



U.S. Department  
of Transportation  
**Pipeline and Hazardous  
Materials Safety  
Administration**

1200 New Jersey Avenue, SE  
Washington, DC 20590

August 19, 2021

Mr. Paul D. Johnson  
Executive Director of Environmental Affairs  
KBI  
125 E Commercial St. A  
Anaheim, CA 92801

Reference No. 21-0058

Dear Mr. Johnson:

This letter is in response to your May 24, 2021, email requesting clarification of the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) applicable to packing lithium batteries in oil. Specifically, you request that we remove Letter of Interpretation (LOI) 15-0100 from the PHMSA website because you believe the guidance provided in that letter may encourage shippers to offer packages into transportation that do not conform to the HMR's lithium battery packaging requirements.

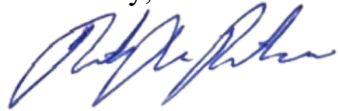
As stated in LOI 15-0100, placing lithium cells or batteries into a container filled with oil is not—on its own—sufficient to meet the lithium battery packaging requirements in § 173.185 when shipping for either purposes of disposal or recycling, or when shipping damaged, defective, or recalled batteries. In accordance with § 173.185(b)(3)(i) and (f)(1), each lithium cell and battery must be placed in a non-metallic inner packaging. Placing a cell or battery into a container filled with oil without first placing it into a non-metallic inner packaging is not sufficient to meet the packaging requirements of the HMR.

It is the responsibility of the shipper to ensure lithium cells and batteries are packaged in such a way to prevent damage from shifting during transportation. Packaging those lithium cells and batteries in oil may assist in preventing damage from shifting; however, consideration must be made on the potential for short circuiting as well as compliance with additional packaging requirements. Placement of lithium batteries in oil is not prohibited by the HMR. We emphasize that as stated in LOI 15-0100, in accordance with § 173.185(b)(3)(i) and (f)(1), lithium batteries must be placed in a non-metallic inner packaging that completely encloses the cells or batteries.

Placing a lithium cell or battery into a container filled with oil unprotected by an inner packaging does not meet this requirement.

I hope this information is helpful. Please contact us if we can be of further assistance.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Dirk Der Kinderen', written in a cursive style.

Dirk Der Kinderen  
Chief, Standards Development Branch  
Standards and Rulemaking Division

**From:** [INFOCNTR \(PHMSA\)](#)  
**To:** [Dodd, Alice \(PHMSA\)](#)  
**Cc:** [Hazmat Interps](#)  
**Subject:** FW: Request for clarification on lithium battery packaging in oil  
**Date:** Tuesday, May 25, 2021 2:24:33 PM  
**Attachments:** [PHMSA Request for clarification on Li batteries in Oil 5 21 21.pdf](#)  
[DOT Lol 173.185 Li batts in oil in word.docx](#)  
[image001.png](#)

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Patrick

Hi Alice,

Please see the attached LOI request.

Let us know if you need anything else.

Regards,

-Breanna

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**From:** Paul Johnson [mailto:pjohnson@kbirecycling.com]  
**Sent:** Monday, May 24, 2021 4:05 PM  
**To:** INFOCNTR (PHMSA) <INFOCNTR.INFOCNTR@dot.gov>  
**Subject:** Request for clarification on lithium battery packaging in oil

**CAUTION:** This email originated from outside of the Department of Transportation (DOT). Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Sir/Madam,

Please find attached the request for clarification on PHMSA Interpretation letter reference No. 15-0100.

Thanks and regards,



[www.kbirecycling.com](http://www.kbirecycling.com)

125 E Commercial St. A  
Anaheim, CA 92801

**Paul Johnson**  
Executive Director, Environmental Affairs

**Phone:** 714-738-8516  
**Mobile:** 714-588-2704  
**Email:** [pjohnson@kbirecycling.com](mailto:pjohnson@kbirecycling.com)

**Affiliates**  
[retrievtech.com](http://retrievtech.com)  
[biggreenbox.com](http://biggreenbox.com)

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May 24, 2021

Office of Hazardous Materials  
Pipeline and Hazardous Materials Safety Administration  
U.S. Department of Transportation  
1200 New Jersey Avenue, SE  
Washington, DC 20590

Attention: Regulatory Guidance  
Re: 49CFR 173.185 Interpretation Reference No. 15-0100 Dated Oct 21, 2015

Dear Madam/Sir,

This is a request for clarification on the interpretation letter issued October 21, 2015 regarding the use of oil as a packaging medium for damaged and defective batteries or batteries otherwise being shipped for disposal or recycling. (See DOT Letter Reference No. 15-0100.)

