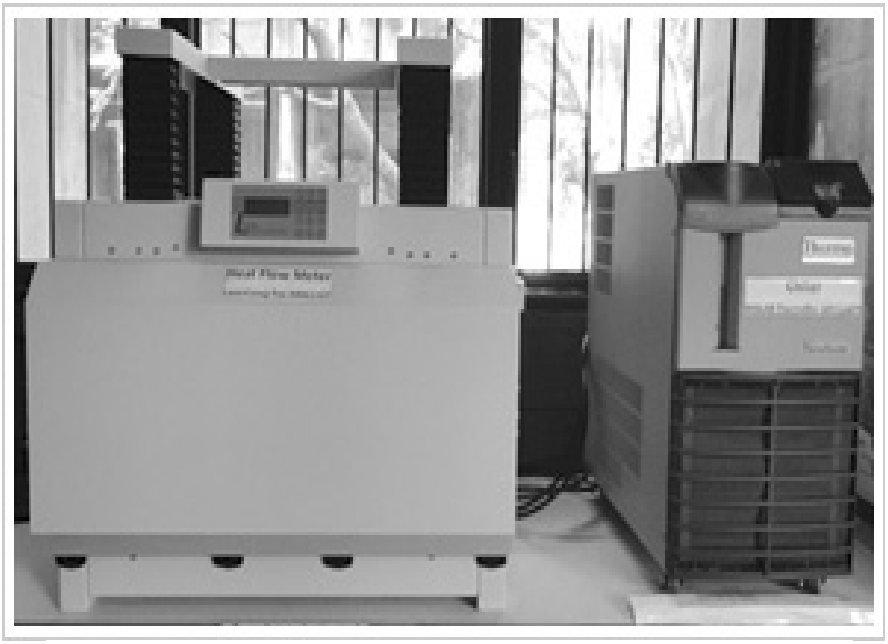
Building Performance Lab

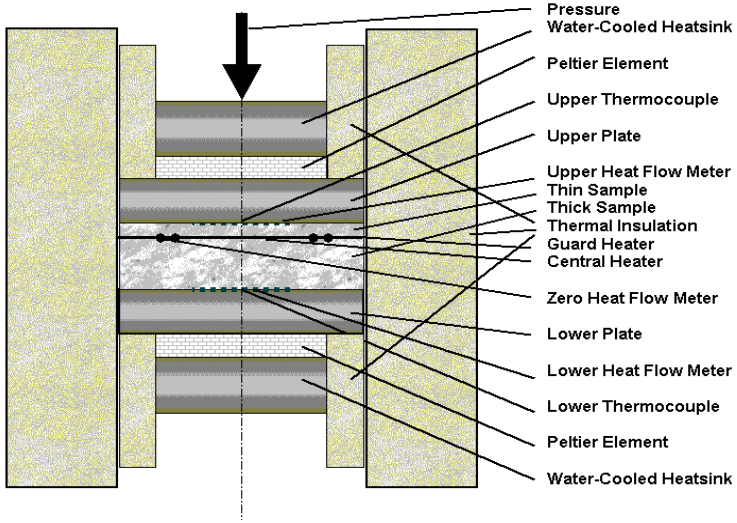
India Insulation Forum, May 15, 2014, Ahmedabad

Thermal Conductivity Characterization

- Slide 1 : What is thermal conductivity – why its important
- Slide 2: What principal we use to characterise it
- Slide 3: Salient feature of our machine – machine name
- What have we done using this machine

