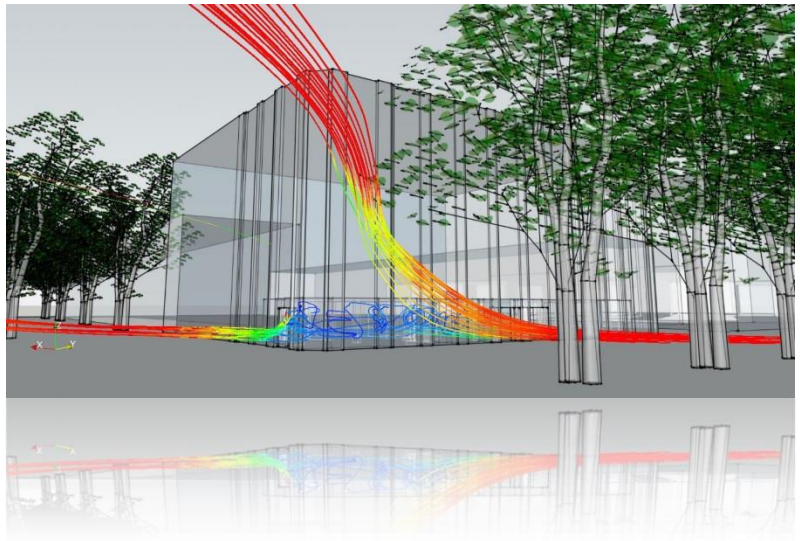
APPLICATION OF
iconCFD®
On Urban flow Environments :
Hugo Boss Retail Store Study



Prepared by:
Mr. Kostas Tsikouris
Presented by:
Mr. Punit Nayyar

June 2019

BOSS
HUGO BOSS

Technology Process Consulting

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AGENDA

- ICON & iconCFD introduction
- iconCFD experience with Built Environments
- Motivation of Study
- CAD Preparation
- Mesh Creation
- CFD Setup
- Results
- Conclusions

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ICON®
INTRODUCTION

Expert industry partner for 25yrs

- Simulation-driven product development
- 100+ CFD/CAE & Application specialists
- Over 1000 customers of Group
- America - Europe – Asia
- Leading Open Source CFD products and services provider for automotive industry since 2004

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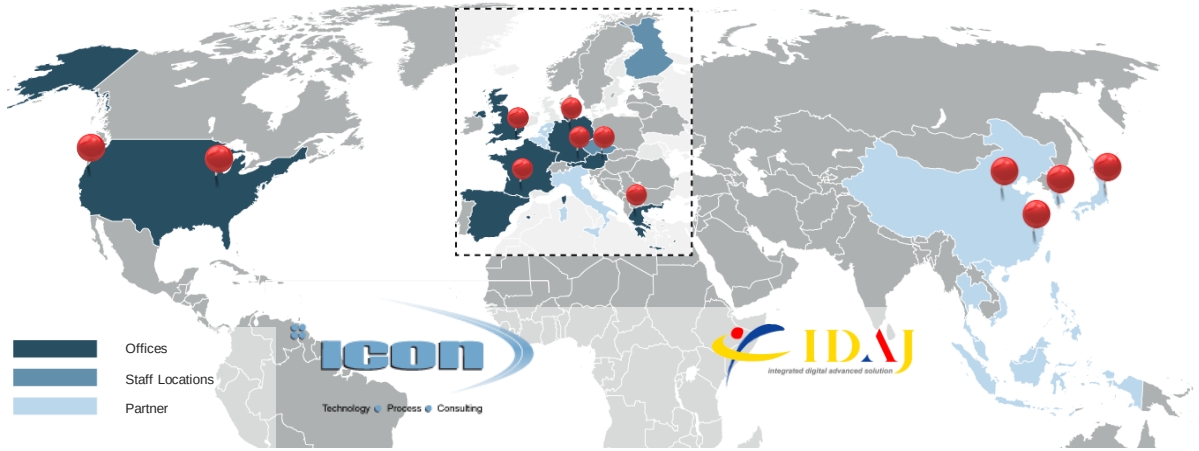

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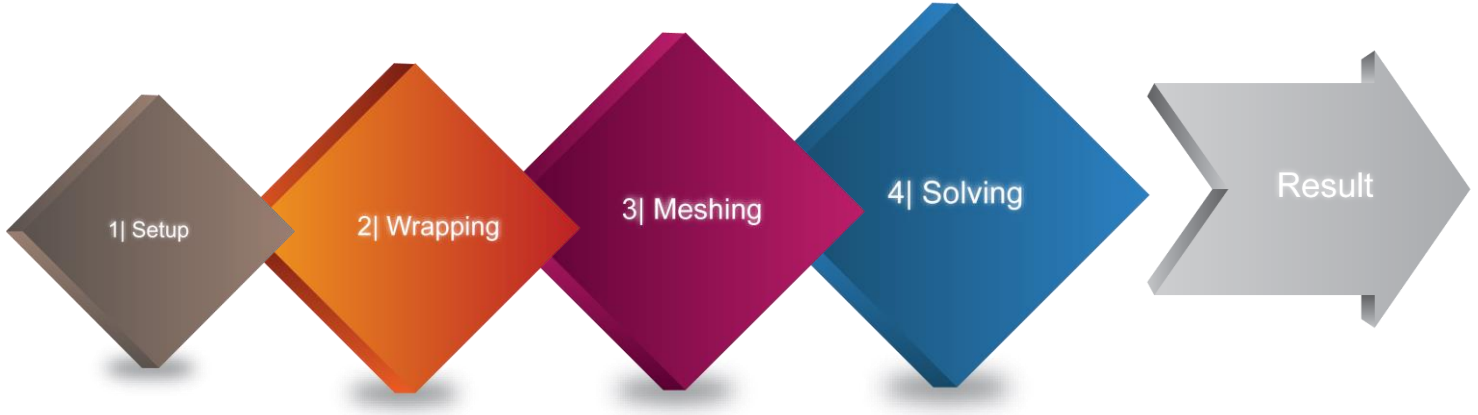
SUPPORTED PROCESS

iconcfd
Modularized ● Industrialized ● Customized



iconCFD® Process	iconCFD® Wrap	iconCFD® Mesh	iconCFD® Cold iconCFD® Thermal iconCFD® Optimize iconCFD® VOF iconCFD®... etc.	iconCFD® Process

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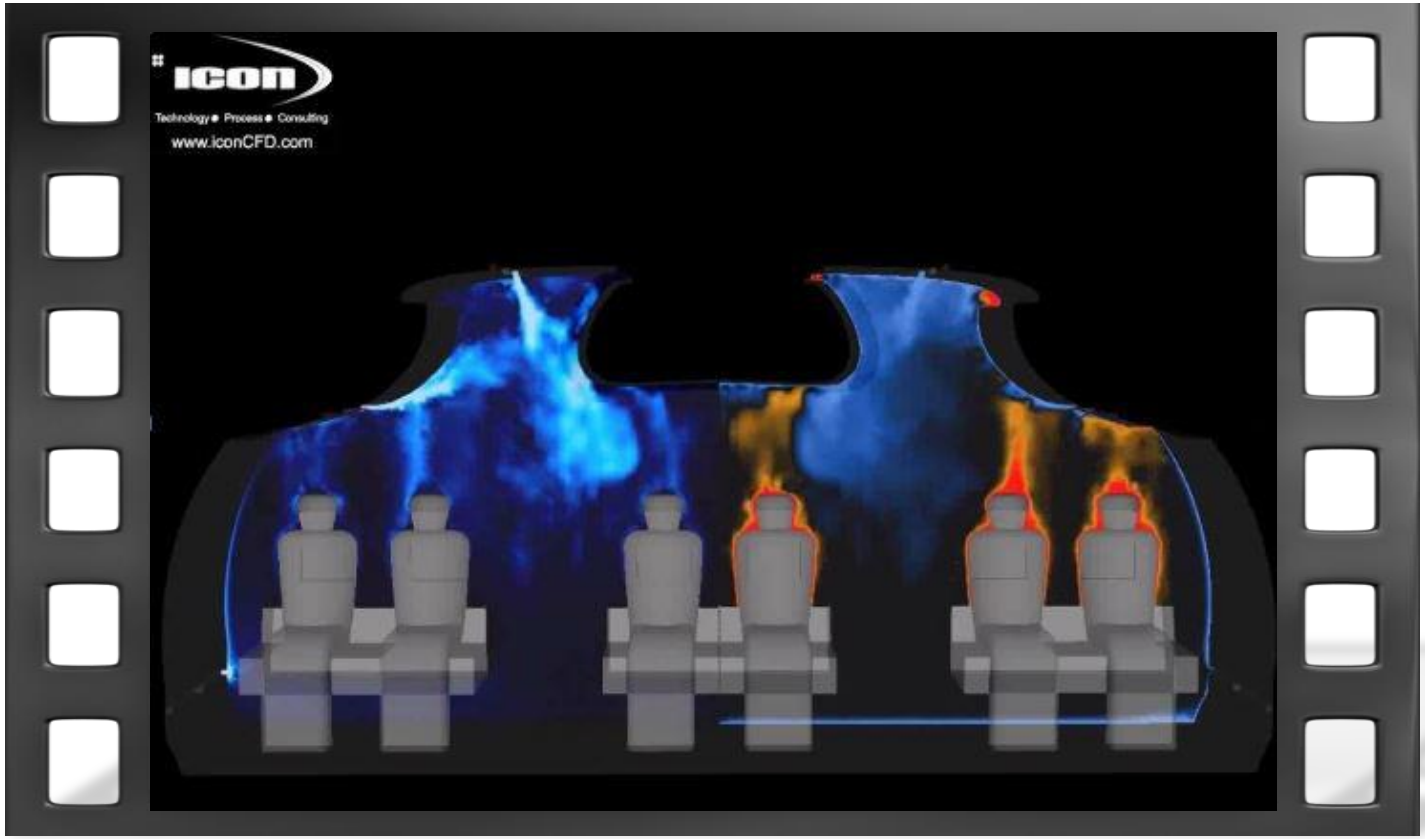

