SECTION 263323.11-S4- STANDARD SPECIFICATION FOR A 120V (10 X 12V) VRLA AGM BATTERY SYSTEM FOR A TRACTION POWER SUBSTATION

NOTE:

This Standard Specification is revision-controlled. ALL edits to this Standard Specification require the review and approval of SEPTA's Power Engineering Manager.

PART 1 – GENERAL

1.1 SUMMARY

A. Description

1. This specification describes a battery system for use in an unattended, non-climate-controlled traction power substation. The ambient temperature will vary from -20 °C [-4 °F] to 45 °C [113 °F]. The system is comprised of monoblocs, a battery rack, a battery charger, ancillary equipment, and possibly, a spill containment barrier.
2. The battery shall be a 120 V, 190 Ampere-hour pure lead VRLA (Valve-Regulated, Lead-Acid) AGM (Absorbent Glass Mat) stationary battery of flat plate construction, comprised of ten (10) monoblocs (a.k.a. multi-cell unit or monoblock) at 12 V each. Each monobloc shall be comprised of six (6) cells, and shall have terminals accessible from the front, not the top, of the package. All acid shall be immobilized in the AGM. No free acid shall be present in the cell.
3. The Purchase Order or Bid Request will specify the following characteristics of the battery system:
   a) the nominal input voltage (typically 240 VAC)
   b) the number of phases of input power, (single phase unless explicitly stated otherwise)
   c) the frequency of the input power (60 Hz unless explicitly stated otherwise)
   d) whether a Spill Containment Barrier is required to be included

B. Codes and Standards

1. The design, manufacturing, testing, labelling, and shipping of the battery system shall comply with the applicable portions of the latest edition of the following standards:
   a) American National Standards Institute (ANSI)
   b) Code of Federal Regulations, 49 CFR 173.159a(d)
   c) International Air Transport Association (IATA) "*Dangerous Goods Regulations*," Section 4.4, Special Provision A67

d) IEEE-485 - "*Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications*"

e) IEEE-1187 - "*IEEE Recommended Practice for Installation Design and Installation of Valve-Regulated Lead-Acid Batteries for Stationary Application*"

f) IEEE-1188 - "*IEEE Recommended Practice for Maintenance, Testing, and Replacement of Valve-Regulated Lead-Acid Storage Batteries for Stationary Applications*"

g) IEEE-1189 - "*IEEE Guide for Selection of Valve-Regulated Lead-Acid Batteries for Stationary Applications*"

h) IEC 60896-21 - "*Stationary lead-acid batteries: Valve regulated types - Methods of test*"

i) IEC 60896-22 - "*Stationary lead-acid batteries: Valve regulated types – Requirements*"

j) National Fire Protection Association - NFPA 70 "*National Electric Code*," Article 480

k) Telcordia GR-4228 "*Valve-Regulated Lead-Acid (VRLA) Battery String Certification Levels Based on Requirements for Safety and Performance*"

l) UL-94 - "*Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances*"

m) National Electrical Manufacturers Association (NEMA) PE 5 "*Utility Type Battery Chargers*."

n) Underwriters Laboratories (UL)

o) Occupational Safety and Health Administration (OSHA)

p) Environmental Protection Agency (EPA)

q) Applicable Local Codes

2. All products supplied shall be listed as approved for their intended use by a Nationally Recognized Testing Laboratory (NRTL), *e.g.* Underwriters Laboratories, and shall be marked or labeled as such.

1.2 SUBMITTALS

A. All documentation required per this Specification shall be submitted for review and approval, prior to delivery, to:

SEPTA
Engineering Manager – Power Department
1234 Market Street, 12th floor
Philadelphia, PA 19107

(an email address will be provided upon request)

B. Submit the following to SEPTA's Engineer for review and approval. The review and approval of a submission, in part or in whole, shall not constitute acceptance of any errors, omissions, changes, or other deviations from this specification. Wherever possible, submittals shall be text-searchable .pdf files. References or hyperlinks to information on the internet are not acceptable.

1. Product data, which shall include manufacturer's catalog cuts, descriptive literature, and diagrams that clearly illustrate conformance with this specification. In particular, the documentation shall demonstrate a 15-year design life of the entire battery system under the application and environmental conditions described in this Specification.
2. Operation and maintenance manuals, including parts list.
3. Dimensions and mass of the monoblocs.
4. Volume of liquid within the individual monoblocs.
5. The battery rack tier and step configuration.
6. Dimensions of the battery rack.
7. Dimensions of the Spill Containment Barrier, including its volume.
8. All applicable Safety Data Sheets (SDSs) (formerly known as MSDSs or Material Safety Data Sheets) for all hazardous chemicals in the Battery System, including, but not necessarily limited to, the cells and the electrical contact grease.

