

RECHARGEABLE LITHIUM-ION BATTERIES FOR SYSTEMS

CERTIFICATION UPDATES

Rich Byczek, 11/15/11



- IEC 62133 adoption, transition
- Certification options for Lithium-Ion Batteries
- End product requirements and application
- Transportation requirements for Lithium-Ion Batteries

North American Certification Capabilities

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IEC 62133: Cortland, New York (CBTL)
Detroit (CBTL)

UL 2054: Detroit, MI and Cortland, NY

UL 1642: Detroit, MI and Cortland, NY

UN-DOT: Detroit, MI

Battery Performance: Detroit, MI

Battery Advisory Service: Detroit/ Cleveland



US- Based Standards:

UL-1642: Lithium Batteries

- Focus on single-cells
- Used for Lithium-Metal (PRIMARY)
- Used for Lithium-Ion (SECONDARY)



UL-2054: Household and Commercial Batteries

- Focus on Portable Batteries
- Typically Battery Packs
- References UL 1642 for Lithium Cells



IEC - Based Standards:

IEC-60086

- Primary Batteries (Non-rechargeable)
- Covers Performance and Safety

IEC-62133

- Secondary Batteries (Rechargeable)
- Focus on Lithium-ion Batteries
- First Edition, October 2002
- Second Edition in process, potential 2012 release



IEC 62133 ADOPTION, TRANSITION

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BACKGROUND:

- For many years, IECEE (“CB SCHEME”), has accepted the UL Standard as the basis for accepting batteries.
 - Based on common usage of UL 1642/ 2054 for battery packs.
- Proposal in place to fully accept IEC 62133 within IECEE, as standard has been released since 2002.
 - Proposal includes transition period.



IEC 62133 ADOPTION, TRANSITION

- At the moment, IEC is working with product level groups to enforce the IEC62133 standard into the product level standard
- Some product level committees are making revision changes to their standard to comply with battery requirement
- CMC accepted a firm and final enforcement date of May 1, 2012 for battery standard IEC 62133, phasing out UL 1642 entirely, except for standards IEC 60950-1 and 60065, at the request of TC 108, responsible for those two standards.

Example

		108/414/RVD
REPORT OF VOTING ON AN FDIS RAPPORT DE VOTE SUR UN FDIS		
Project number Numéro de projet IEC 80065-A2 Ed 7.0	Reference of FDIS Référence du FDIS 108/395/FDIS	
Date 2010-07-23	IEC/TC or SC/CEI/CE ou SC TC 108	
CENELEC Parallel Voting Document		
Résultats du vote		Result of the voting
Le document mentionné en annexe A a été diffusé aux Comités nationaux à la date indiquée, avec prière de faire savoir au Bureau Central dans les deux mois si les Comités nationaux étaient favorables à la publication du FDIS comme Norme Internationale.		The document mentioned in annex A was distributed to National Committees on the date shown, with a request that the Central Office be informed within two months whether or not National Committees were in favour of publication of the FDIS as an International Standard.

SE-3			T/E	There is no normative references for lithium batteries	Add to the list of Normative references IEC 62133, <i>Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications</i>	
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IEC 62133 ADOPTION, TRANSITION

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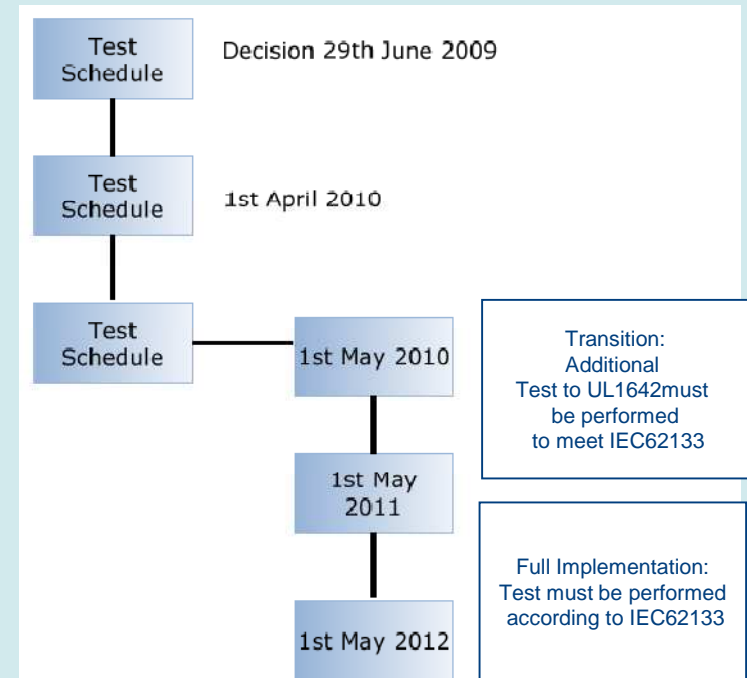
TRANSITION TESTING:

NOW until April 30, 2012:

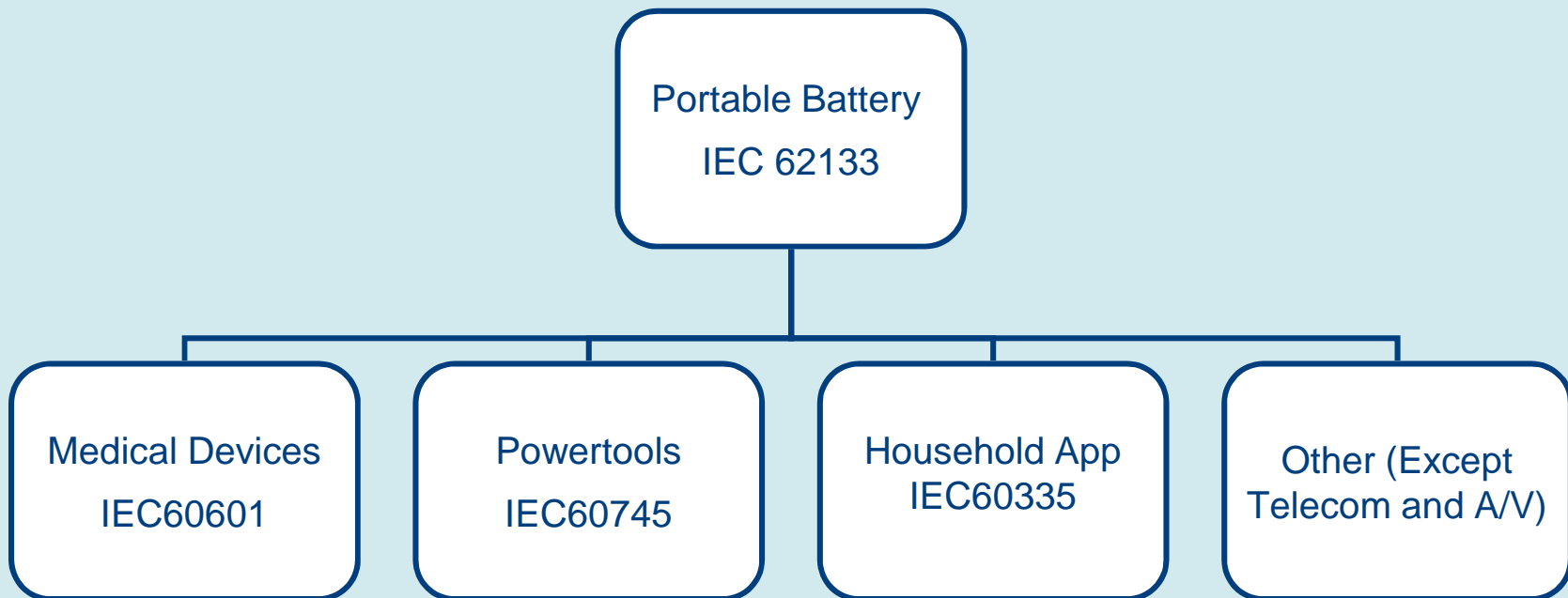
- Assuming battery is already tested and certified to UL-1642:
- “Delta” testing to be performed on UL-1642 certified cells.