In your response the May 26, 2015 request you stated.

*"The method described in your letter is partially compliant with the requirements for offering lithium cells or batteries for disposal or recycling as described in § 173.185(d). **The use of mineral oil effectively prevents movement of the cells or batteries in the package and prevents short circuiting between batteries in the package.** [Emphasis added.] Lithium cells and batteries shipped for disposal or recycling are excepted from the design testing and record keeping requirements of § 173.185(a) and the UN specification packaging requirements of § 173.185(b)(3)(ii). However, in accordance with § 173.185(b)(3)(i), the cells and batteries must be placed in non-metallic inner packages that completely enclose the cells or batteries and separate the cells or batteries from contact with equipment, other devices, or conductive material in the packaging. Based on the information provided in your letter it does not appear that the packing method described in your letter addresses the requirement to place the cells in non-metallic inner packages that completely surround the cells or batteries."*

#### Background

KBI is a RCRA Permitted Part B recycling facility specializing in battery and precious metals recycling. Lithium battery packaging and the safe and compliant transportation of these batteries is an important part of our business. We are routinely questioned about battery packaging and on occasion have been presented with batteries that have been packaged in oil. We want to ensure that we are training our employees and providing our clients with current and accurate information on this topic.

Recently, a national environmental services company began advising generators to package discarded lithium battery "in oil". This may be for two reasons. First, Lithium metal in batteries is thought to be a class 4 flammable metal, dangerous when wet rather than class 9. Second, this is done to avoid the cost and time required to individually insulate and package each battery as described in the HMR.

INTEGRATED RECYCLING SOLUTIONS

125 E. Commercial St. A · Anaheim CA 92801 · P 800.548.8797 · F 714.773.4830 · [kbi recycling.com](http://kbi recycling.com)

During my research on the effectiveness of the environmental services company's recommendations, I came across the PHMSA interpretation listed above. The interpretation appears to endorse the concept of packaging lithium batteries in oil, although, not exactly as described by the original request.

#### Observation

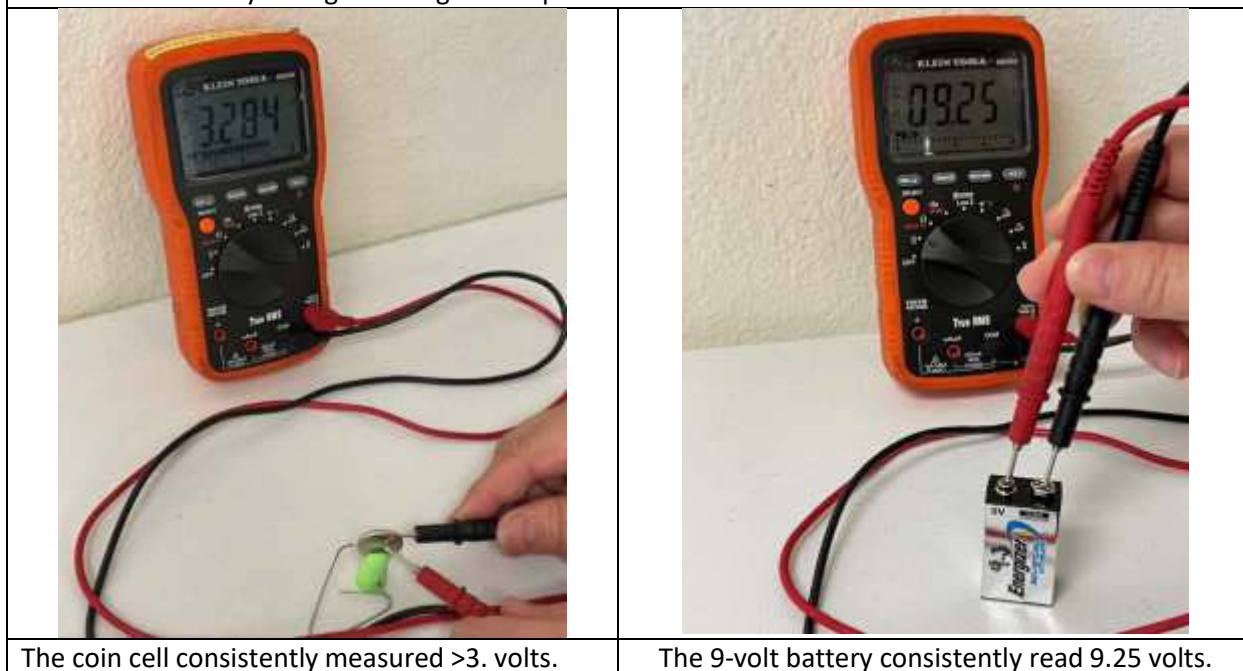
It is our observation that the practice of packaging lithium batteries in oil is not compliant with 49 CFR 173.185 or 173.21 for the reasons listed below. We are, therefore, requesting you remove the above-referenced interpretation letter from PHMSA's public website or modify it based on the reasons outlined below.

