ASHRAE SETS EXAMPLE

ASHRAE has reduced its estimated annual energy use by more than 31.5% through enhancements to the building envelope and use of a dedicated outdoor air system with energy recovery, ground-source heat pumps, and minisplit systems with heat recovery.

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ASHRAE's goal in renovating its existing headquarters in Atlanta was to provide a healthy and productive environment for staff and to showcase ASHRAE technology, while demonstrating the Society's commitment to sustainability.

The 31,000 ft^2 building is designed as a living lab for the membership to advance the arts and sciences of HVAC&R, and to serve the needs of current ASHRAE staff, while at the same time accommodating future growth. The building also has been expanded by 4,500 ft^2 to create the ASHRAE Foundation Learning Center for ASHRAE's growing number of educational and certification programs.

The project started in 2005 when the ASHRAE Board of Directors voted to adopt sustainability as the central theme for the Strategic Plan and committed to making the headquarters decision a significant statement in that program. Consistent with that and demonstrating the commitment to sustainability, the Board decided to renovate and expand the existing headquarters building rather than build anew or lease. At the same time, the decision was made to seek LEED®-EB Gold and LEED-NC 2.2 designation for the renovated building, while fully complying with or exceeding the requirements of ASHRAE standards.

While the construction team included contracted professionals, it also included a volunteer technical committee to take advantage of ASHRAE's volunteer resources in architecture, mechanical systems, lighting, controls, sustainability, IAQ, energy, and operation and maintenance.

BUILDING TEAM

Architect Richard Wittschiebe Hand

General Contractor Gay Construction

Mechanical Engineer
Johnson, Spellman and Associates

Mechanical Contractor
Batchelor and Kimball

Electrical Engineer
Jeffers Engineering Associates

Electrical Contractor Gene Lynn Electric

Commissioning Agent CxGBS

RENEWAL PARTNERS

The generous donations of the following companies help ensure ASHRAE's headquarters is a showcase of sustainability for its members and the HVAC&R industry as a whole. With its sustainability and productivity focus, this project showcases these companies' commitment to environmental leadership and healthy environments.

ASHRAE Foundation
Carrier
Automated Logic Corp./Automated Logic Georgia
ClimateMaster
Daikin Industries, Ltd.
Southern Company/Georgia Power Company
Trane
Aircuity Inc.
Interface Flor
Allsteel/Ivan Allen
Mark H. Brandli—design principal for Richard Wittschiebe Hand
CxGBS
Dynamic Air Quality Solutions
EBTRON Inc.
GE Power
Bill and Margaret Harrison
ITT/Bell & Gossett/James M. Pleasants Co.
NorthWrite Inc.
Thermal Gas Systems Inc.
PolyCon
U.S. Green Building Council
VFA Inc.

DIGITAL CONTROL SYSTEM

The direct digital control system provides overall control with Web browser interface. Additional wiring and sensors are located in selected spaces. There are electronic data storage and manipulation capability, Web access, and a meteorological monitoring station. Sensing and data acquisition system/equipment have capabilities to provide sufficient data that are useful for a broad range of HVAC&R research and development on buildings, the building environment, building systems, subsystems, equipment, and controls. The facility will display the performance of the building, including air temperature, humidity, CO_2 concentration, air pollutants concentration, airflow rates, ambient noise level, and lighting levels, while showcasing mechanical features of the building and monitoring the environmental quality.

ASHRAE has reduced the amount of site runoff by 34% and reduced the runoff rate by 30% by implementing a storm water detention and bioretention system.

The Owners Project Requirements report was developed with goals to:

- Maximize daylighting by minimizing perimeter offices and using modular furniture;
- Tighten the building envelope by reducing air infiltration;
- Follow the guidelines in the *Advanced Energy Design Guide for Small Office Buildings*;
- Provide 30% higher ventilation than required by ANSI/ASHRAE Standard 62.1-2004, *Ventilation for Acceptable Indoor Air Quality*;
- Reduce energy use by 30% as compared to ANSI/ASHRAE/IESNA Standard 90.1-2004, *Energy Standard for Buildings Except Low-Rise Residential Buildings*;
- Provide renewable energy through photovoltaics to meet 10% of the annual peak electrical demand of the building;
- Provide energy, demand, performance and system data from the headquarters building that will interface through ASHRAE.org; and
- Use the technology included within *ASHRAE Handbook*.