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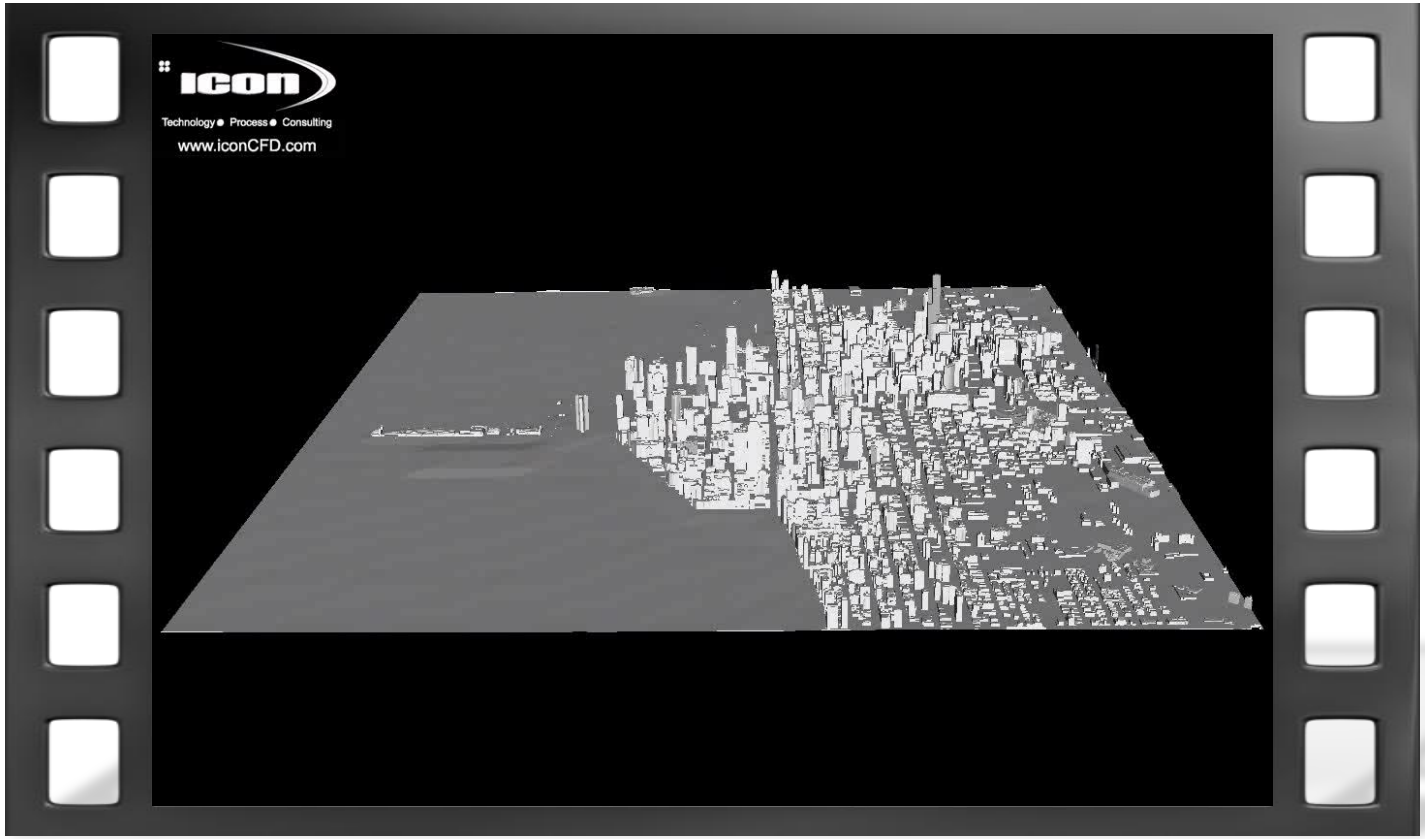

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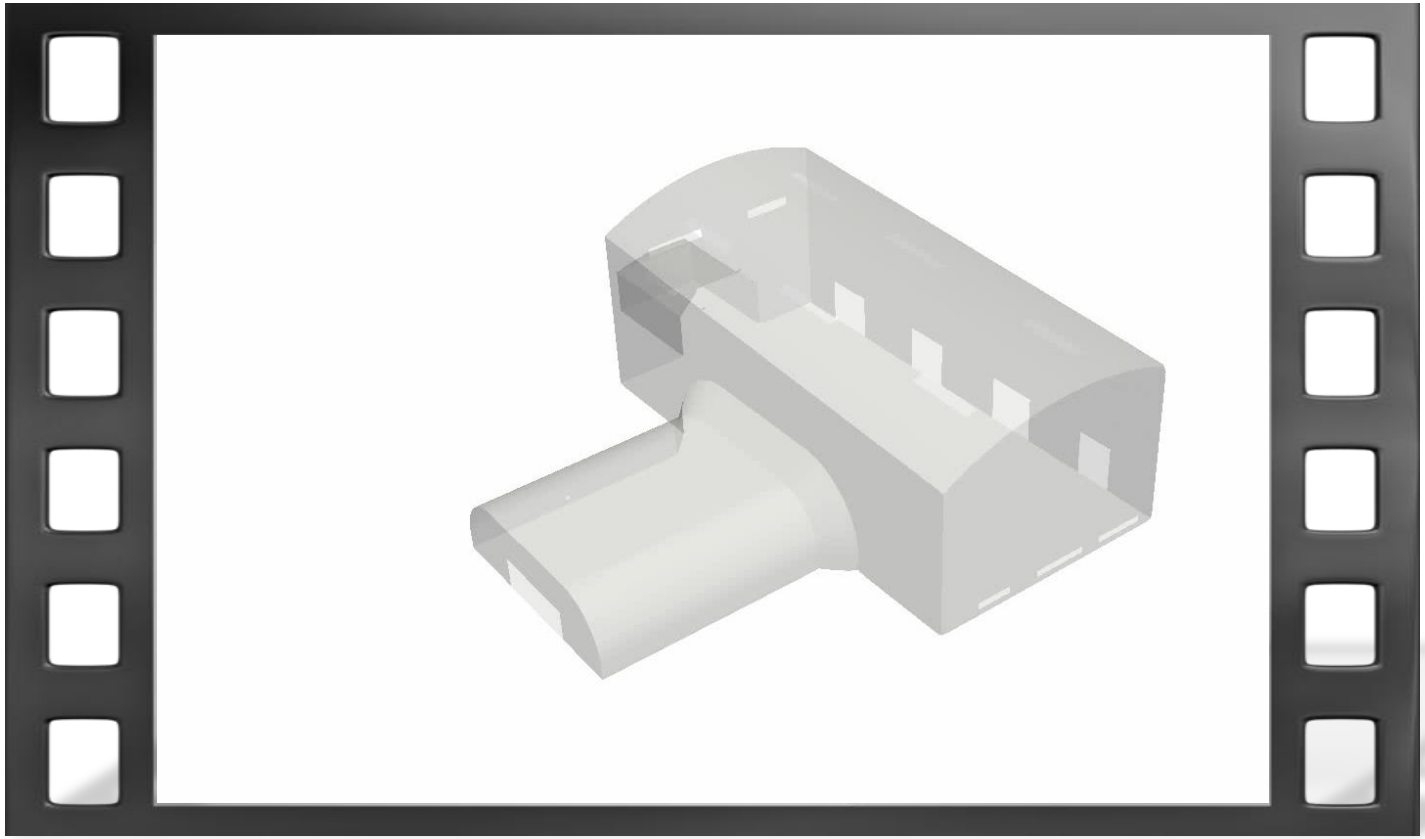

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HUGO BOSS SLOANE SQUARE
MOTIVATION

- Open entrance doors on different facades (client's open door policy)
- Detritus from the street is blown into the store
- Hugo Boss wanted to investigate and mitigate this effect

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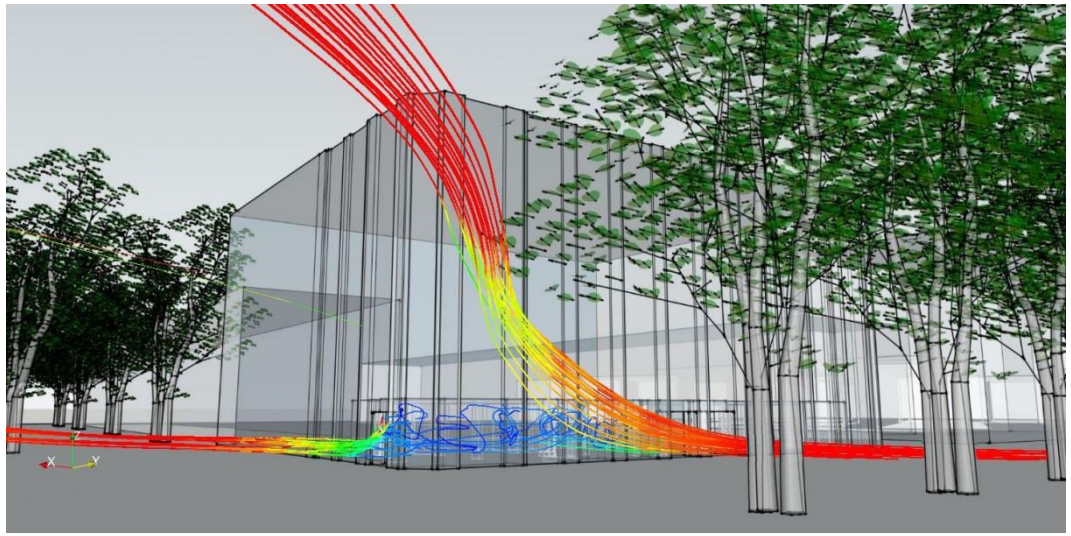
HUGO BOSS SLOANE SQUARE
MOTIVATION

- Objectives of the study:
  - CFD simulation of flow around and inside the Hugo Boss Retail Store (Sloane Square)
  - Investigate the nature of cross flow
  - Suggest how to efficiently prevent the entry of detritus from the street
    - With / without sliding doors



Geometry and results courtesy of Hugo Boss

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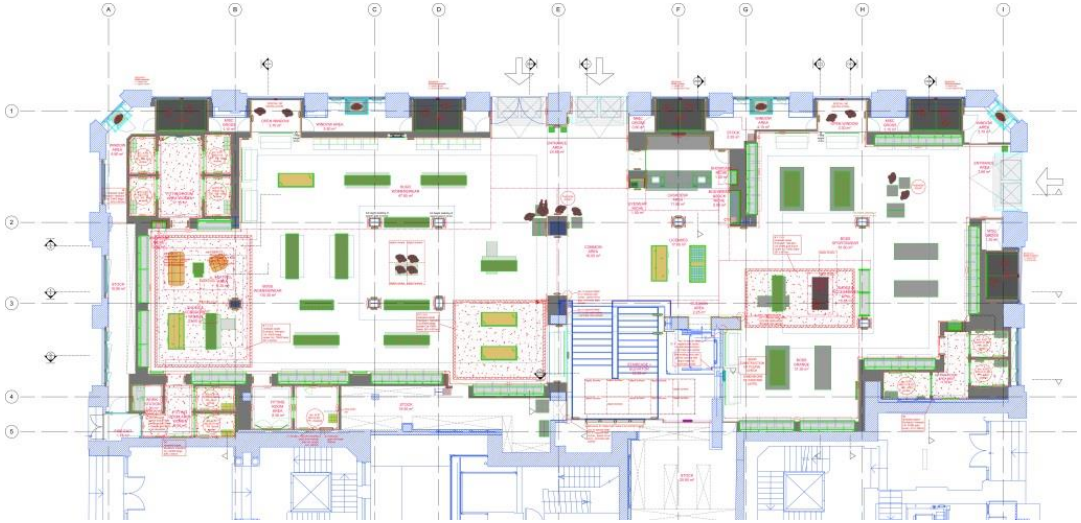
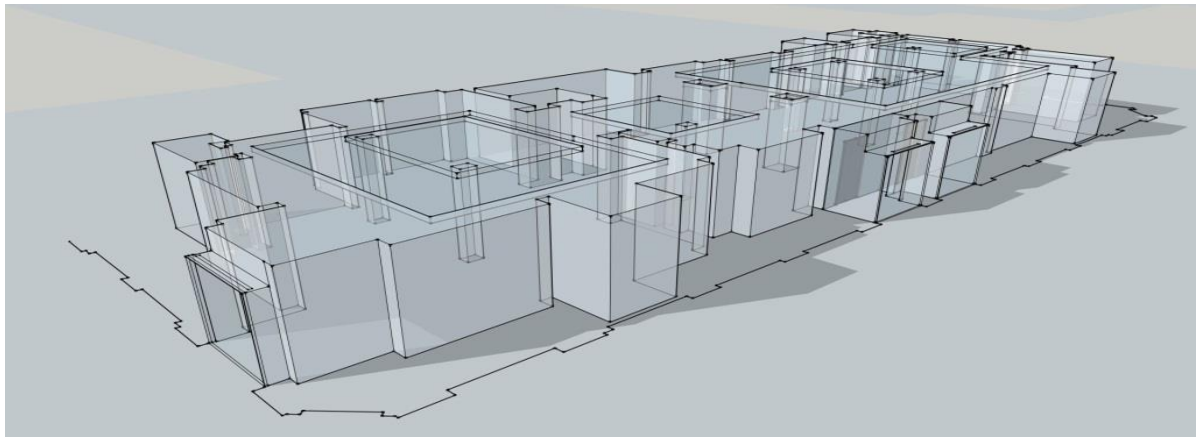
CAD PREPARATION
MODEL CREATION

