

# Building Sustainability

How Suffolk and Yahoo collaborated on a novel design concept to create industry-leading energy efficiency in data centers

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WHITEPAPER

# Challenge

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Data centers across the country have embraced sustainability as integral to their business practices, and Yahoo Ad Tech had developed a propriety concept that could reach one of the lowest power utilization effectiveness (PUE) ratings in the industry. The company turned to Suffolk's Mission Critical Center of Excellence team to execute the design on its centers in Lockport, N.Y., and Quincy, WA. — and to determine if the concept could scale up to serve larger facilities.

## The Team

### SUFFOLK

**Charles McCarthy, Chief Operating Officer, Mission Critical**

**Mike Mallon, Senior Project Manager**

**Samantha Kinnaly, Assistant Project Manager**

**Bob Smith, Senior Superintendent**

### ARCHITECT

#### Corgan

**Gabe Clark, Principal in Charge**

**Josh Self, Senior Associate**

### ENGINEERS

**Electrical Engineer: Wells Global & Argo Critical Solutions**

**Mechanical Engineer: Wendel & Argo Critical Solutions**

### TRADE PARTNERS

#### Electrical Contractors:

**Oregon Electric Group, Inc. (Quincy, WA)**

**O'Connell Electric, Inc (Lockport, NY)**

#### Mechanical Contractors:

**Southland Industries (Quincy, WA)**

**MLP Plumbing & Mechanical, Inc. (Lockport, NY)**

#### BMS Controls

**Automated Logic Corporation (United Technologies) (Both locations)**

# Background

Data centers are reliant on substantial amounts of water and electricity, elevating the sector's carbon footprint and increasing the need for thoughtful approaches to sustainability. With this strategy in mind, Suffolk has completed several projects for Yahoo Ad Tech, which include design-build projects, renovations and fit-outs, and expansions to existing data center campuses. Three of these projects — BF2 Phase Three 1.8 MW and BF2 Phase Three 600 KW in Lockport, N.Y., and Project Seahawk in Quincy, WA. — are among the most sustainable data centers in the country.

To reach those leading sustainability levels, Yahoo developed a proprietary modular data center called the Yahoo Compute Coop (YCC), a design that promotes better airflow and resembles a chicken coop. The facility uses no mechanical cooling, which means no electricity goes toward spinning fans to push cold air up through the raised floor or down from the ceiling. Instead, the facility relies entirely on outside air, supplemented by evaporative cooling. Servers are lined up in hot aisle/cold aisle formation to prevent air mixing.



Aerial views of the Yahoo AdTech facility in Lockport, N.Y.

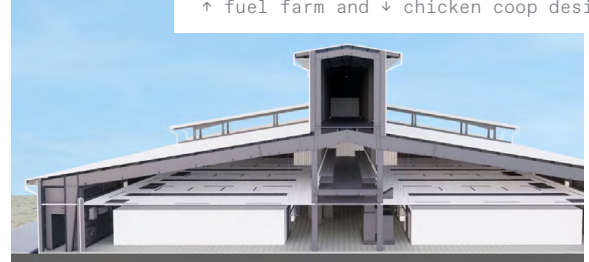


This unique design concept has led to the one of the lowest power utilization effectiveness (PUE) numbers in the industry. A PUE rating of 1 would mean that for every megawatt of power into the facility, 100 percent of that power goes toward computers. That number is impossible to reach because some power must go toward lighting, cooling and other factors. With the Lockport facility, Yahoo achieved a rating of 1.08, far below the industry average of 1.92. That 1.08 number translates to 90 percent of the facility's power going straight to the servers, saving both energy and costs.

To build this concept into reality at the Lockport facility, Suffolk's Mission Critical team relied on their design-build experience, collaborative relationships with the design and engineering teams, and innovative modeling practices.



A rendering of the Lockport facility's ↑ fuel farm and ↓ chicken coop design.



# Solution

Prior to even beginning construction, Suffolk's team brought Yahoo's design from concept to construction drawings through several steps. Suffolk collaborated with its team of engineers on several calculations for the air flow. Those calculations took into account the size of the building, the designed computing load, the heat the servers would generate, and the size of the louvers needed to vent the heat, which resulted in the numbers that determined the air flow needed to move through the building.

