



THE ISRAEL ELECTRIC CORPORATION LTD.  
SUBSTATIONS PROJECTS DEVISION  
EQUIPMENT AND SPECIFICATIONS DEPARTMENT

STR-1791A

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

***FOR SUBSTATIONS AND SWITCHING STATIONS***

***Appendix No.1***

***REQUIRED TESTS FOR STATIONARY BATTERY***



| 1. Type tests                  |                                                            |              |            |                                  |
|--------------------------------|------------------------------------------------------------|--------------|------------|----------------------------------|
| No.                            | Test denomination                                          | standard     | Sub clause | Compliance information mandatory |
| Safe operation characteristics |                                                            |              |            |                                  |
| 1.1.                           | Gas emission test (At the float voltage and at 2,40 V p.c) | IEC 60896-21 | 6.1        | Data Requested                   |
| 1.2.                           | High current tolerance                                     | IEC 60896-21 | 6.2        | Pass                             |
| 1.3.                           | Short circuit and d.c. internal resistance                 | IEC 60896-21 | 6.3        | Data Requested                   |
| 1.4.                           | Internal ignition from external spark sources              | IEC 60896-21 | 6.4        | Data Requested                   |
| 1.5.                           | Protection against ground short propensity                 | IEC 60896-21 | 6.5        | Pass                             |
| 1.6.                           | Content and durability of required markings                | IEC 60896-21 | 6.6        | Pass                             |
| 1.7.                           | Material identification                                    | IEC 60896-21 | 6.7        | Pass                             |
| 1.8.                           | Valve operation                                            | IEC 60896-21 | 6.8        | Pass                             |
| 1.9.                           | Flammability rating of materials                           | IEC 60896-21 | 6.9        | Data Requested                   |
| 1.10.                          | Intercell connector performance                            | IEC 60896-21 | 6.10       | Data Requested                   |
| Performance characteristics    |                                                            |              |            |                                  |
| 1.11.                          | Capacity test                                              | IEC 60896-21 | 6.11       | Data for 10-hours discharge      |



|                            |                                                                     |              |      |                                                          |
|----------------------------|---------------------------------------------------------------------|--------------|------|----------------------------------------------------------|
| 1.12.                      | Charge retention during storage                                     | IEC 60896-21 | 6.12 | Pass                                                     |
| 1.13.                      | Float service with daily discharges                                 | IEC 60896-21 | 6.13 | Value to be requested as function of service environment |
| 1.14.                      | Recharge behavior                                                   | IEC 60896-21 | 6.14 | Pass                                                     |
| Durability characteristics |                                                                     |              |      |                                                          |
| 1.15.                      | Service life at an operating temperature of 40°C                    | IEC 60896-21 | 6.15 | Value to be requested as function of service environment |
| 1.16.                      | Impact of a stress temperature of 55 °C or 60°C                     | IEC 60896-21 | 6.16 | Value to be requested as function of service environment |
| 1.17.                      | Abusive over – discharge                                            | IEC 60896-21 | 6.17 | Value to be requested if service environment warrants    |
| 1.18.                      | Thermal runaway sensitivity                                         | IEC 60896-21 | 6.18 | Pass and data is required                                |
| 1.19.                      | Low temperature sensitivity                                         | IEC 60896-21 | 6.19 | Value to be requested if service environment warrants    |
| 1.20.                      | Dimensional stability at elevated internal pressure and temperature | IEC 60896-21 | 6.20 | Data Requested                                           |
| 1.21.                      | Stability against mechanical abuse of units during installation     | IEC 60896-21 | 6.21 | pass                                                     |



## 2. Equipment qualification to prove seismic withstand

| No.  | Test denomination                                                                                                                                                            | standard           | Sub clause  | Compliance information mandatory |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------|----------------------------------|
| 2.1. | The offered batteries and the racks shall be analyzed to prove the seismic design. The equipment shall be qualified according to<br><br>Required seismic qualification level | IEEE Std. 693-2005 |             | Moderate Level                   |
| 2.2. | After performing the analysis, the Contractor shall submit for approval the calculation that demonstrate the anchorage requirements according to                             | IEEE Std. 693-2005 | Annex. A, J |                                  |

## 3. Acceptance tests

(shall be performed for 100% of the supplied batteries)

| No.  | Test denomination                                                 | standard           | Sub clause | Compliance information mandatory |
|------|-------------------------------------------------------------------|--------------------|------------|----------------------------------|
| 3.1. | Capacity test                                                     | IEC 60896-21       | 6.11       | See remark to cl.3.1             |
| 3.2. | Inter-cell connectors checking including the resistance measuring | IEEE Std. 450-2010 | 7.2.b      | Value not exceed 0.1 mohm – see  |



|      |                 |   |   |                               |
|------|-----------------|---|---|-------------------------------|
|      |                 |   |   | annex. B, sub clause 9.5.1.20 |
| 3.3. | Visual checking | - | - |                               |

#### 4. On - site tests

| No.  | Test denomination                                                                                                                                                  | standard | Sub clause | Compliance information mandatory |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------|----------------------------------|
| 4.1. | After erection on site, the proper condition of the battery shall be checked (cell's voltages, capacity, internal resistance, resistance of inter-cell connectors) | -        | -          |                                  |

Remark to cl.3.1: 10-hours discharging test shall be carried out on the whole battery.

The final voltage (end-of-discharge voltage) shall be  $U_f = 1.80V$  per cell. The discharge current shall be corresponded to the rated capacity of the battery  $I_{rt} = C_{rt}/t$ .

During the discharging test the current and voltage data recorder shall be added to the test circuit to provide continuous registration in the course of all the discharging hours (including date and time). This record will be presented to the checker at the end of the test.