



Best Management Practice for Battery Management

March 19, 2019





Resourcing the world

Veolia North America Corporate Presentation

We design and provide water, waste and energy management solutions for commercial, municipal, and industrial customers.

veolianorthamerica.com



Challenges for the Planet



THE SUSTAINABLE development of cities

We are enhancing our relationship with local government in order to **become a consulting partner to help them improve their performance.**



CLIMATE change

We are **increasing our investment in research** to produce renewable and alternative energy to **improve energy efficiency.**



INCREASINGLY SCARCE resources

We act to preserve and replenish resources. What is discarded by some becomes a resource for others. **That is the principle behind the circular economy.**



FRAGILITY of ecosystems and biodiversity

Through our CSR commitments, we work to **preserve natural resources and diversity.**



Our Mission | Resourcing the World

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Developing

ACCESS TO RESOURCES:

We offer **operational solutions that consume fewer environmental resources and are more economically efficient** to expand both the potential and the accessibility of the resources available.

Preserving

RESOURCES:

We develop solutions to **conserve resources and optimize their use**, while protecting their quality and efficiency throughout the usage cycle.

Replenishing

RESOURCES:

We provide **solutions for creating new “secondary” resources** that will gradually offset the increasing scarcity of natural “primary” resources, generating new opportunities for social and economic development that protect the environment.

Our mission is to resource the world, helping our customers address their environmental and sustainability challenges in energy, water and waste. This means improving our clients' energy efficiency, better managing their water and wastewater, and recovering resources from their wastes.

Global Presence

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168,800

employees

Worldwide employee breakdown

NORTH AMERICA

Revenue: €2,048 M
Workforce: 5%

LATIN AMERICA

Revenue: €731 M
Workforce: 8%

FRANCE

Revenue: €5,414 M
Workforce: 30%

EUROPE

Revenue: €9,504 M
Workforce: 37%

AFRICA MIDDLE EAST

Revenue: €1,227 M
Workforce: 7%

ASIA OCEANIA

Revenue: €2,610 M
Workforce: 13%



Areas of Expertise

We design and operate complex systems while providing water, waste and energy management solutions that contribute to the sustainable development of communities and industries.



WATER

Management of the global water cycle, from production and distribution of drinking water to the collection, treatment and recycling of wastewater.



WASTE

Non-hazardous and hazardous waste management, from collection to recycling, leading to the final recovery of waste as materials or energy.



ENERGY

Energy efficiency, efficient management of heating and cooling networks, green energy production.

Excellence in North America

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\$2.5

billion revenue
(2017)