Thermal Conductivity Characterization





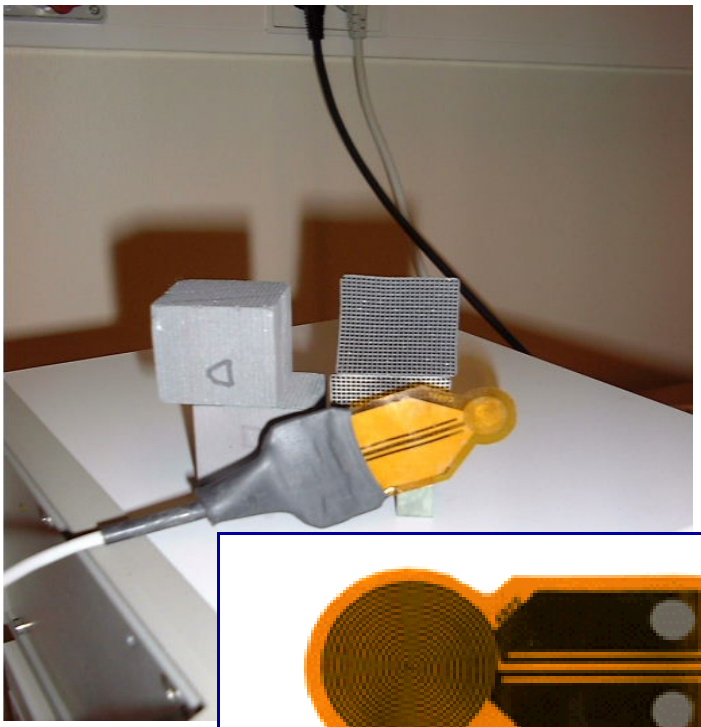
- Thermal conductivity range ~ 0.01 - 0.2 W m-1 K-1
- Accuracy ~1%
- Repeatability ~0.2%
- Reproducibility ~0.5%
- Maximum 65.0C (149.0F)
- Minimum temperature of cold plate -10.0C (14.0F)
- Temperature control stability ~ +/- 0.030C (~0.060F)
- Thickness measurement precision ~ +/- 0.025 mm (+/-0.001").

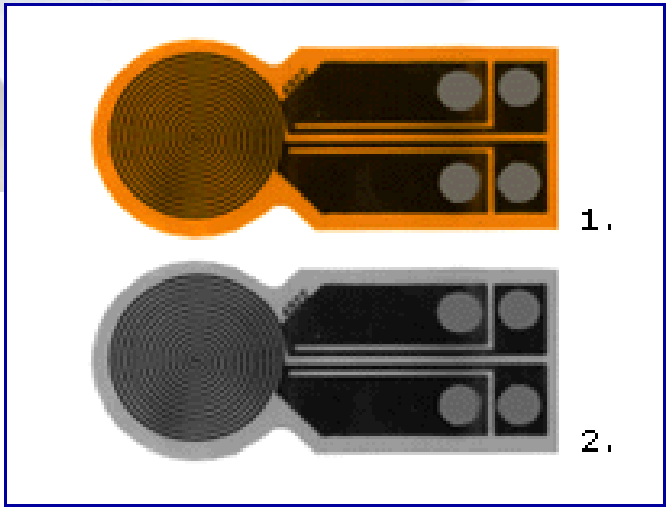
Thermal Conductivity Characterization

Transient Plane Source Method

- **Thermal Conductivity** W/mK0.005 to 500 W/mk
- **Thermal Diffusivity**:0.1 to 100 mm^2/s
- **Specific Heat Capacity**:Up to 5 MJ/M^3k
- **Measurement Time:**1 to 1280 seconds
- **Reproducibility**:Typically better than 1%
- **Accuracy**:Better than 5%
- **Sensor Types** Available:Kapton insulated with or without cable (from cryogenic temperatures up to 180°C)
  Mica insulated without cable (Room Temp. up to 750°C).

