

An abstract graphic in the top left corner consisting of a fine mesh of lines that form a flowing, ribbon-like shape. The color transitions from purple and blue on the left to yellow and green on the right.

COMPUTATIONAL FLUID DYNAMICS

Summary of Qualifications

COMPUTATIONAL FLUID DYNAMICS (CFD)

A mathematical analysis tool that can be used to verify the performance of an HVAC system.

BENEFITS

CFD provides all project stakeholders with insurance that a system will perform as specified and will result in recommendations for how to further optimize a system.

- Confidence in final design - design insurance
- Value engineering tool to optimize each project dollar up front
- Potential to downsize mechanical infrastructure saving money for the client
- Leverage Predict experience in HVAC to design your project

PREDICT ADVANTAGE

Lab validated modelling

Application of lab-validated boundary conditions.

In-depth product knowledge

Our team has access to all product design details and performance information.

Modelling expertise

Our team specializes in modelling indoor environments and air distribution. You are hiring a team of experienced (10+ years) and specially trained engineers to consult on your design.

WHERE TO USE CFD

It is recommended that CFD analysis be performed on difficult to design spaces within a building. It is also recommended for spaces that repeat many times throughout a building like an office (private or open) or a patient room. Generally, projects that are well suited for a CFD analysis fall into two categories: high-risk environments and challenging applications.

HIGH-RISK ENVIRONMENTS

An environment that requires precision control of temperature, humidity, and/or air quality in the space.

APPLICATION EXAMPLES

- Clean rooms
- Healthcare facilities
- Drug storage facilities
- Specialized manufacturing
- Horticultural facilities
- Archival vaults
- Agricultural facilities

CHALLENGING APPLICATIONS

These applications might use an engineered product or a conventional system that is being applied in a large open space, or in an application that may be subject to extreme heat gains or losses.

APPLICATION EXAMPLES

- Atriums
- Auditoriums
- Areas with high ceilings or no ceiling
- Data centers, battery storage facilities
- Airport terminals
- Arenas
- Areas with a large glass facade
- Use of engineered products (displacement, underfloor, etc.)

EDUCATION

Martensville School

Calgary, AB, 2015

Areas Analyzed: Student classroom

Ventilation System: Displacement and radiant

University of Iowa School of Music

Iowa, USA, 2012 - 2013

Areas Analyzed: Music rehearsal room, and atrium

Ventilation System: Displacement (music room) and mixing (atrium)

Optimized an architecturally complex atrium with a mixing system, and a musical rehearsal hall with a displacement system.

Maples Collegiate

Winnipeg, MB, 2012

Areas Analyzed: Student Commons

Ventilation System: Displacement and radiant

University of Cincinnati

Cincinnati, OH, 2010

Areas Analyzed: Student dormitory

Ventilation System: Mixing

YWCA of Honolulu: E. Fuller Hall

Honolulu, HI, 2008

Areas Analyzed: Multipurpose space

Ventilation System: Displacement

Indiana University

Indiana, 2008

Areas Analyzed: Lecture hall

Ventilation System: Displacement

MANUFACTURING

MCI Factory

Winnipeg, MB, 2017

Areas Analyzed: Manufacturing facility

Ventilation System: Displacement

Determined a design that will maintain manganese (Mn) particles generated by multiple welders to a concentration below 0.02 [mg/m³].

Wyman – Gordon Heat Treatment Factory

Ohio, 2016

Areas Analyzed: Heat treatment factory

Ventilation System: Mixing

Verified that the ventilation system can remove emissions from the furnaces to prevent the build-up of harmful gases (NO).

Magellan Manufacturing

Winnipeg, MB, 2016

Areas Analyzed: Precision manufacturing space

Ventilation System: Mixing

Developed a design that can maintain very strict uniform temperature requirements in order to maintain manufacturing tolerances.

R.J.R. Cigarette Factory

Missouri, 2015

Areas Analyzed: Two cigarette product lines

Ventilation System: Mixing

Reduced airborne tobacco built up (yellow staining) on diffusers.



MCI Factory

Determined a design that will maintain manganese (Mn) particles generated by multiple welders to a concentration below 0.02 [mg/m³]

AUDITORIUM / PERFORMANCE CENTERS

Grand Théâtre de Quebec

Quebec, 2015

Areas Analyzed: Five story foyer

Ventilation System: Displacement

San Mateo Performing Arts Center

California, USA, 2011

Area Analyzed: Concert Hall

Ventilation System: Displacement

Stanford Performing Arts Centre

California, USA, 2009

Areas Analyzed: Concert Hall

Ventilation System: Displacement

Designed a displacement system around a stage located in the center of the auditorium that can be lowered and raised.

Le Cercle Moliere Theatre

Winnipeg, MB, 2008

Areas Analyzed: Concert Hall

Ventilation System: Displacement

Designed a displacement system where the diffusers are placed behind a large architectural curtain that surrounds the occupied area.

