



SOUTHWEST RESEARCH INSTITUTE



Battery Safety and Abuse Testing

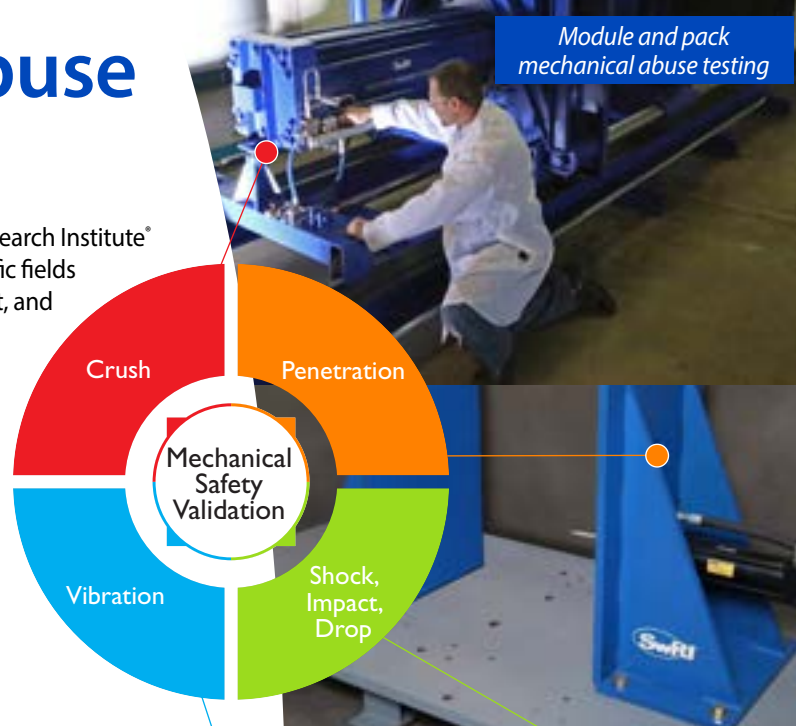
The Energy Storage Technology Center® (ESTC) program at Southwest Research Institute® (SwRI®) is a collaborative effort of technology experts from diverse scientific fields to support industry and government clients in the research, development, and evaluation of energy storage systems.

SwRI conducts high-quality, independent testing across a full range of test standards to determine the battery's safe operating envelope. Testing is performed under an ISO 9001 certified quality management system, with most tests covered under an ISO 17025 testing laboratory accreditation. Disposal of any hazardous waste follows ISO 14001.

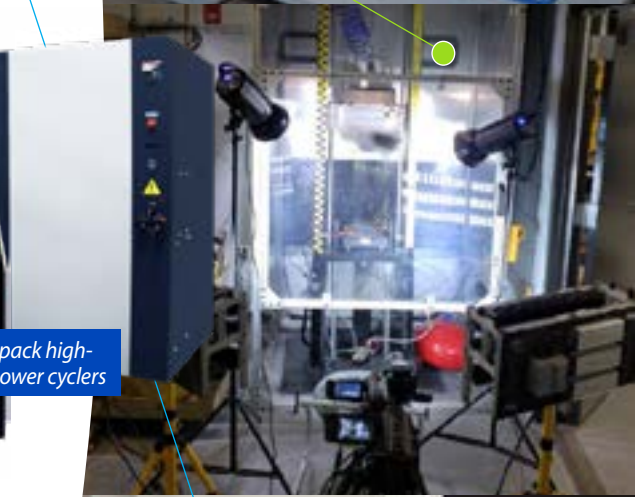
Test and Evaluation

Services offered for battery cell, module, and pack include:

- Mechanical testing
 - Ballistics
 - Crush
 - Nail penetration
 - Vibration
 - Shock
 - Drop
 - Impact
 - Rotation
- Environmental testing
 - Extreme environmental conditions: -70°C to +175°C
 - Altitude simulation up to 32,000 m
 - Fire resistance and flammability
 - Corrosive atmospheres such as salt fog and dust
- Electrical testing
 - External short circuit
 - Overcharge and overdischarge up to 1200 V and 1333 amps
- Additional services
 - Gaseous and particulate emissions measurement and characterization
 - Nondestructive and destructive post-test analysis
 - Teardown analysis



Battery pack high-voltage power cyclers



SwRI is a qualified test house for the Combat Capabilities Development Command (CCDC) Ground Vehicle Systems Center (GVSC).

ESTC Services

Multidisciplinary services offered by the SwRI Energy Storage Technology Center include:

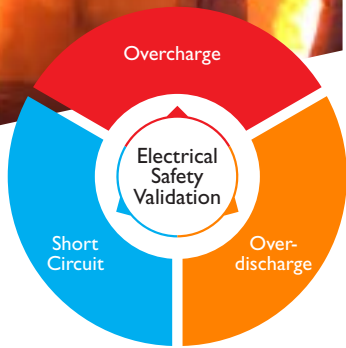
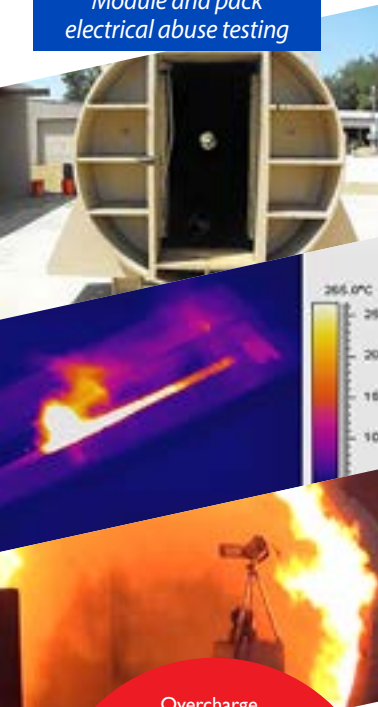
- Battery safety testing and evaluation
- Battery performance and life testing and evaluation
- Fast charge algorithm development
- Lithium plating diagnostics and prognostics
- Battery management system development and testing
- Chemistry and material analysis-related services
- Large system development for grid-scale storage
- Manufacturing system development
- Materials development
- Qualification testing
- Test protocol development
- System integration
- Design and consulting

Safety Test Standards

SwRI can conduct testing to a variety of custom or modified test standards procedures, including:

- UN ECE100-02
- UN 38.3
- KMVSS
- SAE J2464
- SAE J2929
- NAVSEA S9310
- ISO-12405-3
- IEC-62660
- DO-311
- MIL-STD-810G
- GB/T 31467.3
- Flight Readiness
- UL 1642
- UL 1973
- UL 2580
- UL 9540
- CAN/ULC-S2271-13
- NASA CMC-EP-WI-033
- NASA EP-WI-032
- AAR S-9401
- MIL-PRF-32565C GVSC Qualified Lab

Module and pack electrical abuse testing



Environmental abuse testing



We welcome your inquiries.
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**ENERGY STORAGE
TECHNOLOGY
CENTER**
A Department of SwRI

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