1. Oil does not effectively insulate a battery terminal from creating a circuit that can ultimately generate heat or thermal runaway.
2. Oil does not prevent movement within the package.
3. Oil provides additional fuel in a thermal event.

The photos below demonstrate oil is an ineffective packaging material for lithium batteries.



The materials used include a clear glass jar, food grade mineral oil with a flash point of  $>350^{\circ}\text{F}$  and a voltmeter. Commercially available 9 volt and standard CR2032 coin cells were chosen from an inventory of discarded batteries shipped for recycling. These batteries were in a full state of charge as demonstrated by voltage readings taken prior to the demonstration.



The coin cell consistently measured  $>3$ . volts.

The 9-volt battery consistently read 9.25 volts.



The cell was submerged in oil for approximately 1 minute. Once submerged, the voltage was measured by placing the negative probe of the voltmeter on the back of the cell and placing the positive probe on the edge or positive side of the cell. The cell constantly provided >3 Volts. The measurement was repeated several times and yielded a similar result, regardless, of the orientation of the battery.



The 9-volt battery was placed into the oil and again, after approximately 1 minute, the voltage measured was identical to the dry reading. This was repeated several times with identical results demonstrating that the oil does not provide insulation from the current. Even though the oil itself is not conductive, it does not insulate the battery terminals.





Four batteries were placed into a jar partially filled with oil to demonstrate that the oil cannot prevent movement within a package incidental to transportation. When the jar is tilted, even slightly, the batteries easily slide to one side of the container. We can assume that inner packages will react similarly if submerged in oil within a container.



In the last demonstration, we placed a randomly selected group of batteries into a jar. The batteries may still become oriented such that the terminals could make contact. Insulated batteries were chosen as a safety precaution for the demonstration. However, our experience is that most generators assume (based on previous guidance) that the oil provides insulation and are placing the batteries directly into a container. We also found that the oil prevents most adhesives from adhering to the batteries, thus further exposing the terminals to contact within the container.

The high energy density within lithium batteries represents a potential hazard during transportation when not packaged in a manner that prevents short circuit, movement, or activation of equipment containing lithium batteries. If a short occurs because of uninsulated batteries it could result in thermal runaway<sup>1</sup>. The heat generated from a battery during internal decomposition can propagate to other cells within a package. Research on lithium battery fires and the resulting debris generated from a thermal event demonstrates that temperatures reach the melting point of copper foil within the battery<sup>2</sup>. This indicates that local internal temperature in a lithium battery fire can exceed 1800 °F, (copper melts at 1985 °F.). Since mineral oil has a flash point below 500°F, even high temp oils may achieve auto ignition. Therefore, the oil provides additional fuel that may spread the fire to adjacent areas if released during a fire.

For these reasons, we hope that you will concur with our concern that packaging lithium batteries in oil is not compliant with the HMR and may potentially exacerbate a thermal event.

We look forward to hearing from you on this matter. If you have any questions concerning the information within, please contact my office at (714) 738-8516.