- Geometry provided as 2D CAD drawings
- 3D model created and cleaned up





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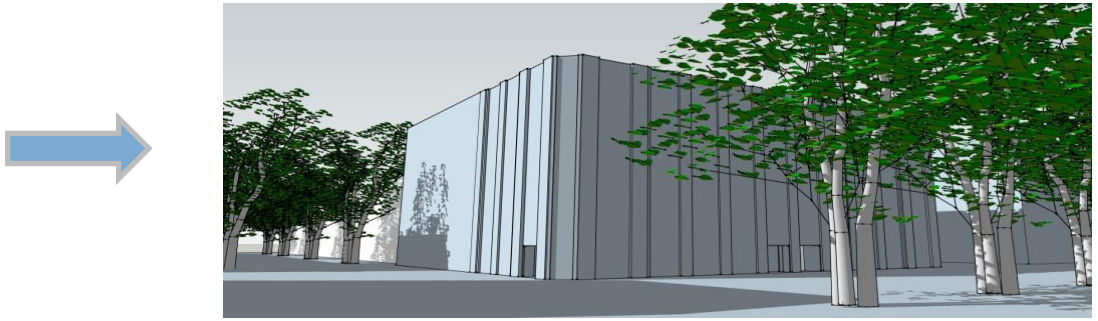
CAD PREPARATION
MODEL CREATION



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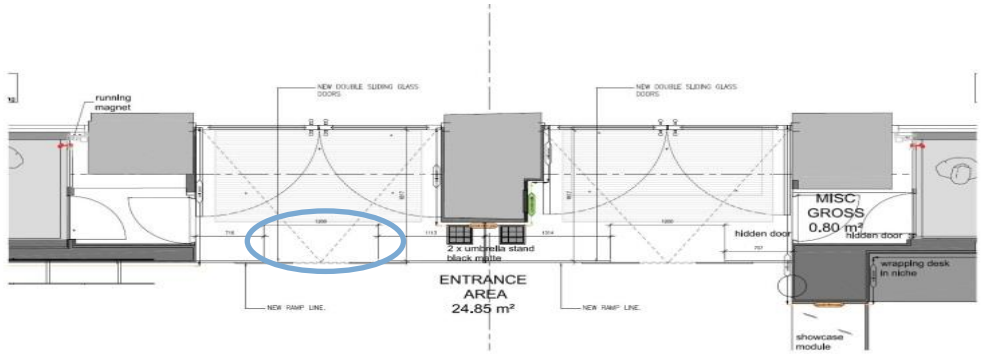
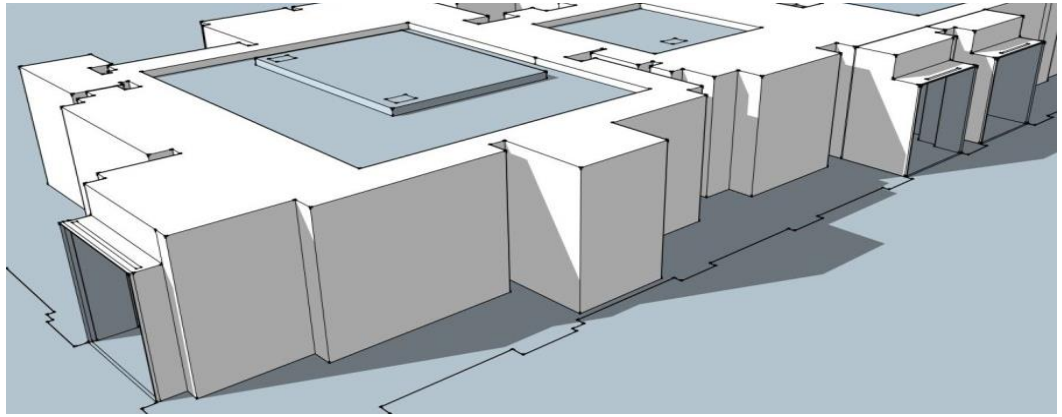
CAD PREPARATION
SLIDING DOORS

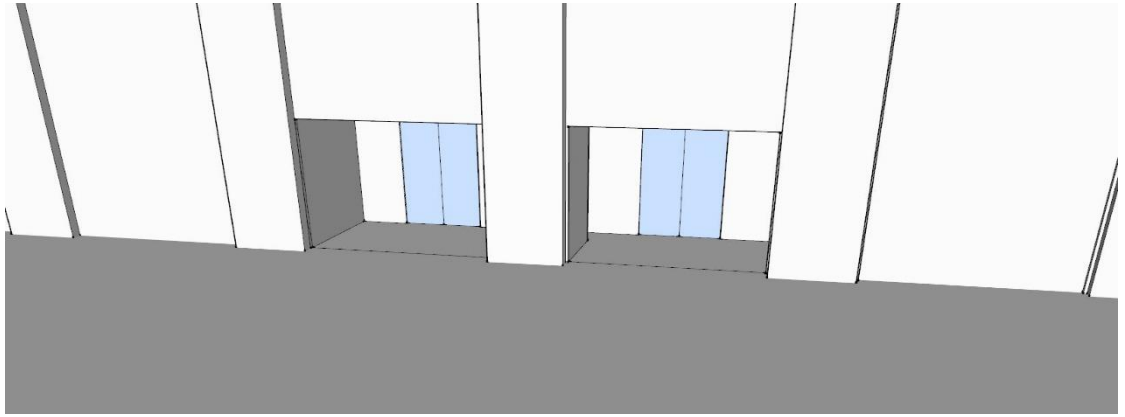
- Sliding doors were added to the model based on the provided drawings



Sliding doors were applied on the front entrance doors only



Blue regions on the CAD model depict the sliding doors



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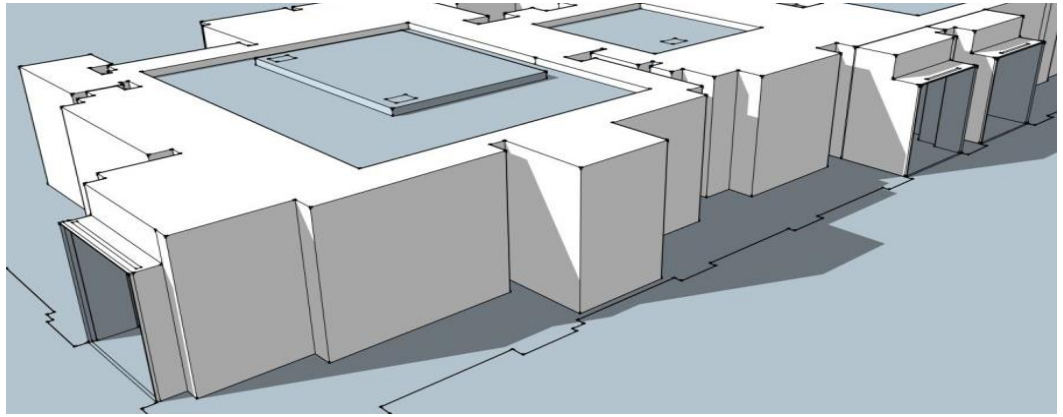
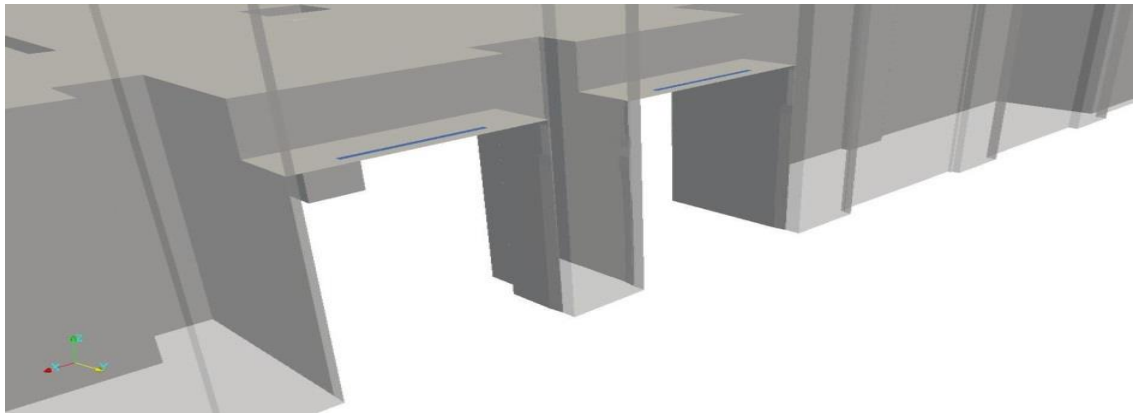
CAD PREPARATION
AIR CURTAINS

- Air curtains were also introduced at all entrance doors with the size and specifications provided
  - 1.5m length each
  - Mass flow rate of each curtain: 1.84m^3/s

Air Curtains are shown on the top of the entrance doors as “inlets”

Blue regions on the CAD model depict where the inlet boundary conditions are applied to model the effect of air curtains





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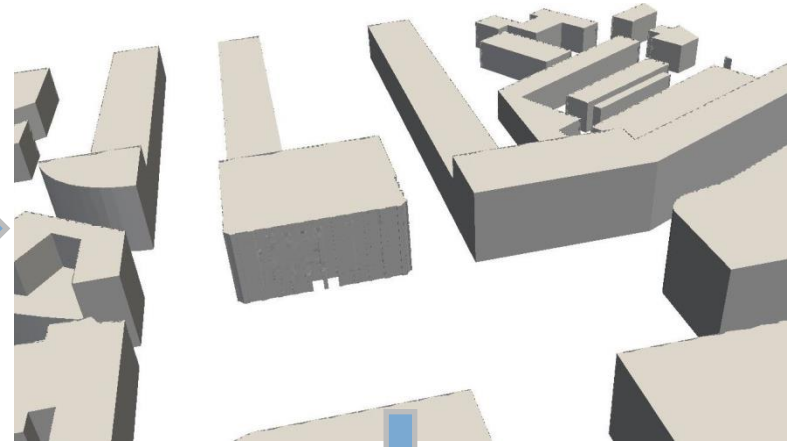
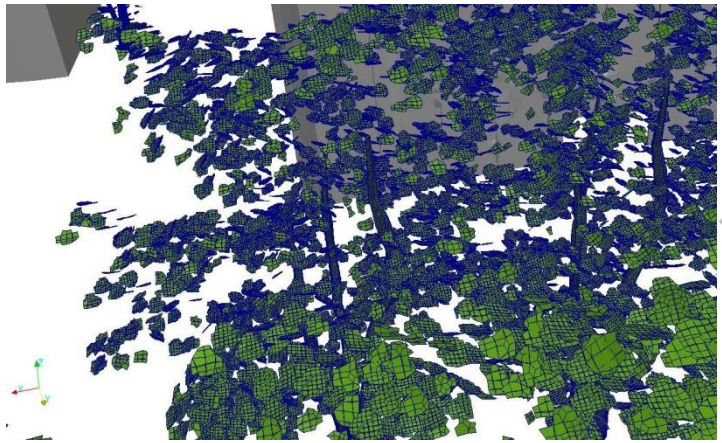
MESH CREATION
DETAILS

