

# Ecosystem of Systems Testing Platform

## Background Information

- RPI CASE collaboration focused on improving building practices
  - Energy consumption
  - Sustainability and resource management
  - Health and quality of indoor air
- Improvement of indoor air quality using biomaterials

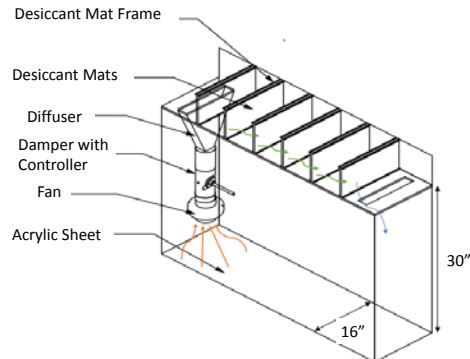


Figure 1: Desiccant absorption test set up

## Objectives

- Analyze the effect of fan location and design on air flow
- Design and fabricate traverse insertion panel
- Update LabView code for the traverse movement and sensor analysis
- Design, construct and perform thermal analysis on a scaled occupied office setting
- Design and fabricate a raised plenum ceiling for multiple configurations
- Simulate airflow and pressure drop ratings of ceiling panel models

## Purpose

Our purpose is to provide CASE with a modular test bed to assess a variety of new technologies and provide infrastructure to perform further expected tests.

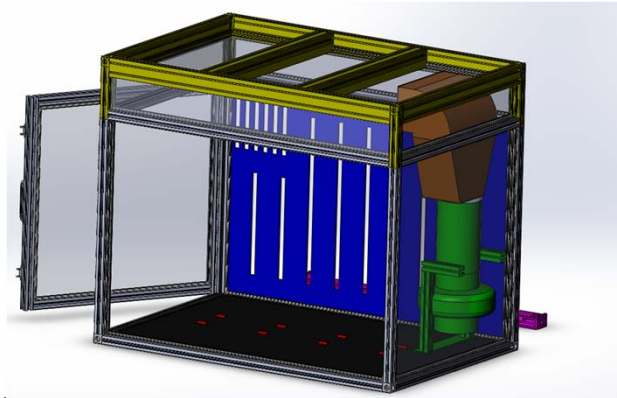


Figure 2: ESOS Chamber Elements

## Future Plans

- Integration of Velmex hardware into the chamber for tests
- Fabrication of the diffuser and acquisition of inlet for the plenum
- Transient analysis of thermal layering effects
- Further infiltration testing to improve chamber performance
- Design and construct a slotted ceiling panel for further testing with the traverse

## Results and Accomplishments

- Fabricated a airtight panel for the traverse to perform its measurements
- Design and fabricated two versions of plenum ceilings
- Ran infiltration analysis on the fully constructed chamber
- Applied the simulated designs for airflow trajectory and pressure effects for a fan, diffuser and plenum inlet
- Rewrote the LabView code to enable three-axis movement by the traverse as well as the data acquisition program
- Simulations and models for surface roughness to assess the effects on airflow
- Performed temperature and relative humidity testing on the effect of heating elements

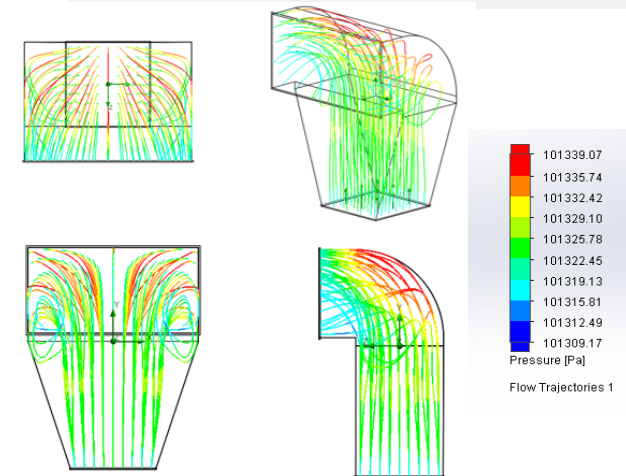


Figure 3: Pressure simulation of final inlet duct and diffuser design (pressure drop= 9.62 Pa).