Respectfully submitted,

Paul D. Johnson  
Executive Director of Environmental Affairs  
KBI

cc; George Kerchner, Wiley Rein LLP

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<sup>1</sup> This is when the electrodes decompose, liberating gas vapors, and the internal structures of the cell collapses. Often resulting in the rapid deconstruction of the battery

<sup>2</sup>Temperature effect and thermal impact in lithium-ion batteries: A review A123 Systems Research Center, 200 West Street, Waltham, MA 02451, USA



U.S. Department  
of Transportation

Pipeline and Hazardous  
Materials Safety  
Administration

1200 New Jersey Avenue, SE  
Washington, D.C. 20590

OCT 2 1201

Mr. Richard Weinberger  
Lab Department Engineer  
Rayovac Corporation  
Portage, WI 53901

Reference No. 15-0100

Dear Mr; Weinberger:

This is in response to your May 26, 2015 email and subsequent telephone conversation with a member of my staff requesting clarification of the requirements for shipping dented or damaged lithium metal batteries in accordance with the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180). In your email you state that damaged or dented lithium metal batteries are collected in a 30-gallon drum and filled with mineral oil. After reviewing the regulations in § 173.185 for damaged, defective, or recalled batteries you ask if the regulations for damaged and defective batteries are in addition to the regulations for lithium batteries shipped for disposal and whether the method described in your letter is compliant with the HMR.

The regulations for shipping damaged, defective, or recalled batteries are separate from the regulations for lithium batteries shipped for disposal or recycling. The regulations in § 178.185(d) and (f) are intended to address specific cases as identified in the introductory text to those paragraphs.

The method described in your letter is partially compliant with the requirements for offering lithium cells or batteries for disposal or recycling as described in § 173.185(d). The use of mineral oil effectively prevents movement of the cells or batteries in the package and prevents short circuiting between batteries in the package. Lithium cells and batteries shipped for disposal or recycling are excepted from the design testing and record keeping requirements of § 173.185(a) and the UN specification packaging requirements of § 173.185(b)(3)(ii). However, in accordance with § 173.185(b)(3)(i), the cells and batteries must be placed in non-metallic inner packages that completely enclose the cells or batteries and separate the cells or batteries from contact with equipment, other devices, or conductive material in the packaging. Based on the information provided in your letter it does not appear that the packing method described in your letter addresses the requirement to place the cells in non-metallic inner packages that completely surround the cells or batteries.

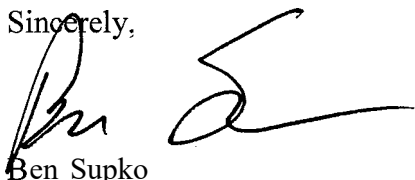
The method described in your letter is not compliant with the requirements for offering damaged lithium cells and batteries as described in § 173.185(:). The regulations for the shipment of damaged lithium cells and batteries found in § 173.185(f) apply to cells and batteries that have been damaged, or identified by the manufacturer as being defective for

safety reasons, that have the potential for producing a dangerous evolution of heat, fire or short circuit. Such cells and batteries must be placed in individual, non-metallic inner packaging that completely encloses the cell or battery. The inner packaging must be surrounded by cushioning material that is non-combustible, non-conductive, and absorbent. Finally, each inner package must be individually placed into one of the specific outer packagings identified in § 173.185(±).

You may apply to PHMSA for permission to use an alternate means to package damaged lithium cells and batteries under the terms of a special permit. To apply, you must submit an application to the Associate Administrator for Hazardous Materials Safety that conforms to the requirements prescribed in 49 CFR Part 107, Subpart B. In your application, you must provide justification that the method you are considering achieves a level of safety that is equal to or greater than that required under the HMR. You may obtain information on the special permit and approvals applications process from our website at <http://www.phmsa.dot.gov/hazmat/regs/sp-a>, or by calling PHMSA's Approvals and Permits Division at (202) 366-4511.

I trust this information is helpful. If you have further questions, please do not hesitate to contact this office.

Sincerely,

A handwritten signature in black ink, appearing to read 'Ben Supko', with a stylized flourish extending to the right.

