ELARA ENGINEERING

Big Picture Thinking. Practical Approach. Sustainable Design.

CPS Christopher Elementary School

Project Highlights and Results

- Main heating and cooling systems replaced with new and more energy efficient air source VRF system.
- VRF implemented with hybrid approach incorporating existing heating systems for supplemental heat to reduce implementation costs.
- Ventilation systems upgraded to new and more robust setup utilizing energy recovery wheels with improved distribution.
- Demand Control Ventilation implemented via carbon dioxide monitoring to supply ventilation as required to save energy.
- Displacement Ventilation added to spaces to improve indoor air quality and as a primary source of cooling for select large volume spaces with high occupancies.

Project Background

Owner:	**Chicago Public Schools**
Location:	**Chicago, IL**
Team/Team Lead:	**Sean Hidaka, Brian Malone**
Elara Role:	**Design Engineer**
Type:	**MEP Renovation and Energy Upgrade**
Construction Cost:	**$3,500,000**

Project Overview

Building Type:	**Elementary School**
Building Attributes:	**Classrooms, Offices, Gymnasium, and Pool; 65,500 SF**
Initial Construction:	**1930**
MEPFPIT Systems:	**Steam boiler plant, steam radiation (for low ambient conditions), air source VRF, DOAS RTUs with energy recovery wheels, mixed air RTU for Cafeteria and Auditorium with energy recovery wheel, displacement ventilation and DCV for all RTUs, BAS**

Innovation

- This project faced many unique challenges as it was implemented during COVID. Lead times for equipment regularly fluctuated, site access was often limited due to environmental improvements, and the summer construction window was truncated to accommodate a COVID adapted school schedule.
- Each design element that could reduce the building's energy and carbon footprint was evaluated for impact, value, and affordability. This process required the conceptual design of multiple elements which were, after further evaluation, either rejected or altered to accommodate the variable project budget while simultaneously continuing to address the main project goals of increased energy efficiency, improved indoor air quality, and upgraded equipment. For example, the hybrid solution to space heating that was ultimately derived from the design process utilizes both VRF and existing steam heating, which allowed for existing windows to be re-used rather than replaced. When the existing windows are eventually replaced, the steam heating portion of the system can be eliminated.
- Displacement Ventilation was utilized in each classroom and serves as the primary cooling source for the cafeteria and auditorium spaces. This design utilizes thermal buoyancy and controlled air temperatures to induce vertical flow of ventilation air, thereby displacing contaminants and prioritizing clean ventilation air in the lower occupied zone of spaces. Existing ductwork was modified and re-used in select areas, while almost 50 existing floor openings in the auditorium were modified to accommodate floor displacement diffusers.