

# Assessment of Mercury-Free Alkaline Button Batteries Made by Foreign and Japanese Manufacturers

Test Conducted September 2015  
Battery Association of Japan

# Batteries Under Test: Mercury-Free Batteries (LR44)

[Batteries made by foreign manufacturers]

Foreign manufacturer A (mercury-free)

Foreign manufacturer B (mercury-free)



Foreign manufacturer C (mercury-free)

[Batteries made by Japanese manufacturers assessed under same conditions for comparison]

Japanese manufacturer 1 (mercury-free)

Japanese manufacturer 2 (mercury-free)

# Test Conditions

Test Item	Test Conditions
Heavy load discharge with 4 batteries in series	4 batteries in series simulating a emergency buzzer, 36 $\Omega$ load x 24-hour discharge (4 batteries per test)
Load discharge with 3 batteries in series	3 batteries in series simulating an LED flashlight, 50 $\Omega$ load x 24-hour discharge (3 batteries per test)
Real device - emergency buzzer	Petit Alarm 2 (PAW-20) water-resistant, ultra-high sound type personal alarm, 24-hour discharge (4 batteries per test) 
Real device – flashlight	LED LENSER K2L (OPT-8202L) compact key flashlight 24-hour discharge (4 batteries per test) 

# Safety Test Results

## Test Results

No. of ruptures/No. of tests

Manufacturer	Foreign Manufacturer A	Foreign Manufacturer B	Foreign Manufacturer C	Japanese Manufacturer 1	Japanese Manufacturer 2
Mercury Content	Mercury-Free	Mercury-Free	Mercury-Free	Mercury-Free	Mercury-Free
Heavy load discharge with 4 batteries in series	0/2	0/2	2/2	0/2	0/3
Load discharge with 3 batteries in series	0/2	0/2	2/2	0/2	0/3
Real device - emergency buzzer	-	0/1	1/1	-	-
Real device – flashlight	-	-	0/1	-	-





## Test Conditions

Test Item	Test Conditions
Heavy load discharge with 4 batteries in series	4 batteries in series simulating a personal alarm, 36Ω load x 24-hour discharge (4 batteries per test)
Load discharge with 3 batteries in series	3 batteries in series simulating an LED flashlight, 50Ω load x 24-hour discharge (3 batteries per test)
Real device - emergency buzzer	Petit Alarm 2 (PAW-20) water-resistant, ultra-high sound type personal alarm (button released after 24 hrs) (4 batteries per test)
Real device – flashlight	LED LENSER K2L (OPT-8202L) compact key flashlight (button released after 24 hrs) (4 batteries per test)

# Safety Test Results (Photos)

## Test Results

Ruptures occurred in batteries made by Foreign Manufacturer C

Test Conditions	No. of Days Elapsed	Photo of Rupture
Heavy load discharge with 4 batteries in series (36 $\Omega$ load x 24h)	Ruptured after being left to stand for 20 and 30 days after test	 
Load discharge with 3 batteries in series (50 $\Omega$ load x 24h)	Ruptured after being left to stand for 7 and 30 days after test	 
Real device - emergency buzzer (24h)	Ruptured after being left to stand for 20 days after test	