Ben Supko  
Senior Regulations Officer  
Standards and Rulemaking Division

Leary  
173.185(F)  
Lithium Batteries  
15-0100

**Goodall, Shante CTR (PHMSA)**

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**From:** Kelley, Shane (PHMSA)  
**Sent:** Tuesday, May 26, 2015 4:55 PM  
**To:** Goodall, Shante CTR (PHMSA); Dodd, Alice (PHMSA)  
**Subject:** FW: Lithium Metal Cell Shipping Regulations

Hi Shante and Alice,

Can we log in this request for an interp from Mr. Weinberger please? We'd like it assigned to PHH-13. Thank you

**From:** Leary, Kevin (PHMSA)  
**Sent:** Tuesday, May 26, 2015 1:55 PM  
**To:** Kelley, Shane (PHMSA)  
**Cc:** Pfund, Duane (PHMSA)  
**Subject:** FW: Lithium Metal Cell Shipping Regulations

Another question on "damaged" batteries. There is a growing need to clarify our position on how the damaged/defective batteries provisions should be implemented. The presence of requirements for damaged batteries continues to lead people in the direction that any damage is damage that have the potential to produce dangerous heat, fire or short circuit. The attached letter in question and answer 3) touches on the idea that "damage" requiring treatment under the provisions of § 173.185(f) is linked to the likelihood that the damage will produce dangerous heat fire or short circuit in transit.

I recommend assigning this letter for a written response so that we can properly coordinate.

Kevin

**From:** Weinberger, Richard [mailto:richard.weinberger@spectrumbrands.com]  
**Sent:** Tuesday, May 26, 2015 12:56 PM  
**To:** Leary, Kevin (PHMSA)  
**Subject:** Lithium Metal Cell Shipping Regulations

Hello Kevin,

My name is Rick Weinberger and I handle the environmental system for Rayovac in Portage, WI. I was hoping to get clarification on the new Lithium DOT regulations. At our facility, any dented or damaged lithium metal batteries had been collected in a 30 gallon steel drum filled with oil. After looking at the new DOT regulations of damaged lithium cells, our disposal company raised concerns with this method.

Would this still be a viable option for our facility or are we now required to individually package each lithium cell in a vacuum packed bag with something like Argon? Are the rules for "lithium cells shipped for disposal" in addition to the regulations for "damaged, defective, or recalled batteries"?

This would obviously be problematic for our facility as we produce hundreds of thousands of damaged or tested cells each year. If you could get back to me at your earliest convenience I would greatly appreciate it.

Thank you,

Rick Weinberger  
Lab Department Engineer

**Regulations in question:**

- (f) *Damaged, defective, or recalled cells or batteries.*
- Lithium cells or batteries, that have been damaged or identified by the manufacturer as being defective for safety reasons, that have the potential of producing a dangerous evolution of heat, fire, or short circuit (e.g. those being returned to the manufacturer for safety reasons) may be transported by highway, rail or vessel only, and must be packaged as follows:
  - Each cell or battery must be placed in individual, non-metallic inner packaging that completely encloses the cell or battery;
  - The inner packaging must be surrounded by cushioning material that is non-combustible, non-conductive, and absorbent; and
  - Each inner packaging must be individually placed in one of the following packagings meeting the requirements of part 178, subparts L and M, of this subchapter at the Packing Group I level:
    - Metal (4A, 4B, 4N), wooden (4C1, 4C2, 4D, 4F), or solid plastic (4H2) box;
    - . Metal (1A2, 1B2, 1N2), plywood (1D), or plastic (1H2) drum; and
- The outer package must be marked with an indication that the package contains a "Damaged/defective lithium ion battery" and/or "Damaged/defective lithium metal battery" as appropriate.
- (d) *Lithium cells or batteries shipped for disposal or recycling.*
- A lithium cell or battery, including a lithium cell or battery contained in equipment, that is transported by motor vehicle to a permitted storage facility or disposal site, or for purposes of recycling, is **excepted** from the testing and recordkeeping requirements of paragraph f and the specification packaging requirements of paragraph of this section, when packed in a strong outer packaging conforming to the requirements of §§ 173.24 and 173.24a. A lithium cell or battery that meets the size, packaging, and hazard communication conditions in \_\_\_\_\_ of this section is excepted from subparts C through H of part 172 of this subchapter.

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