U.S. Department
of Transportation

**Pipeline and Hazardous
Materials Safety
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

December 12, 2023

Vincent M. Melillo
Wabtec Corporation
2901 East Lake Road
Erie, PA 16531

Reference No. 23-0088

Dear Mr. Melillo:

This letter is in response to your October 5, 2023, email requesting clarification of the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) applicable to lithium batteries. You provide schematics for a lithium ion battery pack design that weighs approximately 1600 lbs, with a completely enclosed fiberglass-resin composite casing comprised of "end cap" housings and "covers" with a nominal thicknesses of 0.20 inch and 0.13 inch respectively. The end caps are mounted and sealed to the ends of the covers at each end with an aluminum chill plate and the covers are mounted and sealed against the top and bottom faces of the aluminum chill plate. When fully assembled, the battery pack is sealed. You ask for confirmation that the battery pack design described above, and illustrated in the schematics you provided, would meet the requirement in § 173.185(b)(5) to have a "strong, impact-resistant outer casing."

Based on the information in the schematics you provided, it is the opinion of this Office that the battery pack design meets the performance standard of a strong, impact-resistant outer casing as specified in § 173.185(b)(5).

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

Sincerely,

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

Cardeez

23-0088

**From:** INFOCNTR (PHMSA)
**To:** Dodd, Alice (PHMSA)
**Cc:** Hazmat Interps
**Subject:** FW: Interpretation and Application of 49 CFR § 173.185(b)(5)
**Date:** Friday, October 6, 2023 10:52:37 AM
**Attachments:** image001.png
WABTEC BATTERY PACK DESIGN (97 & 83 kWH) OVERVIEW - 2023-10-05.pdf

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Hello Alice,

Please see the below interpretation request. Let us know if you need anything.

Sincerely,
Janaye

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**From:** Melillo, Vincent <vincent.melillo@wabtec.com>
**Sent:** Thursday, October 5, 2023 4:22 PM
**To:** INFOCNTR (PHMSA) <INFOCNTR.INFOCNTR@dot.gov>
**Cc:** Perumal, Durai <durai.perumal@Wabtec.com>
**Subject:** Interpretation and Application of 49 CFR § 173.185(b)(5)



To Whom This May Concern at the Hazardous Materials Information Center,

Wabtec Corporation kindly requests an interpretation of 49 CFR § 173.185(b)(5) and the applicability of this clause to our battery pack design. Our Li-ion battery pack is designed to be incorporated into Freight and Diesel Locomotives, creating Battery Electric and Hybrid Locomotives.

An interpretation of 49 CFR § 173.185(b)(5) would be helpful due to our desire to transport our Li-ion battery packs to customer service facilities as new replacement packs for our customers' battery electric locomotives (We understand that used/defective/damaged batteries have different packaging requirements).

We're working with packaging companies to develop dunnage to safely ship our battery pack. However, we were recommended by consultant Lion Technology (Located in Sparta, NJ) to acquire an interpretation of 49 CFR § 173.185(b)(5) and whether our battery pack meets the requirements of this clause, specifically the "strong, impact-resistant outer casing" requirement.

I've included an overview of our battery pack design in the presentation attached to this email. If you have any questions about the design specifics or require additional images for clarity, please do not hesitate to contact me.

Lastly, if you could provide approximately how long an interpretation may take, that would allow us

to design our dunnage and plan validation testing, if the interpretation requires.