From May 1, 2012, full testing to IEC 62133 required

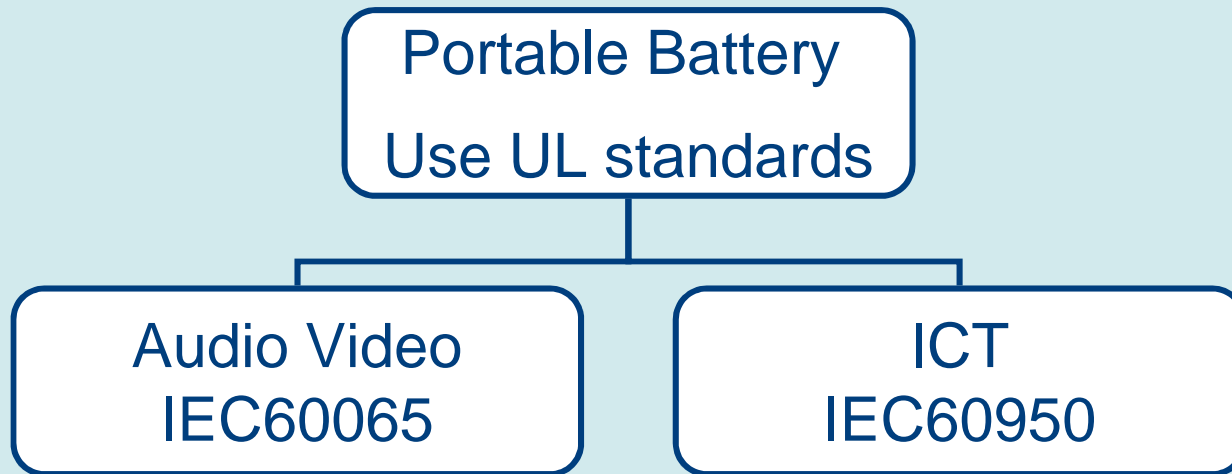
THIS TIMELINE IS NOW IN EFFECT, for products in most IEC/CB categories!!



Who is affected by this regulatory change?



Who is NOT YET affected by this regulatory change?



NOTE: TC 108 expects to adopt IEC 62133 2nd edition by 2013

IEC 62133 ADOPTION, TRANSITION



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DELTA TESTING: For Lithium Cells already certified to UL-1642, the following tests must be applied

APPLIES TO CELLS ONLY

Required:

- 25 cell samples
- Copy of the cell manufacturer's ISO-9001/13485 or similar Quality System certification.
- Rating in Ah (Amp-hours)
- Maximum Charge Voltage
- Minimum Discharge Voltage ("cutoff")
- Maximum and Nominal Charge Current
- Maximum and Nominal Discharge Current



IEC 62133 ADOPTION, TRANSITION

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TESTS and EVALUATIONS REQUIRED

- 1.4 IEC - Parameters measurement tolerances:
- 2 IEC - General Safety Considerations:
- 2.1 IEC - Insulation and Wiring:
- 2.2 IEC - Venting: -
- 2.4 IEC 62133 – Terminals Contacts:
- 2.5 IEC – Assembly of Cells into Batteries:
- 2.6 IEC – Quality Plan:
- 3 IEC – Type test conditions:
- 4.2.1 IEC – Continuous Low Rate Charging –
- 4.2.3 IEC – Moulded case stress at high ambient temperature
- 4.3.3 IEC – Free Fall
- 4.3.6 IEC – Crushing of cells
- 4.3.9 IEC - Overcharge for lithium systems
- 5. Annex A and B IEC - Information for Safety
- 6.1 IEC – Cell Marking per IEC 61960, IEC 61951-1, -2, IEC 61436, IEC 61440, 60285
- 6.2 IEC – Battery Marking: IEC 61960, IEC 61951-1, -2, IEC 61436, IEC 61440, 6028



CB CERTIFICATION OPTIONS

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BATTERY MANUFACTURER LEVEL for CB:

CELLS MUST BE IEC-62133 TO CERTIFY THE BATTERY



DELTA TESTING ON CELLS (ALREADY CERTIFIED TO UL-1642)

- Requires 25 cell samples
- Provided CB cert for those cells
- Can be used until April 30, 2012
- Re-certification not required after May 2012 if they complete in time.



