



U.S. Department  
of Transportation

Pipeline and Hazardous  
Materials Safety  
Administration

1200 New Jersey Avenue, SE  
Washington, DC 20590

APR 06 2017

Mr. Keegan Ritchie  
RDD Engineering Technologist  
Baker Hughes – Pipeline Inspection  
4839 90<sup>th</sup> Avenue S.E.  
Calgary, Alberta T2C2S8  
Canada

Reference No. 16-0155

Dear Mr. Ritchie:

This letter is in response to your September 22, 2016, letter requesting clarification of the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) applicable to testing requirements for a lithium metal battery. Specifically, you ask if you can substitute the component cells in a lithium battery from one brand to another without having to retest the battery in accordance with Part III Sub-Section 38.3 of the United Nations (UN) Manual of Tests and Criteria.

According to your letter, you plan to change the component cells in your in-house assembled battery pack from one brand to another. Both the existing cells and the new cells are the same chemistry (Lithium Sulfuryl Chloride), the same shape and dimensions, and of a type proven to meet the tests in Sub-Section 38.3 of the UN Manual of Tests and Criteria. However, the lithium weight of the new cells decreases from 10.2 grams (existing cells) to 9.6 grams (new cells).

The provisions in Section 38.3.2.2 are intended to provide a tolerance for minor differences that may develop during the manufacture of otherwise identical cells or batteries. Using only the information you provide in your letter, this Office cannot make a determination that the new component cells are identical to the existing cells, as there are various features inherent to the new cells (such as diodes and a specific electrolyte) that may or may not be present in the existing cells.

Section 38.3.2.2 of the UN Manual of Tests and Criteria states for primary cells and batteries a change of 0.1 grams or 20% by mass—whichever is greater—to the cathode, the anode, or the electrolyte or any change to a lithium battery that would lead to failure of any of the tests prescribed in this section must be considered a new type and subjected to the required tests. Section 38.3.2.2 (c) also describes the types of changes that may be considered sufficiently different from a tested type so that it might lead to a failure of a lithium battery test result. These changes include but are not limited to the following:

- A change in the material of the anode, the cathode, the separator, or the electrolyte;
- A change of protective devices, including hardware and software;
- A change of safety design in cells or batteries, such as a venting valve;
- A change in the number of component cells; and
- A change in connecting mode of component cells.

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

Sincerely,

A handwritten signature in cursive script that reads "Duane A. Pfund". The signature is fluid and stylized, with a large initial "D" and a long, sweeping tail on the "f".

Duane A. Pfund  
International Standards Coordinator  
Standards and Rulemaking Division

Leary  
§173.185  
Batteries  
16-0155



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Calgary, Alberta T2C 2S8  
Canada  
Phone: 403.531.5300  
Fax: 403.236.8740  
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To whom it may concern,

We are requesting an interpretation letter for the following regulation (attached in email): UN 38.3 Rev 6.pdf Section 38.8.2.2 to confirm that substitution of an equivalent UN certified cell from a different manufacturer will allow our battery pack to retain its UN / DOT certification.

Our situation is as follows:

Baker Hughes is currently using an in-house assembled battery pack using primary cells that have been UN/DOT Certified. We plan on changing the cells in the pack from one brand to another, Electrochem to Vitzro Cell. The new cells are also UN/DOT Certified. The ONLY change aside from the brand of cell is the lithium weight decreases from 10.2g (Electrochem) to 9.6g (Vitzro Cell).

Keeping the current UN/DOT Certification for the existing battery pack design is important to us. Our interpretation is that since there is no change in chemistry and no substantial change in lithium mass. Please note no other features or design specs are changing (i.e. safety features or size of pack) then the certification would stay valid.

In conclusion, is our interpretation correct of 38.8.2.2 regarding the change in mass of lithium weight ("a change of more than 0.1g or 20% by mass, whichever is greater") for our situation.

Thank you in advance for your timely assistance.

Best regards,

**Keegan Ritchie** | RDD Engineering Technologist

Baker Hughes | Pipeline Inspection

Office: +1 403.531.5088

[Keegan.Ritchie@bakerhughes.com](mailto:Keegan.Ritchie@bakerhughes.com)

<http://www.bakerhughes.com> | *Enabling safe, affordable energy, improving people's lives*





## PIG Cell

**PN: 34-111-H100-001TC** (TERMINAL CAPPED)

**34-111-H100-001ST** (SOLDER TABBED)

## Lithium Sulfuryl Chloride Battery

3.9 V DD-Size Lithium Sulfuryl Chloride Cell (Li-SO<sub>2</sub>Cl<sub>2</sub>)

High Rate Capability

High Capacity

100 °C Operational Temperature

### Benefits

- 20% Higher Wh Capacity than Competitive Product
- High rate capability for high constant current and pulse applications
- Automated assembly for uniform performance
- Certified shock and vibration testing to ensure trouble free operation under severe conditions in process.
- Competitive price

### Key Features

- 304 L stainless steel structure
- Non-bulge design
- Hermetic glass-to-metal seal engineered for leak free operation
- Integral safety fuse and parallel diode to protect from short circuits and guarantee continued pack operation
- Electrode Surface Area, 441 cm<sup>2</sup> of common surface area: high rate capability & lower self-discharge.
- Gallium Based Electrolyte for improved performance.