Some of the key technical parameters of the final project include:

- A roof-mounted DOAS system proving 6,000 cfm of outside air and incorporating dual stage air-to-air heat recovery desiccant heat wheels, variable speed outside air and exhaust air fans, DX cooling coils and MERV 13 air filters;

The new ASHRAE headquarters building has sensing and monitoring capabilities at a level that is unprecedented in current commercial buildings. The purpose is to create a living laboratory to provide ongoing value to ASHRAE members. Effectively, the building will serve as a laboratory without walls to extend its knowledge and information worldwide.

The building includes sensors to support monitoring the energy performance of the whole building but also its major systems—the dedicated outdoor air system, the ground source heat pump system providing space conditioning to the second floor, and the variable refrigerant flow system providing cooling for the first floor.

Measurements include:

- Energy use and electric power demand of the whole building, major systems, subsystems, and individual system components/equipment segregated by energy type;
- Conditions, such as on/off status, operation mode, temperature, humidity, pressure, and flow rate, at many points in the various systems and equipment;
- Indoor environmental conditions, such as air temperature, humidity, CO_2 concentration, concentration of other air pollutants, airflow rates, lighting levels, and daylight availability;
- Water consumption by the whole-building and targeted end uses; and
- Outdoor weather conditions including total and diffuse solar radiation and air quality.

All data will be stored at five- or 15-minute intervals, but the capability will exist to adjust the collection interval for select sets of points for specific studies to one minute or less. Data can be accessed by members online, through the ASHRAE Web site.

The data collected will be sufficient, for example, for monitoring and studying the indoor environmental quality, the energy use of the building and individual systems, equipment performance (efficiency, reliability, degradation, fault occurrence) in the short term and over its lifetime, control system performance, benchmarking, and investigation of new techniques and technology such as automated fault detection and diagnostics, advanced controls, ventilation strategies, energy conservation strategies, maintenance practices, etc.

The laboratory is envisioned as including occupant satisfaction survey capability, although this is not yet implemented. Occupant surveys will be administered via the building business computer network.

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ASHRAE's living lab provides an opportunity for members to see sustainable technologies operating in accordance with ASHRAE standards and guidelines.

ASHRAE GREEN FACTS

The ASHRAE renovation project is on a greyfield site, which eliminates impact on environmentally sensitive areas such as prime farmland, flood zone, endangered species habitat, wetlands, etc.

ASHRAE has increased the amount of vegetated open space by 45.2% above local code requirement.

ASHRAE has implemented an extensive measurement and verification system and plan to provide for the ongoing accountability of the building performance over time through the ASHRAE living lab.

ASHRAE has installed a cool white reflective roof membrane with a solar reflectance index of 78 to minimize heat island effects.

ASHRAE has updated the landscaping and eliminated the need for landscaping irrigation.

ASHRAE has reduced its estimated annual water consumption per year for bathrooms from 133,100 gal./yr to 63,500 gal./yr (52.3% reduction) by using low flow fixtures compared with conventional fixtures.

ASHRAE has reduced its estimated overall annual water consumption per year from 253,021 gal./yr to 135,921 gal./yr (46.3% reduction) by utilizing low-flow fixtures compared with conventional fixtures throughout building. (When compared with the old building's water use, the savings are even greater with an estimated 79% reduction in annual water consumption).

ASHRAE has reduced its estimated annual energy use by more than 31.5% through enhancements to the building envelope and use of the following systems: dedicated outdoor air system (DOAS) with energy recovery, ground-source heat pumps, and mini-split systems with heat recovery.

ASHRAE and Georgia Power are working together to demonstrate how PV arrays can be used to generate clean power by taking advantage of underused space on the building roof.

ASHRAE used the enhanced commissioning process from ASHRAE Guideline 0 to renovate its headquarters building.

ASHRAE staff is working to reduce waste generated within the building and hauled to and disposed of in landfills by collecting paper, cardboard, glass, plastics and metal on-site for recycling.

