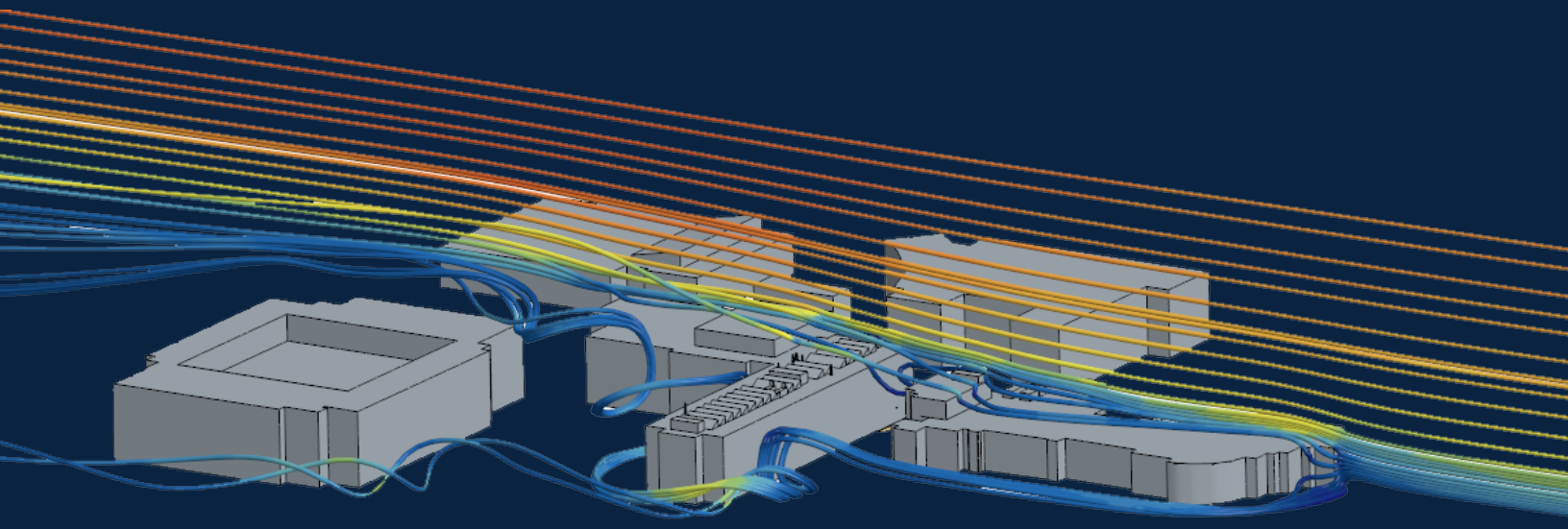
CFD MODELING SERVICES

ENGINEERING INSIGHT THAT DRIVES BUILDING PERFORMANCE



LORING 70 YEARS
CONSULTING ENGINEERS

DESIGN SMARTER, BUILD WITH CONFIDENCE

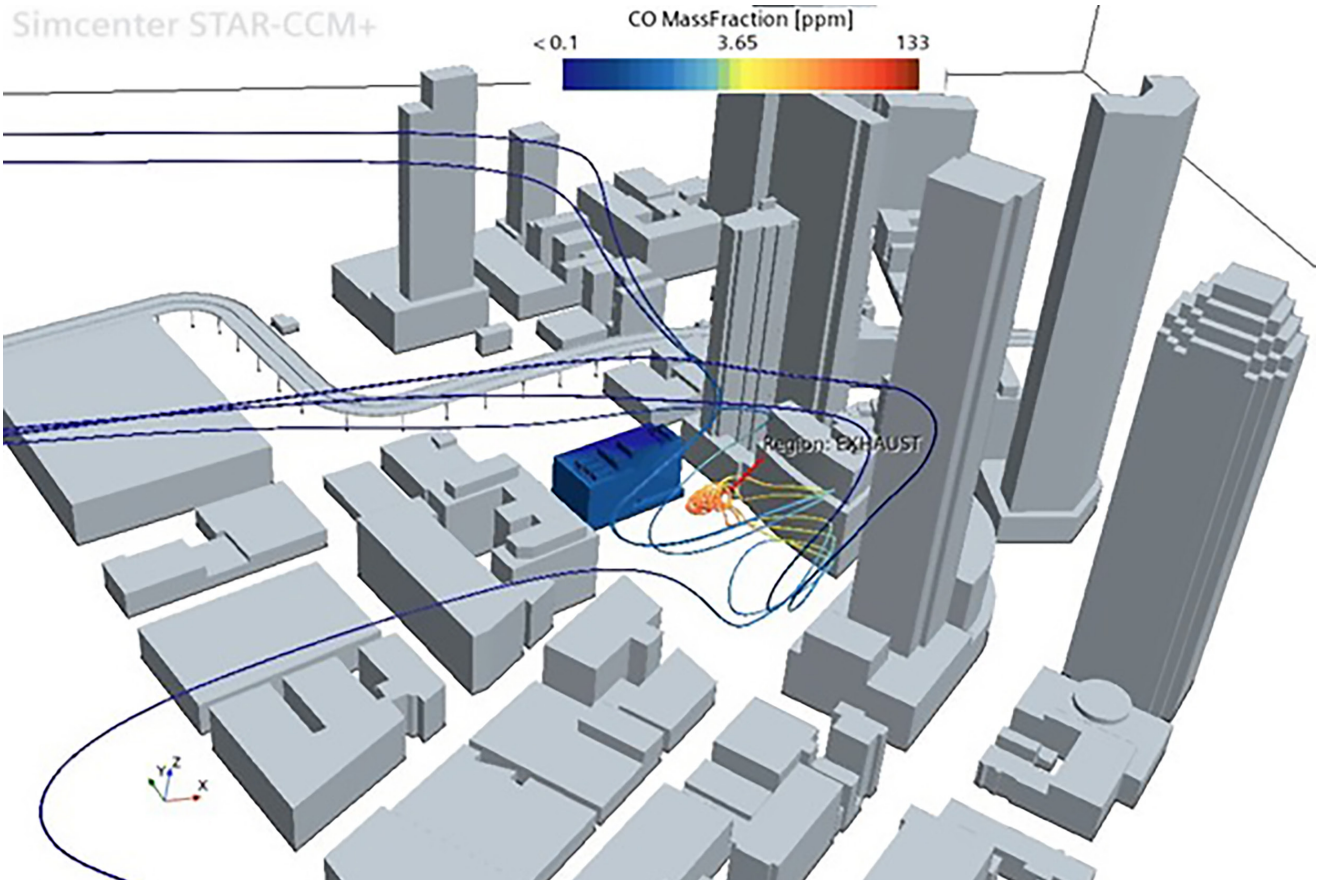
Engineer-led CFD analysis that delivers practical, buildable solutions

At Loring, our Computational Fluid Dynamics (CFD) services are led by licensed mechanical engineers who combine real-world design experience with advanced simulation expertise. We don't just run models — we deliver actionable insights that improve safety, comfort, and efficiency.

From early site planning to complex HVAC layouts, from passive ventilation strategies to critical fire and smoke control, we use CFD to turn design uncertainty into clarity.

Our CFD services empower you to:

- **Visualize** airflow, smoke, and pollutant movement in vivid 3D
- **Optimize** HVAC layouts, exhaust placement, and passive ventilation strategies
- **Enhance** comfort, health, and energy efficiency
- **Validate** designs against proven physics and code requirements
- **Detect** issues early to avoid costly rework



OUR CAPABILITIES

Advanced CFD analysis tailored to your project's challenges

Indoor Thermal & Airflow Analysis

- Optimize air distribution for comfort and efficiency
- Simulate temperature and humidity profiles in complex environments
- Evaluate natural ventilation, buoyancy-driven flows, and passive exhaust strategies