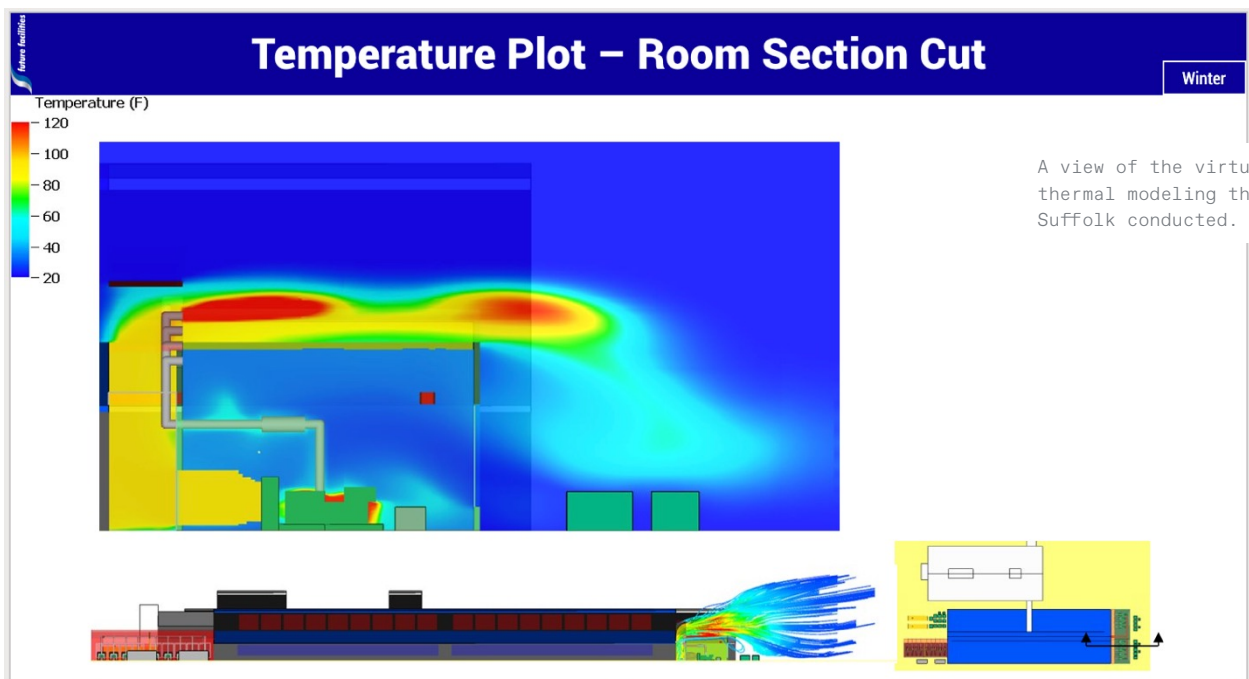
With those calculations, the team completed a virtual thermal modeling of the facility. The 3D model simulated the cool and hot air in and out of the building so the team could visualize the airflow. Those airflow diagrams and the process of the fluid dynamics modeling validated the design.

As part of Suffolk's design validation and based on the company's design-build experience, the Suffolk team discovered it could successfully scale up the concept to a larger space or computing load — in this case, Yahoo could install twice the computing power in the Lockport

facility compared to its prior design. Once the system had been constructed, Suffolk recreated the 3D thermal model to run through the building, simulating the heat load in the facility, turning on the Air Handling Units and activating the systems of louvers and dampers to match the heat coming through the vents. That commissioning process took six weeks; once that process was complete, the Suffolk team fully automated the system for Yahoo's use, on schedule and under budget.

In addition to the industry-leading PUE rating, the successful execution of this design on the Yahoo projects translated to the following sustainability gains:

- Mechanical systems sourced by outside air
- 40 percent less energy and 95 percent less water consumption than typical data centers
- Enough water saved to provide drinking water for 200,000 people
- Enough energy saved to power 9,000 households annually and more than 1 million laptops for a year



# Conclusion

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As the world focuses on reducing carbon remissions, all industries must employ innovative solutions to create energy efficiency. Yahoo's unique design concept — and Suffolk's success in increasing its capacity — has become a proven strategy for data centers as they explore ways to leverage the power of natural resources.

**Here's how you can connect  
with our Mission Critical experts:**

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