



BIG ASS FANS

**EXCEPTIONALLY
ENGINEERED**

ILLINOIS HIGH SCHOOL TARGETS COMMON SPACES, REDUCES RISK BY IMPLEMENTING BAF-CAS

The addition of Big Ass Fans' [Clean Air System \(CAS\)](#) UV-C technology in the commons area and gymnasium of Argo High School reduces the risk of infection transmission by up to 95%.

BACKGROUND:

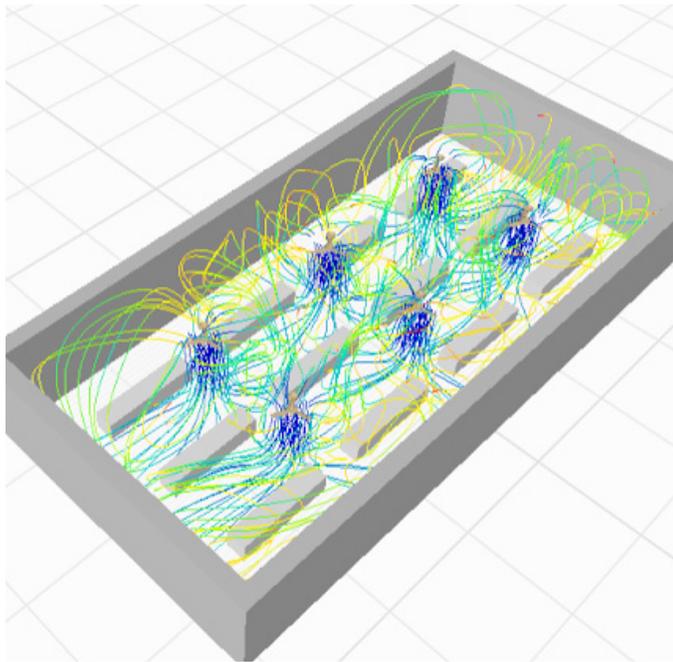
The Covid-19 pandemic has turned traditional education on its head. To reduce the risk of disease transmission, educational facilities have reduced class size to allow for social distancing, initiated daily temperature checks, increased cleaning of high-touch areas, and increased outdoor instruction and activity time when possible. Despite these increased safety measures, many schools have still had to move to online learning. As a result, educational facilities are looking for ways to increase safety on campus. Big Ass Fans (BAF) can provide further safety measures beyond a school's traditional resources. The use of UV-C disinfection technology with ceiling fans can substantially improve safety in education environments. By directing UV-C energy toward the ceiling and using fans to circulate air into the disinfection zone in the upper room, BAF can leverage the ability of UV-C technology to safely inactivate pathogens while simultaneously providing cooling airflow without exposing occupants to harmful levels of UV-C irradiation.

PROJECT SCOPE:

BAF-CAS fans were placed in the commons and the gymnasium of Argo High School. Because of the size and use of these spaces, different fan models were used. The commons is a modified classroom used for study hall. Because of the low ceiling and the number of obstructions in the space, the Haiku UV-C product family was chosen. Six (6) 60-inch Haiku UV-C were strategically placed in the room to provide evenly distributed disinfection energy and air circulation. Unlike the commons, the gymnasium is a much larger space and as such requires a different product for optimized performance. At the beginning of the project in fall of 2019, fans were needed in the gym to create a cooling effect for the occupants. Due to the pandemic, UV-C was later added to the fans to help mitigate disease transmission. The gym has a high roof deck and many more occupants than the commons. In order to cover a larger area, and to better serve the larger occupancy, eight (8) Essence UV-C fans were placed above the seating area. Essence UV-C fans use the same technology as Haiku UV-C fans but are scaled up both in terms of UV-C energy and air movement capabilities.

A detailed CFD simulation and customized infection risk calculation using the Wells-Riley infection risk model were provided for each area. The CFD simulation was used to validate airflow performance throughout each space for cooling and UV-C disinfection. The infection risk calculation provides a numerical comparison of baseline risk vs. risk with CAS for a representative occupant in each space, where different exposure factors in each space result in different infection risk.





CFD Simulation - Airflow Streamline Analysis - Commons Example



Calculation Inputs

Unit System	English (IP)	
Space Length	75	ft
Space Width	35	ft
Space Height	12	ft
Fan Mounting Height	12	ft
Number of Fans	6 Fans	
Haiku Fan Size	60	inches
Extension Tube Length	20	inches
Fan Design Speed	Speed 3	
Path Length Through Disinfection Zone	10	ft
Length of Time to be Studied	60	minutes
Baseline Outdoor Air Ventilation Rate	0.75 ACH	
Occupant Activity Level	Low (Resting/Seated)	
Pathogen #1	Coronavirus (SARS-COV-1)	

Wells-Riley Infection Risk Inputs - Commons Example

KEY DATA AND OUTCOMES:

The risk calculations for the different common areas look at the risk reduction expected for the occupants impacted by the fans. The fans in the commons are evenly distributed in the room, therefore the risk calculations were completed for the entire space. The risk calculations in the gym were completed only for the fan coverage area. The addition of fans in the commons of Argo High School reduces the infection risk for an occupant by 83%. The occupants impacted by the fans in the gymnasium will see a 95% risk reduction.

Configuration	Commons Total ACH (ACH + eACH)	Commons Coronavirus Inf. Risk (6) Haiku + UVC	Gymnasium Total ACH (ACH + eACH)	Gymnasium Coronavirus Inf. Risk (2) Essence + UVC
Baseline (Existing HVAC Only)	0.75	15.0%	1.0	5.5%
BAF Clean Air System (CAS)	3.9	3.0% (83% Reduction)	19.1	0.1% (95% Reduction)

FURTHER ACTIONS:

The implementation of BAF-CAS significantly reduces infection risk in both the commons and the gymnasium. The function and size of the space must be considered when making the appropriate fan selection. One fan model does not serve all spaces. The model of fan chosen to serve in a specific facility type greatly affects the ability to reduce the risk of infection. Big Ass fans not only provide comfort, but also risk mitigation. The improved safety conditions alleviate concerns of administrators, teachers, and families as students begin to return to campus. With school systems around the nation preparing to receive students back on campus, only those school districts with a proactive approach to risk reduction stand a good chance of staying open long term and prevent future spread of any airborne pathogen.