RELIGIOUS INSTITUTION

First Community Church

Columbus, Ohio, 2018

Areas Analyzed: Sanctuary area and church organ

Ventilation System: Displacement

Designed a space using displacement ventilation while minimizing stratification in front of the organ.

Crystal Cathedral

California, 2015

Areas Analyzed: Entire church

Ventilation System: Displacement

Virginia Theological Seminary

Virginia, US, 2013

Areas Analyzed: Chapel

Ventilation System: Displacement

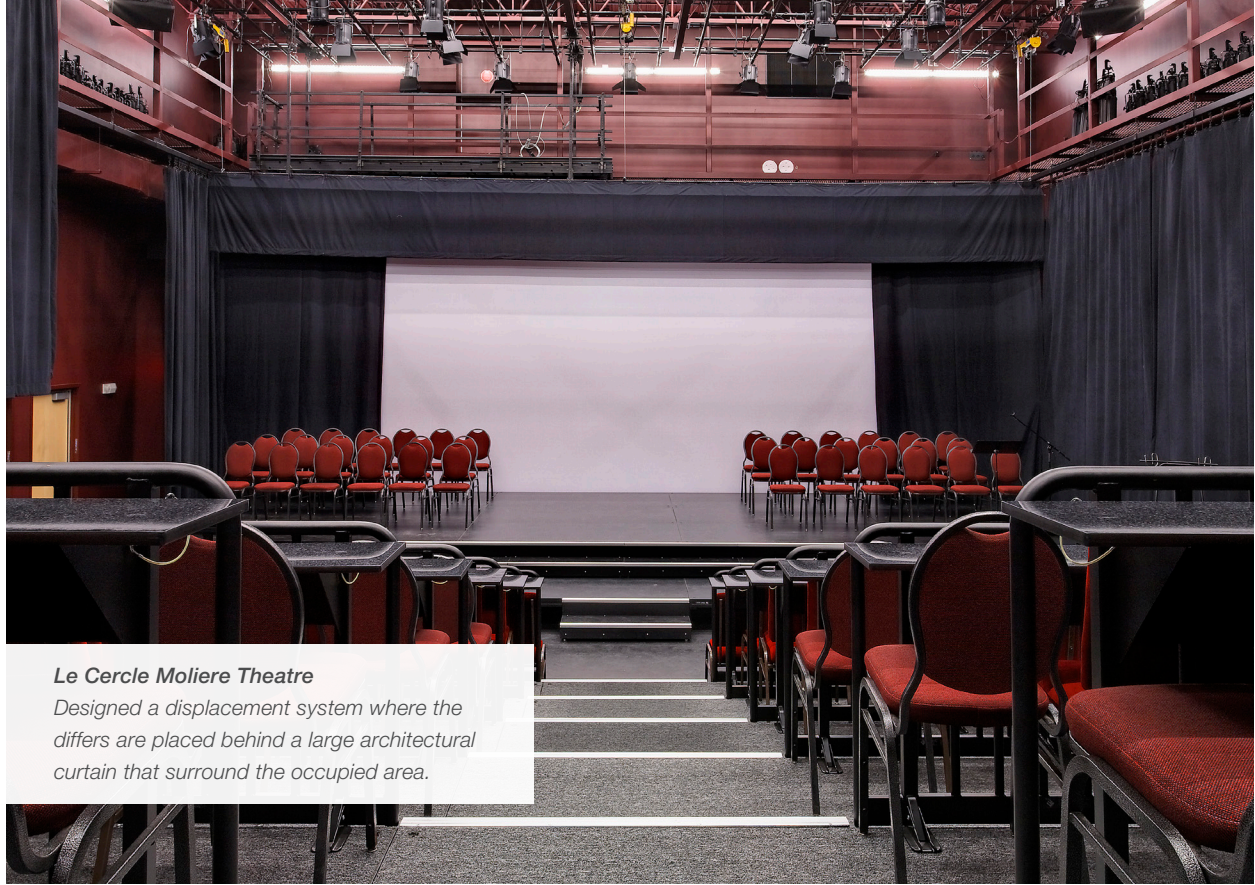
Determined the optimal design of a chapel being renovated with displacement diffusers mounted above the occupied zone.

New Doha International Airport

Doha, Qatar, 2010

Areas Analyzed: Mosque

Ventilation System: Displacement



Le Cercle Moliere Theatre
Designed a displacement system where the diffusers are placed behind a large architectural curtain that surround the occupied area.