### Technical Support

- We pledge our full support to provide you with the service you deserve
- Application Analysis
- Testing and Test Reports
- Analysis of field problems and reports
- Engineering support for custom applications

### Abuse and Transport Certifications

- UN / DOT Certified: Class 9 Transport, UN3090 Lithium Metal Batteries
- Shock Testing: 100G 6ms, 3 shocks each direction X-Y-Z axis, 6 shocks total per axis
- Vibration Testing: 20-500Hz 5 grms 3 hours on X-Y-Z axis

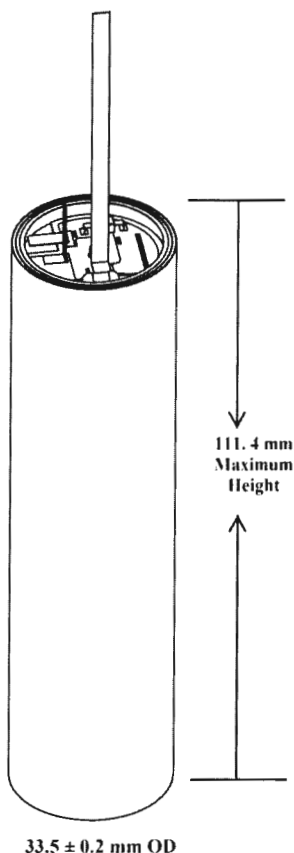
### Cell Characteristics

Nominal Capacity:	27 Ah – 32 Ah
-10 °C - 100°C	
Open Circuit Voltage Nominal	3.91 V
At 20°C	
Nominal Closed Circuit Voltage	3.5V
Based on stable CCV produced at 25 °C under a 600 mA load. The CCV of a cell will decay slightly over discharge due to the normal increase in internal impedance. CCV will also increase with operational temperature.	
Pulse Discharge Capability	6 A
6 Amp pulse discharge of 0.1 sec. duration once every 2 minutes at ≥75 °C will maintain > 3.0 V. Contact Vitzrocell USA to determine the effect of higher currents, longer duration pulses, or lower temperatures. In some cases a capacitor may be required to maintain the desired voltage.	
Constant Current Discharge	1000 mA (max capacity)
Maximum Constant Current Rate	4000 mA (reduced capacity)
Storage Conditions	30 °C (86 °F) Max
Operational Temperature Range	-20 °C to 100 °C
Note full capacity is obtained at temperatures of 25 °C and above. Below 25 °C both the rate capability and the capacity of the cell are reduced.	
Fuse:	7.0 A Littlefuse PICO II 251 Series
Parallel Diode:	8.0 A On Semi MBRD835L-D

### Physical Characteristics

Diameter	33.50 mm +0.5/-0.2 (1.32 in)
Height	111.9 mm +0.4/-0.4 (4.40 in)
Weight	213 ± 1 g
Lithium Metal Content	9.6 g

**Vitrocell USA PIG Lithium Sulfuryl Chloride Battery SPECIFICATIONS,**  
**PN: 34-111-H100**

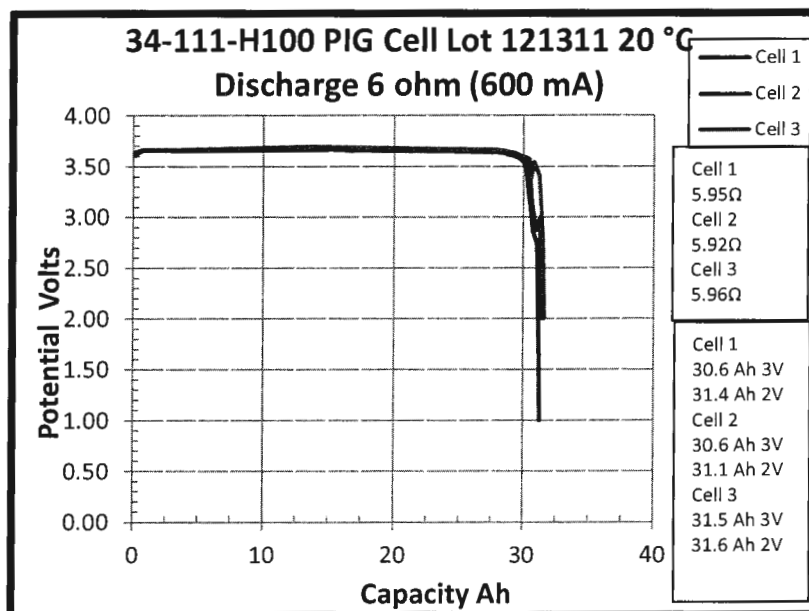
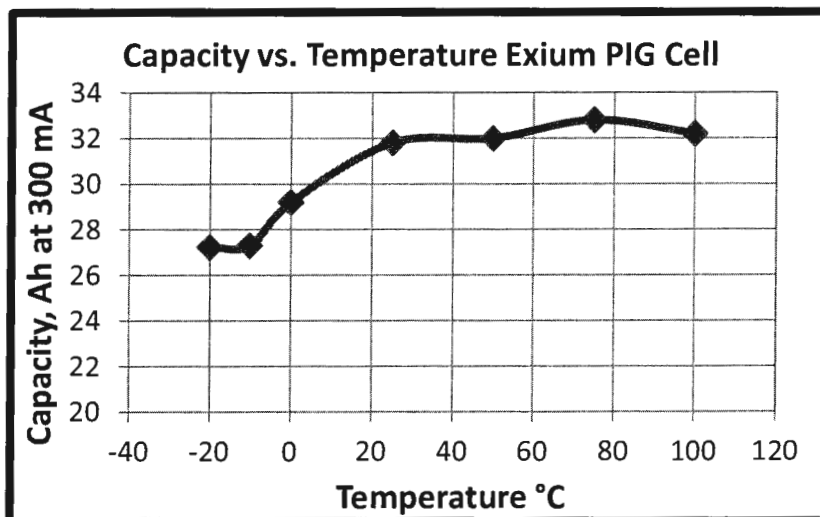


