

Florida Solar Energy Center

<http://www.fsec.ucf.edu/en/>

Photovoltaic – Module Testing and Certification

Web Site Link: <http://www.fsec.ucf.edu/en/certification-testing/PVmodules/index.htm>

Contact Information

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Description

The Florida Solar Energy Center is required by Section 377.705 of the Florida Statutes to develop standards and certify all solar energy equipment manufactured or sold in Florida. To meet the requirements of the Florida Statutes, FSEC has developed a PV Module and PV System Certification program that protects the public interest and advances the use of renewable technologies. The objectives of the program are to:

- Provide Florida residents with reliable, safe and high quality PV system designs.
- Provide a means for consumers to obtain a summary of their certified PV system design including the installer's name, address, telephone number and Florida contractor's license number.
- Provide Florida consumers and/or agency officials with the expected power output of certified PV systems using accurate PV module performance ratings.
- Provide a PV system design approval certificate with a checklist that list the items that require compliance with National Electrical Code. The certificate and checklist can be used by local building officials for both the issuing of permits and the inspection of installed PV systems.

To satisfy these objectives, FSEC has developed a PV Module and System Certification processes. These certification processes are intended to be simple and straightforward.

Fee Schedule:

Facility use is negotiated on a per-proposal basis.

Photovoltaic Materials Laboratory

Web Site Link: http://www.fsec.ucf.edu/en/about/facilities/pv_mat_lab.htm

Contact Information

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Description

Photovoltaic Materials Laboratory performs research in the areas of thin film solar cells for terrestrial & space application; Photoelectrochemical Water Splitting for Hydrogen Generation; High Voltage Bias Testing of Thin Film PV Modules; and Tribological coatings. The research details are given at the web site.

Fee Schedule:

Facility use is negotiated on a per-proposal basis.

Solar Thermal Collection Test Laboratory

Web Site Link: <http://www.fsec.ucf.edu/en/certification-testing/STcollectors/index.htm>

Contact Information

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Description

The FSEC testing program evaluates solar collectors to determine that they meet the certification standards. Testing and certification of both glazed (hot water) and unglazed (pool heating) collectors is a State of Florida-mandated activity. All collectors and systems sold or manufactured in Florida must be certified by FSEC. The details are given at the web site.

Fee Schedule

Testing fee information can be found at:

http://www.fsec.ucf.edu/en/publications/pdf/FSEC_Thermal_Test_Fees_2010_Final_17-May-10.pdf

Solar Thermal Systems Test Laboratory

Web Site Link: <http://www.fsec.ucf.edu/en/certification-testing/STsystems/index.htm>

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Email: thermal@fsec.ucf.edu

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Description

The FSEC testing program evaluates ICS (Batch solar water heater) and Thermosiphon systems to determine that they meet the certification standards. The Florida Solar Energy Center (FSEC) is responsible for approving all solar water heaters that are sold or manufactured in Florida. The system approval process was mandated by the Florida State Legislature as part of the Solar Energy Standards Act which required that beginning in 1980 all solar energy systems manufactured or sold in Florida meet standards established by FSEC.

The FSEC standards program has been designed to meet the intent of the legislation while also helping the Florida solar industry to develop quality products, aiding building departments in product approval, and instilling confidence in the consumer who chooses to use solar energy in their residence or business. The details are given at the web site.

Fee Schedule

Testing fee information can be found at:

http://www.fsec.ucf.edu/en/publications/pdf/FSEC_Thermal_Test_Fees_2010_Final_17-May-10.pdf

Advanced Energy Research Division (AERD) Labs

Web Site Link: http://www.fsec.ucf.edu/en/about/facilities/hydrogen_fuelcell_lab.htm

Director: Dr. Ali Raissi

Contact Information

Dr. Ali Raissi

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Phone: 321-638-1407

Description

Research activities of the FSEC's Advanced Energy Research Division (AERD) are carried out within three fully equipped laboratories (Class B & C – total of 5,000 square foot), and a 1,500 square foot field facility. These laboratories are:

- Alternative Fuel Lab
- Instrumentation Lab
- Fuel Cell Lab

These laboratories and the field facility meet and/or exceed the design and safety requirements imposed by the Florida State Fire Marshall and all the state and federal codes (NFPA 45 Standard on Fire Protection for Laboratories Using Chemicals, NFPA 50A Standard for Gaseous Hydrogen Systems at Consumer Sites, and NFPA 70 National Electric Code) for handling large volumes of hazardous and flammable gases and chemicals including both gaseous and liquid hydrogen. The field facility is fitted with explosion proof electrical systems and meets NFPA 50B Code "Liquefied Hydrogen Systems at Consumer Sites."