#1 All Environmental Firm

as reported by Engineering News Record

15-20%
Cost-savings

30,000

Customers

7,500

employees in the U.S. and
Canada

13

OSHA VPP Star
Certified sites

19

million people
supplied with water

750,000

tons of
managed waste

500MW

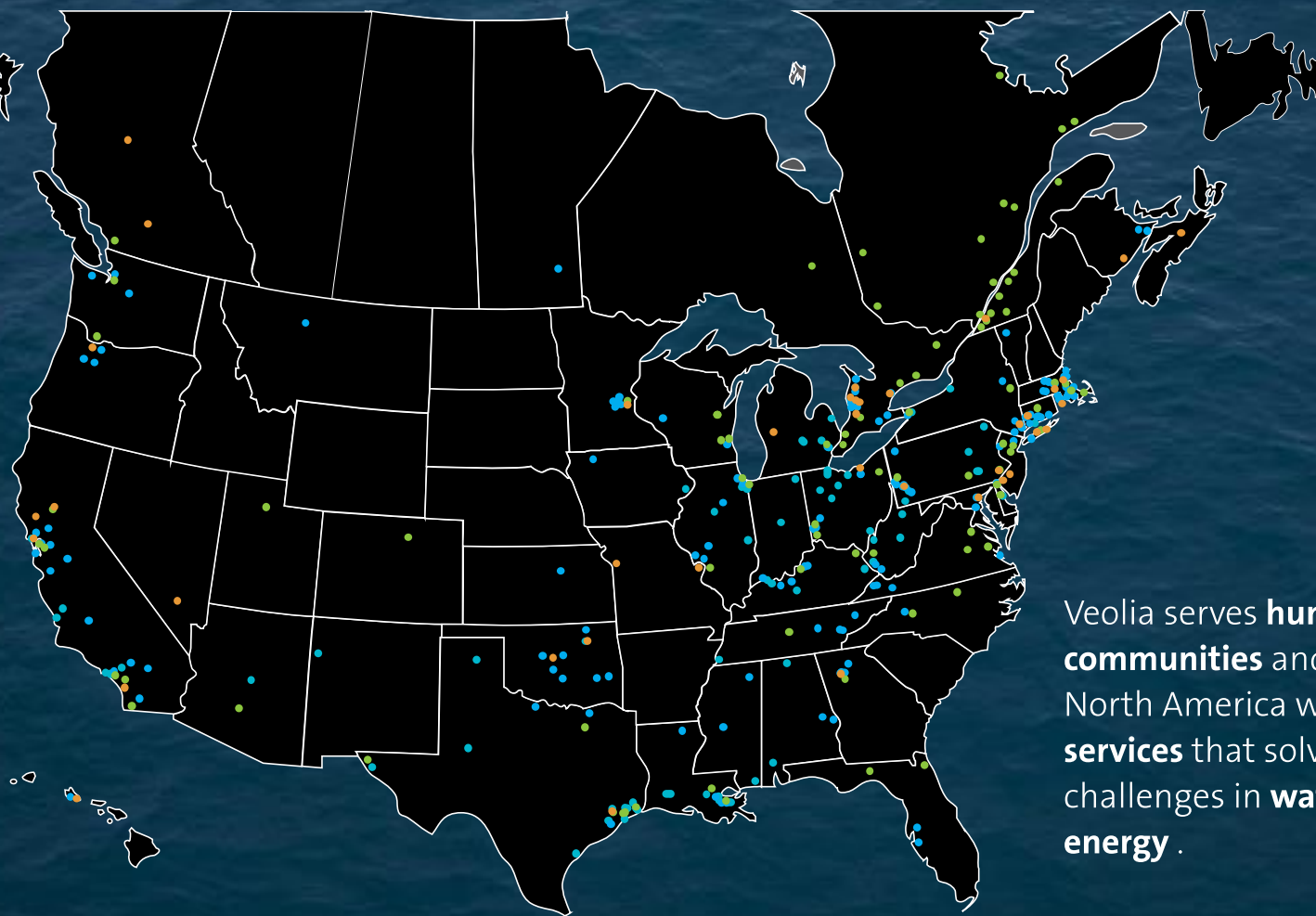
of CHP owned
or operated

Resourcing the world



Across North America

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Veolia serves **hundreds of communities** and **customers** across North America with **customizable services** that solve complex challenges in **water, waste and energy**.

● Water

● Waste

● Energy

Resourcing the world



Our Commitment to Safety

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Our mindset “**Goal Zero. Leading Safety Together**” exemplifies our continuous improvement philosophy regarding safety at work and at home.



We strive for zero work-related injuries and illnesses



GOAL ZERO
Leading Safety Together

Pledging to make safe behaviors and work practices is a core value of everything we do. We are all safety leaders - leading by example at all times.



Best Management Practice for Batteries

Battery Management

- Types of batteries that are classified as Universal Waste and must be collected, stored, and recycled include:
 - Nickel Cadmium,
 - Nickel Metal Hydride,
 - Lithium Ion,
 - Lithium,
 - Mercury,
 - Silver,
 - Lead Acid, Lead Acid Flooded Cell Batteries, Non-Spillable Lead Acid Batteries,
 - Sodium batteries,
 - Potassium hydroxide.



Challenges we face



In Series Battery



Challenges with batteries

- *Do not know level of charge in the battery*
- *Many different types to identify*
- *Lithium batteries increasing in marketplace*
- *Battery fires hard to control*
- *Short circuits lead to heat generation an fire potential*

NORMAL



Reacting battery
OVERCHARGED

Challenges we face



Overcharged Lithium battery
during testing



Was a Tesla



Challenges we face



Challenges we face



Challenges we face



Challenges we face

Office UPS Units

Office UPS units (Uninterruptable Power Supplies), containing non-spillable lead acid batteries, are designed to be serviced by non-qualified personnel and have safety measures incorporated into their design. This may include protecting terminals from short circuit within the unit or encasing the batteries in a non-conductive housing that will be removed and replaced as a unit. These safety features will allow for office UPS units to be transported “as is” with the batteries in place.