**Storage**

Store cells in a cool (<30 °C) and dry location

**Warning**

- Fire, explosion, and burn hazard
- Contents of this hermetically sealed cell are water reactive and will produce flammable and toxic gases if exposed to water
- Do not recharge, expose to flame, short circuit, crush, disassemble, or incinerate
- Do not expose cell to temperatures in excess of the maximum operating temperature, 100 °C



**Example Discharge Curve**

**Vitrocell USA, Inc.**

Houston, Texas USA  
 Calgary, AB Canada  
 Tel: (832) 850-7095  
 Mobile: (832) 851-3811  
 Email: [info@vitrocellusa.com](mailto:info@vitrocellusa.com)  
 Web: [www.vitrocellusa.com](http://www.vitrocellusa.com)

P/N:3B36  
CSC93

## HIGH PERFORMANCE LITHIUM CELL

SIZE  
DD

+ High Rate Capability

+ Lithium / Sulfuryl Chloride Chemistry

+ Custom terminations available

### CELL SPECIFICATIONS

Open Circuit Voltage (25° C)	3.9 V
Rated Discharge Current	1.0 A
Rated Capacity	30 Ah
Maximum Continuous Current	4.0 A
Cell Diameter	33.5 mm (1.32 in.)
Cell Length	111.4 mm (4.39 in.)
Cell Weight	213g
Lithium Weight	10.2g
Safety Fuse	7.0 A
Self Discharge	3% per year at 25°C
Operating Temperature	-20°C to +93°C -4°F to +200°F

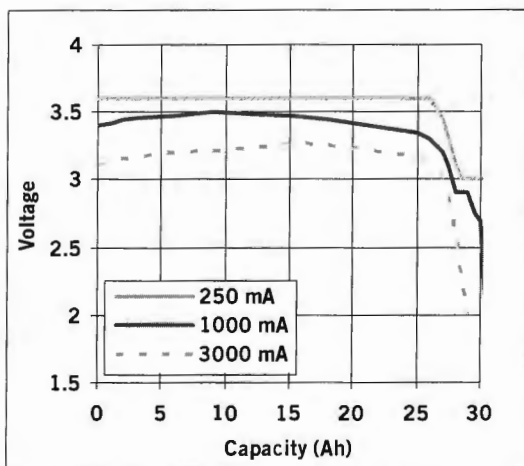
### OPERATING TEMPERATURE

93°C

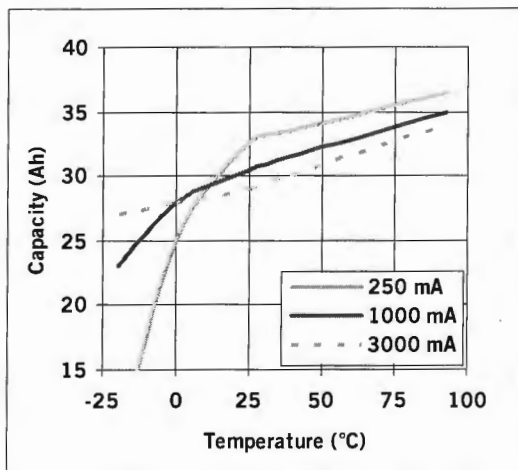
-20°C

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25°C discharge



Capacity as a function of  
current and temperature



+ 9645 WEHRLE DRIVE, CLARENCE, NEW YORK 14031  
+ 716.759.5800 TEL + 716.759.2562 FAX + WWW.ELECTROCHEMPOWER.COM  
+ SALES@ELECTROCHEMPOWER.COM + A DIVISION OF GREATBATCH LTD.



THE WORLD'S MOST RELIABLE > MOST DURABLE > LONGEST-LASTING > CELLS AND BATTERY PACKS