



Wal-Mart HE.5 Supercenter

In March 2008, Wal-Mart Stores, Inc. opened its HE.5 prototype in Las Vegas, Nevada. **The HE.5 is a western climate-specific store that is up to 45 percent more energy efficient than the baseline Supercenter.** The store is part of Wal-Mart's high efficiency series of HE.1, HE.2 and HE.5 prototypes that incorporate many years of research, experiments, partnerships and pilots, and will ultimately become Wal-Mart's stores of the future.

Building upon learnings from the HE.1 and HE.2 stores that Wal-Mart opened in 2007 and 2008 respectively, the HE.5 begins a new series of prototypes designed for specific climates. The HE.5 is western climate-specific, meaning the efficiency gains are made possible by innovations designed for the unique conditions of the region. **Specifically, the HE.5 includes new evaporative cooling and radiant flooring technologies that together provide a cool, comfortable shopping environment while using less energy.** Additionally, the stores include all of the industry-leading technologies currently being installed in new Wal-Mart Supercenters, such as white roofs, daylight harvesting systems, light-emitting diodes (LEDs) in grocery cases and highly efficient bathroom fixtures.

Given the climate-specific nature of the HE.5 store, this prototype will only be built in regions where its innovations can provide the greatest benefit. Additionally, because most of the pioneering technologies are housed on the roof and within the walls, floor and ceiling of the building, the HE.5 store will look and feel much like a typical Wal-Mart Supercenter.

Wal-Mart is working to stay on the leading edge of sustainable building practices and is committed to openly sharing its learnings with the retail industry and the world. Increasing the efficiency of its stores is just one more way Wal-Mart is moving toward its goal to open a viable prototype that is 25 to 30 percent more efficient by 2009.

INDIRECT EVAPORATIVE COOLING WITH RADIANT FLOORING



The HE.5 store features advancements in heating, cooling, refrigeration and lighting to conserve up to 45 percent more energy than the baseline Wal-Mart Supercenter and reduces refrigerant use by 90 percent. The HE.5 store utilizes the integrated water-source format system that Wal-Mart piloted in its successful HE.1 and HE.2 prototypes and adapts it to a western climate by adding indirect evaporative cooling and radiant flooring technologies. The new system cools water naturally by pumping it through roof-mounted towers and then running the cold water underneath the retail floor to cool the shopping area.

INDIRECT EVAPORATIVE PROCESS



Cooling towers



Water evaporates as it travels through the cooling towers

Wal-Mart's HE.5 store is believed to be the first U.S. retail environment to combine indirect evaporative cooling with a radiant floor. In the evaporative process, water travels through cooling towers on the roof of the building, which lowers the temperature of the liquid as some of the water evaporates. The resulting water is able to supply 80 percent of the building's cooling needs and is more efficient than using electricity to cool the water. Once cooled, the water is circulated to the water-source format refrigeration system to chill grocery and freezer cases, and to the radiant floor to cool the entire store. Even in the extreme desert climate, the store will stay cool and comfortable for customers and associates while saving energy.

Because water has approximately four times the heat-carrying capacity of air, all of Wal-Mart's high efficiency prototypes were designed to use water for transference between systems. The HE.5 store's indirect evaporative process is an even more efficient use of water that also optimizes electricity use.

INTEGRATED WATER-SOURCE FORMAT REFRIGERATION SYSTEM



Integrated water-source refrigeration system

All of Wal-Mart's high-efficiency stores contain 100 percent integrated, water-source format heating, cooling and refrigeration systems that reclaim waste energy from the refrigeration units. This, as with the HE.2 projects, utilizes a medium temperature, secondary loop system driven by a modular chiller concept that both improves overall system efficiency and reduces the refrigerant charge by 90 percent. The common loop low temperature system reduces installed copper and also reduces total charge. Both medium and low temp systems incorporate state of the art technology with electronic valves and variable speed drives on compressors.

Like most Wal-Mart stores, waste heat from the refrigeration system is used to heat domestic hot water for restrooms and kitchen areas. Nationwide, approximately 70 percent of the hot water needs for Wal-Mart Supercenters, Sam's Clubs and Neighborhood Markets are generated this way, saving enough energy to provide hot water for more than 30,000 U.S. homes per year.

RADIANT FLOORING



Wal-Mart first tested radiant floor cooling in its Aurora, Colo. experimental store in 2005. Most retail buildings use heating, ventilating and air conditioning (HVAC) units located throughout the store to cool the ambient air. With Wal-Mart's radiant floor system, cold water is circulated underneath the sales floor, cooling the ambient air closest to customers as it floats upwards. The radiant floor is much more efficient than a conventional air-cooled system and significantly reduces maintenance costs.