Industrial Battery Power Supplies

Industrial battery power supplies are intended to only be serviced by qualified personnel and as such, do not include the same types of safety features found in office UPS units. These units will often have more batteries for a higher voltage and the batteries will often be much larger. All shipments of industrial battery power supplies must meet the following requirements:

1. Battery Power Supplies must be safely de-energized prior to shipment.
2. Batteries must be removed from the racking system and packaged in accordance with Veolia policy.
3. Palletized materials must be evaluated to assure that the pallet can safely support the weight of the load.

Since these units will typically require a qualified electrician to remove them from service, it is recommended that the electrician disconnects the batteries at the same time. Under no circumstances should industrial battery power supplies be transported with the batteries in place and electrically connected.

Challenges we face



Challenges we face



Battery Management

Lithium Ion Batteries. These are rechargeable lithium batteries, similar to those found in cameras, cell phones, laptop computers, and radio-controlled toys. Lithium polymer batteries are those types of lithium ion batteries.

Lithium Metal Batteries. These cannot be recharged and are designed to be discarded once their initial charge is used up.

Smaller Lithium Ion Batteries contain up to 100 watt-hours. Cell phone batteries and most laptop computer batteries fall below the 8 gram threshold.

Spare Batteries. Spare batteries, also called "loose" batteries, are those not installed in equipment. A lithium ion battery inside your laptop computer is an installed battery. A battery carried separately, in case that installed battery runs low, is a spare battery.

Battery Management- Examples



Battery Management



Battery Management



Battery Management- Nickel Cadmium



Battery Management-Lead Acid



Best Practices

General Guidelines Applicable to All Batteries Regardless of Type or Size

- Only chemically compatible battery types should be packed in the same package. Do not mix acidic batteries with alkaline batteries.
- USDOT requires that all batteries be packaged in a manner to prevent short circuiting and damage to the terminals. Acceptable methods for short circuit prevention and terminal protection are described in the next section of this document
- Note that batteries with recessed terminals in which damage to the terminals or short circuits would not occur and those batteries that fall under the exception for 9-volts or less as described below do not require additional short circuit protection.
- All methods employed to protect from short circuit and to protect the terminals of the batteries must be adequate to withstand conditions normally incident to transportation. This includes the effects of shifting and vibration caused during transportation and subsequent handling
- All batteries should be stored in a cool, dry environment.
- Leaking batteries must be individually packaged and may require shipment as an EPA hazardous waste.

Best Practices



PREVENT SHORT CIRCUITS AND PROTECT BATTERY TERMINALS

All batteries with exposed terminals must be packaged in a manner to prevent short circuiting and with adequate protection of the battery terminals.

To prevent short circuiting the USDOT has identified the following methods as acceptable methods of short circuit protection:

1. Packaging each battery or each battery-powered device when practicable, in fully enclosed inner packaging made of non-conductive material.
2. Reattach the manufacturer's original terminal caps/covers and further secure the covers in place with tape if loose or seem likely to fall off during transportation/handling.
3. Separating or packaging batteries and battery-powered devices in a manner to prevent contact with other batteries, devices or conductive materials (e.g., metal) in the packaging.
4. Ensuring exposed terminals are protected with non-conductive caps, non-conductive tape, or by other appropriate means.
5. Proper insulation includes taping the terminals of the batteries or packaging in individual clear plastic bags.
6. Clear tape should be used for small batteries so that battery identification is still possible.



Best Practices

BATTERIES PACKED IN OUTER CONTAINERS

Multiple (chemically compatible) batteries may be packed together in a single outer packaging in accordance with the following requirements:

- Batteries with different DOT shipping names should not be combined in the same outer packaging unless authorized by the US DOT under specific packaging instructions or an exclusion from the regulations.
- Batteries must be packaged in a manner that meets or exceeds the battery specific packaging requirements specified within this document and all applicable regulations.
- Wet cell batteries must be placed in an upright position and secured from movement within the outer container.
- The outer container must be constructed of a material that is non-conductive and compatible with the battery chemistry.
- The total weight of the outer packaging must not exceed the weight rating tested for the container.

