

10 Things You Should Know About Designing with Batteries

	Things That Matter	Why
1	Battery Chemistry	The various battery chemistries can have different: <ul style="list-style-type: none">• Voltages – Open Cell and Operating• Operating temperature ranges• Self discharge rates, i.e. Shelf Life
2	Size	In general, larger batteries have; <ul style="list-style-type: none">• Greater available energy (Capacity)• Higher discharge rates• Longer run times
3	Construction	Batteries are made in Cylindrical, Flat, and Coin/Button form factors <ul style="list-style-type: none">• Cylindrical batteries are able to discharge at higher rates than flat, or coin/button cells.• Batteries made with wound electrodes have the highest discharge rate capability• Coin/Button cells have small form factors, but also low discharge rates.
4	Depth of Discharge	<ul style="list-style-type: none">• Battery capacity is specified to end of life voltage• Over discharge leads to cell damage and leakage• Circuit designs must have voltage cut offs
5	Safety	<ul style="list-style-type: none">• Primary batteries are not to be charged.• Battery cavities should be isolated from the circuits• Battery cavities should be designed with battery polarity control.
6	Temperature	<ul style="list-style-type: none">• Battery performance declines at low temperatures• High temperatures increase self discharge and reduce shelf life
7	Environmental Conditions	<ul style="list-style-type: none">• Temperature, humidity, shock and vibration all can reduce battery performance and damage the battery.• Please consult Duracell for safety and handling guidelines
8	Batteries are not AC Power Supplies	<ul style="list-style-type: none">• Batteries are dynamic sources of power• The battery's internal resistance rises with the depth of discharge• Power declines as internal resistance increases• Batteries are impacted by environmental conditions
9	Batteries have Shelf Life or "Freshness" limits	<ul style="list-style-type: none">• Shelf life refers to the ability of the battery to retain capacity under specified storage conditions.• Different battery chemistries have different shelf life limits, ranging from 3 – 15 years depending upon the chemistry.• Rechargeable batteries lose energy at a high rate and need to be recharged weeks or months after the last charge.

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10	Intermittent vs. Continuous Discharge Affects Run Time	<ul style="list-style-type: none">• Discharging batteries intermittently results in longer run times than with a continuous discharge.• Designing discharge with an optimized pulse drain and duty cycle will result in the best run time
	For more design help, contact Duracell's Global OEM Sales and Consulting Group	<u>www.duracell.com/OEM</u>