Outdoor Airflow & Environmental Wind Studies

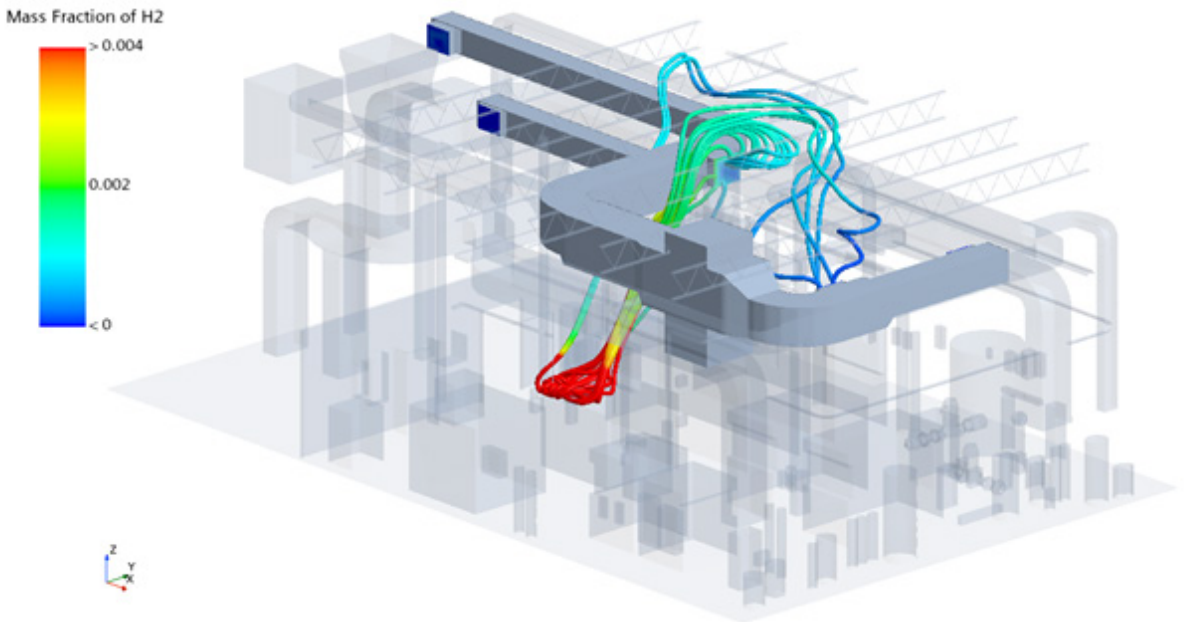
- Model exterior pollutant dispersion and exhaust dilution
- Prevent exhaust re-entrainment into sensitive air intakes (e.g., data centers)
- Assess pedestrian-level wind comfort and safety

Indoor Air Quality & Contaminant Control

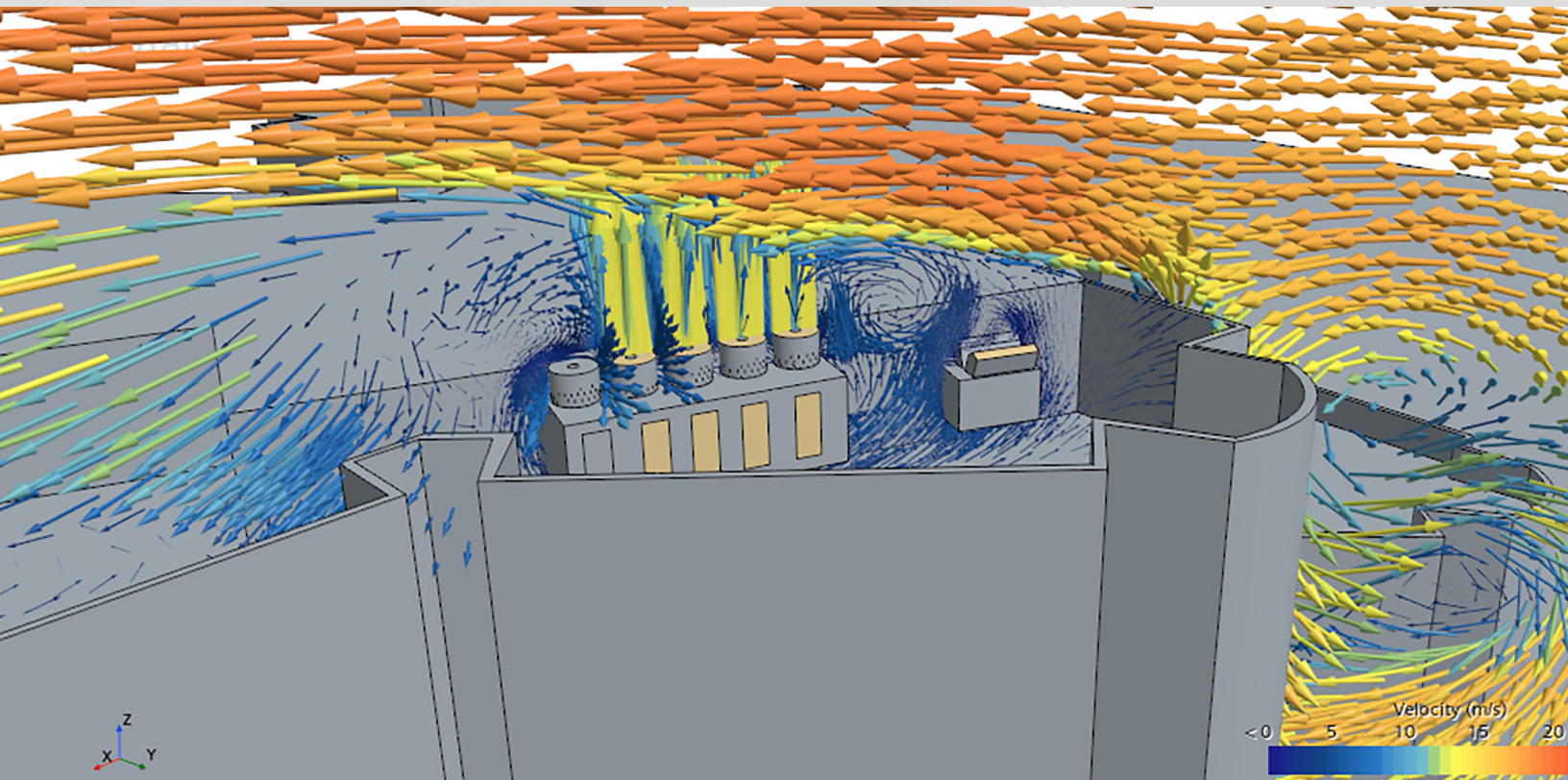
- Compare and refine ventilation strategies for effectiveness
- Simulate airborne contaminant transport
- Support infection control in sensitive environments such as healthcare and schools