Best Practices



Best Practices

BATTERIES LOADED ONTO A PALLET

When loading batteries onto a pallet for transportation the following requirements must be followed:

- Batteries must be stacked on the pallet with the terminals protected from short-circuits with non-conductive caps, tape or other insulating material and facing away from touching terminals of other batteries.
- Layers of batteries with top facing terminals should be stacked in a manner that will protect the terminals from damage or breakage. Heavy batteries should always be placed on the lowest level to prevent crushing. Layers should be separated by waffle board or sheets of cardboard for stabilization and to help prevent short circuits.
- Batteries must be secured against movement or shifting on the pallet by nailing wooden cleats to the pallet.
 - Plastic banding or shrink-wrap of sufficient strength should be wrapped around the completed pallet to secure the batteries in place.
 - Banding must not be in a position in which it will come in contact with the battery terminals.
 - When using non-conductive banding to secure batteries to pallets, precautions should be taken to assure any metal clips used to connect the banding straps do not come in contact with exposed battery terminals.
- Pallets must be of good integrity with no broken or loose boards and must be sturdy and durable enough to handle the weight of the battery load.

Best Practices

WAFFLEBOARD OR SHEETS OF CARDBOARD*

BATTERIES

WAFFLEBOARD PREFERRED*

(MINIMIZES POTENTIAL FOR POST PENETRATION AND SHORT CIRCUIT)

BATTERIES

WAFFLEBOARD PREFERRED*

(MINIMIZES POTENTIAL FOR POST PENETRATION AND SHORT CIRCUIT)

BATTERIES

CARDBOARD

SKID BOARDS

RUNNERS

* See Item 4 and 7 under Stacking Pallet Instructions

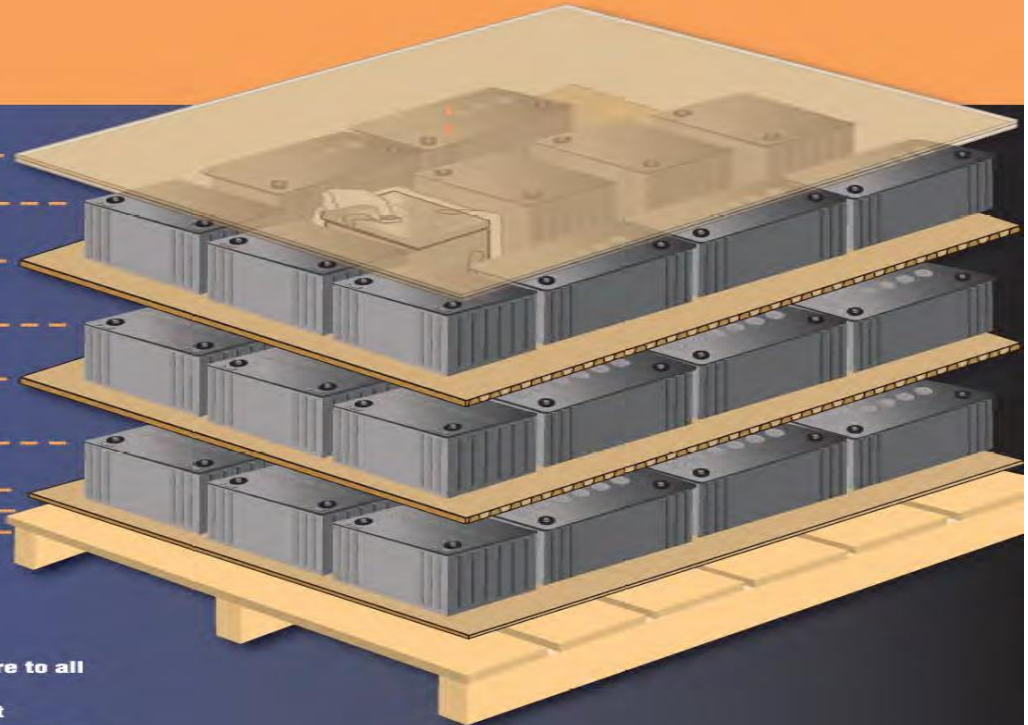
IMPORTANT GENERAL HANDLING REQUIREMENTS

Before handling battery/cell(s), please read and adhere to all of the following requirements:

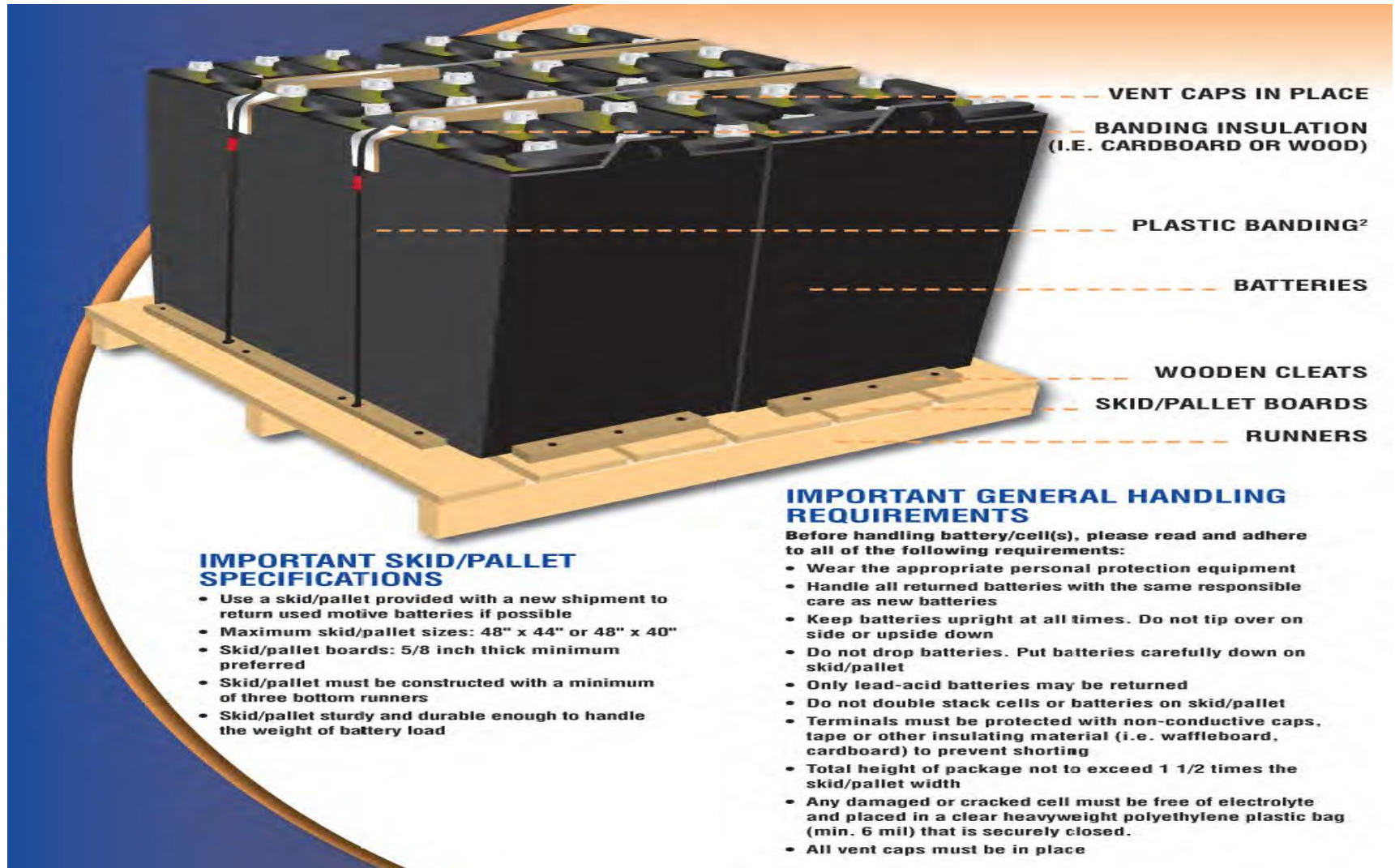
- Wear the appropriate personal protection equipment
- Handle all returned batteries with the same responsible care as new batteries
- Keep batteries upright at all times. Do not tip over on side or upside down (Except Non-Spillables)
- Do not drop batteries. Put batteries carefully down on skid/pallet
- Only lead-acid batteries may be returned
- Do not double stack cells or batteries on skid/pallet
- Terminals must be protected with non-conductive caps, tape or other insulating material (e.g. waffleboard, cardboard) to prevent shorting
- Total height of package not to exceed 1 1/2 times the skid/pallet width
- Any damaged or cracked cell must be free of electrolyte and placed in a heavyweight clear polyethylene plastic bag (min. 6 mil) that is securely closed.
- All vent caps must be in place

IMPORTANT SKID/PALLET SPECIFICATIONS

- Use a skid/pallet provided with a new shipment to return used motive batteries if possible
- Maximum skid/pallet sizes: 48" x 44" or 48" x 40"
- Skid/pallet boards: 5/8 inch thick minimum preferred
- Skid/pallet must be constructed with a minimum of three bottom runners
- Skid/pallet sturdy and durable enough to handle the weight of battery load



Best Practices



Q&A



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