CB CERTIFICATION OPTIONS

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BATTERY MANUFACTURER LEVEL for CB:

BATTERY PACK TEST to IEC-62133 (Cells already IEC 62133):

- Requires 35 packs
- Copy of the battery manufacturer's ISO-9001/13485 or similar Quality System certification.
- Battery Bill of Materials (BOM)
- 2D layout drawing with Label Artwork (or representative label)
- Rating in Ah (Amp-hours)
- Maximum Charge Voltage
- Minimum Discharge Voltage ("cutoff")
- Maximum and Nominal Charge Current
- Maximum and Nominal Discharge Current
- **Full IEC 62133 (1st edition) evaluation on packs, with CB report.**



CB CERTIFICATION OPTIONS

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END PRODUCT LEVEL for CB:

SCENARIO: END product to IEC 60601-xx, Cells are UL-1642, pack has no certification, "portable" device

- Previous Slide applies

SCENARIO 2: END product to IEC 60601-xx, Cells are UL-1642, pack has no certification, Non-portable device

(Ie: device is not hand portable, battery is not user-replaceable)

- Cell-level IEC -62133 DELTA Testing applies
- pack level testing per end-product battery req's
 - Short Circuit : depends on end product construction eval.
 - Molded case stress: If battery utilizes plastic enclosure.
 - Overcharge: depends on end product construction eval

PROVIDES CB CERT FOR THE CELLS, BUT NOT FOR THE PACK

- IF END PRODUCT STANDARD SPECIFIES IEC-62133, then full certification must be performed



NOTE:

**IEC 62133 Battery
Certification is **REQUIRED**
for IEC **60601-1 3rd** Edition
Certification**



ETL CERTIFICATION OPTIONS

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BATTERY MANUFACTURER LEVEL (US, non-CB):

CELL TESTING TO UL-1642 (if not already certified):

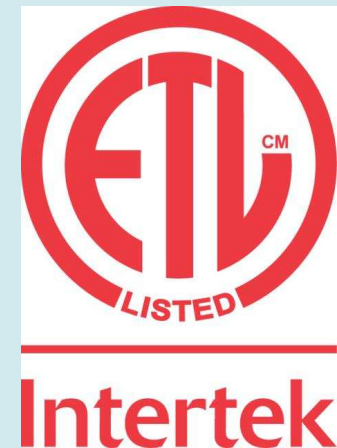
- Requires 150 cell samples
- Note that preconditioning may require up to 90 days of charge/discharge cycling.
- Need to know the rated life expectancy in charge/discharge cycles
- ETL Recognition for the cells

BATTERY PACK TEST to UL-2054 (Cells already UL-1642):

- Requires 55 packs (15 sealed, 40 opened)
- Reduced samples may be possible if samples can be reused after individual tests (depends on actual test results for each group of 5 samples)
- Requires Bill of Material and Description of all safety, current-limiting, and current interrupting circuits.
- ETL Recognition or Listing on Packs

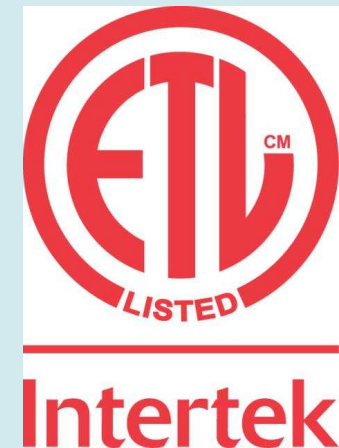
END-PRODUCT LEVEL TEST to UL-2054: (depends on size of battery)

- Battery will be an unlisted component
- Short Circuit, Overcharge testing applies
- Depends on end-product construction evaluation if additional tests required.



IF....