- Real life situation was replicated as closely as possible
- Created with iconCFD® Mesh
- Fully automatic Hexahedral dominant mesh
- 35 million cells
- 3 surface layers on critical parts





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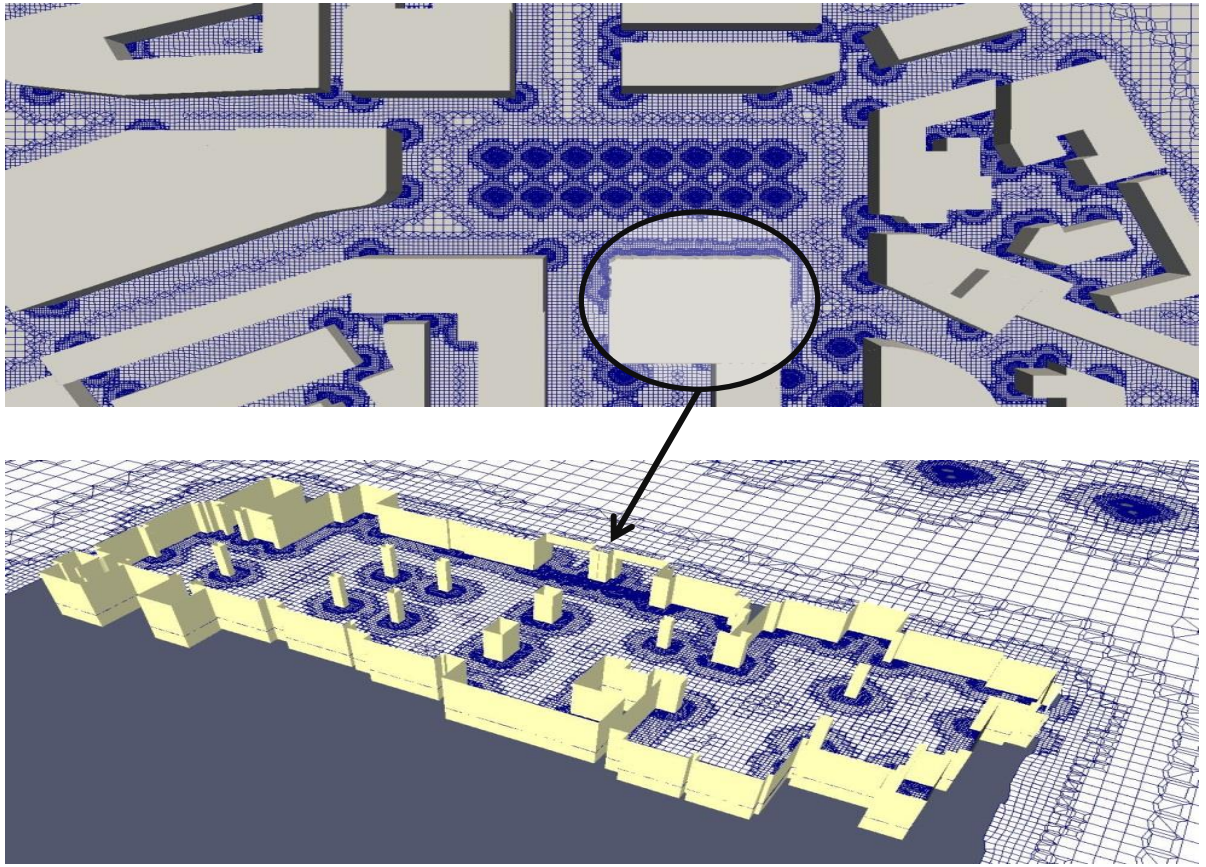

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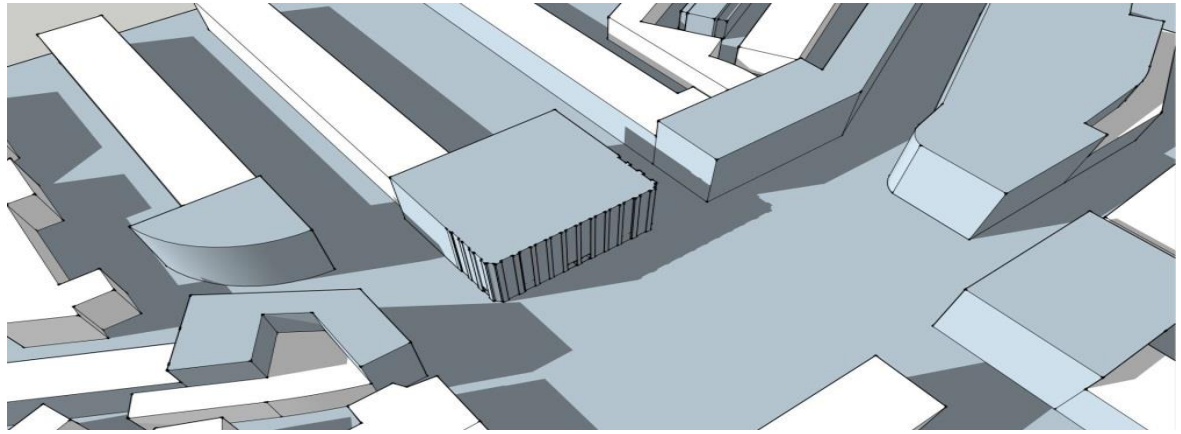
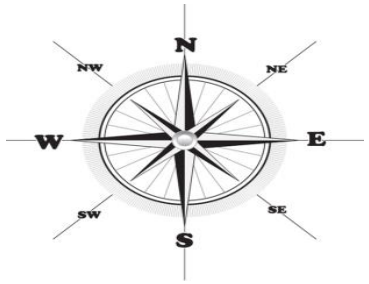
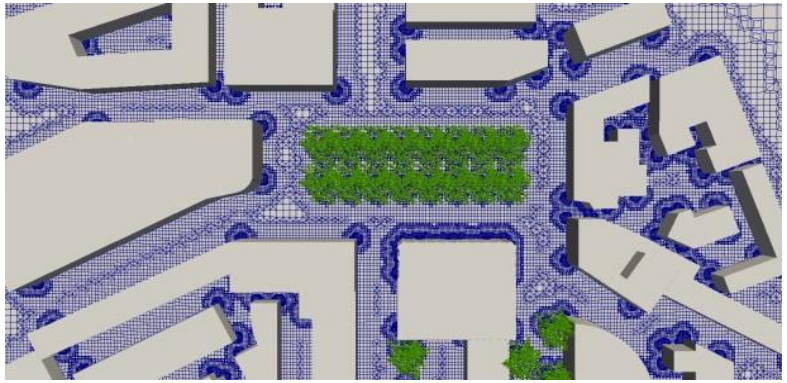
CFD SETUP
SOLVER SETTINGS

- Product: iconCFD® Cold
- Steady-state RANS
- Single phase
- Incompressible
- Hybrid kω-SST turbulence model
- 3000 iterations for full converged solution







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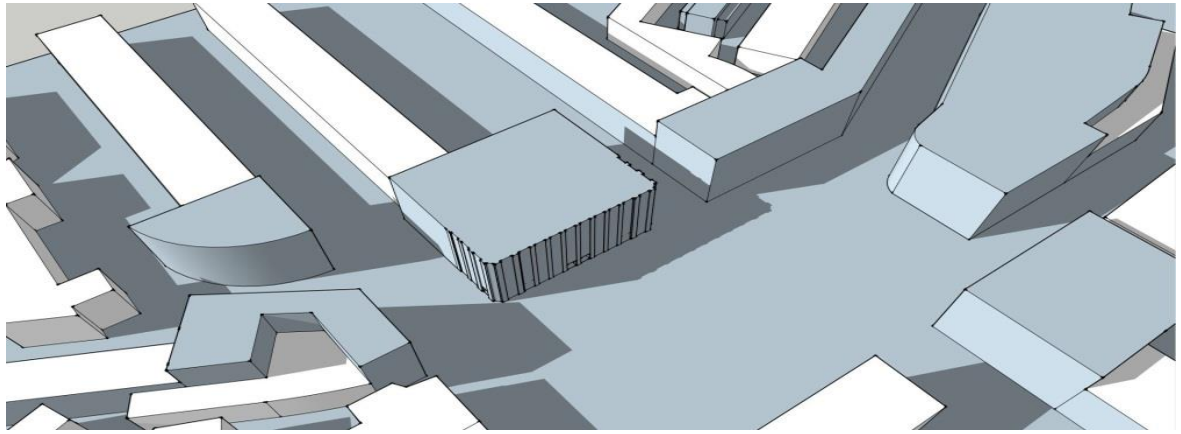
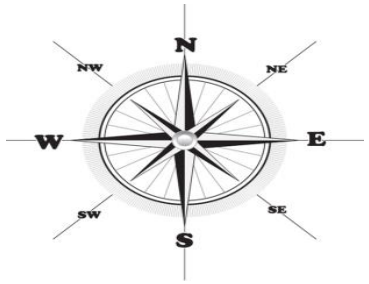
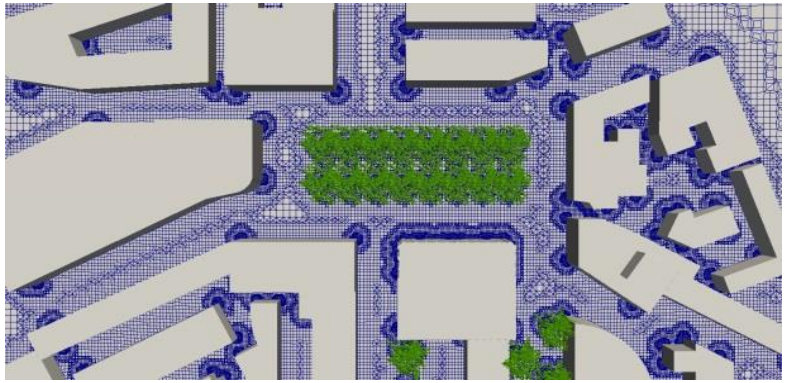
CFD SETUP
BOUNDARY CONDITIONS

- Inlet: 5m/s (annual average for the area)
- Outlet: fixed pressure
- 8 different wind directions were simulated
- Prevailing wind direction in the area is West







