PREP Research Associate

This position is part of the National Institute of Standards (NIST) Professional Research Experience (PREP) program. NIST recognizes that its research staff may wish to collaborate with researchers at academic institutions on specific projects of mutual interest, and thus requires that such institutions must be the recipient of a PREP award. The PREP program requires staff from a wide range of backgrounds to work on scientific research in many areas. Employees in this position will perform technical work that underpins the scientific research of the collaboration.

Research Title:
Postdoctoral Research Associate: Evaluating the wind performance of asphalt shingle roof coverings

Overview:
The Infrastructure Materials Group at the Engineering Laboratory of the National Institute of Standards and Technology (NIST) is seeking qualified persons (U.S. Citizens preferred) to develop test and material standards to assess the long-term wind resistance of asphalt shingles through accelerated weathering, multi-scale mechanical testing, and finite-element strength modeling.

The work will entail:
This postdoctoral researcher should have knowledge of evaluating the wind performance of asphalt shingle roof coverings and expertise in the following areas: polymer degradation characterization, instrumented mechanical testing for strain evolution, structural health monitoring, and material damage analysis or modeling. The researcher should also have a working knowledge of current building codes used in the United States and, preferably, an Engineer in Training (EIT) license.

If selected, you will play a significant role in the Disaster and Failures Studies (DFS) Program's Hurricane Ian Study program for roofing material evaluation, which includes working with NIST staff and external partners on planning and executing experimental research to study the effects of Hurricane Ian's wind hazards on roofing material, including asphalt shingles. These findings, if warranted, will lead to proposing guidance, codes, and/or standards provisions for improved resilience of coastal communities.

US citizens preferred

Key responsibilities will include, but are not limited to:

- Design and implement an experimental program to investigate factors that affect the wind performance of asphalt shingles. The program should examine the effects of weathering, installation, and material properties, and evaluate existing standard test methods.
- Characterize the effect of laboratory weathering on the long-term wind capacity of asphalt shingles.
- Develop new methods, if warranted, for accelerated aging of roofing materials.
- Develop new test methods, if warranted, to evaluate wind uplift resistance of asphalt shingles, including hip and ridge shingles.
- Develop and validate non-linear finite element models to assess the strength of asphalt shingles and the sealants used in shingle installation using a fracture mechanics-based approach.
- Develop sensitivity and service life prediction models for asphalt shingle roof cover materials based on simulated and experimental data.
- Disseminate research results through presentations at conferences, codes and/or standards meetings, and publication of authoritative journal papers and reports.

- Form working connections with various roofing stakeholders, including trade associations and standard development committees.
- Provide technical leadership on the failure mechanisms for roofing materials based on field work and/or laboratory studies.

Qualifications

- **US citizens preferred; currently living in the United States.**
- Ph.D. in Chemistry/Physics/Material Science/Civil Engineering with an emphasis on multi-scale structural testing. Preference for candidates having an Engineer-In-Training (EIT) certification.
- 3+ years of expertise in the design and implementation of large-scale structural experimental programs in the fields of structural retrofitting, residential construction, adhesives used in building construction, polymer composites, and natural hazards.
- 2+ years of experience in characterizing fracture mechanics properties of adhesive materials used in building materials, including pressure sensitive tapes, elastomeric sealants, and hot melt adhesives.
- 1+ year(s) of experience in mechanical, chemical, and physical characterization of asphalt-based adhesives used on asphalt shingles.
- 1+ year(s) of research experience with accelerated weathering and strength testing of asphalt shingle roof covering materials.
- 1+ year(s) of demonstrated experience with using finite element simulations to evaluate the capacity of adhesive materials used on asphalt shingles.
- Expertise in Ansys LS-DYNA, Abaqus/Explicit, Origin, SolidWorks, AutoCAD and Isight is required.
- Understanding of existing ASTM D3161 and D7158 test standards for asphalt shingles. Experience running the relevant test methods is preferred.
- 1+ year(s) of demonstrated experience with using FTIR spectroscopy and research grade laboratory weathering devices.
- 5+ years of demonstrated experience with operating universal testing machines and strain instrumentation.
- Expertise with developing mechanical test methods, including fixture design and construction, to evaluate the wind performance of hip and ridge asphalt shingles.
- Prior experience communicating, collaborating, and presenting to roofing material associations and standard development committees.
- Membership in ASTM is required. Participating as a voting member in relevant committees is preferred.
- Strong oral and written communication skills.

Privacy Act Statement

Authority: 15 U.S.C. § 278g-1(e)(1) and (e)(3) and 15 U.S.C. § 272(b) and (c)

Purpose: The National Institute for Standards and Technology (NIST) hosts the Professional Research Experience Program (PREP) which is designed to provide valuable laboratory experience and financial assistance to undergraduates, post-bachelor's degree holders, graduate students, master's degree holders, postdocs, and faculty.

PREP is a 5-year cooperative agreement between NIST laboratories and participating PREP Universities to establish a collaborative research relationship between NIST and U.S. institutions of higher education in the following disciplines including (but may not be limited to) biochemistry, biological sciences, chemistry, computer science, engineering, electronics, materials science, mathematics, nanoscale science, neutron science, physical science, physics, and statistics. This collection of information is needed to facilitate administrative functions of the PREP Program.

Routine Uses: NIST will use the information collected to perform the requisite reviews of the applications to determine eligibility, and to meet programmatic requirements. Disclosure of this information is also subject to all the published routine uses as identified in the Privacy Act System of Records Notices: NIST-1: NIST Associates.

Disclosure: Furnishing this information is voluntary. When you submit the form, you are indicating your voluntary consent for NIST to use of the information you submit for the purpose stated.