DRY CELLS AND DRY BATTERIES
TESTS AND INSPECTIONS

1. GENERAL

1.01 This section covers tests and inspections of dry cells and dry batteries.

1.02 This section is reissued to include instructions for disposing of cells which may contain mercury or other pollutants. This issue does not affect the Equipment Test List.

1.03 Theory of operation of dry batteries and other educational information will be found in Section 157-421-101.

2. LIST OF APPARATUS

CODE OR SPEC NO.	DESCRIPTION
APPARATUS	
19G	Resistor, 40 and 100 ohms ±5%
19N	Resistor, 5 and 8 ohms ±5%
19GC	Resistor, 110 and 75 ohms ±1%
19HP	Resistor, 10 and 40 ohms ±1%
19JB	Resistor, 20 and 150 ohms ±1%
19JL	Resistor, 300 and 2460 ohms ±1%
18KF	Resistor, 10,000 ohms ±1%
—	DC Volt-Ammeter, Weston Model 281 (of suitable scale)
—	Voltmeter, Weston Model 931 (of suitable scale)

Note: Equivalents may be substituted.

3. MAINTENANCE TESTS

General

3.01 The KS dry batteries are marked with the approximate date of manufacture and will ordinarily be furnished to the field before they are 6 months old. The date of manufacture of large batteries is located on each battery enclosure or jacket in the box designated DATE OF MANUFACTURE. For example, the date 4-13-68 indicates that the battery was packed for shipment during the week ending April 13, 1968. The date of manufacture on small batteries is placed on the bottom of the battery in code. An arrow pointing to the battery bottom will be found in the date of manufacture box. The date code consists of three digits. The first two digits indicate the week of the year the battery was packed for shipment, and the third digit indicates the last digit in the year in which the battery was manufactured. For example, 128 indicates that the battery was packed for shipment during the 12th week of 1968.

3.02 Since dry batteries are perishable, they should be ordered periodically in quantities sufficient only to provide for regular and possible emergency requirements. To avoid short life replacements, batteries in storage which reach certain age limits without having been placed in service should ordinarily be discarded ▶(see Caution under 3.03).◀ These installation age limits for each type of dry battery, based on storage at approximately 70°F, are included in Tables A and B. However, under special emergency conditions or where dry batteries have been kept in cold storage, the installation age limits can be exceeded as determined by local conditions.

Acceptance Tests

3.03 Generally, it is not necessary to make acceptance or preinstallation tests of KS dry batteries. Dry batteries shall be assumed to be in good serviceable condition unless they are overage; the shipping containers are wet or damaged; the cells are wet or leaking; or the jackets, seals, or terminals are damaged. Batteries that do not meet these standards or whose performance is so poor as to be readily apparent should not be accepted.

Caution: ***▶Since some dry cells contain mercury and all cells contain some form of pollutant, all dry cells MUST be shipped to the location designated for proper disposal. Refer the matter to the supervisor if necessary.◀***

TABLE A — BATTERIES IN GRID SERVICE

TYPE	INSTALLATION AGE LIMIT	NO. OF CELLS	RATED VOLTAGE	CUTOFF VOLTAGE
KS-6567	2 Years	2	3.0	2.90
KS-6568	2 Years	3	4.5	4.35
KS-6569	2 Years	3	4.5	4.35
KS-6573	2 Years	15	22.5	21.7
KS-7105	1-1/2 Years	15	22.5	21.7
KS-7342	2 Years	3	4.5	4.35
KS-7889	1-1/2 Years	31	46.5	45.0
KS-7890	1 Year	60	90.0	87.0
KS-8587	2 Years	21	31.5	30.4
KS-8588	2 Years	15	22.5	21.7
KS-9025	2 Years	15	22.5	21.7
KS-15998	2 Years	5	7.5	7.25

TABLE B — STANDARD BELL SYSTEM DRY BATTERIES

TYPE	* INSTALLATION AGE LIMIT	NO. OF CELLS	TEST RES. OHMS	RATED VOLTAGE	CUTOFF VOLTAGE	SEE NOTE	USUAL TYPE OF SERVICE
KS-6522	1 Year	1	10	1.5	0.9		Flashlight
KS-6542 (#6)	2-1/2 Years	1	10	1.5	1.08	1	Transmitter, Test Set, Aux, Reserve
KS-6569	2 Years	3	30	4.5	3.0	2	Grid, Test Set
KS-6570	2 Years	3	30	4.5	3.25		Test Set
KS-6571	1-1/2 Years	16	150	24.0	15.0		Plate, Test Set
KS-6572	1-1/2 Years	15	150	22.5	15.0		Plate, Test Set
KS-6573	2 Years	15	150	22.5	15.0	2	Grid, Plate, Test Set
KS-6700	2-1/2 Years	3	30	4.5	3.25		Transmitter
KS-6948	2 Years	30	300	45.0	30.0	1	Plate, Test Set, Aux, Reserve
KS-7105	1-1/2 Years	15	150	22.5	15.0	2	Grid, Plate
KS-7342	2 Years	3	30	4.5	3.0	2	Grid, Test Set
KS-7595	2-1/2 Years	2	20	3.0	2.17		Transmitter
KS-8128	2 Years	30	75	22.5	15.0	1,3	Plate, Aux, Reserve
KS-8587	2 Years	21	210	31.5	21.0	2	Grid, Plate, Test Set
KS-8588	2 Years	15	150	22.5	15.0	2	Grid, Plate, Test Set
KS-9025	2 Years	15	150	22.5	15.0	2	Grid, Plate, Test Set
KS-13493	2 Years	5	50	7.5	5.0		Test Set
KS-14196	1 Year	30	300	45.0	30.0		Test Set
KS-14367 (#6)	1-1/2 Years	1	10	1.5	0.9	1	Test Set, Aux, Reserve
KS-14368	1 Year	1	10	1.5	0.75		Flashlight