AERD labs are equipped with the state-of-the-art analytical instruments including: a JEOL GCmate-II GC/MS-MS for determining elemental compositions, unit's special features include: linked-scan MS/MS for structure determination, high-resolution selected ion monitoring (SIM), programmable temperature heated direct insertion probe with separate ion source chambers for EI and CI operation and for analysis of volatile solid samples, and link to NIST library search routines; two SRI 8810 gas chromatographs (GC) equipped with TCD, FID & FPD; a Shimadzu GC equipped with TCD & FID; a Perkin-Elmer (PE) GC equipped with TCD & FPD; a Varian refinery GC; a Buck Scientific GC; and a Dionex DX 500 Gradient Ion Chromatograph/ HPLC with AD20 absorbance detector; an Altamira AMI 200 catalyst characterization instrument capable of TPD-MS, TPR-MS, TPO-MS, and TPRx-MS; a Perkin-Elmer Spectrum 100 FTIR with Universal ATR Accessory (UATR); an Autoclave Engineers BTRS-jr lab reactor system; a CDS Analytical pyroprobe 1000 with three modes of operation; a PE Diamond Differential Scanning Calorimeter (DSC) equipped with Hyper DSCTM technology for automated unattended operation over the temperature range of -170°C to 300°C and fast heating and cooling rates (as high as 500°C/min); a PE Diamond TG/DTA-MS system equipped with ThermoStar bench-top quadrupole MS with closed ion source for mass range of 1-300 amu and a detection limit of less than 1 ppm.

Labs also house a Shimadzu UV/VIS scanning spectrophotometer; a Hach UV/VIS; an IR spectrophotometer; a PMI BET surface area analyzer; several PEM electrolyzers, three complete, fully automated (operating from LabView environment) thermovolumetric analyzers (ranging in size from 160 mL to 2 L); a Hiden Isochema HTP1-V volumetric sorption analyzer capable of operating at 100 bar and 500°C; a Hitachi TM3000 tabletop SEM; Ranson Digital Sonifier 450 W sonicator Model No. 450, EDP: 100-214-239; two 1 kW Newport solar simulators Model No. 91190-1000 (equipped with AM1.5 global, AM1.0 & 0.0 filters); two glove-boxes equipped with purification systems for reducing moisture and oxygen to the ppm level and vacuum systems with Schlenk glassware for handling materials under inert conditions; two Carver hot presses; a SPEX CertiPrep 8000M high-energy ball mill; and two Retsch ball mill units; two PARSTAT® 2273 potentiostats controlled by the PowerSuite software (Princeton Applied Research); complete electrochemical test equipment; assortment of computerized data acquisition and control systems; an induction furnace and a collection of ovens, autoclaves, AC and DC power supplies and assortment of pumps and balances.

The fuel cell lab is equipped with devices ranging from that needed for the MEA fabrication to complete in-situ electrochemical diagnostic systems. There are four Scribner Associates test stands, several potentiostats and frequency response analyzers, and a one of a kind MEA Durability Test System, (MEADS) that allows long term testing of eight fuel cells, simultaneously. The in-situ electrochemical diagnostics facility includes a test stand, a load box and a frequency response analyzer – constituting a

complete FC test station capable of using either 5 or 25 cm² single cell hardware. AERD's field facility houses the pilot-scale biomass gasification/Fischer-Tropsch synthesis plant.

AERD's computational and modeling capabilities include: Gaussian '03, GaussViewTM, CAChe, AspenPlusTM CPS, FACTSage, FLUENT CFD platform and GE's GateCycleTM program.

The list of equipment in each lab is given below.

Alternative Fuel Lab (AERD Lab Room 101)	Instrumentation Lab (AERD Lab Room 103)
SRI 8610 C GC and	Retsch Ball Mill (2)
SRI 8610 A GC	Shimadzu UV-VIS
Denton Vacuum System	PE Diamond DSC
Ziess Microscope	Hach UV-VIS
Minolta CR-10 Colorimeter	Altamira AMI 200 TPD-MS
Varian GC-TCD/FID	PE Diamond TG/DTA-MS
PE Sulfur GC-FID/FPD	PMI BET
Shimadzu Refinery GC-FID	Dionex DX-500 IC-HPLC
Buck Scientific GC	Jeol GCmate-II GC-MS/MS
Varian 3400 GC-TCD/FID	PE Spectrum 100 FTIR
Chemiluminescence Analyzer	Hidden Isochema HTP1-V Volumetric Sorption Analyzer
EnviroNics Multi-Gas Calibrator	Varian GC-MS (ion selective)
Glove box (2)	CDS Analytical Pyro-probe 1000
Spex Certi Prep Ball Mill	Autoclave Engineers BTRS-jr Lab Reactor
Fluent CFD Platform	Potentiostat Parstat 2273
Fuel Cell Lab (AERD Lab Room 109)	Newport Solar Simulator (2)
8-Channel FC MEA Durability Test System (MEADS)	Cryocooler & Accessories
Potentiostat (2)	Carver hot press (2)
Scribner Associates 850C Fuel Cell Test Stand (4)	Electrolyzers (3)
Teledyne Medusa	Ranson Digital Sonifier 450 W Model 450
	MEA Prep Unit
	Hitachi TM3000 Tabletop SEM

Fee Schedule

A mini proposal is requested from each applicant describing the service(s) needed. The fee will be determined based on the service needs. The proposal will be submitted to Dr. Ali Raissi at: ali@fsec.ucf.edu.

