FIRE CONTAINMENT COVER
LITHIUM ION BATTERY FIRE TESTS

Shakir Jamaldeen

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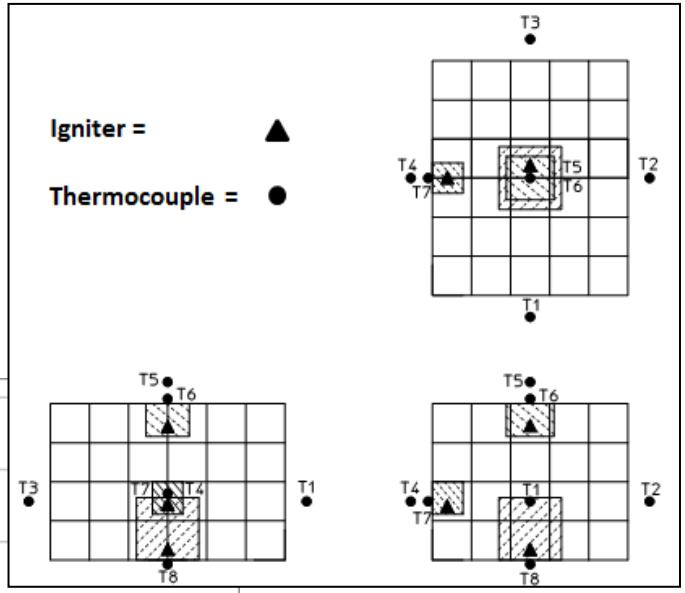
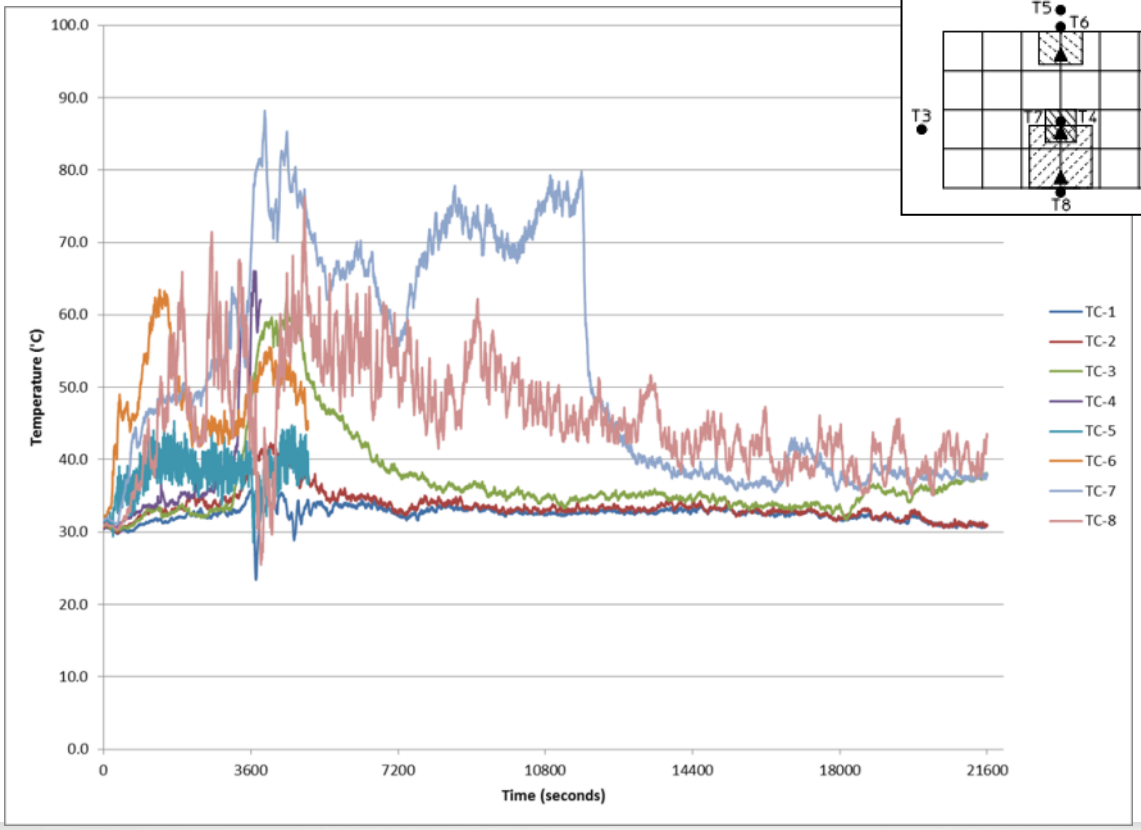
- FCC with dimensions 121” x 92” x 96” height
- 18650 Li-Ion (Secondary) 2600mAh 3.7V batteries
- Brand new semi-charged direct from manufacturer in original packaging
- Total of 1500 Li-Ion batteries – 9 boxes
- 2 boxes positioned directly beneath FCC roof
- 1 box positioned on 125” side touching FCC side
- 6 boxes positioned in middle immediately above pallet
- Balance volume filled up with cardboard boxes containing shredded paper
- Standard aluminium pallet
- 2 x 100W cartridge heaters at each battery location (6 in total)
- Ignition at all 3 locations simultaneously
- 8 thermocouples positioned on the exterior of the FCC

