

The [Efficient and Healthy Schools Program](#) aims to motivate and empower K-12 schools to reduce energy costs and improve student and teacher health. The Program connects schools with practical solutions and provides technical assistance and resources to significantly improve school facilities. It is led by the U.S. Department of Energy Building Technologies Office with technical support from Berkeley Lab and New Buildings Institute.



CASE STUDY:

Retrofit Revolutionary Lincoln Public Schools

Project Details

Location: Lincoln, NE
 Number of Students: 41,000
 Number of Schools in District: 74
 Locale: Large city
 Percent Free and Reduced Price Meal: 46%
 Percent Title 1 Schools: 35%
 Project Cost: \$29 million
 Funding Mechanism: Bond
 Project Dates: May 2020–Dec 2022

Design/Performance Criteria Used: LPS Sustainable Building Guidelines, which require meeting LEED Gold standards

Key Project Features:

- Efficient windows
- Occupancy sensors
- Upgraded BAS
- LED lights
- Geothermal variable refrigerant flow (VRF)
- Water source heat pumps
- Heat recovery dedicated outdoor air system (DOAS)
- Low-return air grilles

Project Scope & Approach

In 2020, Lincoln Public Schools (LPS) undertook a massive project encompassing a suite of measures at Park Middle School. This work, funded from a \$290 million bond covering a variety of projects across LPS, sought to address a variety of thermal comfort issues and better control of air contaminants for the nearly 100-year-old facility.

This project builds on a 20+ year foundation of innovative design and high performing buildings led by the LPS Director of Operations. The project team of in-house architecture, mechanical, electrical, environmental, and sustainability personnel coordinated with the design architects and engineering team on this project to ensure the LPS Sustainable Building Guidelines were fulfilled. Even though Park Middle School is not new construction, the team sought to get the building as close as possible to the Guidelines' target site energy use intensity (EUI) of 25 kBtu/sq ft. Strategic decisions were made to maximize the interconnectedness of building systems; for example, the lighting control system uses occupancy sensors to control the LED lights, and these sensors are also tied to the ventilation system to reduce ventilation when the space is unoccupied. The upgraded building automation system (BAS) is connected to the room reservation system; the need for manual intervention is minimized by automatically setting the HVAC to "occupied" when a room is reserved, and after normal school hours all rooms are reverted to "unoccupied."

Park Middle School was the first renovation project to include low-return air grilles throughout the facility, which increase occupant comfort and decrease energy use compared to traditional ceiling returns.

Project Outcomes & Lessons Learned

A bonus outcome of the project is the simplification of HVAC system maintenance; if an issue or repair is needed, individual heat pumps can be addressed without an entire building going offline. Additionally, the project provides an opportunity for staff and students to compare their school's performance with other district schools through the ENERGY STAR® Portfolio Manager.

PROJECT HIGHLIGHTS

As a result of the project, the school has seen a 61% decrease in EUI, a 58% decrease in GHG intensity, and a 43% decrease in annual energy cost!

- Energy reduction during unoccupied hours through upgraded controls logic
- Improved occupant comfort via addition of AC to the gym and zonal control
- Resiliency: entire system is not compromised if individual heat pumps go offline
- Simplified maintenance, improved humidity control; and reduced natural gas use by 94%