**Vincent M. Melillo**
Lead Energy Storage Packaging Design Engineer

Wabtec CORPORATION
2901 East Lake Road
Erie, PA 16531

# WABTEC BATTERY PACK OVERVIEW

## 97 kWh / 83 kWh

VINCENT M. MELILLO

10/05/2023

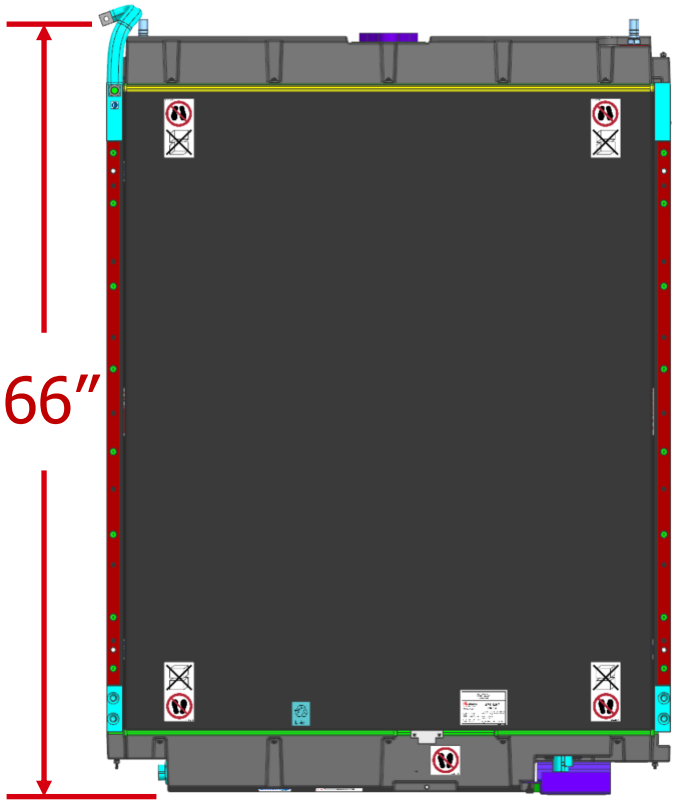


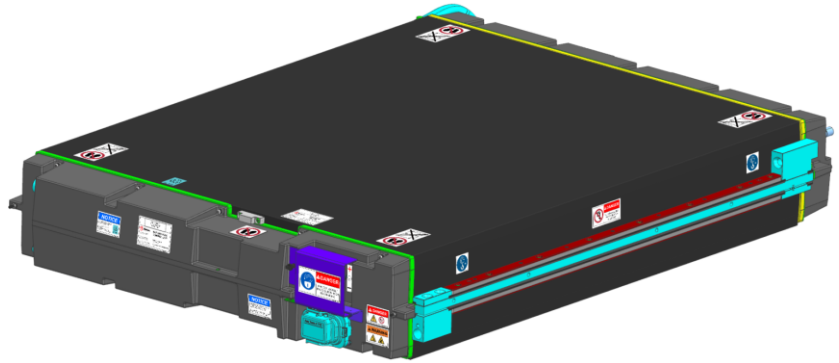
Wabtec CORPORATION

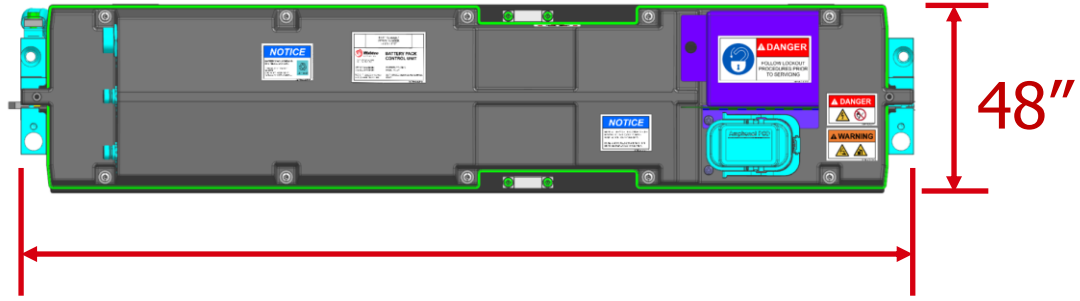
# Battery Pack Designs - Overview

- Wabtec has designed the following battery packs for our next generation of locomotives - Battery Electric Locomotives (BELs) and Hybrid Locomotives
- Height and width of both battery packs are consistent – 97 kWh Battery Pack is approximately 7” longer than 83 kWh Battery Pack

