

**GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(Railway Board)**

**INDIAN RAILWAY STANDARD SPECIFICATION
FOR
'SITEL' PRIMARY CELLS (DRY, LECHLANCHE TYPE)
FOR RAILWAY S&T INSTALATIONS**

0. FOREWORD

0.1 This specification is issued under the fixed serial No.S-95, followed by the year of original adoption as standard, or in the case of revision, the year of last revision.

0.2 This specification requires reference to the following standards:

IS: 1885 (Pt. XV) –1967	Electrotechnical vocabulary: Part XV Primary Cells and Batteries
IS: 6303-1984	General requirements and methods of tests for Dry Cells and Batteries.
IS: 2652-1976	Schedule of terminals for Lechlanche type Primary Batteries
IRS:S 23	Electrical Signalling & Interlocking Equipment.
BS: 397 Part-I -1989	British Standard for General requirements of Primary Batteries.
IS: 11153-1984	Specification for Manganese Dioxide for dry batteries.
IS: 12178-1987	Specification for Acetylene Black.
IS: 209-1979	Specification for Zinc
IS: 701-1966	Specification for Zinc Chloride
IS: 1113-1965	Specification for Ammonium Chloride, Technical & pure
IS: 6648-1972	Specification for carbon electrodes for dry Cells and batteries

0.3 Whenever, in this specification, any of the above mentioned specifications are referred by number only without mentioning the year of issue, the latest issue of that specification is implied, otherwise, the particular issue referred to is meant.

0.4 This specification is intended chiefly to cover the technical provisions and does not include all the necessary requirements of the contract.

1. SCOPE

1.1 This standard specifies the basic requirements, dimensions, performance and tests for Lechlanche type dry round Cells having a nominal voltage of 1.5 V for use in Railway Signalling and Telecommunication applications.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given IS: 1885 (Pt. XV)-1967, IS: 6303-1984, BS: 397 Part 1-1989 and IRS:S 23 shall apply.

3. DESIGNATION AND RATING

3.1 The cells covered by this specification shall be designated 'SITEL' – Primary Cells to be used in lieu of R-40 Cells, for Railway Signalling and Telecommunication applications.

4. RATING IN TERMS OF AMPERE HOUR

4.1 The rating of the cell shall not be less than 45 AH when tested at 10 ohm continuous discharge test at 27 ± 2 deg.C.

5. MATERIAL AND CONSTRUCTION

5.1 GENERAL

5.1.1 The material used in the cell shall be in accordance with para 5 of IS: 6303-1984 and Cl. 5.2 to 5.4 of this specification.

5.2 JACKETS

5.2.1 The cell ingredients shall be enclosed in close fitting jacket of High Impact PolyStyrene (HIPS) so as to withstand external shocks, vagaries of weather and to prevent bursting open of the cell containers due to internal pressures generated during discharge of the Cells. The jacket and its cover shall preferably be of black or maroon colour.

- 5.2.2 The material of the cell container and lid shall be the same. The cell container and top lid shall be ultrasonically welded for high strength. Gluing shall not be permitted.

5.3 CELL INGREDIENTS

- 5.3.1 The main ingredients of the cell are Carbon rod, Zinc sheet, Zinc Chloride, Ammonium Chloride, Electrolytic Manganese Dioxide, Acetylene Black, Brass Terminals etc. Best quality material shall be used. The manufacturer shall keep record for source of procurement for cross checking the material used in the cell at any stage. The following important ingredients shall conform to corresponding IS specification as given below.

i) Electrolytic Manganese Dioxide – Type C	IS: 11153-1984
ii) Ammonium Chloride, pure grade, Type I	IS: 1113-1965
iii) Carbon rod for Dry Cells and batteries	IS: 6648-1972
iv) Acetylene Black, Grade I	IS: 12178-1987
v) Zinc Chloride (Battery Grade)	IS: 701-1966
vi) Zinc (Grade Zn 99.99)	IS: 209-1979

5.4 TERMINALS

- 5.4.1 The terminals of the cell shall be a set of brass bolts of size M4 with hexagonal heads designed to fit into the internal cavity of the cell lid, made of brass in accordance with designation SC1 or SC2 of IS: 2652-1976. Each terminal brass bolt shall be held in place by means of a flat brass nut. A solid brass-knurled nut shall be provided for hand tightening around the connecting cables for each terminal.
- 5.4.2 The location of the terminals shall be such that +ve terminal is at the centre of the top lid and –ve terminal spaced at 27 ± 1.5 mm.
- 5.4.3 The cell terminals shall be provided with protective plastic insulating caps to prevent accidental shorting. Red cap shall indicate positive terminal and the blue cap indicate negative terminal.
- 5.4.4 To indicate the polarity of the cell terminals, plus (+) and minus (-) signs shall be embossed on the top lid near to the terminals for visual identification.

