair of doors also require gasketing to seal the meeting stile
- Left untouched, these gaps allow free passage of air and are a significant source of energy loss
- ASTM E283 (lab) provides guidelines for air infiltration performance
- ASTM E783 (field) provides guidelines for air infiltration performance
- Gasketing available in several materials
  - Silicone
  - Santoprene (100% recyclable—avoid Chloroprene/Neoprene)
  - Vinyl
  - Polypropylene
- Materials are flexible
  - Do not impede door operation
- Available in varying Grades to meet conditions of different climate zones
- Look for products that meet or exceed ANSI 156.22 Door Gasketing and Edge Seal Systems standards
The Importance of Door Closers

- **LEED IEQc5- Indoor Chemical and Pollutant Source Control** – This requirement in LEED calls for self-closing doors on janitor closets

- **Overcoming stack pressure**
  - Stack pressure created by differences between inside and outside air pressure
  - Can create a strong rush of air to flow out that overpowers the closing cycle of the door closer
  - Door may stay open longer than intended or fail to latch shut
  - Properly sized closer needed to overcome stack pressure

- **Innovations**
  - A new generation of mechanical closers have self-adjusting features
  - Eliminates the need to determine closer size
  - Automatically adjusts any time there is a change in stack pressure
  - One size fits all
  - Simplifies code compliance
  - Battery and wire free versions available
  - Can be used in retrofit applications
Automatic Operators

- Automatic or power-assisted doors used on heavily-accessed entrances
- 43% energy savings achieved during 9 month test
Revolving Doors

- Alternatives to swinging/sliding doors
  - Revolving doors

- Swinging/sliding doors allow air to rush out of the building

- Revolving doors stop the free flow of air
  - Revolving door is never open
  - Seals remain in contact with walls of the doors at all times
  - Only air transferred is in the chamber with the person using the door

- MIT 2006 study
  - Swinging doors allow 8x as much air exchange as a revolving door
  - Study estimated that limiting ingress and egress to revolving doors would save school $7,500 a year for a single building
  - Accompanying reduction in emissions would total about 15 tons of CO2 annually per building
  - Result achieved by utilizing 2 of the 29 revolving doors on campus!

- Overcoming habits
  - MIT study found most people entering the building bypassed the revolving door in favor of the nearby swinging door
  - Building codes require a swinging door to be placed in close proximity to revolving doors
  - Revolving door traffic increased after a sign was posted indicating the potential energy savings

- Improving manual revolving door efficiency
  - Efficiency can be improved by including a speed control enhancement that moves the door to the X position (return-to-quarter-point)
  - When door rests in X position, all four door wings seal the door unit to the outside curved wall
  - Keeps the door in rest position until activated by a user
Vestibules

US Army Corps of Engineers tested the addition of vestibules to existing buildings. The result was a 10–20% reduction in the amount of energy used by the buildings with a payback of under 4 years for many of the buildings types tested. Many new codes are requiring vestibule on the primary entrance doors leading from spaces in a building greater than or equal to 3000 ft.
A Sealed Building

- Optimizing thermal performance requires attention to the entire building envelope
- Steps should be taken to create a sealed barrier that prevents air infiltration and energy transfer
- Each opening component should be carefully selected and preferably tested as a complete solution.
- Following this strategy, high-performance door solutions can be used to create a more energy efficient green building!
• Virtual Design Construction (VDC) is the process. BIM is the Tool that Enables the Process.
• BIM is NOT a software program.
• Database of building information that can be visually represented in 3D
  – The power lies in the connectedness between the data and the virtual object
• BIM can be used to model the efficacy of door openings in high performance buildings
• Database is a shared resource; Design/Costing/Procurement/Fabrication/Scheduling/Facility Management
How To Get More Information?

Email Aaron C Smith, LEED AP  asmith@assaabloydss.com
Director - Sustainable Building Solutions
ASSA ABLOY Door Security Solutions

ASHRAE: www.ashrae.org

United States Green Building Council: www.usgbc.org

US Army Corps of Engineers: www.usace.army.mil

Massachusetts Institute of Technology: www.sustainability.mit.edu

International Living Building Institute: www.ilbi.org

AIA 2030 Challenge: www.architecture2030.org

USGBC: www.usgbc.org

ASSA ABLOY Door Security Solutions: www.assaabloydss.com/sustainability