SAE International

SURFACE VEHICLE STANDARD

SAE J2185 FEB2012

Issued 1991-11
Revised 2012-02

Superseding J2185 SEP1997

(R) Life Test for Heavy-Duty Storage Batteries (Lead Acid Type only)

RATIONALE

A Rationale is required explaining why the document is being revised. Since the original publish date of this document there have been significant advancements in lead-acid storage battery technology for use in heavy-duty applications. This document addresses the key considerations for performing life test on different lead-acid battery technologies, specifically, flooded and valve-regulated types, and effects on the associated test methods.

1. SCOPE

This SAE Standard applies to lead-acid 12 V heavy-duty storage batteries as described in SAE J537 and SAE J930 for uses in starting, lighting and ignition (SLI) applications on motor vehicles and/or off-road machines. These applications have some of the following characteristics:

a. High levels of power are required to start the vehicle's internal combustion engine. The need to supply this power limits the maximum depth of discharge to a fraction of the total capacity of the battery. The battery must be maintained at a charge level sufficient to perform this primary function by vehicle's voltage-regulated charging system.

b. The vehicle's engine powers a voltage regulated charging system that limits the charging voltage when spinning at sufficient speed and when total loads do not exceed its output limits.

c. The battery is subject to deeper discharging than a typical automotive application as a result of the following conditions:

- High daily hours of use
- High numbers of starts per day
- Electrical loads often exceeding charging system output (at idle)

Batteries will be classified into two types for this life test. Type 1 applies to BCI group sizes typically with reserve capacity (RC) rating of 250 minutes or less. Type 2 applies to larger batteries typically with reserve capacity greater than 250 min.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: http://www.sae.org

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA). www.sae.org.

SAE J537 Storage Batteries

SAE J930 Storage Batteries for Off-Road Self-Propelled Work Machines

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA). www.sae.org.

SAE J240 Life Test for Automotive Storage Batteries

SAE J2801 Comprehensive Life Test for 12 V Automotive Storage Batteries

2.2.2 Battery Council Publication

Available from Battery Council International, 401 N. Michigan Ave., Chicago, IL 60611-4267, Tel: 312-644-6610. www.batterycouncil.org.

BCI Battery Technical Manual

3. DEFINITIONS

3.1 CCA

Cold Cranking Amperes at -18 °C as defined in SAE J537.

3.2 RC

Reserve Capacity in minutes at 25 °C as defined in SAE J537.

3.3 FLOODED LEAD-ACID BATTERY

A common type of lead-acid battery in which cell element is immersed in an excess amount of free-flowing sulfuric acid electrolyte.

3.4 VALVE-REGULATED LEAD-ACID (VRLA) BATTERY

A class of lead-acid batteries that uses a re-sealable one-way check valve to control the gassing pressure inside the battery. These batteries are characterized by the ability to operate under the oxygen recombination cycle. There are two main sub-classes of the VRLA battery, namely, Absorptive Glass Mat (AGM) Lead-Acid Battery, and Gel Lead-Acid Battery.

3.4.1 Absorptive Glass Mat (AGM) Lead-Acid Battery

A subclass of valve-regulated lead-acid (VRLA) battery in which the electrolyte is immobilized by the separator system by way of capillary action. The separator (system) typically comprises of microglass fibers that lead to the AGM in the subclass nomenclature.

3.4.2 Gel Lead-Acid Battery

A subclass of valve-regulated lead-acid (VRLA) battery in which the electrolyte is immobilized by the use of a gelling agent in the electrolyte.

4. TESTING PROCEDURE

4.1 The battery shall be pre-conditioned following the sequence of test prior to optional tests as shown in SAE J537 (Section 3.3, Table 1, Steps 1 through 8), and cycle life testing shall begin normally within sixty days of the final non-destructive test after the sequence. Overall battery age should be no more than 90 days from the date of manufacture to the start of the test unless previously agreed to by the test requesting activity or battery manufacturer.

4.2 Place the fully charged test battery in a water bath maintained at 50 °C ± 1.7 °C (122 °F ± 3 °F) throughout the duration of the life test.

4.3 The test is conducted on a weekly cycle as follows:

4.3.1 Alternate charging and discharging 26 times, starting with charge portion first.

4.3.1.1 Charge

a. Time: 2.5 h

b. Voltage: 14.80 V ± 0.05 V for flooded batteries, and not less than 14.0 V for VRLA batteries, unless previously agreed to by the test requesting activity or per the battery manufacturer's recommendation.

c. Type 1 maximum current: 25.0 A ± 0.10 A

d. Type 2 maximum current: 50.0 A ± 0.10 A

4.3.1.2 Discharge

a. Time: 1.0 h

b. Type 1 discharge current: 25.0 A ± 0.10 A

c. Type 2 discharge current: 50.0 A ± 0.10 A

4.3.2 Immediately after the 26th discharge, charge the battery as follows:

a. Time: 2.5 h

b. Voltage: 14.80 V ± 0.05 V for flooded batteries, and not less than 14.0 V for VRLA batteries, unless previously agreed to by the test requesting activity or per the battery manufacturer's recommendation.

c. Type 1 maximum current: 25.0 A ± 0.10 A

d. Type 2 maximum current: 50.0 A ± 0.10 A

4.3.3 After 4.3.2, to eliminate electrolyte stratification, charge flooded batteries as follows. It is acceptable to eliminate the charging step in 4.3.3 for VRLA batteries (see Section 4.3.4).

a. Time: 4.0 h

b. Type 1: 5.0 A ± 0.10 A or 1% of CCA rating

c. Type 2: 10.0 A ± 0.10 A or 1% of CCA rating

4.3.4 Rest the battery on open circuit at 50 °C for 57.5 to 68.0 h. For VRLA batteries that are not subjected to step 4.3.3, the rest period is 61.5 to 72 h at 50 °C.

4.3.5 Immediately after the rest period, discharge the battery at a rate equal to its -18 °C (0 °F) cold cranking rate in amperes (see SAE J537) for 50 s at 50 °C. The minimum battery voltage requirement at 50 s is 7.20 V.

4.3.6 Rest the battery on open circuit until the start of the next weekly cycle.

4.4 The life test shall be considered completed when the battery fails to meet the 7.20 V requirement during the 50 s discharge at the specified CCA rating or if the battery fails to sustain 10.5 V during the discharge cycles (4.3.1.2). The life shall be defined as the number of cycles that have successfully passed the weekly 50 s discharge requirements or cycles reached prior to failure to sustain 10.5 V during discharge. Cycles that occur during the week of failure should not be counted in the total. The cycle life may also be shown as total AH delivered by multiplying the number of discharge cycles by the discharge current corresponding to the battery type classification.

NOTE: On flooded batteries only, and in the absence of OEM manufacturer's guidance, periodically check and add water (see SAE J537) to maintain electrolyte levels prior to charging unless test sample is marked or identified as "maintenance free".

NOTE: Any water additions must be conducted using either distilled or de-ionized water. No use of tap water is allowed as it may introduce impurities which will adversely affect battery performance. Water addition amounts must be limited to the level prior to the start of battery testing and should not be overfilled. Contact the battery manufacturer to confirm initial/factory acid levels if necessary. A short mixing charge should be conducted following any water additions.

4.5 Post test teardown analysis (optional). If a teardown is requested to determine failure mode, the teardown analysis should be completed within 60 days of test completion with a fully charged sample, if battery condition permitted.