6. DIMENSIONS AND MASS

- 6.1 The cell shall have the following dimensions and mass.

i) Diameter on jacket	-	67 mm, Max
ii) Height over shoulder	-	157 mm, Max
iii) Height over terminals	-	172 mm, Max
iv) Mass	-	1.00 Kg Max

7. MARKING

7.1 The following information shall be indelibly and durably marked on the outside of the cell.

- | | | |
|-------------------------------------|---|-------------|
| i) Type of cell | - | SITEL |
| ii) IRS Specification | - | IRS:S 95-96 |
| iii) Nominal voltage | - | 1.5 V |
| iv) Month & year of manufacture | - | mm-yy |
| v) Month and year of expiry | - | mm-yy |
| vi) Manufacturer's name and Address | - | |

8. GENERAL ELECTRICAL REQUIREMENTS

8.1 The cell shall give satisfactory performance as stipulated in this specification, in the temperature range, -10°C to 55°C and RH up to 90%.

8.2 The ampere hour capacity shall not be less than the declared capacity at 10 ohm discharge up to its end point voltage of 0.85V, when measured during acceptance test.

8.3 PACKING

8.3.1 A maximum number of 24 Cells shall be packed in a wooden box. Each cell wrapped in a paper or polythene shall be placed in 24 partitioned rectangular compartments of the wooden box. All the Cells shall be protected against shocks, bumps etc., likely to be encountered in handling and transport by filling suitable shock absorbing material in the wooden box.

9. TESTS

9.1 TYPE TESTS

9.1.1 The following shall constitute type tests and carried out in the following order:

- | | | |
|-----------|---|------------------|
| a) | Checking of dimensions and mass | (Cl. 6) |
| b) | Checking of markings | (Cl.7) |
| c) | Checking of terminal | (Cl 5.4) |
| d) | Checking of material and construction | (Cl.5) |
| e) | Initial life tests | (Cl.9.3) |
| f) | Delayed life tests under Standard Atmospheric Condition | (Cl. 9.5.1) |
| g) | Delayed life test under dry heat conditions | (Cl.9.5.2) |
| h) | Delayed life test after expiry period | (Cl. 9.6) |

9.1.2 For conducting type tests, **28 Cells** shall be selected as per TABLE-I, randomly from a lot of min 100 Cells and shall be numbered before sampling

for type test. If any of the sample fails in any of the type tests, the testing authority at its discretion, may call for fresh samples not exceeding twice the original number and subject the Cells again to all the tests in which failure occurred. If there is any failure in any of the repeat test(s), the type test shall be considered as not having passed the requirements of this standard.

TABLE 1: LIST OF TYPE TESTS, SAMPLES REQUIRED AND TEST REQUIREMENTS

S.No	Name of test	Min no. of Cells	Test requirements
a	Checking of marking, dimensions, mass and terminals	2	As per Specn
b	Checking of materials and construction	2	As per Specn.
c	Initial life test i) 5 ohm continuous discharge test ii) 10 ohm continuous discharge test iii) 20 ohm continuous discharge test iv) Light intermittent discharge test v) Heavy intermittent discharge test	3 3 3 3 3	125 hrs min 325 hrs. min 650 hrs min 325 days min 110 hrs min
d	Delayed life test under standard atmospheric conditions {test no. c(v)} after storage of 6 months at 27 ± 2 deg.C	3	100 hrs min
e	Delayed life test under dry heat conditions {test no. c(v)} after storage of 10 weeks at 40 deg.C	3	84 hrs min
f	Delayed life test, at ambient temperature under roofed store having natural light and air circulation	3	77 hrs min
Total Cells		28	

9.2 ACCEPTANCE TESTS

9.2.1 The following shall constitute acceptance tests

- a) Checking of dimensions and mass (Cl. 6)
- b) Checking of markings (Cl.7)
- c) Checking of terminal (Cl 5.4)
- d) Checking of material and construction (Cl.5)
- e) 5 ohm continuous discharge test (Cl 9.3.2)

9.2.2 The samples for acceptance tests and the criteria for acceptance shall be in accordance with Clause 10.

9.3 INITIAL LIFE TESTS

- a) 5 ohm continuous discharge test (Cl.9.3.2)
- b) 10 ohm continuous discharge test (Cl.9.3.3)
- c) 20 ohm continuous discharge test (Cl.9.3.4)
- d) Light intermittent discharge test (Cl.9.3.5)
- e) Heavy intermittent discharge test (Cl.9.3.6)

9.3.2 5 ohm continuous discharge test

- 9.3.2.1 Each cell shall be discharged continuously through a fixed load resistance of 5 ohms. Three Cells shall be independently subjected to the test. The test shall be continued until the voltage falls below 0.85V.
- 9.3.2.2 The life shall be reported as the total number of hours on test up to the first time the voltage reading falls below 0.85V.
- 9.3.2.3 The voltage readings shall be taken at intervals of 24 hours.
- 9.3.2.4 The closed circuit voltage of any of the three Cells shall not fall below 0.85V at the end of 125 hours.