**END-PRODUCT STANDARD NOTES SPECIFIC
BATTERY STANDARD REQUIREMENTS (such as UL-
2054), then**



**Full testing must be performed at the
battery level**

TRANSPORTATION REQUIREMENTS



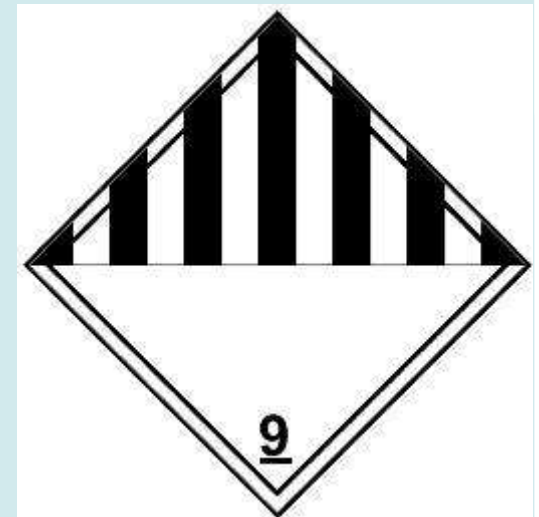
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UN / USDOT Battery Designations for Lithium/ Li-Ion Batteries

- Class 9 Material
- UN3090: Lithium (Lithium Metal) Batteries
- UN3091: Lithium Batteries contained in equipment
- UN3480: Lithium-Ion Batteries
- UN3481: Lithium-Ion Batteries contained in equipment
- IATA 966, etc

- All mean the same!!!



TRANSPORTATION REQUIREMENTS

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LATEST and GREATEST UN MANUAL:

Recommendations on the Transport of Dangerous Goods.
Manual of Tests and Criteria. 5th Revised Edition

(Issued December 2009)

Section 38.3 refers to “Lithium Battery Testing Requirements”

Per Federal register 49 CFR sections 171.7

- 5th edition since January 2011



T1-T5 (Same Samples, Tested in Order, All Types)

T1: Altitude Simulation

T2: Thermal Test

T3: Vibration

T4: Shock

T5: External Short Circuit

T6: Impact (Primary and Rechargeable Cells Only)

T7: Overcharge (Rechargeable Batteries Only)

T8: Forced Discharge (Primary and Rechargeable Cells Only)

Samples Needed: SECONDARY CELLS (5th edition)

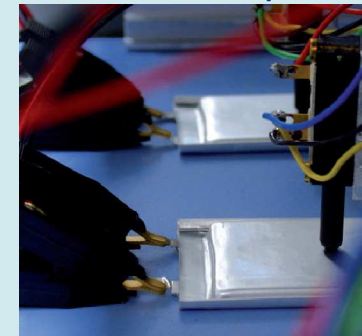
Cylindrical

(18650, Canister)



Prismatic

(Pouch)



Tests T1-T5, T6 and T8 are required

	FULLY CHARGED	FULLY DISCHARGED	1 st Cycle 50% CHARGE	50 Cycle DISCHARGED	TOTAL
Cylindrical Cells	10	5	10	10	35
Prismatic Cells	10	10	10	10	40

Samples Needed: SECONDARY BATTERIES (5th edition)

SMALL BATTERY:
Gross Mass up to 12 kg



LARGE BATTERY:
Gross Mass over 12 kg



Tests T1-T5 and T7 are required

	1 st Cycle CHARGED	25 Cycle CHARGED	TOTAL
Small Batteries	8	8 (50 cycles)	16
Large Batteries	4	4 (25 cycles)	8

Samples Needed: additional criteria

- Lithium Ion Rechargeable Packs
 - Up to 6,200 Wh rating
 - Cells/ Modules already tested
 - 1 (or 2) sample(s) only, cycled 25 times, fully charged
 - Tests 3,4,5 and 7 only
- More than 500g Lithium or 6,200 Wh Rating
 - Cells/Module already tested
 - No testing required if BMS in place



BATTERY TESTING INFO NEEDED

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Basic information needed to quote your test program:

- Nominal Voltage and Capacity (Ah) rating
- Maximum charging current and voltage
- Maximum discharge current and voltage
- Normal discharge current
- Cutoff voltage (voltage at which output is cut off or battery is considered "dead")
- Fully charged current/voltage (current and voltage points where battery is considered fully charged)
- Schematics of battery packs and protection circuitry (if applicable)
- For UL 2054 Limited Power Source test on Request only
- Existing certifications on cells or packs
- Chemistry used (MSDS, Shipping requirements)

QUESTIONS?



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- Please use the Q&A box and type questions.



Thank You.

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Storage**

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