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UN Test Report
- ASM P/N 45N1152 (100Wh, 11.1V)-

목 차

2013. 1. 22

LG Chem
Mobile Energy Division

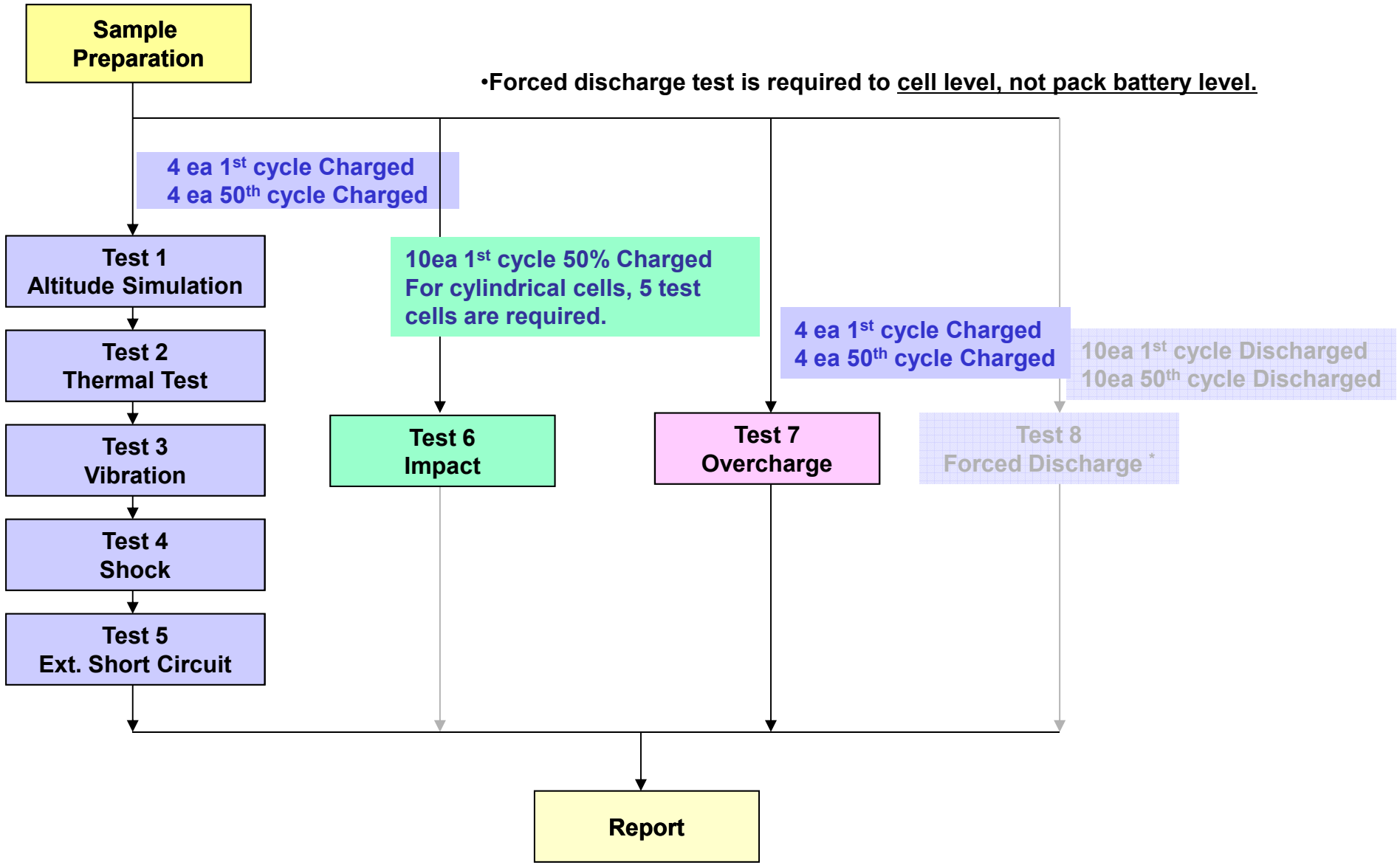
1. UN Transportation Regulation Test

Test	Condition	Requirements
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20+/-5℃	- Measuring mass before/ after each test (If M>5g, less than 0.1%) - Measuring voltage before/ after each test (more than 90%) - No leakage, no venting, no disassembly, no rupture, no fire
Test 2. Thermal Test	[75±2℃,6hr ↔ -40±2℃,6hr,interval max. 30min] x 10cycle Storing at 20±5℃ for 24h	
Test 3. Vibration	[7Hz↔200Hz↔7Hz, in 15min] x 12 times x 3 direction 1) sinusoidal waveform with a logarithmic sweep 2) 7Hz 18Hz (maintaining 1gn) app. 50Hz (until 8gn) 200Hz (maintaining 8gn), 1.6mm total excursion	
Test 4. Shock	Half sine shock (peak acceleration : 150gn, pulse duration : 6msec) x 6 (±x, y, z) direction x 3 cycle	
Test 5. External Short Circuit	100mΩ ext. short-circuit at 55±2℃ 1hr continue after returning at 55±2℃	- No disassembly, no rupture, no fire (after 6 hours) - Temp. monitoring (max. 170℃)
Test 6. Impact	Φ=15.8mm bar, 9.1kg mass, 61±2.5cm height	
Test 7. Overcharge	Current = Manufacturer's recommended max. continuous charge current X 2 Voltage 1.If charge voltage ≤ 18V, V (min.) = 2 x (max. charge voltage) or V (min.) = 22V. 2.If charge voltage > 18V, V (min.) = 1.2 x (max. charge voltage)	- No disassembly, no fire (after 7 days)
Test 8. Forced Discharge	Only for Cell, not battery.	- No disassembly, no fire (after 7 days)

* Tests through T1-T5 shall be conducted in sequence with the same battery.