ASHRAE is 'walking the talk' by showing building owners how they can extend the life cycle of the existing building stock, conserve resources, and reduce waste and environmental impacts of new buildings by retaining more than 75% of the existing building structure as part of this renovation.

ASHRAE helped to protect our local environment by diverting more than 75% of the construction waste from this project away from landfills and incinerators and instead redirected it back into the manufacturing process as recovered resources.

ASHRAE is helping to increase the market for recycled content materials by using products and materials made from recycled content that make up more than 10% of the total value of the materials for the project.

ASHRAE is helping to increase demand for building materials and products extracted and manufactured within 500 miles of the building site by utilizing materials from this region that make up more than 20% of the total value of the materials for the project.

ASHRAE is using an extensive permanent air quality monitoring system to help sustain occupant comfort and well-being in the renovated building.

ASHRAE and Interface Carpet worked together to reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

ASHRAE is providing a comfortable thermal environment that supports the productivity and well-being of all building occupants by adhering to the requirements of ASHRAE Standard 55 and by surveying their occupants for feedback on a regular basis.

ASHRAE is using a Green Cleaning Program to keep toxic and hazardous cleaning products out of the working environment.

ASHRAE has reduced the amount of site runoff by 34% and reduced the runoff rate by 30% by implementing both a stormwater detention and bioretention system.

Minimizing the number of perimeter offices and using glass-walled cubicles maximizes the daylight entering the space.

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- Level 1 of the building and the learning center are conditioned using variable refrigerant flow inverter driven, two-stage outdoor DX heat pumps and ducted fan coil units operating on R-410A;
- Level 2 of the building is conditioned using two-stage, 27 EER variable speed ground source heat pumps operating with

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LEFT A weather station on the roof of the learning center monitors outdoor weather conditions including total and diffuse solar radiation and air quality.

BELOW A roof-mounted 20 kW photovoltaic electrical power generating array provides power back to the grid.

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ASHRAE FOUNDATION LEARNING CENTER

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The 4,500 ft^2 learning center has a total seating capacity of about 400 when three main meeting rooms are used in conference seating configuration. The three rooms can also be subdivided to create seven individual meeting rooms.

a geothermal field of 12 wells that are 400 ft deep and a closed loop piping system;

- High-efficiency lighting operates at 25% to 35% lower power level with occupancy sensor control;
- A roof-mounted 20 kW photovoltaic electrical power generating array;
- A water-efficient plumbing system includes high-efficiency low-flow toilets, waterless urinals, and solar preheat of domestic hot water; and
- Storm water retention capacity provides harvested storm water for irrigation.

ASHRAE's 106 employees moved back into the building July 28 after more than 10 months in temporary space. Energy data will be available on ASHRAE's Web site and will be reported in subsequent issues of *High Performing Buildings* and in *ASHRAE Journal*. ●

THE HEADQUARTERS RENOVATION AD HOC COMMITTEE

Chair

Bill A. Harrison, Member ASHRAE, president of Trane Arkansas, Little Rock, Ark.. Harrison is 2008–2009 ASHRAE president.

Members

Darryl Boyce, P.E., Member ASHRAE, director, the Department of Physical Plant, Carleton University, Ottawa.

Damon Gowan, Presidential Member ASHRAE, president of Gowan Inc., Houston.

Gordon V.R. Holness, P.E., Fellow/Life Member ASHRAE, chairman emeritus, Albert Kahn Associates Inc., Detroit.

Ron Jarnagin, Member ASHRAE, staff scientist/program manager, Battelle's Pacific Northwest National Laboratory, Richland, Wash.

Jeff H. Littleton, executive vice president of ASHRAE.

Mike Vaughn, Member ASHRAE, manager of ASHRAE's research and technical services sections.

HISTORY

The building that serves as the current headquarters for **ASHRAE** in Atlanta, was built in 1965 and dedicated to Employers Mutual of Wausau, an insurance company, on Feb. 23, 1966. The building was known as the Wausau Building until 1981, when ASHRAE purchased the building and moved its headquarters from New York City to Atlanta.

The headquarters building was extensively renovated in 1981 and dedicated to ASHRAE on Oct. 6, 1981. Another major renovation of the interior took place in 1991–1992. Smaller changes in the 1990s included reconfiguration of interior space on both floors for additional office space.