9.3.3 10 ohm Continuous discharge test

- 9.3.3.1 Each cell shall be discharged continuously through a fixed load resistance of 10 ohm. Three Cells shall be independently subjected to the test. The test shall be continued until the voltage falls below 0.85V.
- 9.3.3.2 The life shall be reported as the total number of hours on test up to the first time the voltage reading falls below 0.85V.
- 9.3.3.3 The voltage readings shall be taken at intervals of 24 hours.
- 9.3.3.4 The closed circuit voltage of any of the three Cells shall not fall below 0.85V at the end of 325 hours.

9.3.4 20 ohm Continuous discharge test

- 9.3.4.1 Each cell shall be discharged continuously through a fixed load resistance of 20 ohm. Three Cells shall be independently subjected to the test. The test shall be continued until the voltage falls below 1.00V.
- 9.3.4.2 The life shall be reported as the total number of hours on test up to the first time the voltage reading falls below 1.00V.
- 9.3.4.3 The voltage readings shall be taken at intervals of 24 hours. The exact life shall be calculated by interpolation when the voltage falls below 1.00 V.

- 9.3.4.4 The closed circuit voltage of any of the three Cells shall not fall below 1.00 V at the end of 650 hours.

9.3.5 Light Intermittent Discharge Test

- 9.3.5.1 Three Cells connected in series shall be discharged through a resistance of 20 ohms for 10 periods of 4 minutes, discharge beginning at hourly intervals, followed by a rest of **14 hours** per day during 7 days per week.
- 9.3.5.2 The Cells shall be continued on test until the closed circuit voltage of the three Cells in series falls below 2.55 V. The life shall be reported as the total number of days on test up to the first time the voltage reading falls below 2.55 V and it shall not be less than 325 days.
- 9.3.5.3 The closed circuit voltage of the three Cells in series shall be taken every day initially and also at the end of tenth discharge.

9.3.6 Heavy Intermittent Discharge Test

- 9.3.6.1 Three Cells connected in series shall be discharged through a resistance of 8 ohms for 2 periods of 1 hour discharge every day, according to the following schedule.
 - 9.3.6.1.1 "One hour discharge, six hour rest, again one hour discharge followed by sixteen hours rest per day".
- 9.3.6.2 The Cells shall be continued for test until the closed circuit voltage of the three Cells in series falls below 2.55 V. The life shall be reported as the total number of hours of actual discharge till the voltage reading falls below 2.55 V for the first time and it shall not be less than 110 hours.
- 9.3.6.3 The closed circuit voltage of the three Cells in series shall be taken every day at the end of the second discharge period.
- 9.4 The Cells shall not show any leakage during or at the end of any tests as stipulated in this specification.

9.5 Delayed Life Tests

9.5.1 Delayed Life Test under Standard Atmospheric Condition.

- 9.5.1.1 Three Cells shall be kept stored for a period of six months at a temperature of 27 ± 2 deg.C and relative humidity of 45 to 75% and thereafter tested in accordance with para 9.3.6 (i.e. Heavy intermittent discharge test)
- 9.5.1.2 The life of the three Cells shall not be less than 100 hours.

9.5.2 Delayed Life Test under Dry heat conditions

The batteries shall be stored for a period of 10 consecutive weeks at a temperature of 40 ± 2 deg C and RH of 40 to 60%.

Three batteries connected in series shall be discharged through a resistance of 8 ohms (2.67 ohms / cell) as per clause 9.3.6.

9.5.2.1 The life of the three Cells shall not be less than 84 hours.

9.6. Delayed Life Test After Expiry Period

9.6.1 Three Cells shall be stored at ambient temperature for their expiry period, which may be of 12 months, under roofed store having natural light and air circulation arrangement. The Cells shall be thereafter tested in accordance with para 9.3.6 (i.e. Heavy Intermittent Discharge Test). The rated life of the Cells shall not be less than 77 hours (i.e. 70% of rated life)

10. SAMPLING PLAN

10.1 The minimum number of Cells to be sampled for Acceptance Test shall be as follows:

S.No.	Lot size	Sample size	Permitted number of defective samples
1	Up to 100	8	0
2	101 to 300	13	1
3	301 to 1000	20	2
4	1001 to 3000	32	3
5	3001 to 10000	50	5