* We declare that the above-mentioned test is the result of being checked according to UN Test (Manual of Test and Criteria ST/SG/AC.10/11/Rev.5)

2. Test Procedure



3-1. T1-T4 Test Result

Before				Altitude (T1)					Thermal (T2)					Vibration (T3)					Shock (T4)				
	Pack NO.	OCV	Mass	OCV	Mass	Residual OCV(%)	Mass Loss(%)	Result	OCV	Mass	Residual OCV(%)	Mass Loss(%)	Result	OCV	Mass	Residual OCV(%)	Mass Loss(%)	Result	OCV	Mass	Residual OCV(%)	Mass Loss(%)	Result
A. 1st cycle fully state																							
Charge	1	12.995	485.509	12.981	485.506	99.89	0.001	Pass	12.859	485.492	99.06	0.003	Pass	12.838	485.469	99.84	0.005	Pass	12.818	485.466	99.84	0.001	Pass
	2	12.999	485.251	12.976	485.228	99.82	0.005	Pass	12.852	485.210	99.04	0.004	Pass	12.828	485.187	99.81	0.005	Pass	12.808	485.181	99.84	0.001	Pass
	3	13.002	485.483	12.984	485.458	99.86	0.005	Pass	12.858	485.452	99.03	0.001	Pass	12.841	485.436	99.87	0.003	Pass	12.827	485.429	99.89	0.001	Pass
	4	13.003	486.022	12.988	486.007	99.88	0.003	Pass	12.865	486.001	99.05	0.001	Pass	12.845	485.979	99.84	0.005	Pass	12.821	485.976	99.81	0.001	Pass
	Ave.	13.000	485.566	12.982	485.550	99.87	0.003	-	12.859	485.539	99.05	0.002	-	12.838	485.518	99.84	0.004	-	12.819	485.513	99.85	0.001	-
B. 50th cycle fully state																							
Charge	1	12.984	485.952	12.969	485.937	99.88	0.003	Pass	12.847	485.915	99.06	0.005	Pass	12.828	485.907	99.85	0.002	Pass	12.810	485.890	99.86	0.003	Pass
	2	12.982	485.474	12.968	485.466	99.89	0.002	Pass	12.842	485.460	99.03	0.001	Pass	12.828	485.437	99.89	0.005	Pass	12.813	485.418	99.88	0.004	Pass
	3	12.975	485.265	12.950	485.243	99.81	0.005	Pass	12.833	485.223	99.10	0.004	Pass	12.810	485.213	99.82	0.002	Pass	12.791	485.213	99.85	0.000	Pass
	4	12.975	486.060	12.957	486.056	99.86	0.001	Pass	12.838	486.046	99.08	0.002	Pass	12.813	486.028	99.81	0.004	Pass	12.797	486.024	99.88	0.001	Pass
	Ave.	12.979	485.688	12.961	485.676	99.86	0.003	-	12.840	485.661	99.07	0.003	-	12.820	485.646	99.84	0.003	-	12.803	485.636	99.87	0.002	-

Requirement	- Measuring mass before/after each test (If M>5g, less than 0.1%) - Measuring voltage before/after each test (more than 90%, only charged samples) - No leakage, no venting, no disassembly, no rupture, no fire

3-2. T5/T7 Test Result

EXT.Short Circuit (T5)				
	Pack NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully state				
Charge	1	12.818	60.20	Pass
	2	12.808	59.86	Pass
	3	12.827	60.05	Pass
	4	12.821	60.06	Pass
	MAX.	12.827	60.20	-

Test Condition
- 100mΩ ext. short-circuit at 55±2℃

EXT.Short Circuit (T5)				
	Pack NO.	Initial OCV(V)	Max. Temp (℃)	Result
B. 50th cycle fully state				
Charge	1	12.810	59.76	Pass
	2	12.813	59.90	Pass
	3	12.791	59.67	Pass
	4	12.797	59.20	Pass
	MAX.	12.813	59.90	-

Requirement
- Temperature < 170 (℃) - No disassembly, no rupture, no fire within 6 hours

Over Charge (T7)				
	Pack NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully state				
Charge	9	12.967	24.23	Pass
	10	12.977	24.27	Pass
	11	12.979	25.03	Pass
	12	13.022	25.65	Pass
	MAX.	13.022	25.65	-

Test Condition
- Max. Charge Current : 3800mA - CC/CV 2Imax(7600mA) 22V cut-off 24Hr

Over Charge (T7)				
	Pack NO.	Initial OCV(V)	Max. Temp (℃)	Result
B. 50th cycle fully state				
Charge	13	13.046	25.66	Pass
	14	12.959	25.23	Pass
	15	13.022	24.99	Pass
	16	12.966	25.59	Pass
	MAX.	13.046	25.66	-

Requirement
- No disassembly, no fire within 7 day

3-3. T6 Test Result (ICR18650D1)

Impact (T6)			
Pack NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle 50% charge state			
C-1	3.779	26.36	**Pass**
C-2	3.778	29.21	**Pass**
C-3	3.779	28.31	**Pass**
C-4	3.778	27.61	**Pass**
C-5	3.779	25.61	**Pass**
MAX.	3.779	29.21	-
B. 50th cycle fully discharge state			
C-6	3.485	25.28	**Pass**
C-7	3.485	25.20	**Pass**
C-8	3.489	24.66	**Pass**
C-9	3.490	30.92	**Pass**
C-10	3.491	22.63	**Pass**
MAX.	3.491	30.92	-
Test Condition			
- Φ=15.8mm bar, 9.1kg mass, 61±2.5cm height			
Requirement			
- Temperature < 170 (℃) - No disassembly, no rupture, no fire within 6 hours			

4. Sample Image