CASINO

Harrah's Cherokee Casino

2015

Areas Analyzed: Gaming floor

Ventilation System: Underfloor

City of Dreams

Macau, China, 2007

Areas Analyzed: Casino floor, entrance hall, grand stair-case, bubble, and plenum

Ventilation System: Displacement and underfloor

AIRPORT

Confidential International Airport

Missouri, 2018

Areas Analyzed: Passenger boarding area

Ventilation System: Mixing

San Francisco International Airport

San Francisco, CA, 2017

Areas Analyzed: Passenger boarding area

Ventilation System: Displacement

Evaluated the performance of using custom column wrapped displacement diffusers under different heating and cooling scenarios.

HEALTH CARE

Hôpital Maisonneuve-Rosemont

Quebec, 2015

Areas Analyzed: Patient dialysis room

Ventilation System: Mixing

Veterans Affairs Hospital

Palo Alto, CA, 2013

Areas Analyzed: Multiple operating rooms

Ventilation System: HORD

Stockton Prison Hospital

Stockton, CA, 2011

Areas Analyzed: Day room

Ventilation System: Displacement

Banner Health Center

Arizona, USA, 2011

Areas Analyzed: Exam room, x-ray suite, and concourse

Ventilation System: Displacement

Designed a displacement ventilation system template that can be deployed across multiple hospitals.

Nanimo Hospital

Vancouver, Canada, 2010

Areas Analyzed: Patient Exam Room

Ventilation System: Displacement and Radiant

Cleveland Clinic

Abu-Dhabi, UAE, 2009

Areas Analyzed: Multi-level space

Ventilation System: Displacement

Optimized the air distribution in an architecturally complicated multi-level space, with a glass envelope in a high temperature climate.

Cathedral Pacific Medical Center

California, 2008 - 2009

Areas Analyzed: Core area, family waiting room, labor delivery room, patient room

Ventilation System: Hybrid displacement and mixing



San Francisco International Airport
Evaluated the performance of using custom collar wrapped displacement diffusers under different heating and cooling scenarios.

OFFICE

O-Street
Sacramento, CA, 2018

Areas Analyzed: Cubicle office area
Ventilation System: Underfloor with chilled sails
Maximized occupant comfort during both heating and cooling scenarios using a hybrid underfloor and chilled sail system design.

3M Design Center
Michigan, 2017

Areas Analyzed: Open office area
Ventilation System: Chilled Beams
Reduced the risk of condensation on window mullions during the winter.

Scott Sports Headquarters
Givisiez, Switzerland, 2017
Areas Analyzed: Cubicle working area
Ventilation System: Mixing and radiant
Determined the best design for a new innovative ceiling fabric radiant panel system.

American Airlines Operations Center
Forth Worth, TX, 2015

Areas Analyzed: Cubicle area
Ventilation System: Mixing

MITRE Office Building
McLean, VA, 2015
Areas Analyzed: Executive office, boardroom, and conference room
Ventilation System: Mixing
Optimized a mixing system for a boardroom with a 30 ft. ceiling.

OAA Headquarters
Toronto, ON, 2015
Areas Analyzed: Entire two story office building
Ventilation System: Displacement
Analyzed a central displacement system for the entire building.

Nvidia Headquarters
California, 2014
Areas Analyzed: Office space
Ventilation System: Underfloor and radiant

DuPont Chestnut Run Plaza
Delaware, USA, 2009

Areas Analyzed: Large open office
Ventilation System: Underfloor



LAB / CLEANROOM

University of North Carolina
Chapel Hill, NC, 2018
Areas Analyzed: Cryo Electron Microscope Lab
Ventilation System: Displacement
Determined the optimal displacement design for a space with very strict temperature and air velocity requirements.

Laboratory Medicine Building
New York, NY, 2013
Areas Analyzed: Mass spectrometer lab
Ventilation System: Mixing compared to chilled beam with radiant panels
Provided a recommendation on which ventilation system to use for a laboratory with a very high cooling load.

Intel Austin Facility
Austin, TX, 2011
Areas Analyzed: Computer chip test lab area
Ventilation System: Displacement

Intel Guadalajara Facility
Guadalajara, Mexico, 2011
Areas Analyzed: Computer chip test lab area and open office
Ventilation System: Displacement

Pharmaceutical Company (Multiple Buildings)
Ontario, 2017
Areas Analyzed: Cold storage and incubation rooms
Ventilation System: Fan filter units
Optimized the ventilation design for a space with very strict temperature requirements.

Pfizer Main Street Facility
Cambridge, MA, 2013
Areas Analyzed: Animal holding room
Ventilation System: Mixing



OTHER

McCormick Place Exhibition Hall
Chicago, IL, 2018
Areas Analyzed: Portion of the exhibition hall
Ventilation System: Mixing compared to displacement
Compared the performance of two different systems, mixing and displacement, in a cooling scenario.

Conestoga Meats Hog Barn
2017
Areas Analyzed: Hog barn
Ventilation System: Mixing
Determined the effectiveness of the mixing system's ability to ventilate ammonia generated by the hogs in the facility.