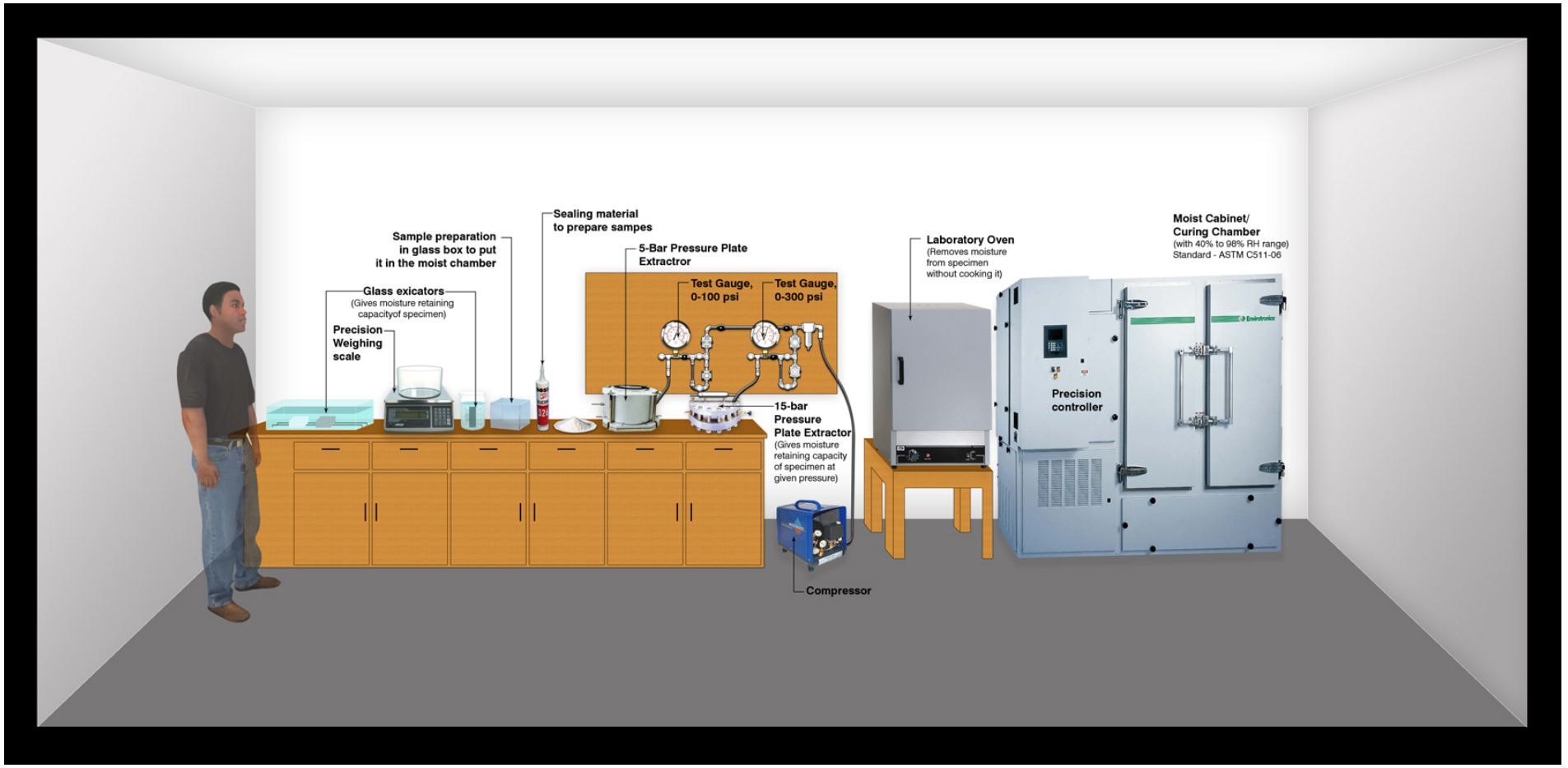
Thermal Conductivity Characterization





1. Kapton insulated sensor.
2. Mica insulated sensor.

Hygrothermal Characterization



HYGROTHERMAL

1. ENVIRONMENTAL CHAMBER
2. INERT GAS MECHANICAL CONVECTION OVEN
3. LABORATORY OVEN
4. PRESSURE PLATE
5. PRECISION WEIGHING SCALE

ENVIRONMENTAL CHAMBER

ENVIROTRONICS [EC – 20 – 1 – 1 – X]

