

COMPUTATIONAL FLUID DYNAMICS (CFD) MODELING

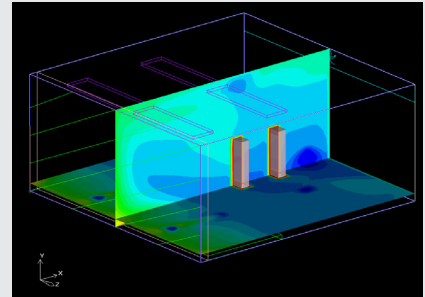
PREDICTING THE EFFECTIVENESS OF SUSTAINABLE DESIGN ALTERNATIVES

CFD uses numerical methods to solve nonlinear differential equations that describe fluid flow to make predictions on flow velocity, temperature, density, and chemical concentrations for any region where flow occurs.

CFD Modeling is a virtual modeling technique with powerful visualization capabilities. Engineers can evaluate the performance of a wide range of HVAC system configurations without the time, expense, and disruption required to make actual changes on site.

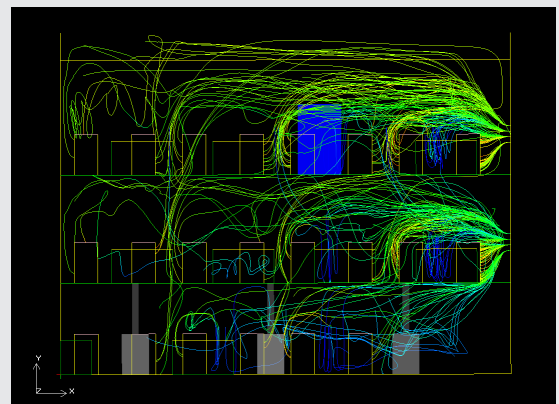
Glumac has used CFD Modeling to evaluate a number of situations, including displacement ventilation, natural ventilation, radiant heating/cooling, data centers, and server rooms. We have provided services for a variety of building types, such as office buildings, mission critical facilities manufacturing facilities, and museums.

Glumac employs CFD experts including Ph.D. and scientists for advanced analysis of building systems.



ADVANTAGES OF USING CFD MODELING

- CFD predicts performance before constructing systems, so one can predict what design change will best enhance performance.
- The advances in HVAC/IAQ technology require broader and more detailed information about the flow within an occupied zone, and the CFD technique meets this goal better than any other theoretical or experimental methods.
- CFD costs less than building prototypes because physical modifications are not necessary. (The cost and time for physical changes/ modifications increase almost exponentially as the size of the system increases).
- The numerical schemes and methods upon which CFD is based on proven technologies.



WHERE CAN CFD BE UTILIZED?

- CFD data can be utilized to validate various design parameters such as the location and number of supply, return and exhaust registers and temperature and flow rate (CFM) of supplied air to meet design criteria. Such systems include:
 - Natural ventilation
 - Displacement ventilation
 - Raised floor
 - Atrium smoke control
- CFD can be used in evaluating modification/ improvement of malfunctioning HVAC systems.
- CFD can be used to compare various options for designing HVAC systems for a designated space, such as mixing or displacement ventilation.
- CFD analysis of temperature, velocity and chemical concentration distributions can help engineers understand problems correctly and provide ideas for best resolution.
- CFD can be used to evaluate airflows for:
 - High density data centers
 - External building flows
 - Perimeter Offices
 - Contaminant/species simulations
 - Fume hood design
 - Contamination control chemical lab design
 - Industrial ventilation design
 - Smoking lounge
 - Problem solving simulations
 - AHU mixing enhancement investigation
 - Fire and smoke management
 - Building atria fire simulation
 - Swimming Pool ventilation
 - Medical facilities (operating room)
 - Clean room simulation
 - Animal and plant environments
 - Enclosed vehicular facilities
 - Halls, stadiums, arenas, and places of assembly