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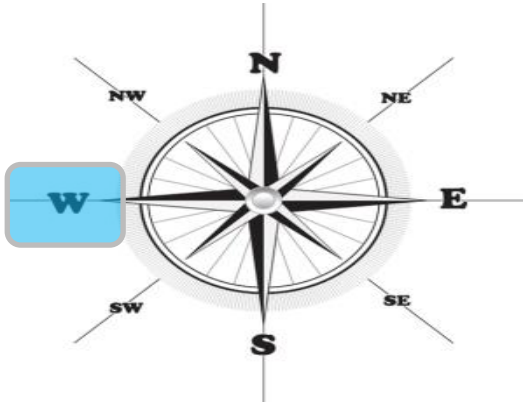
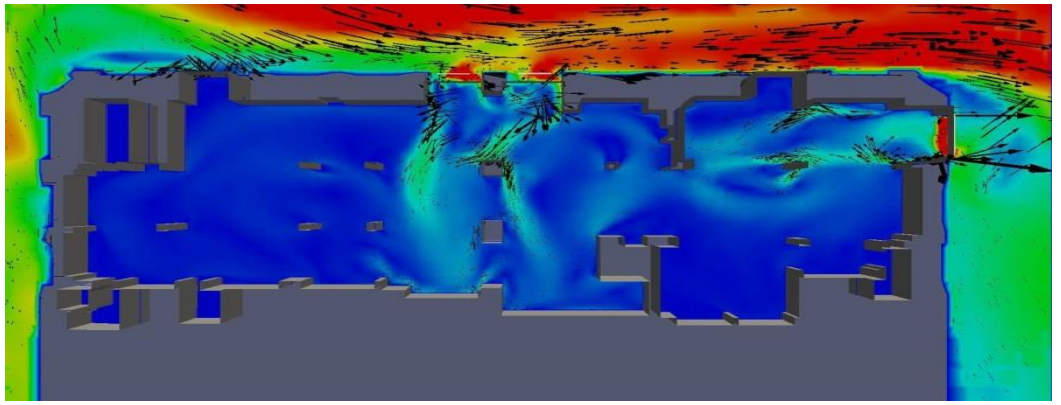
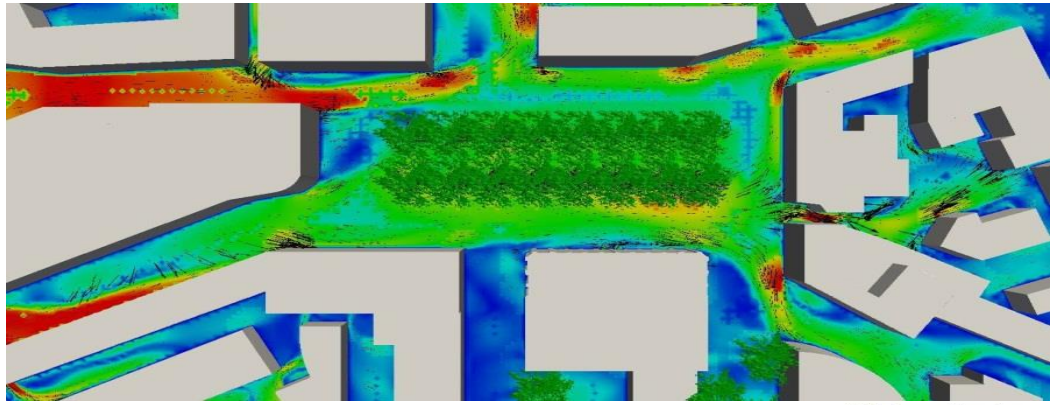
RESULTS

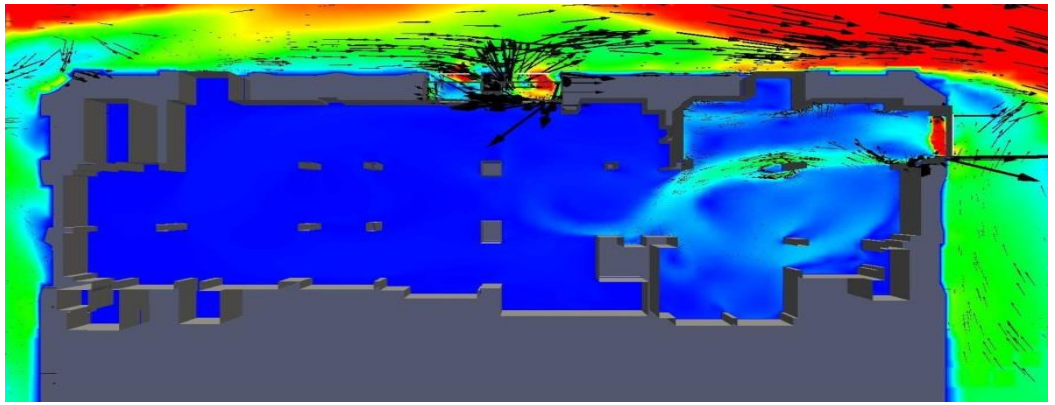
WIND DIRECTION: W





Without sliding doors





With sliding doors

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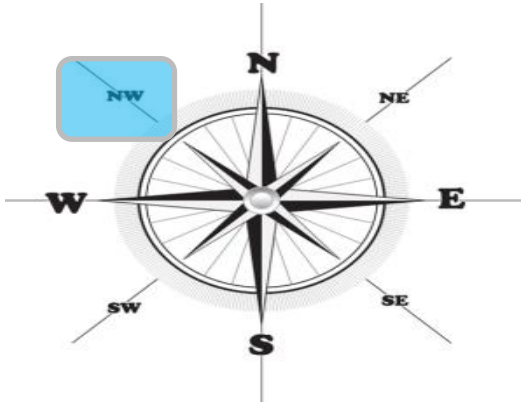
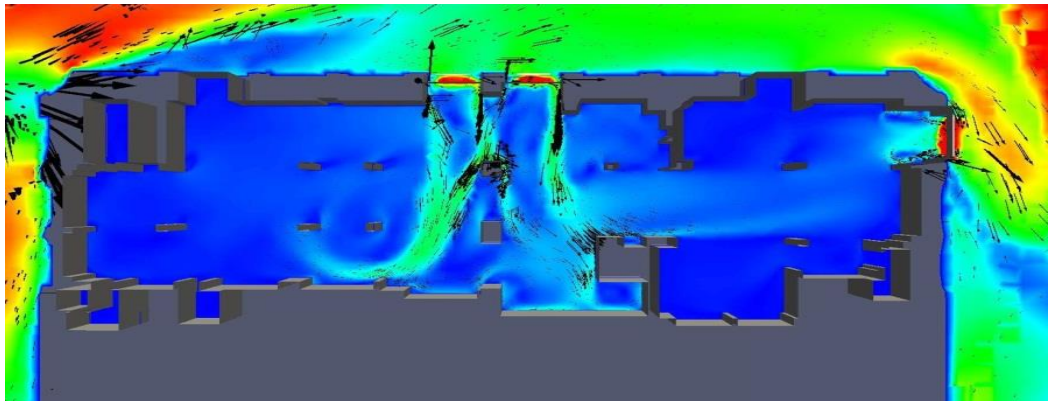
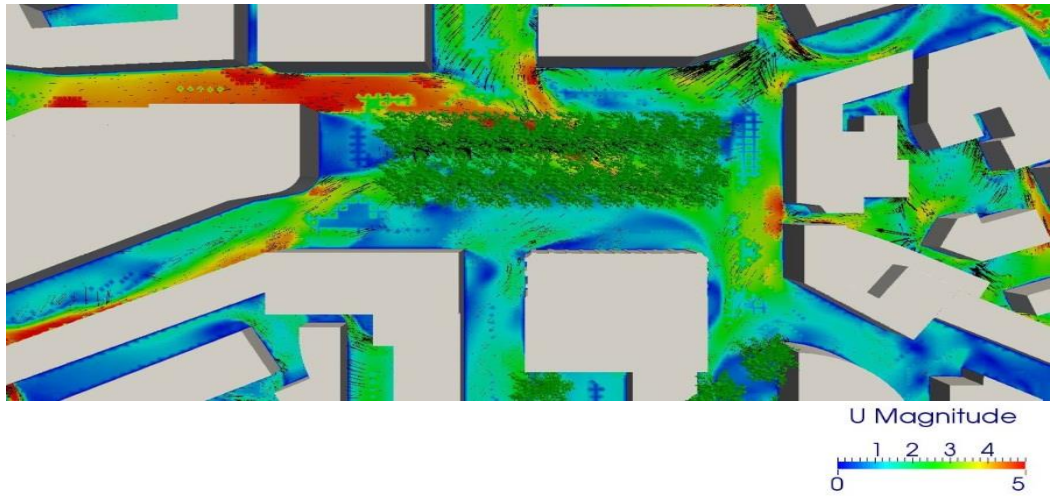
RESULTS