TABLE B (Cont)

TYPE	* INSTALLATION AGE LIMIT	NO. OF CELLS	TEST RES. OHMS	RATED VOLTAGE	CUTOFF VOLTAGE	SEE NOTE	USUAL TYPE OF SERVICE
KS-14369	1-1/2 Years	30	300	45.0	30.0		Test Set
KS-14370	1-1/2 Years	30	300	45.0	30.0		Plate, Test Set
KS-14371	2 Years	4	40	6.0	3.6		Lantern
KS-14495	2 Years	2	5	1.5	1.0	3	Test Set
KS-14711	1-1/2 Years	1	10	1.5	0.9		Test Set
KS-14757	1-1/2 Years	30	300	45.0	30.0		Plate, Flasher
KS-14773	1 Year	15	3000	22.5	15.0	4	Plate, Test Set
KS-15936	1 Year	15	3000	22.5	18.0	4	Test Set
KS-15937	1 Year	20	4000	30.0	20.0	4	Test Set
KS-15939	2 Years	20	50	7.5	3.0	3	Emergency Floodlight
KS-15998	2 Years	5	50	7.5	5.0	2	Grid, Test Set

* See instructions in 3.02, 3.06, and 3.07. This age limit does not apply to cells in use.

Note 1: "Aux" denotes battery used in central office for coin control, ringing, tripping, or superimposed ringing. "Reserve" denotes battery used as standby for rectifier power supply in case of ac power failure.

Note 2: Where these batteries are used for grid service, use cutoff voltage in Table A.

Note 3: Series parallel arrangement.

Note 4: Because of small size of KS-14773, KS-15936, and KS-15937 batteries, the artificial load shall be 200 ohms per cell and the test shall be made with a voltmeter having a resistance of at least 10,000 ohms per volt of full-scale deflection.

Replacement

3.04 In certain services, practices have been established for replacing batteries on a periodic basis. Because improvements which may extend their service life are constantly being incorporated into dry batteries, these replacement intervals should be reviewed periodically. Where batteries are readily accessible and where a battery failure can be tolerated, it will be economical to operate a battery to almost complete exhaustion. However, in most cases specific maintenance tests have been provided in connection with standard circuits and when these tests are available, they should be followed.

3.05 Where specific maintenance tests have not been provided, the tests described in 3.06 and 3.07 should be used to determine whether the cells or batteries should be replaced. However, individual cells or batteries which are part of a series string with other cells or batteries should not be replaced unless the entire string is replaced ▶(see Caution under 3.03).◀ It is permissible in specific cases to add a relatively small number of cells to such a string. This is particularly applicable for batteries requiring close voltage regulation, where, without the addition of extra cells, only a relatively small proportion of the battery capacity could be used. Additions should not be carried to the point where any one of the existing units will be in danger of being entirely depleted since such a condition will increase the hazard of sudden failure, leakage, or fire. Where these series strings of dry cells are a part of a power plant supplying current for coin control, ringing, etc, specific maintenance tests or maximum cell quantities and minimum voltage limits are specified in most cases and shall be followed when determining whether cells should be added.

Tests on Batteries Subjected to Negligible Current Drain

3.06 Dry batteries, used to provide potential only, or a drain so small that its effect on the life of the cells is negligible, such as in some grid services, shall be tested with a voltmeter of suitable scale having a resistance of at least 1000 ohms per volt of full-scale deflection. Cells and batteries which may be used in grid service are listed in Table A. Table A shows cutoff voltages which might be used to determine whether replacement is necessary provided other values have not been specified for the particular service. Installation age limits are also included for the batteries listed in Table A.

Tests on Batteries Subjected to Steady or Variable Current Drain

3.07 Dry batteries subjected to steady or variable current drains, such as plate supply, test set supply, transmitter supply, etc, shall be tested with a voltmeter having a resistance of at least 1000 ohms per volt at full-scale deflection (except as noted in Table B) 5 seconds after the application of an artificial load and, where possible, with the service load disconnected. The suggested cutoff voltages in Table B should be used to determine whether replacement is necessary, provided other values have not been specified for the particular service. However, service conditions to which the batteries were previously subjected, the period of time that will elapse before the next test is made, the temperature at which the batteries are being operated, or other local conditions may indicate that some other cutoff voltage between 0.8 and 1.2 volts per cell may be more appropriate. Installation age limits are also included for the batteries listed in Table B.

Fire Prevention

3.08 Periodic inspections should be made for electrolyte leakage, which may cause a short circuit, result in dissipation of the energy of the battery, and create a fire hazard. Cells and batteries showing bulging or leaking of electrolyte or a deposit of salts on the outside should be replaced at once.