Fire, Smoke & Heat Transfer Analysis

- Predict smoke movement and stratification during fire events
- Evaluate smoke control system performance
- Analyze heat transfer to protect materials and systems

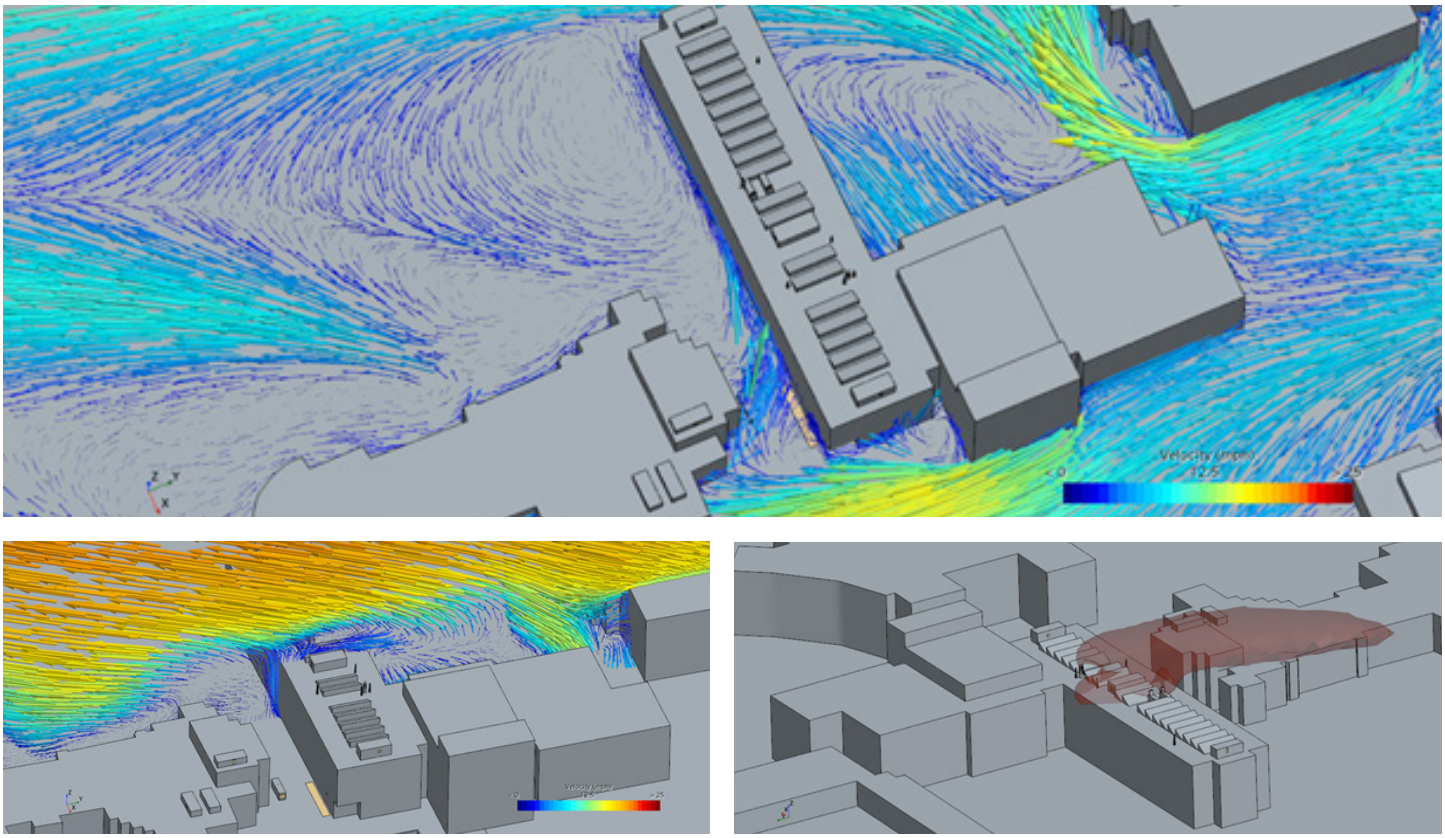


REAL RESULTS, REAL IMPACT



CASE STUDY: EXHAUST RE-ENTRAINMENT CONTROL

Confidential University Art Center



Localized flow pattern and exhaust plume

CHALLENGE:

Exhausts from art studios, spray booths, welding shops, and a diesel generator were located close to rooftop air intakes, creating a risk of indoor air quality issues and odor complaints.

SOLUTION:

- Modeled exhaust dispersion and re-entrainment risk at 8 air intakes
- Tested multiple wind-driven scenarios
- Confirmed compliance with OSHA and NIOSH exposure limits
- Recommended carbon filtration for targeted odor control

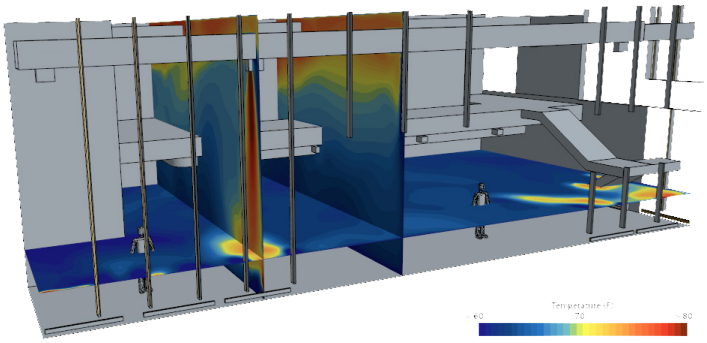
IMPACT:

The CFD study gave the design team confidence in the layout, avoided costly system redesign, and ensured reliable air quality performance in a sensitive environment.

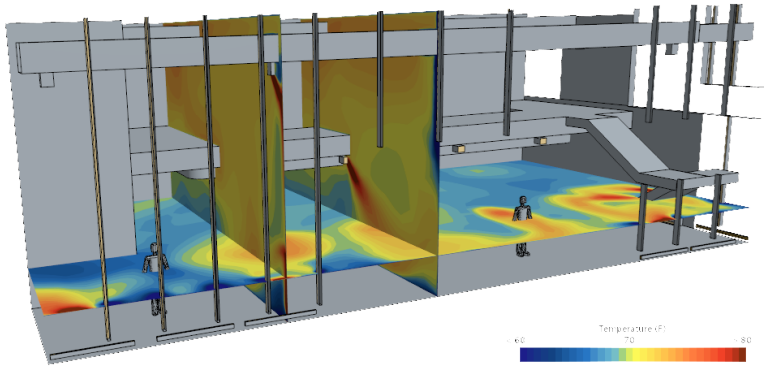
CASE STUDY: HEATING SYSTEM OPTIMIZATION FOR DOUBLE-HEIGHT LOBBY

Confidential Commercial Building – Upstate New York

Temperature Profiles



Before Optimization



After Optimization

CHALLENGE:

The double-height lobby with extensive curtain walls faced severe heat loss and cold interior surfaces during harsh winters, leading to occupant discomfort and a critical need to balance comfort with energy efficiency.

SOLUTION:

- Assessed comfort risks using thermal comfort and air distribution measures
- Tested multiple heating strategies, including two-level air supply, adjusted air angles, and optimized baseboard capacity
- Used iterative CFD and thermal simulations to select a hybrid approach combining targeted air supply and calibrated baseboard heating

IMPACT:

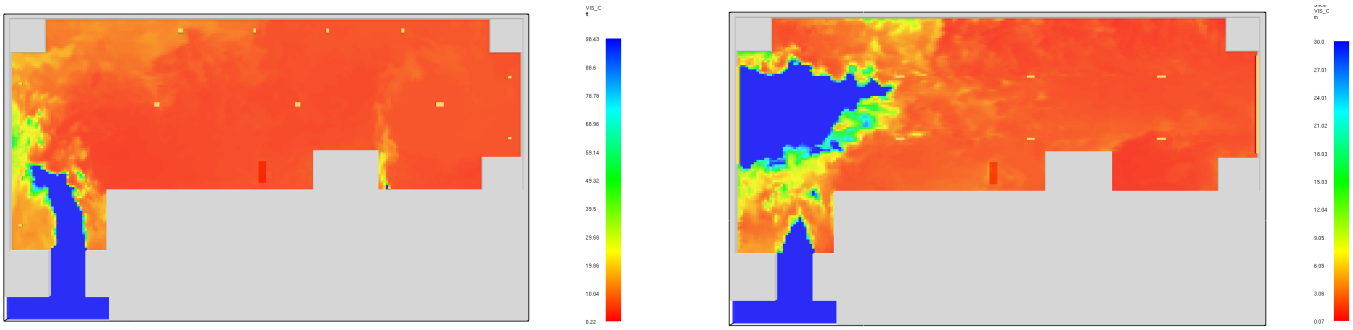
The optimized design maintained occupant comfort within the ASHRAE 55 standard, reduced cold drafts from glazing, and balanced comfort with energy efficiency to support both savings and the architectural vision.

CASE STUDY: CAR PARK VENTILATION AND SMOKE CONTROL

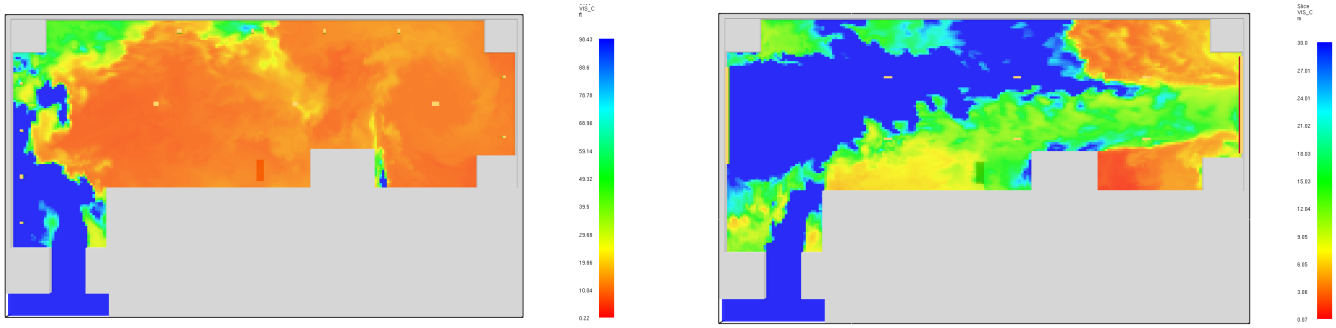
Confidential Municipal Building Garage

Visibility Profiles Post Fire Extinguished

5 minutes **10 minutes**



C2: Increased Ventilation



C3: Increased Ventilation with Jet Fans

CHALLENGE:

Designing a car park ventilation system meant ensuring good air quality, effective smoke control, and high performance in a space-constrained environment.

SOLUTION:

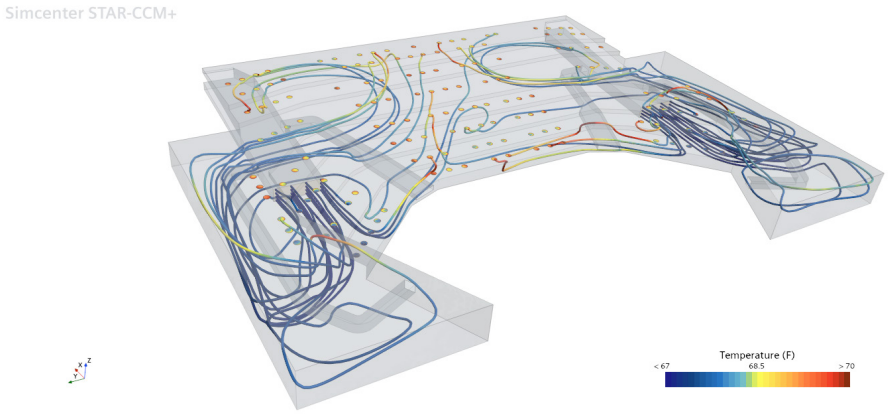
- Used CFD to compare ducted extraction and jet fan ventilation strategies
- Eliminated stagnant zones to improve air quality
- Verified rapid smoke clearance in fire scenarios
- Delivered a compact, efficient system supported by CFD for approval

IMPACT:

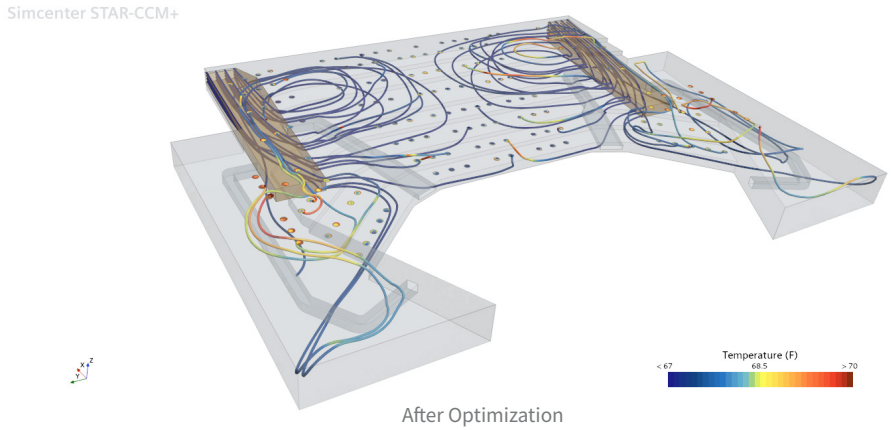
Loring delivered a safer, more efficient, and space-optimized ventilation system that protects occupants and property in both daily use and emergencies.

CASE STUDY: UNDERFLOOR AIR DISTRIBUTION OPTIMIZATION

Confidential Performing Arts Theater



Before Optimization



After Optimization

CHALLENGE:

The theater's underfloor air distribution system faced thermal decay - an increase in supply air temperature as it traveled through the underfloor plenum before reaching the diffusers - compromising comfort and system efficiency.

SOLUTION:

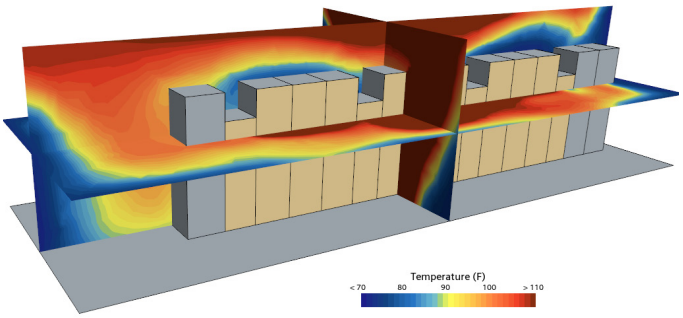
- Evaluated multiple design scenarios using CFD simulations
- Analyzed velocity and temperature distribution within the air supply plenum
- Optimized supply layout to minimize thermal decay

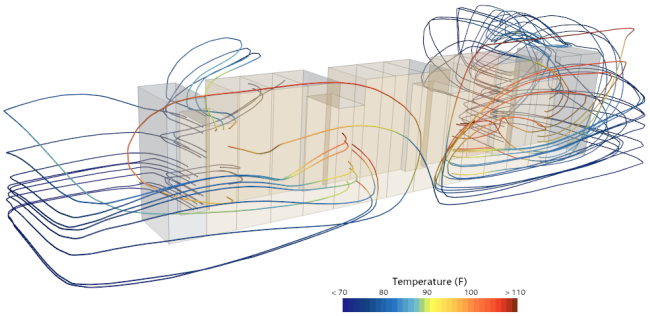
IMPACT:

The optimization resulted in a more uniform air distribution within the plenum. Supply air temperatures at the floor diffusers were reduced, effectively mitigating thermal decay. This improved both occupant comfort and overall system performance.

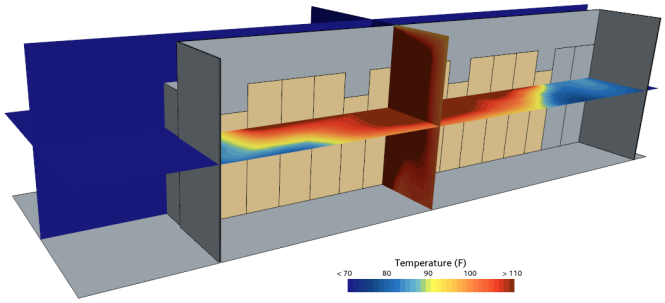
CASE STUDY: DATA CENTER AIR DISTRIBUTION OPTIMIZATION

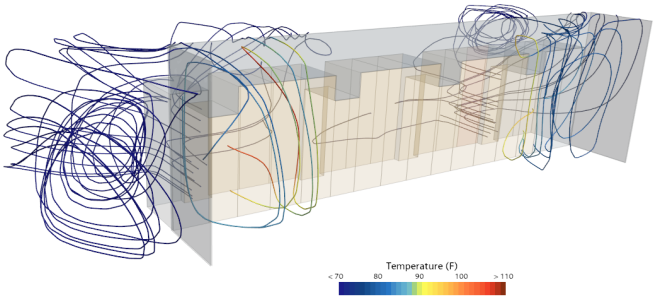
NYC SCA Data Center





Before Optimization





After Optimization

CHALLENGE:

Uncontrolled air mixing in data centers can greatly reduce cooling efficiency. Without proper management, conditioned cold air bypasses IT equipment and mixes with hot exhaust air, wasting energy and creating unpredictable hot spots within racks.