- Fire successfully contained for 6 hours
- Battery box on front side collapsed against FCC
- Net braid melted where battery box collapsed. Majority intact. No net flaming
- Cardboard seen burning through gaps between FCC and pallet
- All batteries vented

Thermocouple	Position	Temperature	
T1	Right Centre - 4”	36.17 °C	97.1 °F
T2	Back Centre - 4”	42.28 °C	108.1 °F
T3	Left Centre - 4”	62.68 °C	144.8 °F
T4	Front Centre - 4”	66.05 °C	150.9 °F
T5	Roof Centre - 4”	45.32 °C	113.6 °F
T6	Roof Centre - touch	63.48 °C	146.3 °F
T7	Front Centre - touch	88.20 °C	190.8 °F
T8	Pallet Under - touch	76.30 °C	169.3 °F

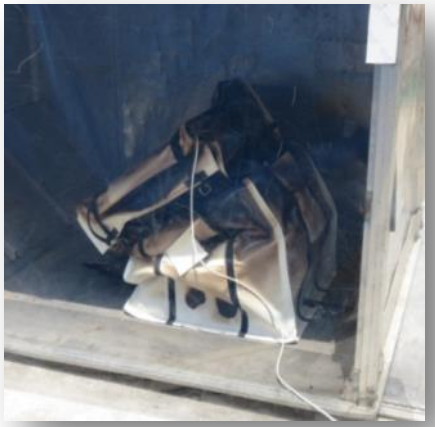




- FCB test within aluminium ULD container
  - _ Laptop battery details: 11.1 V, 5200mAh, quantity 2
  - _ Cargo load: 3 cardboard boxes filled with shredded paper
  - _ Laptop batteries placed in bottom most box

- FCB (damaged) test within composite ULD container
  - _ FCB damaged to maximum allowable limits
  - _ Laptop battery details: 11.1 V, 5200mAh, quantity 2
  - _ Cargo load: 3 cardboard boxes filled with shredded paper
  - _ Laptop batteries placed in bottom most box
  - _ FCB surrounded by unprotected combustible cargo

- FCB test within Aluminium ULD container
  - Batteries explode/vent at 3:50 min following ignition
  - **Fire successfully contained**
  - *Two large fabric sections of the FCB were cut out to allow for ventilation. Fire reignited and test continued for 3 hours.*
  - All batteries had exploded/vented
  - Aluminium container was not affected by fire



- FCB (damaged) test within composite ULD container
  - Batteries explode/vent at 1:15 min following ignition
  - **Fire successfully contained**
  - All batteries had exploded/vented
  - Composite container and unprotected boxes were not affected by fire

FCC Lithium-ion fire test

- FCC contained Li-ion battery fire for 6 hours
- All cells experienced thermal runaway
- Temps measured outside did not exceed 90°C (194°F)

FCB Lithium-ion fire test in aluminium container

- FCB contained Li-ion battery fire
- All batteries experienced thermal runaway

Damaged FCB Lithium-ion fire test in composite container

- FCB contained Li-ion battery fire
- All batteries experienced thermal runaway
- No damage to container or surrounding boxes

Thank you for your time

Shakir Jamaldeen
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