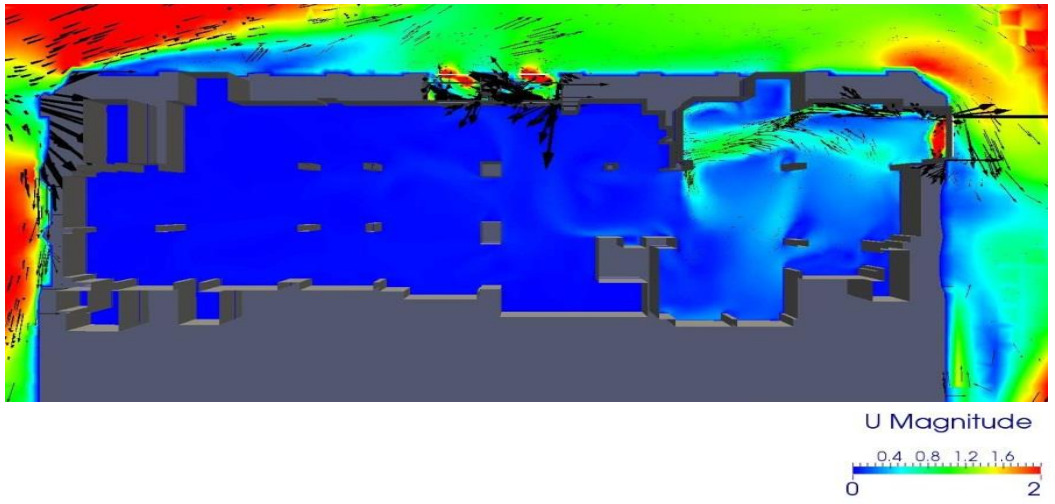
WIND DIRECTION: NW





Without sliding doors





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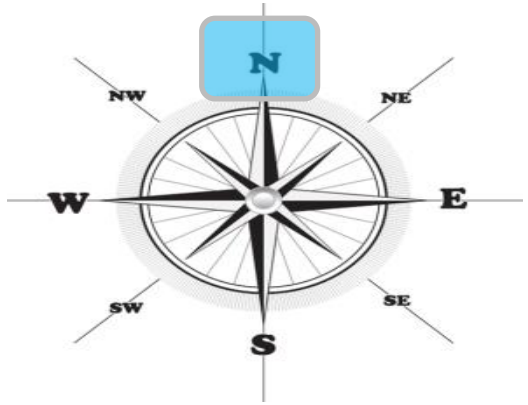
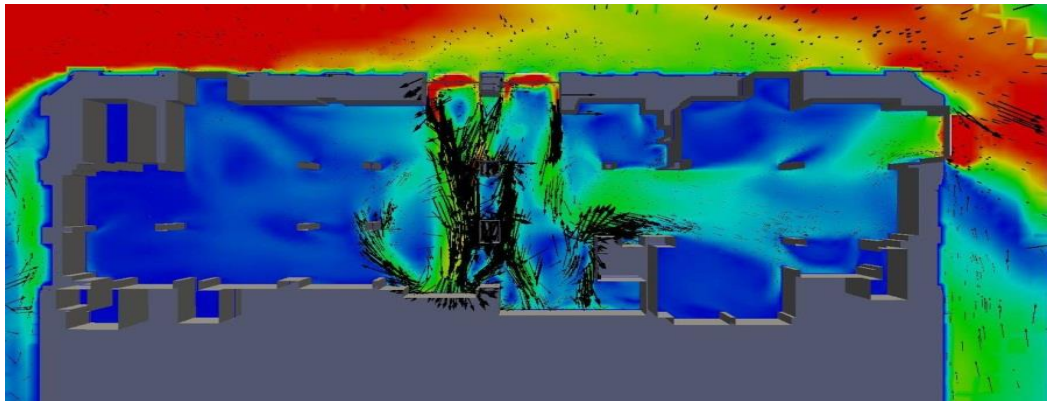
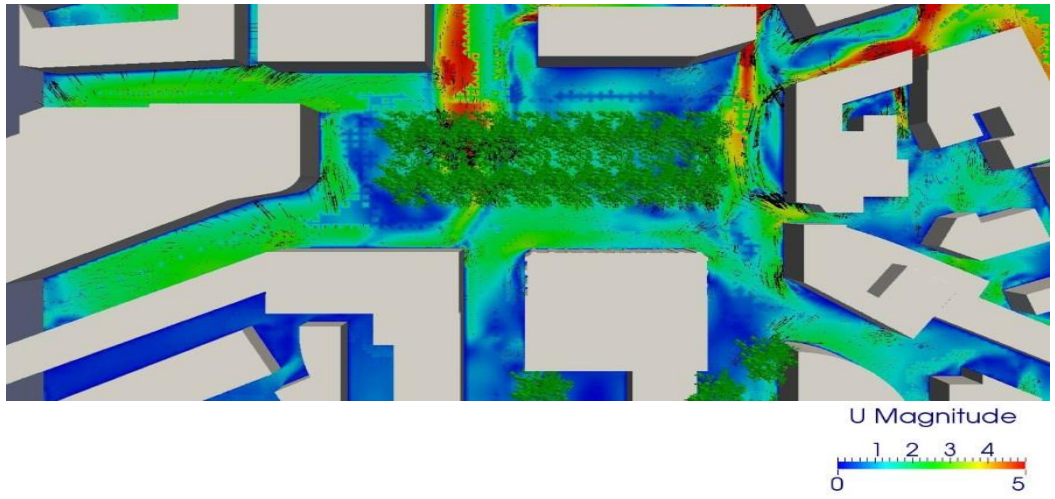
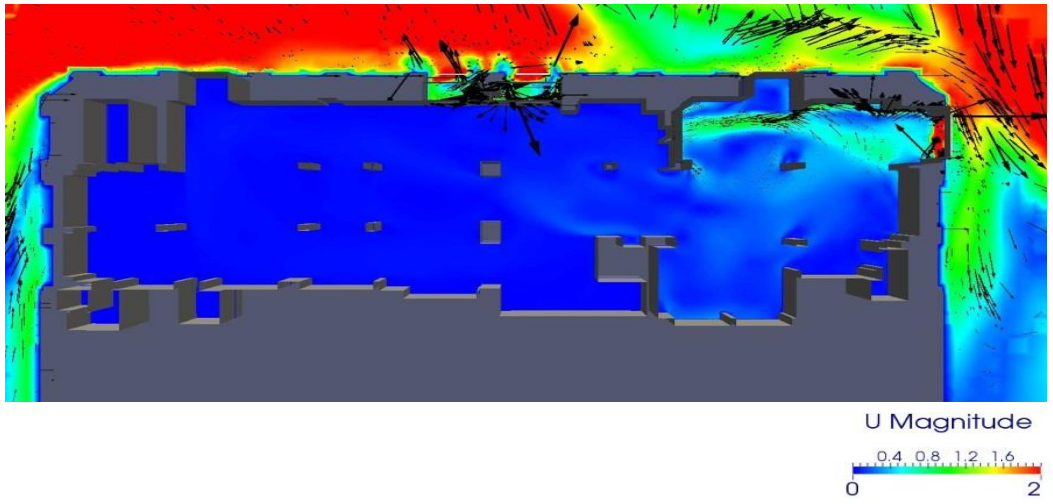
RESULTS
WIND DIRECTION: N





Without sliding doors





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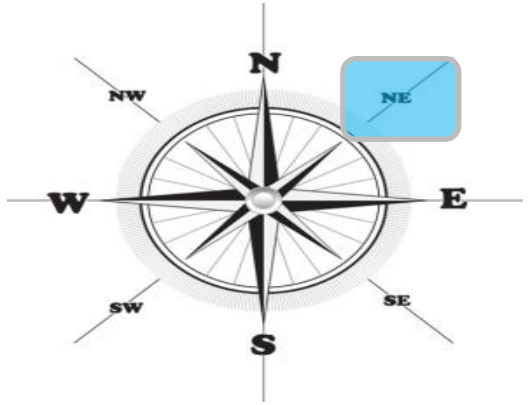
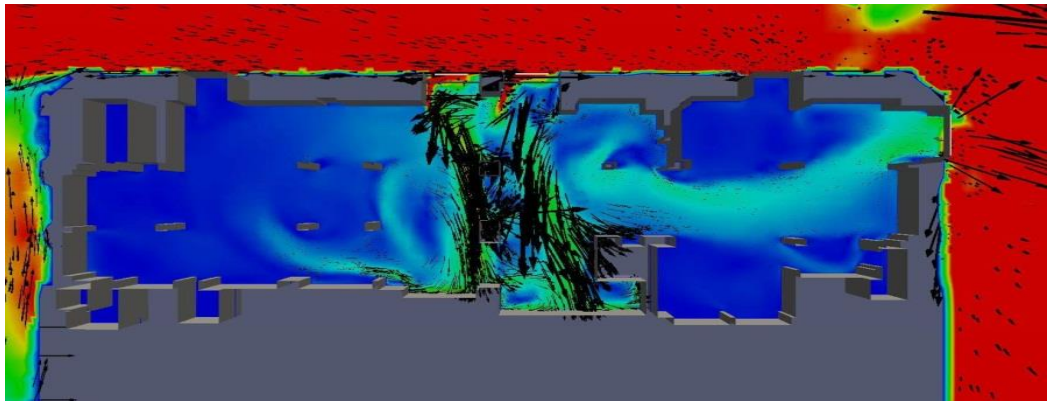
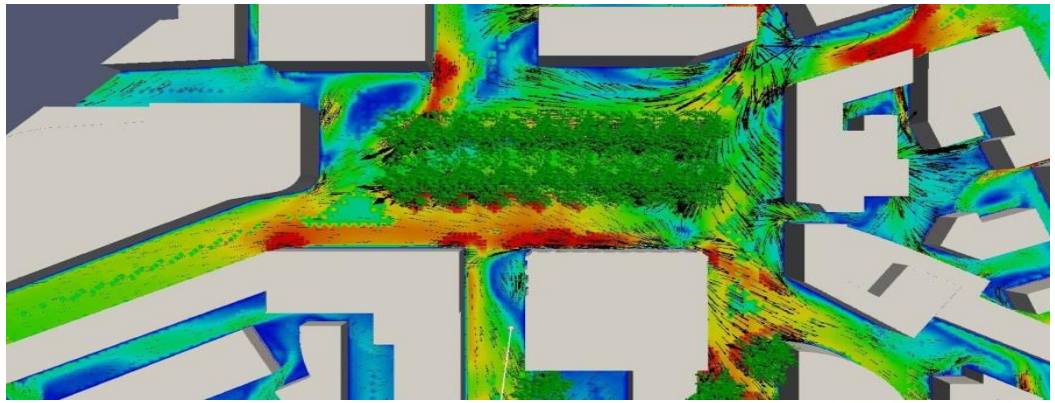
RESULTS