SOLUTION:

- Analyzed the proposed server rack and cooling unit layout to ensure all server inlets meet thermal design specifications.
- Evaluated the impact of a hot air containment system to minimize mixing and maintain consistent, cool intake air.

IMPACT:

Our CFD study identifies the optimal layout and containment strategy, enabling higher energy efficiency, stable server performance, and greater cooling capacity.

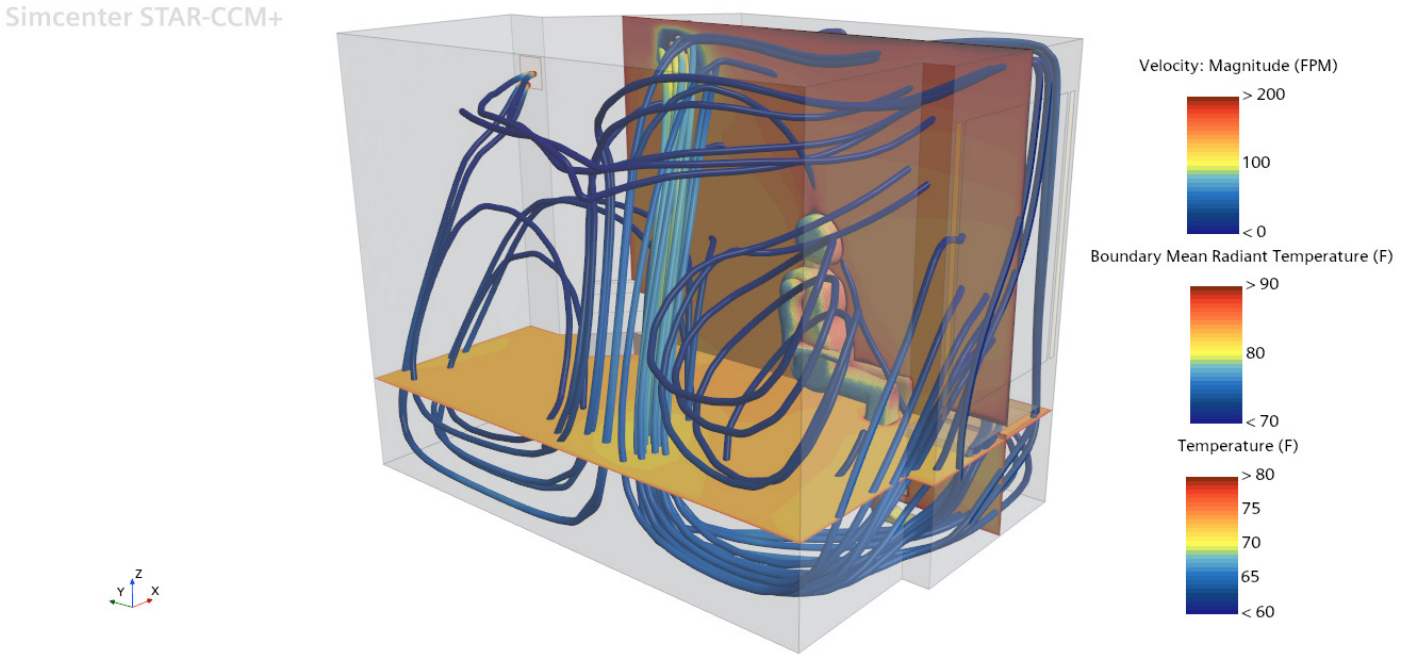
WHY CHOOSE US FOR CFD

Engineer-Led
All studies are guided by licensed mechanical engineers who speak the language of design and compliance, ensuring that simulations are technically grounded, code-aware, and practical.

Collaborative
We work closely with architects, MEP consultants, and sustainability teams to integrate CFD insight into the broader design conversation, not as an afterthought, but as a valuable part of the process.

Project-Aligned
We adapt our workflow to your project phase, whether it's concept design, detailed engineering, peer review, or value engineering, providing only the level of detail needed, when it's needed.

Design-Focused
Our only objective is to support the best possible design outcome. We maintain a vendor-neutral, tool-agnostic stance, so we're free to recommend innovative, cost-effective strategies that balance performance, budget, and constructability.



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