1.3 WARRANTY

A. The manufacturers of each component within the complete battery system shall warrant their respective components to be free from defects in workmanship and material for a period of five (5) years from the date of delivery.

B. The manufacturers of each component within the complete battery system shall warrant their respective components to operate per this Specification for a period of five (5) years from the date of delivery, except that the warranty on the cells shall be extended and pro-rated for a period of ten (10) years.

1.4 QUALITY ASSURANCE

A. The manufacturers of the supplied equipment shall have not less than 15 years' experience in the production of the specified products.

B. Workmanship shall conform to recommended practices for the manufacture of a product suitable for application in a substation environment.

C. Each component of the battery system shall be engineered and manufactured by firms which are certified to comply with an internationally-recognized quality management system, (*e.g.* ISO 9001).

D. Rejection

1. SEPTA reserves the right to reject any product that does not meet any of the requirements of this Specification. Upon notice to the manufacturer, any such rejected material shall be removed promptly from SEPTA's property, and shall be replaced, at no additional cost to SEPTA, with material that complies fully with every requirement of this Specification.

E. Patented Material

1. In the event that any product delivered to SEPTA under this Specification is protected by any patent or copyright, the vendor agrees to and shall defend, indemnify and save harmless SEPTA from any and all suits, claims, judgments, costs and causes of action at law or in equity arising out of or related to the sale, purchase or use of any such article, which sale, purchase or use is alleged to be in violation of any rights under a patent or copyright.

PART 2- PRODUCTS

2.1 DESCRIPTION

A. The cells shall be lead-acid chemistry with a design life of fifteen (15) years in float service operation under the environment and application described in this Specification. End-of-life is defined as retaining 80% of rated capacity and a voltage of 1.75 volts per cell; 10.5 V per monobloc.

B. The battery shall be comprised of 10 monoblocs, connected in series.

C. The monobloc and cell construction shall be as follows:

1. Monobloc containers and lids shall be constructed using flame retardant ABS with a UL94 rating of V0 and an LOI (Limiting Oxygen Index) of at least 28%, and shall have leak-proof joints.

2. Monobloc containers shall incorporate integrated handles designed for lifting.

3. The monobloc containers and the lid-to-container joint shall be capable of withstanding an internal pressure of at least four times the normal working pressure. Monoblocs shall be equipped with a low-pressure self-resealing one-way safety pressure relief valve, which will prevent ambient air entering the cell/monoblocs.

4. The cell plate shall be a rolled and punched grid type. Re-cycled lead shall not be used in the manufacturing process. No antimony or calcium shall be used in the plates. The grid thickness of the positive plate shall not exceed 1.25 mm [0.049 in].

5. Monobloc internal terminals shall consist of lead-tin coated inserts machine cast into the lead.

6. The design of the cell/monobloc shall be sufficiently robust to withstand external short circuits in full compliance to IEC 60896 Part 21.

7. The battery shall have a recombining efficiency greater than 98% during normal float charge operation.
8. Monobloc external terminals shall consist of stainless steel front access, with top access copper alloy insert.

D. The external links between the monoblocs shall be made from insulated flexible connectors.

E. Monoblocs shall not exceed the following physical characteristics:
1. Length: 561 mm [22.08 in]
2. Width: 125 mm [4.92 in]
3. Height: 316 mm [12.44 in]
4. Mass: 60 kg [132.3 lbs]

F. The battery shall consist of ten (10) monoblocs to provide a nominal 120 V output voltage.

G. The nominal capacity at the eight (8) hour discharge rate at 25 °C [77 °F] to 1.75 volts per cell (10.5 V per monobloc) shall be no less than 190 A.