Unlike a typical retail store that needs up to 40 Roof Top Units (RTUs) to heat and cool the building, the HE.5 uses only 10 Air Handling Units (AHUs) that bring in fresh outdoor air to maintain air quality. The reduction in rooftop units considerably reduces noise, raw materials and maintenance costs.

DAYLIGHT HARVESTING SYSTEM



Skylights provide natural daylight



Store lights dim based on available daylight

More than 95 percent of newly constructed Wal-Mart Supercenters and Sam's Clubs include a daylight harvesting system, which incorporates skylights that refract daylight throughout the store and light sensors that monitor the amount of natural light available. During periods of higher natural daylight, the system dims or turns off the store lights if they aren't needed, thereby reducing energy usage. While barely noticeable to shoppers and associates, this program saves a substantial amount of energy. As an added bonus, dimming and turning off building lights eliminates unnecessary heat in the building.

Daylight Harvesting can reduce up to 75 percent of the electric lighting energy used in a Supercenter during daylight hours. Each daylight harvesting system saves an average of 800,000 kWh per year, which is enough energy to provide electric power for 73 single family homes (11,020 kWh average annual usage) for an entire year.

Compared to American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) standards, Wal-Mart's lighting system is 38 percent more efficient than the 2005 baseline minimum.

WATER CONSERVATION IN RESTROOMS



Highly efficient faucets save water and energy

Wal-Mart uses advanced water- and energy-saving technologies in its bathrooms. The restroom sinks in newly constructed Wal-Mart stores contain sensor-activated 1/2 gallon per minute high efficiency faucets. These faucets regulate water flow and reduce water usage by 78 percent compared to currently mandated 1992 EPA standards. In addition to electronic sensors, there are water turbines built into each faucet. During use, water flowing through the turbines generates the electricity needed to operate the sensors.

In newly constructed stores and Sam's Clubs, Wal-Mart also installs high efficiency urinals that yield an 87 percent reduction in water usage and low-flow toilets that yield a 20 percent reduction in water usage (over EPA standards). Automatic flush valves on the toilets have water turbines similar to the low-flow faucets, which generate the power required to activate the flush mechanism. These turbines not only save energy but also save raw materials by eliminating the need for electrical conduits and wiring otherwise required to power automatic flush valve sensors.

Wal-Mart estimates that its water conservation measures will reduce the overall water consumption in each newly constructed store by 17 percent.

LED CASE LIGHTING



LED case lighting

Wal-Mart has been using LED lighting for all exterior signage since 2005 and began incorporating LEDs into freezer and grocery cases in new Wal-Mart Supercenters beginning in January 2007. All of Wal-Mart's high efficiency stores contain LED lighted cases.

LEDs last three to four times longer than fluorescent bulbs; stay cooler, which reduces the cooling load on the cases; perform better in cold environments; regenerate when turned off and contain no environmentally harmful mercury. The life span of LED lights is projected to be at least 10 years beyond conventional fluorescent lighting, which allows for a significant reduction in re-lamping and maintenance costs. In refrigerated cases, this may result in the case lighting lasting as long as the cases themselves.

OTHER ENVIRONMENTALLY FRIENDLY ASPECTS OF THE HIGH-EFFICIENCY STORE



Recycled plastic baseboards

All U.S. Wal-Mart stores run on a centralized Energy Management System (EMS), which monitors all heating, air conditioning, refrigeration and lighting units from the Home Office in Bentonville, Ark.; 24 hours per day, seven days per week. It allows the company to monitor energy usage, analyze refrigeration temperatures, observe HVAC and lighting performance, and adjust system levels accordingly at all times.

Many Wal-Mart stores have “white” membrane roofs, including the HE.5 prototype. The high solar reflectivity of the white membrane roof can lower the cooling load of the store by roughly 8 percent.

The environmentally friendly features of a Wal-Mart store include recycled construction materials in its buildings. All newly constructed Wal-Mart stores and Clubs require up to 20 percent fly ash or 25 percent slag in concrete mixes. Wal-Mart uses 90 percent recycled content steel for interior and exterior metal studs, structural framing systems, and wall and foundation reinforcements. By integrating these recycled components into its stores, Wal-Mart is using by-products instead of raw materials and protecting the environment.

Base cabinets, wall cabinets and counters in newly constructed Wal-Mart stores and Sam’s Clubs are manufactured from particle board and medium-density fiberboard, which are waste products from sawmills. Additionally, Wal-Mart baseboards are manufactured from 100 percent recycled plastic, made mostly from unused diaper scraps.

Most floors in the HE.5 store are made of integrally colored concrete instead of carpet or tile. Eliminating carpet and tile reduces the amount of surface-applied flooring materials and removes the need for many harsh chemical cleansers, wax and wax strippers, which can be harmful to the environment.