

ATLANTA INTERNATIONAL SCHOOL

Atlanta International School Early Learning Center (AIS-ELC) is a 17,231 square foot, two-story pre-school that was certified in the EarthCraft Light Commercial (ECLC) green building certification program. The school partnered with Southface to analyze building design and performance through the U.S. Department of Energy sponsored Advanced Commercial Buildings Initiative. Actual performance data of AIS – ELC was collected with circuit-level energy monitors and temperature sensors deployed in the building for one year post-occupancy. Southface studied hourly energy simulation modeling and building monitoring data to assess the actual performance of efficiency strategies implemented at the school.

Where is energy being used in AIS?

Interior lighting accounts for the largest energy end-use, at 34%, followed by cooling and fans, each at 17%, plug loads and appliances at 15%, heating at 11%, water heating at 4% and exterior lighting at 2% (Figure 1).

Findings

The AIS-ELC is currently saving 18% in electricity consumption relative to a code-equivalent (ASHRAE 90.1-2007) building operating under code-prescribed schedules (Figure 2). If the building had been only built to code-minimum standards and operated under its actual, measured schedules, energy use would have increased by 43%.



BUILDING SPECIFICATIONS:

Where:	Atlanta, GA
Building Use:	Preschool
Year Built:	2012
Square Feet:	17,283
Floors:	2
Certified ECLC:	2012
ECLC Level:	Gold



Figure 1. AIS-ELC energy segmented by end-use.

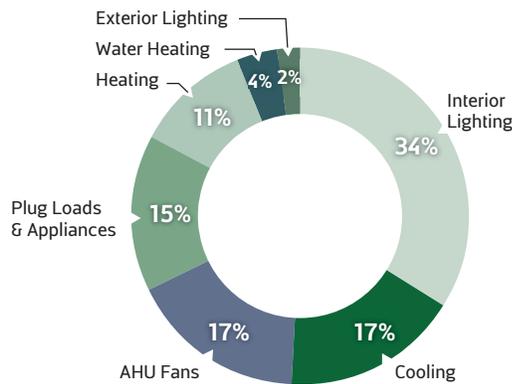
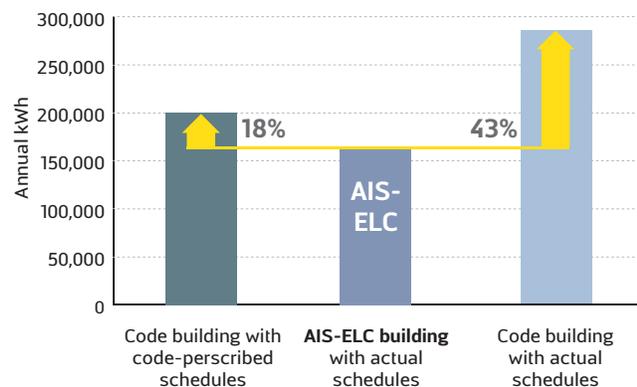


Figure 2. AIS-ELC actual energy consumption is less compared to a code equivalent building operated with code prescribed and AIS schedules



What is driving energy savings?

HEATING AND COOLING

The heating and cooling systems incorporated variable speed air handler fans and multi-stage compressors. These efficient systems accounts for nearly half (49%) of AIS-ELC's energy savings.

INTERIOR LIGHTING

Passive infrared occupancy sensors are installed in the bathrooms, offices and conference rooms. These detect movement and turn lights on and off accordingly.

DEMAND CONTROLLED VENTILATION

The Demand Controlled Ventilation (DCV) system at AIS adjusts the level of outside air entering the building based on occupancy. This system delivers ventilation levels required by code, while ensuring the building is not over-ventilated.

Areas for Improvement

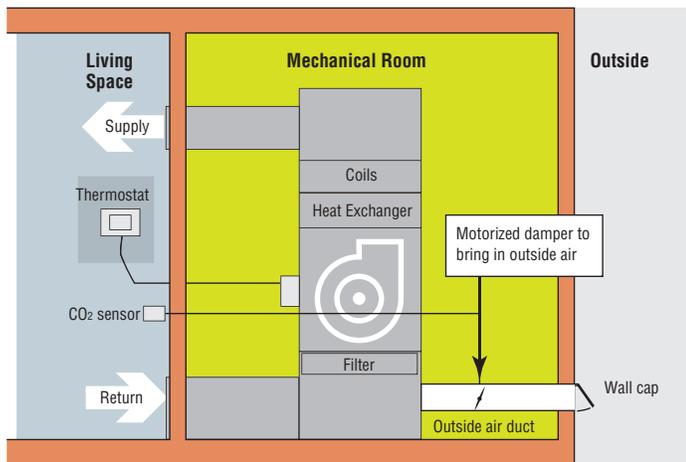
HVAC CONTROLS

Classroom relative humidity levels reached concerning levels (>70%) during the summer. Here's why:

HVAC System Design

Fifteen split systems heat, cool, and ventilate the building. Outside air, which is required to meet ASHRAE 62.1 indoor air quality standards, is introduced into the building by a duct connected from the outside to the air handler return plenum. The outside air is then filtered and conditioned by the fan coil unit before being supplied to the room (Figure 3). The system is also equipped with a CO₂ sensor which was designed to open a damper and turn on a fan to bring in outside air when CO₂ levels are above 800 ppm. When CO₂ concentrations are below 800 ppm, the damper then closes to a minimum position.

Figure 3. CO₂ sensor controls a fresh air intake in the air handler



Observed System Operations

The thermostats were programmed to run the fans continuously in "on" (vs. auto) mode for long periods of the day. In fact, all air handler fans ran in "on" mode for 19 hours per day on average. Notably, the thermostat programming interface was not user-intuitive, and may be another factor for the unusual fan operation schedules.

Outcome

With the air handler fan running continuously, the system was effectively ventilating the classrooms throughout the day and night. This brought in hot and humid outside air during the summer, further exacerbating humidity issues. In addition, during the winter, heat pumps had to use more energy to compensate for the incoming cold air.

HVAC CONTROLS SOLUTIONS

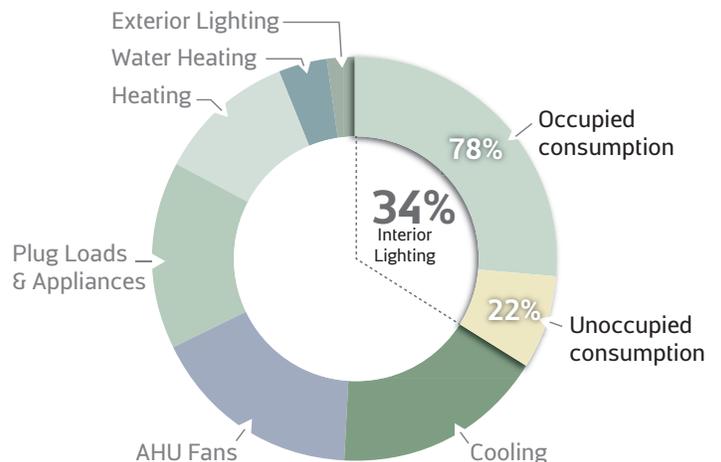
- Adjust thermostat programs to maintain air handler fan settings in "auto" (not "on") mode during unoccupied periods. Ensure thermostat programs reflect the actual occupancy schedule of the building.
- Review thermostat programs at least twice a year and refine as needed.

- For additional energy savings,
 - » Add an occupancy sensor that is integrated with the HVAC system to shut off ventilation when a space is unoccupied.
 - » Apply set-backs to thermostat set points during unoccupied hours.
- For additional energy savings, add an occupancy sensor that is integrated with the HVAC system to shut off ventilation when a space is unoccupied.

LIGHTING CONTROLS

- Analysis revealed that 22% of total interior lighting energy occurred during unoccupied hours (Figure 4).
- Rooms controlled by a control panel had higher instances of lighting while unoccupied versus local lighting controls with a lesser percentage of energy use during unoccupied hours.
 - » Local lighting controls in the building include on/off switches, timer switches, occupancy sensors, and daylight sensors.
 - » A lighting control panel in the electrical room allows for central control of all lighting fixtures.

Figure 4. Circuit level monitoring helped diagnose light usage during unoccupied hours.



LIGHTING SOLUTIONS

- Reprogram the central lighting control panel so lights are turned on only when the building is expected to be occupied.
 - » Ensure lighting programs include summer schedules and holidays.
 - » Confirm regularly lighting programs continue to reflect the occupied/unoccupied hours.
- For areas with local switches or occupancy sensors, remove programmed lighting schedule from the central lighting panel.
- Remind occupants to turn off lights when leaving rooms, and even in rooms with occupancy sensors.