H. Each cell in the battery system shall have the following discharge rates down to 1.75 V per cell at 25 °C [77 °F]:
1. Eight (8) hours - 23 Amps minimum
2. One (1) hour - 131 Amps minimum
3. Fifteen (15) minutes - 328 Amps minimum

I. Each cell in the battery system shall have the following discharge rates down to 1.90 V at 25 °C [77 °F]:
1. Eight (8) hours - 23 Amps minimum
2. One (1) hour - 127 Amps minimum
3. Fifteen (15) minutes - 306 Amps minimum

J. Nameplate: Each cell shall be marked or labelled with the following information:
1. Manufacturer's name
2. Month/Year of manufacture
3. Manufacturer's model number
4. Unique serial number

K. Fixed accessory equipment
1. One (1) Installation, Operation and Maintenance manual.
2. Inter-step, inter-row, inter-tier, end-to-end inter-rack, and back-to-back inter-rack prefabricated cable jumper connectors with lead-tin plated lugs.

3. Individual adhesive backed cell numbers, one (1) inch character height, numbered one (1) to ten (10).

4. Three (3) 0.24-ounce [7 gram] containers of electrical contact grease, NO-OX-ID® "A-SPECIAL," as manufactured by Sanchem, Inc. [www.sanchem.com].

L. Battery Rack

1. A battery rack shall be furnished which shall support and distribute the weight of the connected monoblocs in the battery system.

2. The rack frame shall be coated with an acid-resistant epoxy paint.

3. The battery rack rails shall be polyethylene coated or acid-resistant epoxy painted.

4. The battery support system shall provide rack rail insulation.

M. Spill Containment Barrier

1. If specifically required by the Bid Request or Purchase Order, the battery rack shall be provided with a liquid-tight, electrolyte-resistant plastic Spill Containment Barrier with 4 inch lip extending not less than 1 inch beyond the battery rack in all directions. The volume of the containment system shall be at least equal to the volume of the liquid within the battery.

N. Battery Charger

1. The battery charger shall be solid state, fully automatic, and specifically designed to support the batteries of the type specified herein. The charger shall be built to charge and maintain ("float") the 60-cell lead-acid batteries to 130 VDC nominal. If the battery manufacturer recommends equalization, the charger shall have equalizing capabilities. The charger shall operate as a battery eliminator, *i.e.* operating as a power supply in addition to charging.

2. The battery charger shall have a continuous output rating of at least 3.25 kW.

3. The battery charger shall be at least 85% efficient under all modes of operation, as calculated by output power divided by input power.

4. The battery charger's input and output circuits shall be electrically isolated from each other and from the charger's ground.

5. Means shall be provided to prevent a faulty battery charger from shorting the battery. To meet this requirement, a blocking diode or overcurrent protection device, adequate to handle the short circuit capability of the battery, may be placed in the ungrounded output of the battery charger.

6. The battery charger shall be cooled only by air convection.

7. The battery charger shall be suitable for either floor mounting (free-standing) or wall mounting.

8. The battery charger's cabinet shall be NEMA-1 rated, with knockouts for cable or conduit, and with its front panel hinged for access.

9. The charger shall maintain float voltage within ±0.5% from zero to full load current.

10. The float voltage shall be adjustable in 100 mV increments from 95% of the nominal float voltage to 105% of the nominal float voltage.
11. The charger shall fully charge the batteries in not more than 12 hours after the batteries have been discharged to a level of 80% of their nominal voltage.
12. The output ripple of the charger shall not exceed any of the following limits:
    a) 100 mV(rms) when on battery
    b) ±2% when off battery,
    c) 100 mV(rms) when used as a battery eliminator
13. In all cases, the cell manufacturer's published instructions regarding equalization shall be adhered to rigorously and without exception. If the cell manufacturer recommends against equalization, any equalization function shall be disabled.

O. Accessories

1. One charge ammeter.
2. One DC voltmeter.
3. One selector switch marked Automatic, Float, Manual Equalize.
4. Incoming molded case circuit breaker.
5. Output molded case circuit breaker.
6. Pilot light for AC supply.
7. Low voltage alarm relay for remote sensing.
8. Positive-to-ground and negative-to-ground relay for remote indication.
9. Test switch for verification that ground detection is functional.
10. No charge relay for remote indication.
11. All indication devices shall have identification.

PART 3- EXECUTION

3.1 INSTALLATION

A. The battery cells shall be delivered fully charged.

B. All components of the Battery System shall be packed and shipped in a manner that avoids damage. Damaged shipments will be rejected.

C. The entire battery system, including all the components thereof, shall be delivered to the address given in the Bid Request or Purchase Order.

END OF SECTION 263323.11-S4

Revision Control:

Revision Number	Description of Change	Approved by:	Date:
001	Original Release	Tyler C. Ladd	5/11/2016
002	Formatting changes	Tyler C. Ladd	4/28/2017
003			
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