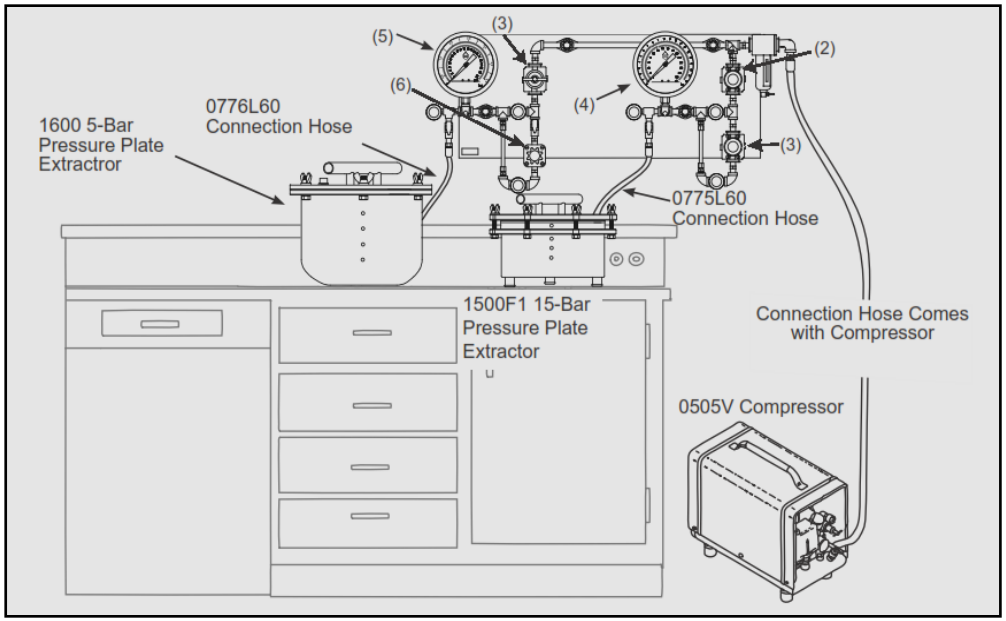
- Moist Cabinet/Curing Chamber is specifically designed for use in the making and curing of building materials
- Dry and submerged storage
- operating temperature range of +15.6° C to +37.8° C and humidity range of 40% to 98% RH as limited by a +4.5° C dewpoint temperature.
- Temperature control is maintained through a Part low 7000 controller/recorder, and humidity is controlled with a solid-state relative humidity transmitter/sensor.
- The EC20 Series uses a one HP single-stage refrigeration system utilizing "environmentally friendly" refrigerant HP62 (R404A) and a local air-cooled condenser.
- **The EC Series conforms to ASTM C 511-06**

