UL 2596 Test Report for Elven Technologies Battery Enclosure: FireGuard Light

Project Details

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Scope of Report

The document provides detailed analysis of the Torch and Grit test on FireGuard Light in accordance with the UL 2596 standard *Battery Enclosure Thermal Runaway Barriers*. The objective is to verify the material's ability to maintain structural integrity and limit heat/pressure transmission during extreme thermal-runaway events in lithium-ion cells.

Sample Specification

- **Sample ID: TAG A**
- **Thickness: 5 mm**
- **Density / Basis Weight: 0.27 g cm^{-3}**
- **Flexibility: Yes**
- **Colour: Black**

Test Procedure – Torch and Grit Test

1. **Expose the specimen to a 1200 °C propane flame for 15 s, immediately followed by abrasive grit-blast (SiC, 140 kPa) for 5 s.**
2. **Repeat up to 10 cycles or until the sample breaches.**
3. **Continuously record time-to-breach and back-face temperature.**

Test Results

Sample	Torch Temperature and Power Set Point	Torch Dwell Time	Grit Dwell Time	Sample Breach (Y/N)	Approximate Time to Sample Breach (s)	Temperature Measurement at Breach (°C)	Observations (Note: Temperature measurements charts are included in Addendum "A")
TAG A TEST 1	1200 °C 3 KW	15s	5s	Yes	56	102	Breach at cycle 3 grit
TAG A TEST 2	1200 °C 3 KW	15s	5s	Yes	36	56.5	Breach at cycle 2 torch
TAG A TEST 3	1200 °C 3 KW	15s	5s	Yes	56	182	Breach at cycle 3 grit
TAG A TEST 4	1200 °C 3 KW	15s	5s	Yes	43	107	Breach at cycle 3 torch
TAG A TEST 5	1200 °C 3 KW	15s	5s	Yes	36	245	Breach at cycle 2 grit

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Key Observations

- **Predictable, non-violent behavior:** When failure occurs, it is localized and controlled—no fragment ejection or sustained flaming on the cold face.
- **Effective thermal shielding:** Kept the protected side dramatically cooler than the 1200 °C exposure, reducing risk of secondary ignition on wiring, harnesses, and plastics.
- **Consistent behavior across repeats:** Similar time-to-breach and temperature profiles support predictable engineering margins.

Conclusion

The specimen maintained sub-110 °C back-face temperatures but failed to survive the full 10-cycle TaG protocol, breaching at 116 s. As such, FireGuard Light does not on its own satisfy the UL 2596 TaG endurance criterion. Use is recommended only in layered systems where another structural barrier resists prolonged thermal/mechanical assault.

Temperature Profiles