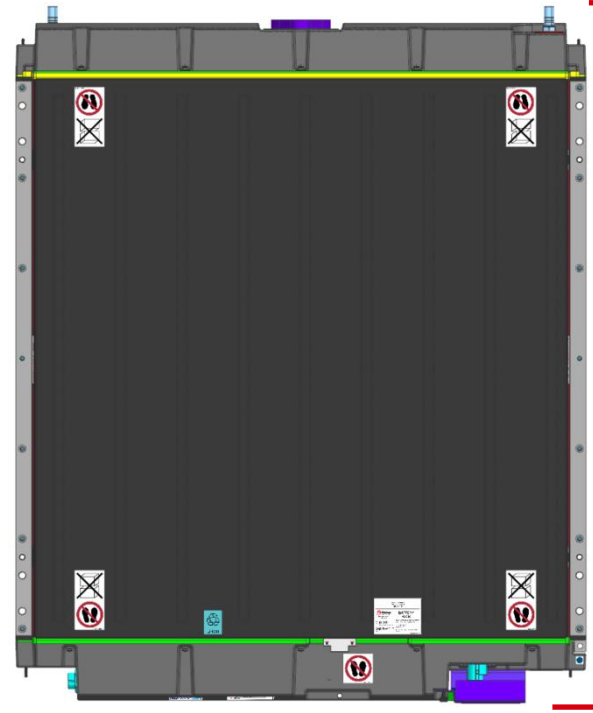
## 97 kWh Battery Pack






## 83 kWh Battery Pack



# Battery Pack Designs - Overview

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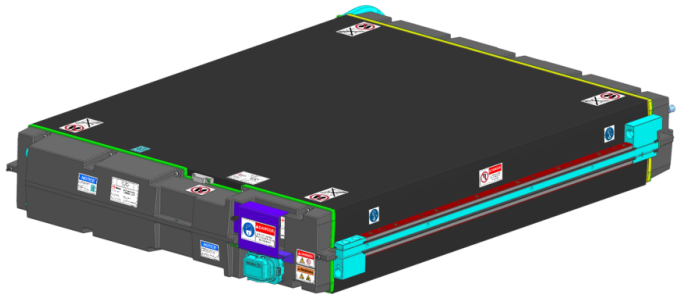

## 97 kWh Battery Pack

LABEL HERE

Wabtec CORPORATION

2901 EAST LAKE ROAD
ERIE, PA 16531 USA

**BATTERY PACK**

357 VDC MAXIMUM
312 ADC MAXIMUM
312 AH / 97 KWH NOMINAL

WEIGHT: 1600 LBS (726 KG)
LIQUID COOLED
IP67

SECONDARY LITHIUM ION BATTERY
INMCP/12/104/310/[(6P2S)42S]M/-30+30/95

PATENTS PENDING
MADE IN USA

**AUTHORIZED SERVICE PERSONNEL ONLY.**

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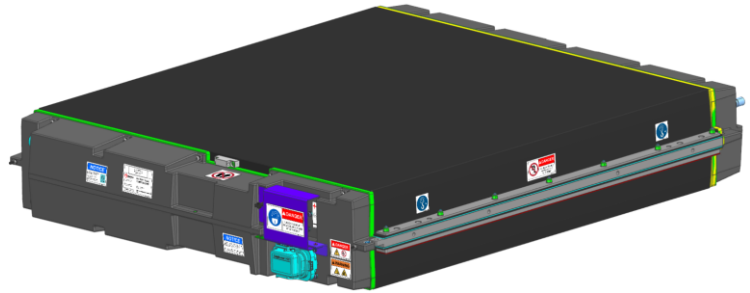


## 83 kWh Battery Pack

Wabtec CORPORATION

2901 EAST LAKE ROAD
ERIE, PA 16531 USA

**BATTERY PACK**

307 VDC MAXIMUM
312 ADC MAXIMUM
312 AH / 83 KWH NOMINAL

WEIGHT: 1400 LBS (635 KG)
LIQUID COOLED
IP67

SECONDARY LITHIUM ION BATTERY
INMCP/12/104/310/[(6P2S)36S]M/-30+30/95

PATENTS PENDING
MADE IN USA

**AUTHORIZED SERVICE PERSONNEL ONLY.**

84B564242P16

# 49 CFR § 173.185(b)(5)

- Interpretation of 49 CFR § 173.185(b)(5) and whether Wabtec battery packs meet the requirements will impact the design of dunnage/packaging for new battery pack shipments

- 49 CFR § 173.185(b)(5) states:

Lithium batteries that…

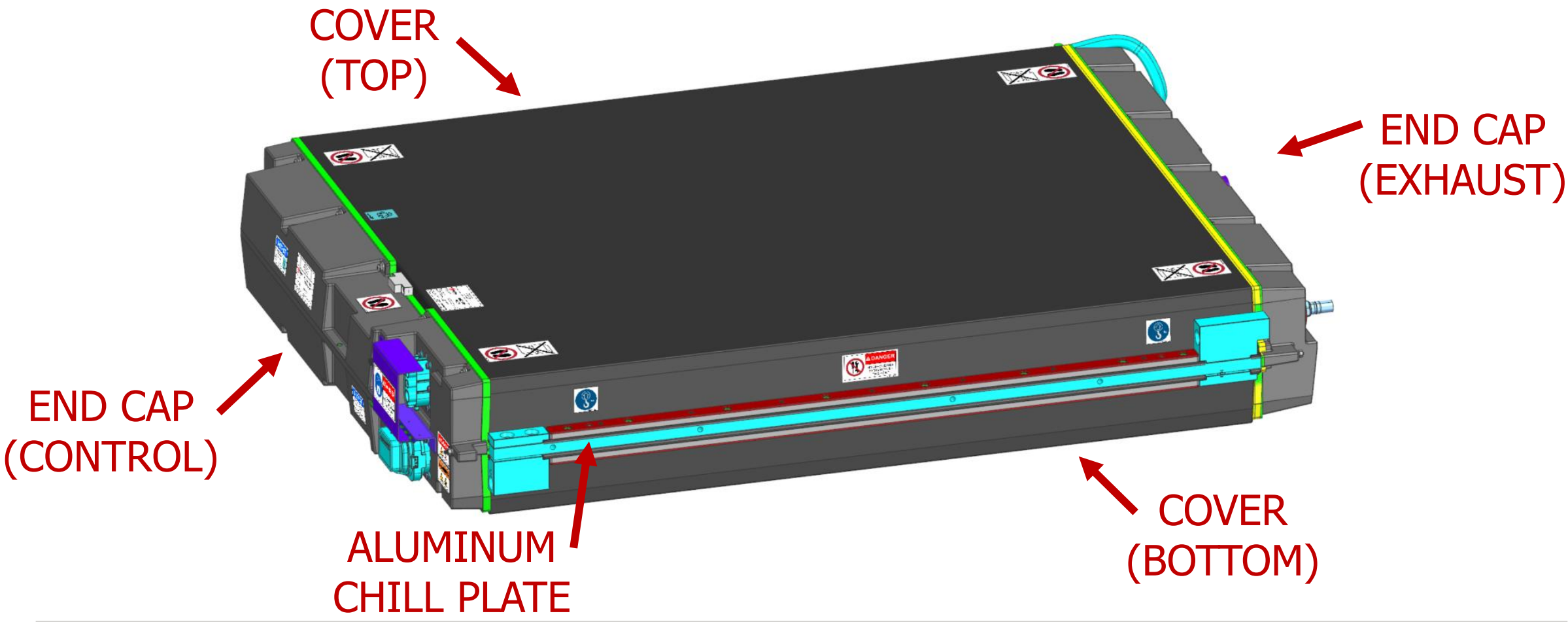
| | | |
|---|---|---|
| weigh 12 kg (26.5 pounds) or more | ✓ | (97 kWh = 1600 lbs; 83 kWh = 1400 lbs) |
| have a **strong, impact-resistant** outer casing | ? | (Wabtec requires Interpretation) |

may be packed in strong outer packagings; in protective enclosures (for example, in fully enclosed or wooden slatted crates); or on pallets or other handling devices, instead of packages meeting the UN performance packaging requirements in paragraphs (b)(3)(ii) and (iii) of this section. Batteries must be secured to prevent inadvertent shifting, and the terminals may not support the weight of other superimposed elements. Batteries packaged in accordance with this paragraph may be transported by cargo aircraft if approved by the Associate Administrator.

- Please note: Wabtec does not intent to transport battery packs by aircraft (at this time)

# “Outer Casing” of Battery Pack

- The “End Cap” housings and the “Covers” of are made of a tough fiberglass-resin composite with a nominal thicknesses of 0.20” and 0.13” respectively.
- The End Caps are mounted and sealed to the ends of the Covers at each end of the aluminum chill plate; the Covers are mounted and sealed against the top and bottom faces of the aluminum chill plate
- When fully assembled, the battery pack is sealed and rated to IP67 (Test Results Pending)



# Validation Testing

- Wabtec's Battery Pack Validation Plan includes, but is not limited to, the following Validation Tests that will validate the mechanical integrity of the Battery Pack:

| TEST NAME | DUT | STATUS |
|---|---|---|
| UN 38.3 Transport Test* | MODULE | COMPLETE, ANALYZING RESULTS |
| Impact Test (IAW IEC 62619) | MODULE | SCHEDULED |
| Service Height Drop Test (IAW SAE J2929; J2464: 1m) | BATTERY PACK | COMPLETE, ANALYZING RESULTS |
| Corner Drop/Bump Test (IAW IEC 62619) | BATTERY PACK | SCHEDULED |
| Environmental Qualification Testing (IAW IEC 61373) | BATTERY PACK | SCHEDULED |
| Temperature Extremes (IAW 62619) | MODULE | SCHEDULED |
| Temperature Cycling (IAW Wabtec Internal Environmental Standards) | BATTERY PACK | SCHEDULED |
| Various Thermal Runaway Tests | CELL<br>MODULE<br>BATTERY PACK | IN PROCESS |
| Ingress Protection (IP67 - IAW IEC 60529) | BATTERY PACK | SCHEDULED |
| *Successful UN 38.3 Testing is required for battery pack transport | | |

# Wabtec Battery Pack Images

# Wabtec Battery Pack Images


Wabtec
CORPORATION