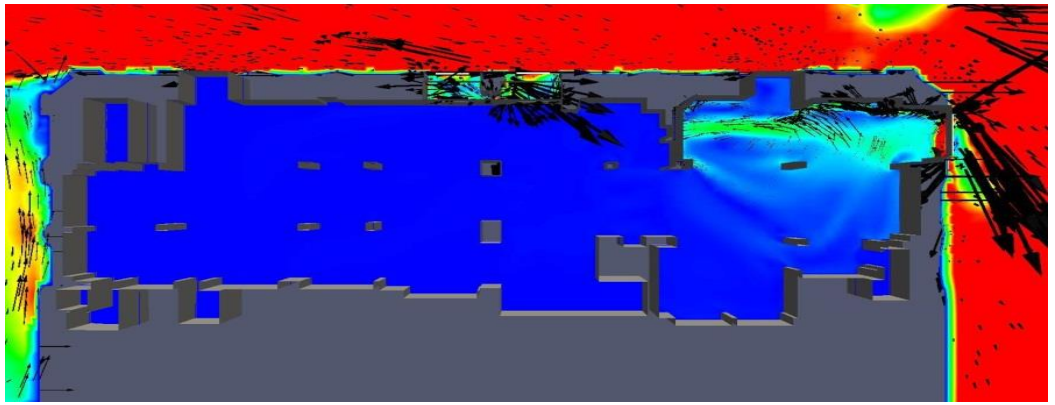
WIND DIRECTION: NE





Without sliding doors





With sliding doors

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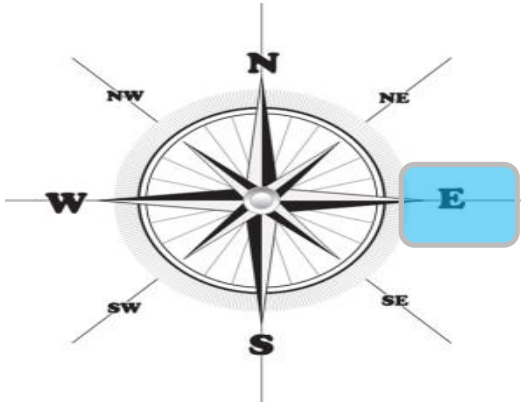
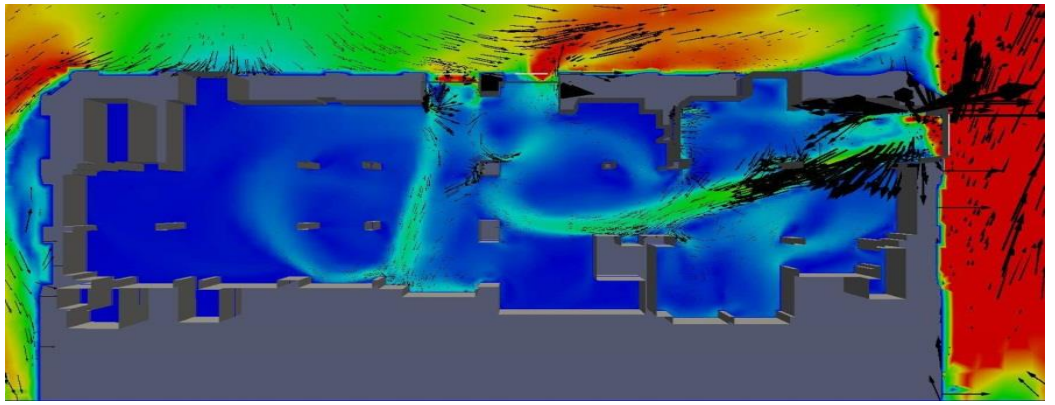
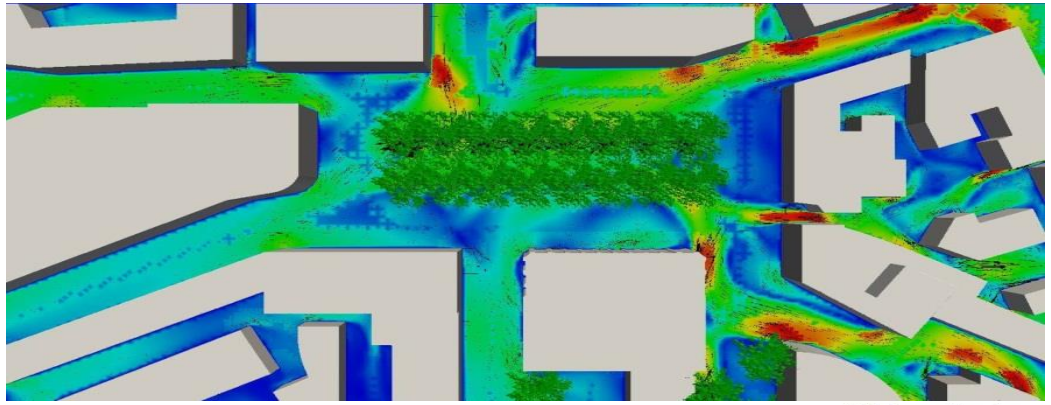
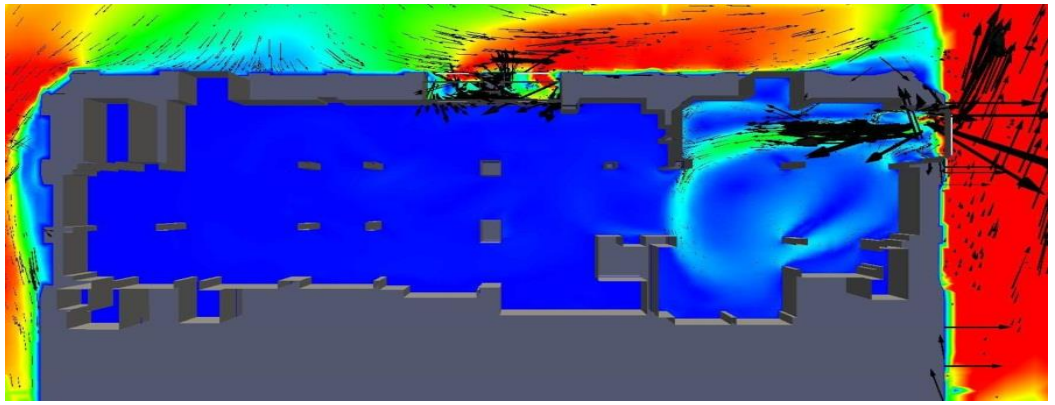
RESULTS
WIND DIRECTION: E





Without sliding doors





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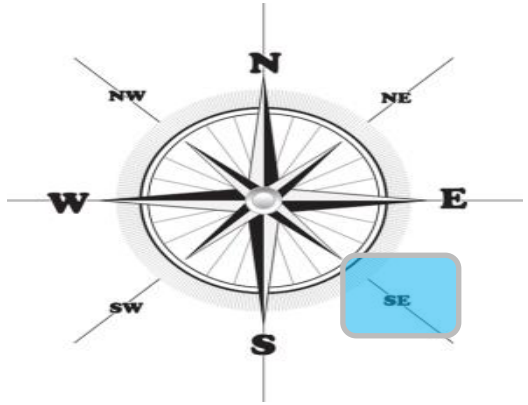
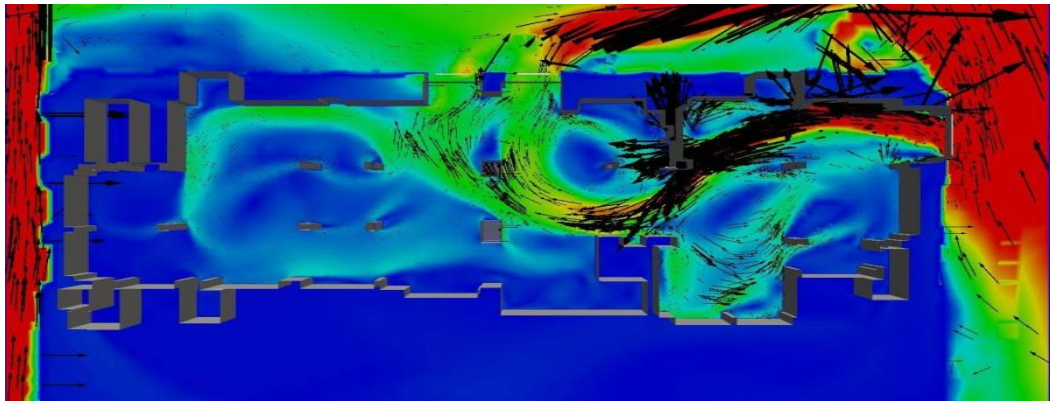
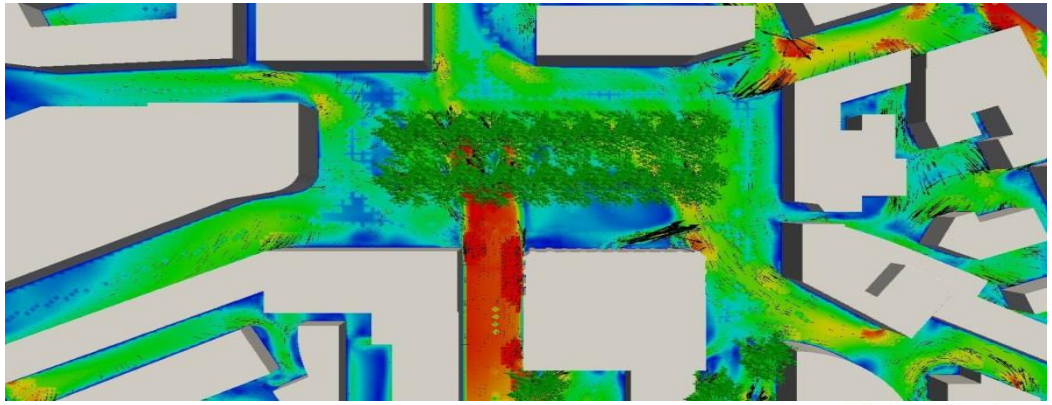
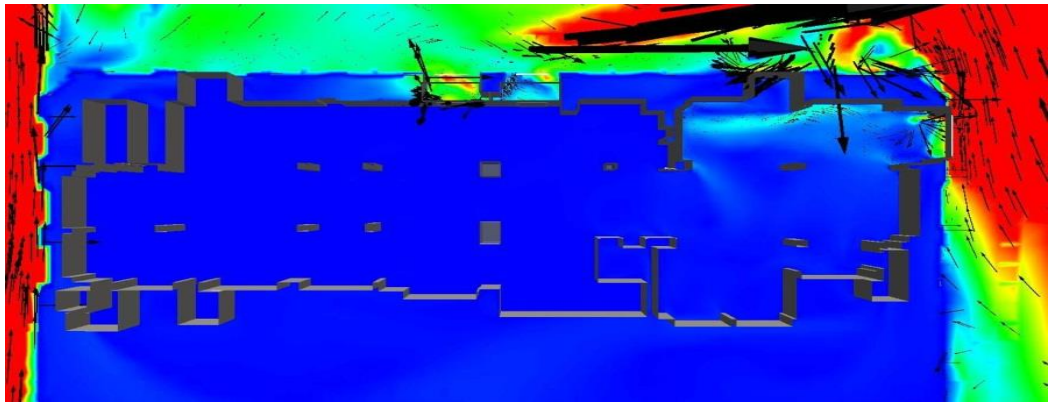
RESULTS
WIND DIRECTION: SE





Without sliding doors





With sliding doors

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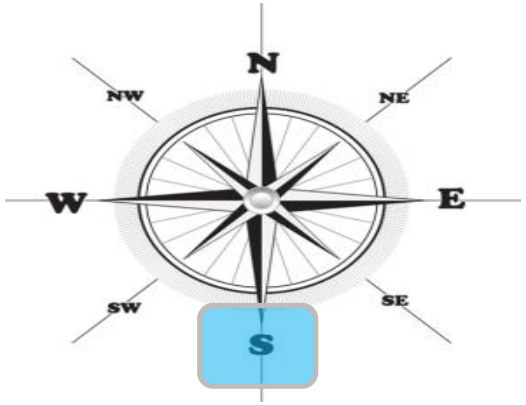
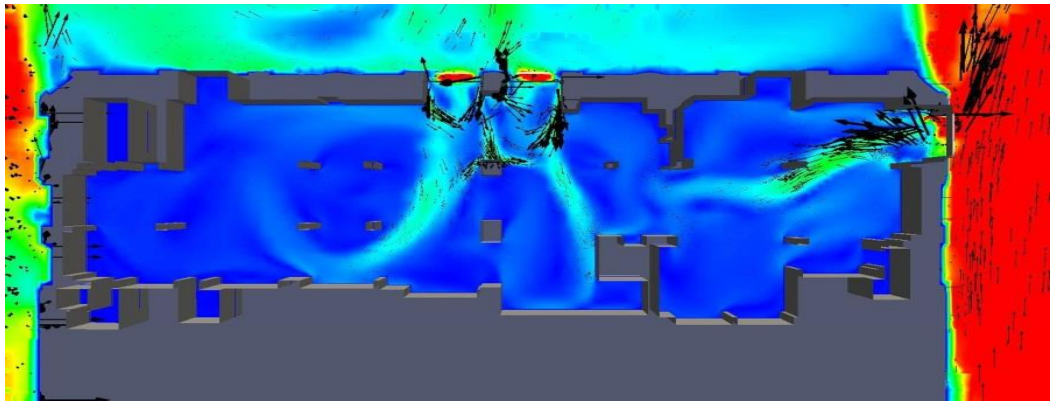
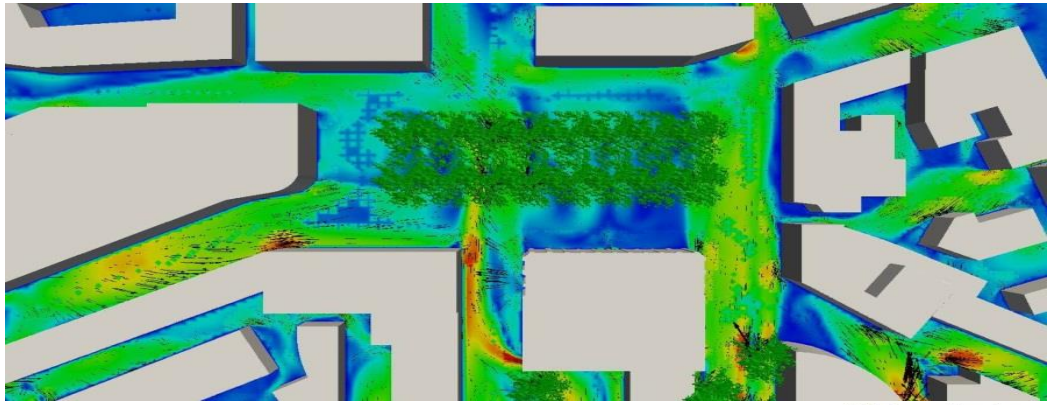
RESULTS