PRECISION WEIGHING SCALE

SARTORIUS MSE5203S-000-DE

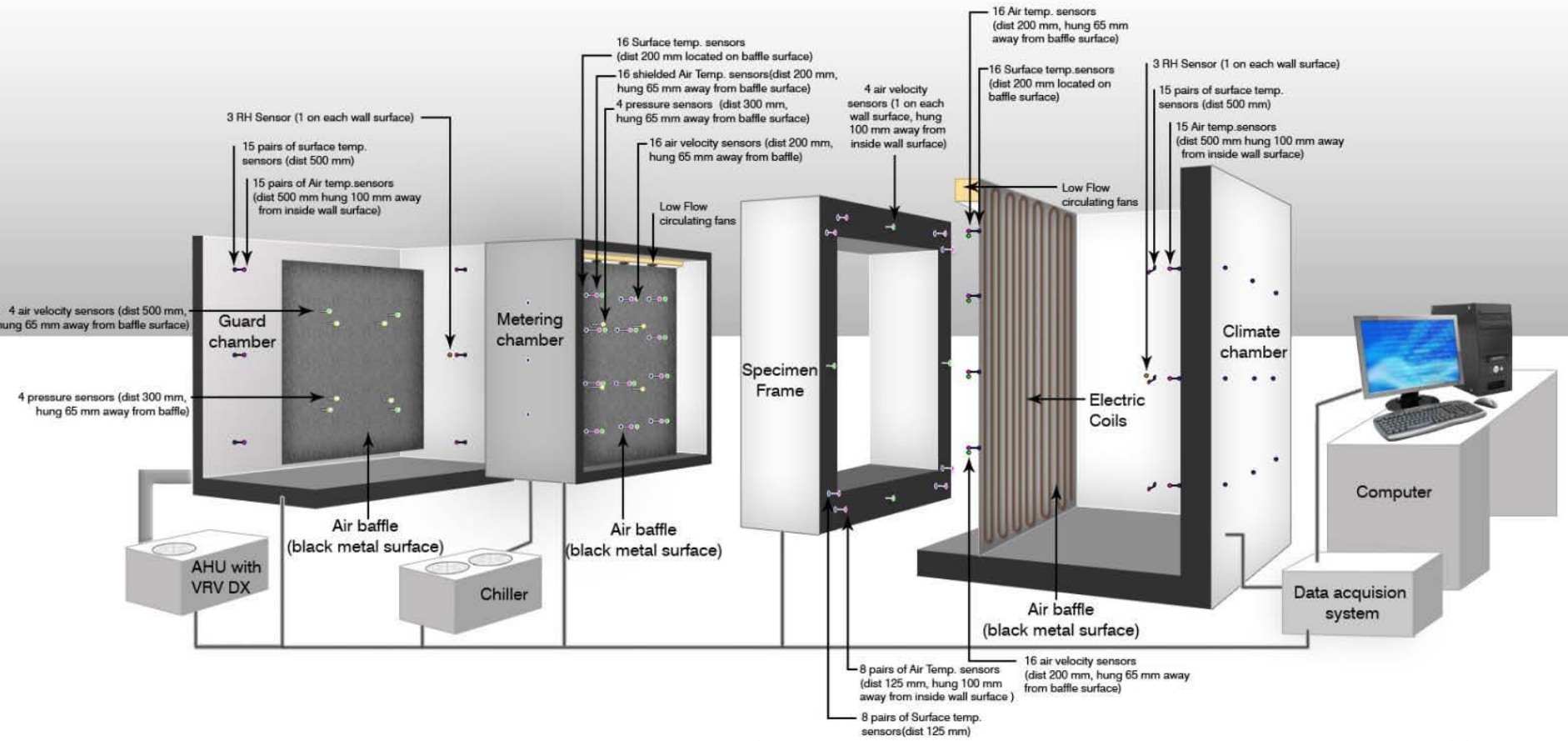
WEIGHING RANGE	5,2 kg
READABILITY	1 mg
MINIMUM SAMPLE WEIGHT	1,5 g

PRESSURE PLATE



- Ceramic plates with microscopic pores.
- Drying temperature within ±2 K for temperatures less than 75 Deg C. and ±4 K for temperature above 75 Deg. C; and relative humidity should be less than 10%.
- Capable of testing minimum of 5 specimens in each pressure environment.