Laval Sports Complex
Laval, QC, 2015
Areas Analyzed: Sports complex with ice rink
Ventilation System: Mixing
Developed an air distribution design in a hockey arena to keep occupants comfortable without comprising the rink ice.

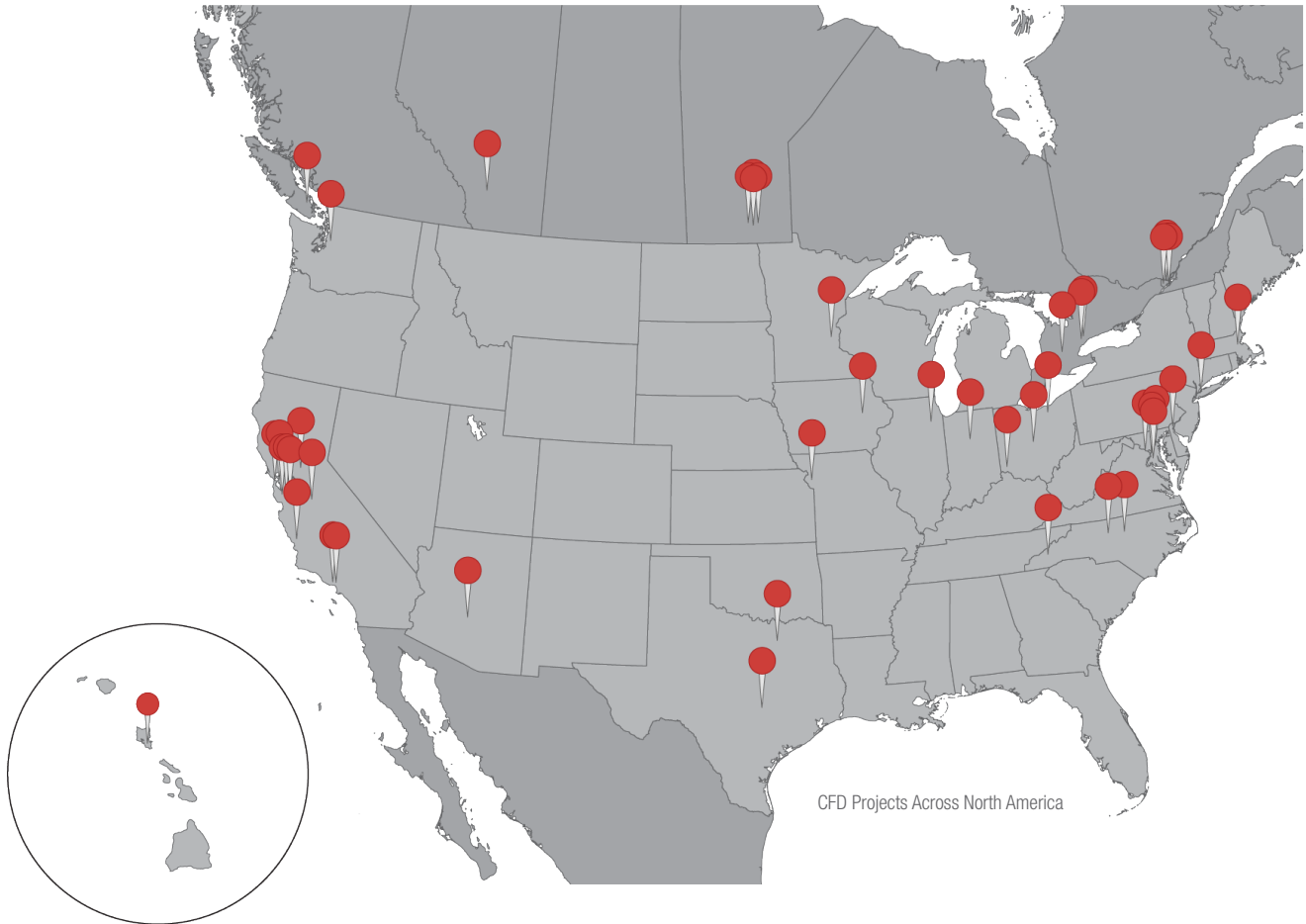
Snob Club
Moscow, Russia, 2014
Areas Analyzed: Large glass dome, multi-purpose recreational facility
Ventilation System: Mixing
Designed a mixing system that can handle a space that can be used as a pool, dance hall and event centre.

Smithsonian National Air & Space Museum
Washington, DC, 2014
Areas Analyzed: Food court
Ventilation System: Displacement

Asia Square Tower 2
Singapore, 2012
Areas Analyzed: Ballroom
Ventilation System: Mixing

Lotte World Tower
Seoul, South Korea, 2010
Areas Analyzed: Building lobby
Ventilation System: Displacement and Radiant
Optimized the displacement design for a 120 ft. glass atrium.

PredictCFD.com



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