Manufactured House Laboratory

Web Site Link: <http://www.fsec.ucf.edu/en/about/facilities/mhl.htm>

Director: Rob Vieira

Contact Information

Rob Vieira

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Description

The Manufactured Housing Laboratory (MH Lab) is a 1600 ft² ENERGY STAR® manufactured home that will serve as a training center and building science laboratory.

It features two completely separate space conditioning systems, an in-the-attic duct system with a package unit heat pump, and a floor-mounted duct system with a split system heat pump. An interior duct system was also recently installed. The MH Lab is a real-world training and research center used to conduct system-level residential research and to demonstrate building problems and solutions. Researchers and students investigate topics such as airflow and pressure measurement, moisture control, methods of duct leakage testing and repair, ventilation strategies, and analysis and correction of indoor air quality source control problems.

Fee Schedule:

Facility use is negotiated on a per-proposal basis.

Building Science Laboratory

Web Site Link: http://www.fsec.ucf.edu/en/about/facilities/bldg_sci_lab.htm

Director: Rob Vieira

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Description



The Building Science Lab is unique in its ability to vary the building airtightness, air leakage and thermal boundary parameters in a controlled fashion and evaluate their interactions with both conventional and advanced HVAC systems. Its purpose is to advance the understanding of building science and proper application of HVAC equipment through research and training. The design of this building is based upon recent developments in building science and has the flexibility to address a wide range of issues. It has the ability to mechanically adjust infiltration rates with custom ventilation fans and it also has a modular wall on the west façade for testing solar heat gain. The Building Science Lab is ideally suited to hands-on building science and HVAC systems training. In addition to housing the training, it serves as a live training model. Trainees see in real time the pressure and air flow response of the building as air flow rates, barriers to flow and pathways to flow are changed at the turn of a switch.

Fee Schedule:

Facility use is negotiated on a per-proposal basis.

Flexible Roof Facility

Web Site Link: <http://www.fsec.ucf.edu/en/about/facilities/frf.htm>

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Description



The Flexible Roof Facility (FRF) is an FSEC Buildings Research division test facility in Cocoa, Florida designed to compare the performance of different residential roofing systems. The facility can evaluate five roofing systems at a time against a control roof with a vented attic and dark shingles.

The intent of the testing is to evaluate how roofing systems impact summer residential cooling energy use and peak demand.

To make these evaluations, each of the 6 separate attic “cells” is heavily instrumented with sensors measuring temperatures of the shingles, roof deck, attic space and ceiling plane. Data are collected throughout the summer each year and then analyzed. The details are given at the web site.

Reserving a Test Cell

While FSEC uses several cells each year for ongoing research, there are typically two or more cells available for use by outside companies or organizations desiring to have a roof system or product tested. For more information on reserving an FRF test cell, [click here to contact Danny Parker](#).

Fee Schedule

Our standard research contract for one cell of the Flexible Roof Facility is \$14,973. This price includes use of the cell, standard instrumentation and our standard report which will (at a minimum) compare the cell to a reference vented attic with a dark shingle roof and a reference vented attic with a white metal roof (see the 2003 FRF report at <http://fsec.ucf.edu/en/publications/pdf/FSEC-CR-1475-04.pdf> as an example). Tear off of the existing roof and installation of the new roof is not included in this price. Tear off and installation are the responsibility of the individual, organization or company reserving the test cell(s), and all roof work must be done by a licensed and insured contractor.

Flexible Residential Test Structures

Web Site Link: <http://blog.floridaenergycenter.org/echronicle/tag/flexible-residential-test-facility/>

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Description

Construction of the flexible residential test structures was completed in December 2011. The purpose of the two side-by-side test houses is to conduct side-by-side testing of varying residential energy efficiency

strategies and/or systems and to have a base house in which to compare the measured results. A preliminary measurement of temperature during passive load conditions indicates the buildings track each other well. A number of DOE staff toured the facility when they visited the Florida Solar Energy Center in January 2011, after FSEC had been awarded a four year research contract in which the facility will play a significant role.



Completed flexible residential test structures on FSEC campus.

Fee Schedule:

Facility use is negotiated on a per-proposal basis.

Climate-Controlled A/C Laboratory

Web Site Link: http://www.fsec.ucf.edu/en/about/facilities/cc_ac_lab.htm

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Description

FSEC's on-site environmental facilities are capable of testing air-conditioners and heat pumps with cooling/heating capacities up to 3.5 tons. The facility (*photo right*) is made up of an indoor chamber, an outdoor chamber, and a computerized control room. The environmental chamber's indoor and outdoor conditions are maintained automatically with a laboratory grade data acquisition and control system. Full automation allows complete flexibility for parametric testing. The control room houses a data acquisition and control system and is responsible for monitoring instrumentation output, controlling psychrometric chamber temperature and humidity conditions, and controlling compressor, indoor fan, and outdoor fan speeds.



Fee Schedule:

Facility use is negotiated on a per-proposal basis.