Guarded Hot Box



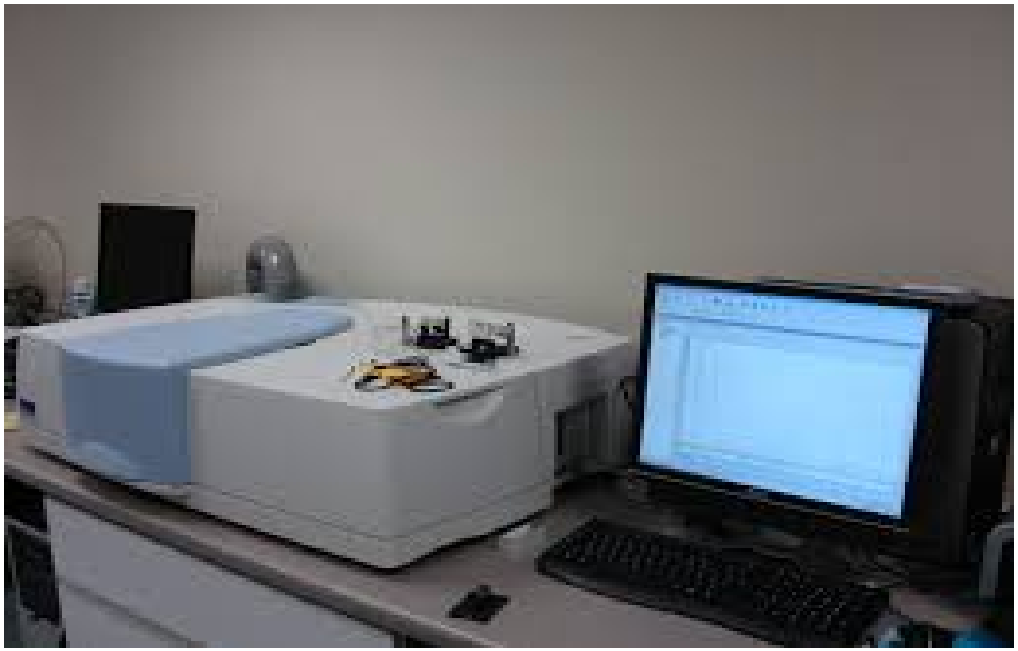
Non Homogeneous Building Construction – Walls

Wall Assemblies

Solar Calorimeter

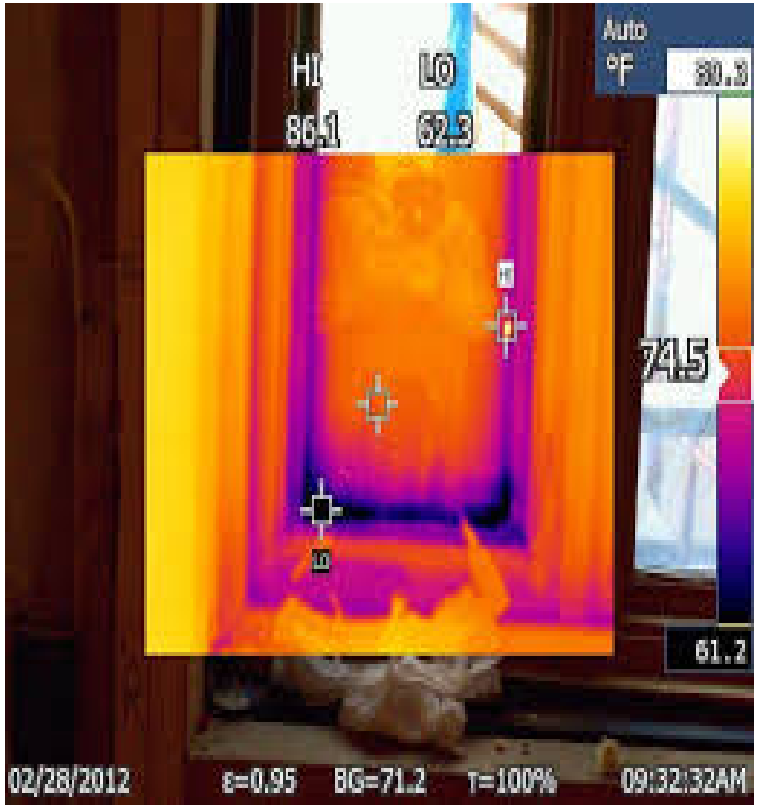
Window Assemblies for its U Value and SHGC Characterization

Spectrophotometer and FTIR



Glass – Films – Mirrors and Cool Roofs

Air Leakages test



Fenestration Air leakage Characterization

Day lighting Simulation

Building Shading Analysis

Daylight Modeling – Clear Sky and diffused Sky

Thermal Comfort Chamber

Adaptive Thermal Comfort Studies
Impact of Air Velocity on thermal comfort

Real scale test beds

Building Controls and Calibration of Simulation Models

THANK YOU

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