



THE ISRAEL ELECTRIC CORPORATION LTD.
PLANNING DEVELOPMENT AND TECHNOLOGY DIVISION
RELIABILITY AND H.V. EQUIPMENT DEPARTMENT

STR-1791A
Appendix No. 3

STR-1791A

***SEALED STATIONARY LEAD-ACID (VRLA) POWER
BATTERIES***

FOR SUBSTATIONS AND SWITCHING STATIONS

Appendix No.3

***Specification for
Reliability, Availability, Maintainability and Safety (RAMS)
Requirements***



1. Definitions

The following definitions are valid for a product's reliability, availability, maintainability and safety terms relevant to this tender.

RAMS

RAMS is the acronym of Reliability, Availability, Maintainability and Safety.

RELIABILITY

Reliability is ability of the item to perform its intended function for a specified time interval and under stated conditions. Therefore for non redundant equipment, reliability is the probability that the equipment will perform without failures, for at least specified period of time (i.e. the time between periodical checks or preventive maintenance actions), when used under stated conditions (in IECO sites).

AVAILABILITY

Availability is the probability that the equipment is in operation condition in any point of time along its life length.

MAINTAINABILITY

Maintainability is a design characteristic defining the ability of the equipment to be restored to its operable condition after a failure, within a given time period, under stated conditions, using stated procedures and resources. MTTR is a maintainability parameter.

SAFETY

Safety is the attribute of the equipment to avoid the following events:

- Endangering human life or health.
- Property damage.
- Substantial economical loss.
- Environmental damage.

FAILURE

Failure is any event that causes an equipment to cease of operation, or functions outside of its specification limits, and requires its repair/replacement.

Failure rate (FR) is the average number of failures per operating time unit at the end of the first year of installation and operation.



2. Contractor shall declare on his stationary battery the following RAMS parameters as per:

TABLE 1 (RAMS data for the stationary battery)

Component	FR (1/years)	GPOTF (%/year)	MTTR (hours)	EOL (years)	MTBPM (years)	MTTPM (hours)
Cells						
Cell's terminals						
Topping vents						
Sealing						
Inter-cell connectors						
Battery racks						
Others (please indicate)						

Where: FR - Failure Rate

GPOTF - Gamma-Percentage Operating Time to Failure – the time during which an item failure shall not occur with a particular probability expressed as a percentage, for example, 95% operating time to failure within at least 5 years means that during 5 years operation failed devices shall make up a maximum of 5% of all devices in service.

MTTR - Mean Time To Repair

EOL - Expected Operating Life

MTBPM - Mean Time Between Preventive Maintenance

MTTPM – Mean Time To (perform) Preventive Maintenance

TABLE 2 (main maintenance activities data)

Maintenance activity	Mean Time (hours)	Man Power	Man Hours

Where: Mean Time – Mean time to perform a main maintenance activity



Man Power – Number of required workers for performing a main
maintenance activity

Man Hours – Number of workers x time duration of a main maintenance
activity

TABLE 3 (Field Demonstrated RAMS data for similar stationary batteries during the
last five years)

Field RAMS data \ Year	2016	2017	2018	2019	2020
Total number of installed stationary batteries					
Total number of repairs or replaces for any reason					
Failures due to wrong design					
Failures due to faulty production					
Failures due to bad use/handling					
Random failures					
Mean time to repair/replace					

3. Safety

The Contractor shall design the stationary battery in such a manner that it shall not endanger in any way any human being, neither property, nor it causes any environmental damage.

Contractor shall indicate what safety standards his stationary battery is stand for, and how he verifies that his stationary battery is really stands these standards.