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Title: Evaluation and Analysis of sub-standard lithium batteries by UN 38.3 Testing

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Transport Canada (TC)'s Transportation of Dangerous Goods Safety Research and Analysis Branch researches and provides evidence-based recommendations to promote safety during the transportation of dangerous goods.

High volumes of lithium batteries are being shipped each year. To minimize hazards that might occur during transportation, these batteries must pass UN's Manual of Tests and Criteria, Sub-Section 38.3 (UN 38.3) prior to transport. However, lithium battery incidents still occur during transport across all modes. This study aims to understand why incidents involving lithium batteries may occur, the prevalence of sub-standard lithium batteries (i.e. batteries that fail UN 38.3) in the transportation system, and whether these sub-standard lithium batteries present additional risk during transport.

Twenty-four sets of OEM and third-party replacement lithium batteries for power tools and smartphones were purchased and tested according to UN 38.3. Trends were examined between the performance of these batteries in UN 38.3 tests against the marketplace where they were purchased, seller, shipper, handling condition, country of origin, mode of transportation used, packaging type used, and labelling. Once sub-standard batteries were identified, a teardown analysis was conducted to reveal features on their wiring, connections, safety features, and individual cell construction.

Test results will be presented on the potential risk of sub-standard lithium batteries, along with what commonalities may exist between them.