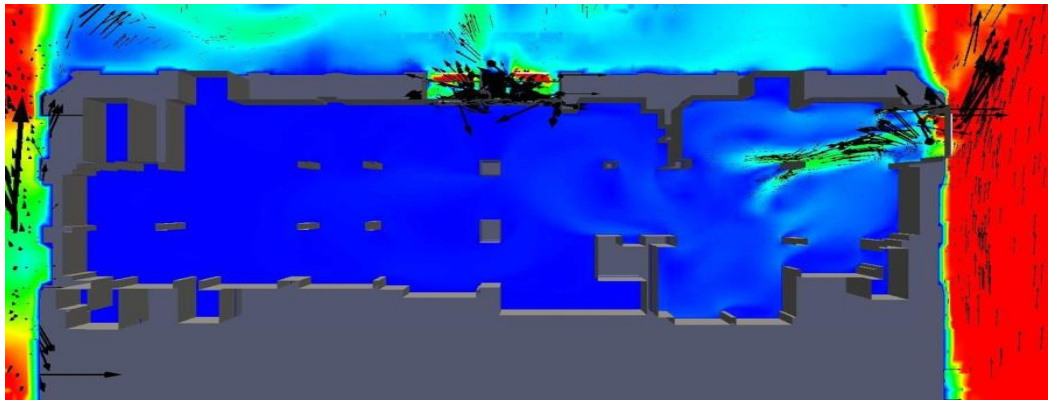
WIND DIRECTION: S





Without sliding doors





With sliding doors

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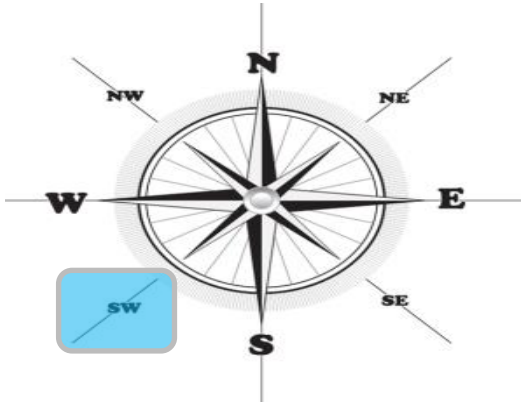
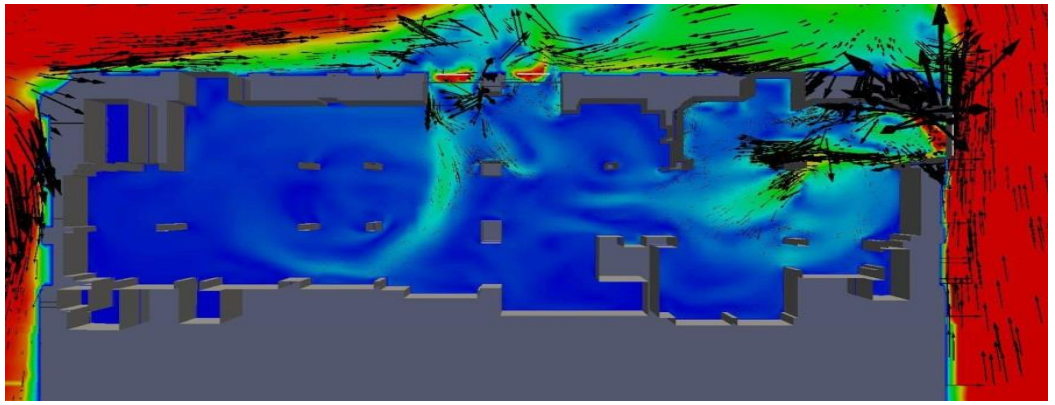
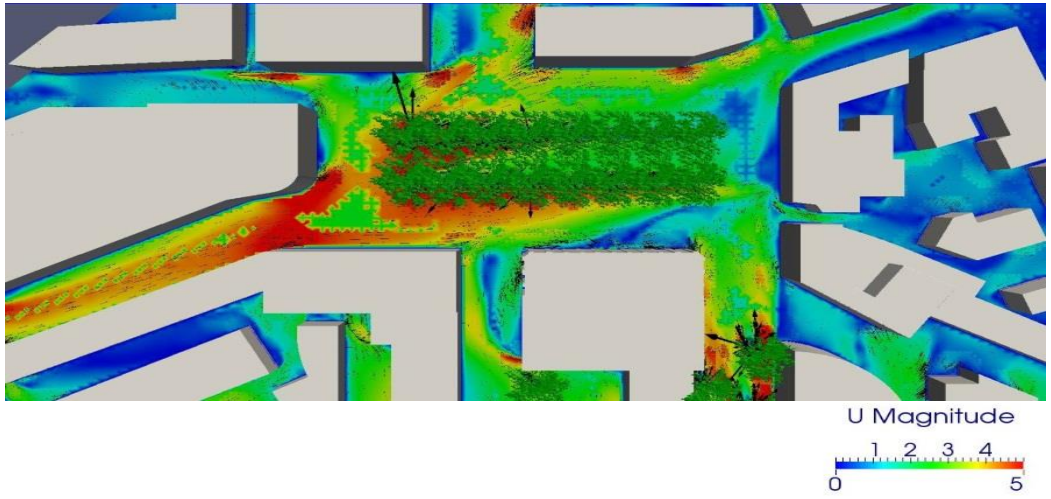
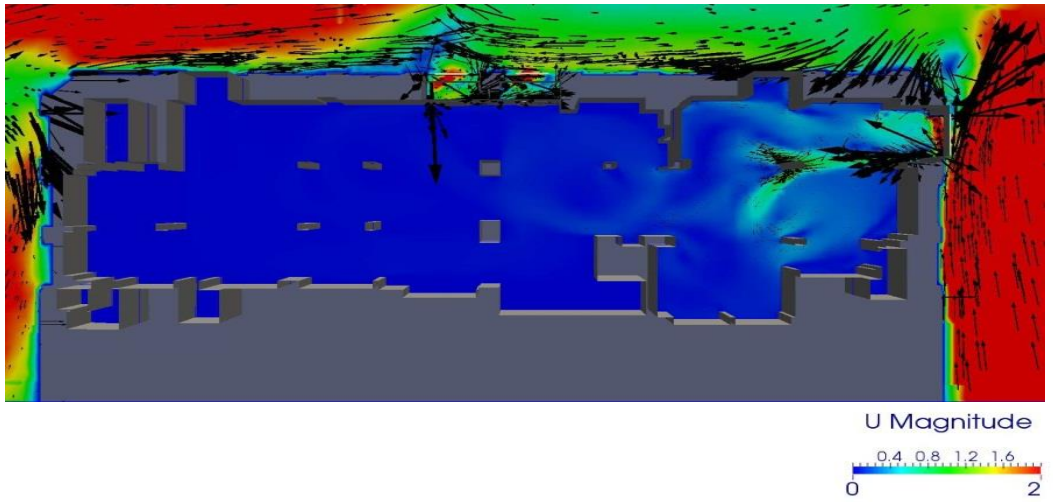
RESULTS
WIND DIRECTION: SW





Without sliding doors





With sliding doors

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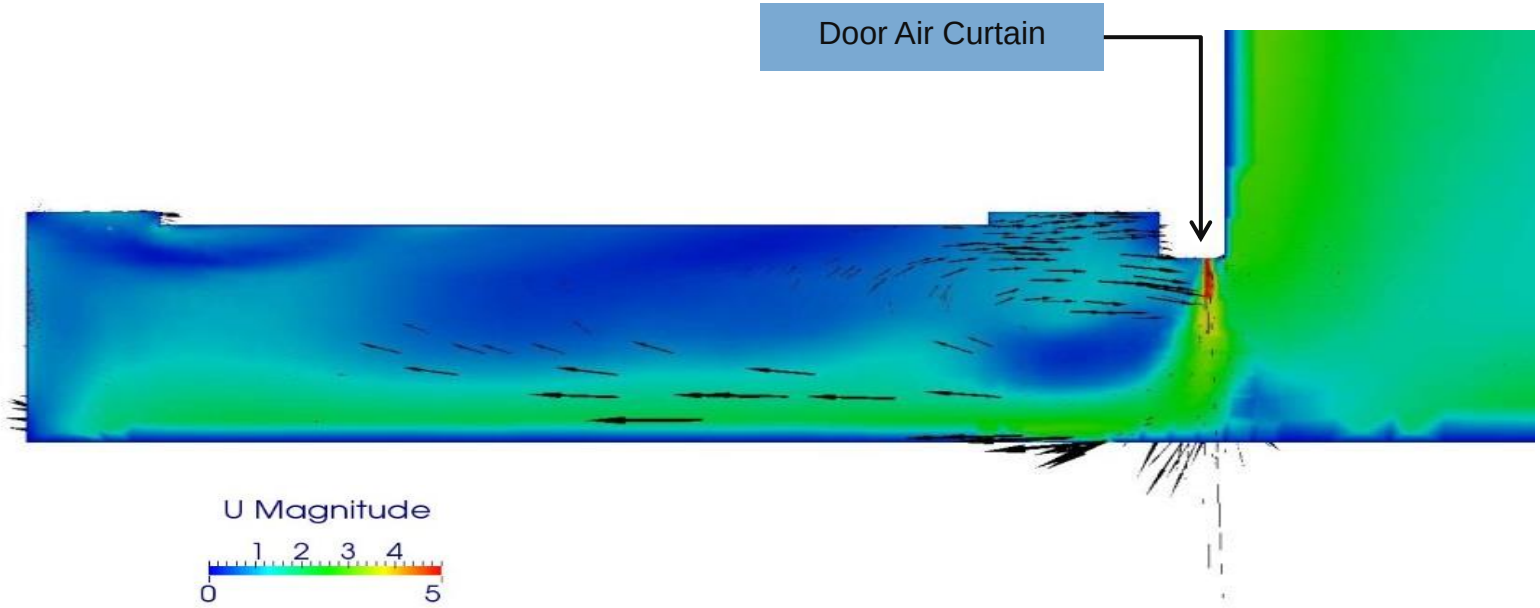
RESULTS
AIR CURTAINS



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CONCLUSIONS

- ICON has successfully modelled detritus on a busy retail store using iconCFD
- Most wind directions (apart from NW): cross flow is generated inside the store
- Detritus from the street is blown into the store
- Door air curtains air flow is not enough to prevent entrance of external air:
  - Forces air to enter from the lower part of the open doors
  - Higher velocities occur at entrance
  - Higher probability of detritus from the street level entering the store

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CONCLUSIONS

- With Sliding Doors (Lobby) cross flow is eliminated
  - Draught is again generated instantly when one or both of them is opened
  - Sliding Doors also reduce inflow from the side entrance for most wind directions
  - Flow from side entrance not eliminated because of high recirculation areas of external air
- Suggested Installation of sliding doors at side entrance to:
  - Eliminate inflow from side entrance completely
  - Reduce the possibility of cross flow when customers enter through the front sliding doors

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THANK YOU

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