



Quantitative Infrared Thermography Facility

Using environmental chambers similar to commercial window testing calorimeter chambers, the Quantitative Infrared Thermography Laboratory (IRLab) is designed to allow the collection of high resolution quantitative surface temperature data using an infrared camera. Uniform enclosure temperature and air flow conditions, detailed background radiation correction and external referencing for the IR camera, all contribute to achieving quantitative surface temperature with an accuracy of $\pm 0.5\text{C}$, comparable to many contact measurement techniques, while providing unmatched spatial resolution of surfaces temperatures. Beyond the visualization of detailed surface temperature patterns revealed in an infrared thermogram image (Figure 1), the surface temperature data are post-processed to extract calibrated and background corrected numerical data that can be compared to

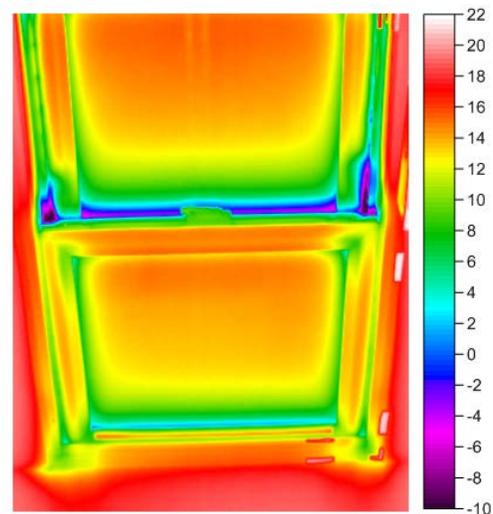


Figure 1. IR thermogram

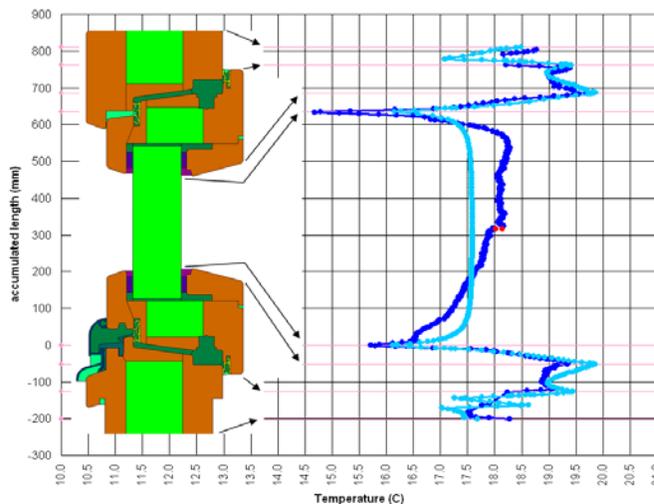


Figure 2. Post processed IR surface temperature validation comparison

computer simulation results for model validation purposes (Figure 2), or provide local performance information when developing high thermal performance prototype products. In addition to surface temperature data collected by the IR camera, a computer controlled 3-axis motion system can position air temperature and velocity sensors in the warm side air space near to the specimen. Figure 3 depicts the open view to the specimen within the warm side

environmental chamber necessary for infrared thermography. There is no internal metering box enclosure typical in a calorimeter. A cross-sectional schematic of the configuration of the cold chamber, specimen plane and the warm chamber is also shown in figure 3. Temperature controlled air flow patterns and the two typical views of the infrared camera are also shown in the schematic. The IRLab contains a machine tool fabrication area that supports fabrication of specimens and test apparatus efforts in the Building Technologies Department.

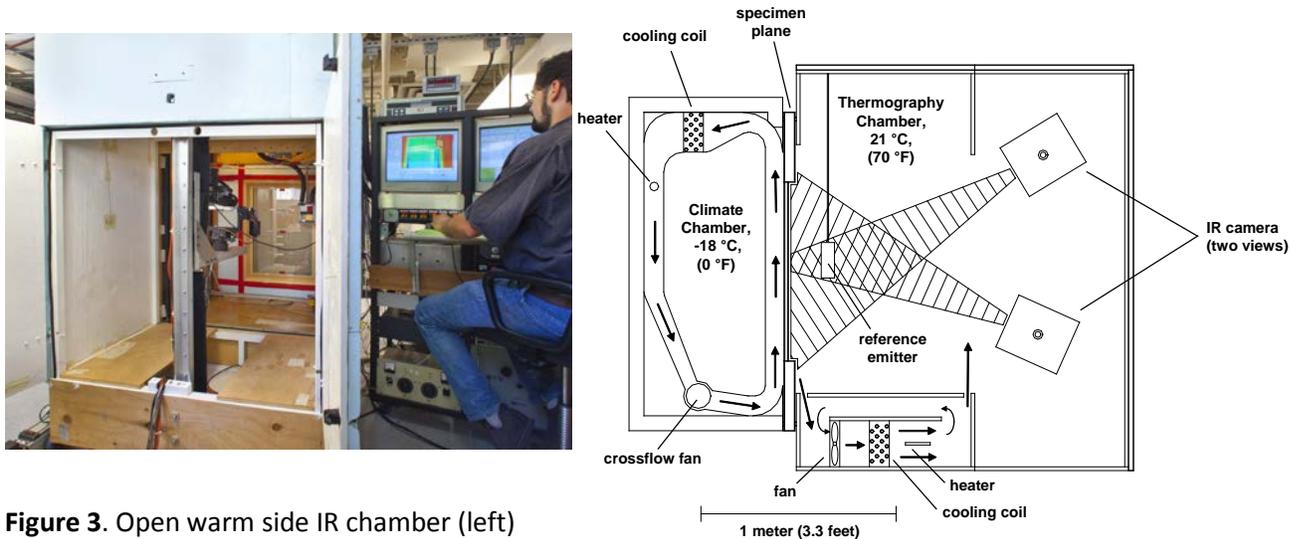


Figure 3. Open warm side IR chamber (left)
Schematic cross-section of environmental chambers (right)

The primary measurement goals of the facility include assessment of the performance of energy-efficient windows currently available or under development, identification of opportunities for new development, and to create a knowledge base that will encourage the rational selection of optimal windows in the design process. In addition to its DOE-supported research, the IRLab is also available for privately-funded studies of specific products or window improvement options. It can:

- provide empirical data for thermal model validation and development
- generate detailed, quantitative, high resolution surface temperature measurements
- identify local thermal bridging (thermal performance non-uniformity)
- operate at a variety of steady state environmental conditions

For more information on Infrared Thermography Laboratory research and facilities contact:

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