WOSS 510/2

British Railways Board

Director of Mechanical and Electrical Engineering

Batteries

Lead Acid

WORKSHOP OVERHAUL STANDARD SPECIFICATION

WOSS 510/2

REVISION RECORD

This Specification will be updated when necessary by the issue of amended pages accompanied by revision letters. The amended or additional part of re-issued pages will be marked with a vertical black line.

If you consider that an amendment is necessary, complete BR Form 14298 and pass it to the local BRB Resident Engineer or Area Quality Engineer. Submission of a form does not authorise the proposed amendments.

Revision No.	Re-issued Page Nos	Date	Inserted by
1	Contents	Nov 84	
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Should any query arise regarding the contents of this document telephone 0332 42442 Ext. 3516, BR Code is 056 3516, or write to the above address.

This Specification applies to equipment fitted to the vehicles indicated 'X' below, but it is only to be implemented when authorised by an appropriate maintenance/overhaul document.

LOCOMOTIVES

03	X
08	X
09	X
20	X
26	X
31	X
33	X
37	X
43	X
47	X
50	
56	
58	

73	X
81	
85	
86	
87	
88	
89	
90	
91	

DMU's

101	X
104	X
107	
108	X
110	X
111	X
114	X
115	X
116	X
117	X
118	X
119	X
120	X
121	X
122	X
127	X
128	
140	
141	X
142	
143	
144	
150	X
151	
154	
155	
156	

EMU's

302	
303	
304	
305	
307	
308	
309	
310	
311	
312	
313	
314	
315	
317	
318	
319	
320	
504	
507	
508	

411	
412	
413	
414	
415	
416	
419	X
421	
422	
423	
432	
438	
442	
455	
485	
486	
487	
488	X
489	

DEMU's

204	X
205	X
207	X
210	

COACHING STOCK

Mk 1	X
Mk 2, 2a-c	X
Mk 2d-e	X
Mk 2f	X
Mk 2 DBSO	X
Mk 3a	X
Mk 3b	X
Mk 3 (HST)	X
Mk 3 SLE and SLEP	X
Non Passenger	X

WORKSHOP OVERHAUL STANDARD SPECIFICATION 510/2

BATTERIES

Lead Acid

CONTENTS

REFERENCE DOCUMENTS

TEE/C/83/R/66 Technical Specification for Constant Current Battery Chargers used for the Overhaul of Lead Acid Batteries.

TDE/A/80/R/10 Technical Specification for Topping-up Equipment for Lead Acid Batteries.

TOOLS AND MATERIALS

Item	BR Cat No
Spanner, insulated, open jaw, single ended 0BA	39/170485
Spanner, insulated, open jaw, single ended 1/4" BSW	39/170470
Spanner, insulated, open jaw, single ended 5/16" BSW	39/170471
Spanner, insulated, open jaw, single ended 3/8" BSW	39/170472
Spanner, insulated, open jaw, single ended 7/16" BSW	39/170473
Spanner, insulated, open jaw, single ended 1/2" BSW	39/170474
Hydrometer 12" 1100-1400 SG	54/ 42185
Hydrometer 18" 1100-1400 SG	54/ 42190
Thermometer 280mm x 15 ø 0-50°C	40/ 74013
Thermometer 200mm x 11 ø 0-50°C	40/ 74014
Voltmeter (accuracy 0.1% minimum)	
Rubber apron 40" long with bib	44/ 3170
Rubber apron 48" long with bib	44/ 3195
Gauntlets, rubber size 8	44/115610
Gauntlets, rubber size 9	44/115611
Gauntlets, rubber size 10	44/115612
Gauntlets, rubber size 11	44/115613
Goggles	44/116120 or 116152
Bottle brush 1.1/8" dia	5/ 1285
Bristle brush	5/ 3500
Petroleum Jelly	27/ 27000
Sodium Bicarbonate 3 kg	7/154795
Eye Wash Solution 500 ml	34/ 1340 or
Eye Wash Solution 1000 ml	34/ 1342
Eye Wash Solution Mounting Bracket	11/ 26125
Topping-up water — See Section 3 Part 5	
Litmus Paper, blue	7/ 58602
Litmus Paper, red	7/ 58603
Paint, vinyl, golden Yellow	28/ 44260
Battery Charger to BR Specification TEE/C/83/R/66	
Manual topping-up gun. Fixed stop	54/ 29023
Topping-up Equipment to BR Specification TDE/A/80/R/10:	
DC Battopper, self-powered, trolley mounted	65/ 68319
240v ac Battopper, trolley mounted	65/ 68321

SECTION 1 REPAIR PROCEDURE

Notes

1. Hydrometers used on alkaline cells must not be used on lead acid cells.

2. A stock of litmus papers should be held so that any contamination or spillage may be identified.

   Blue litmus will turn to red on contact with acid.
   Red litmus will turn to blue on contact with alkali.

3. Neutralise acid spillage with a solution of 4% sodium bicarbonate to warm water (approx 3/4 cup to 1 gallon), but in an emergency any amount can be used.

4. Use insulated spanners on cell connections. Do not lay tools on the cells.

1. Examination, Cleaning and Repair

1.1 Disconnect connecting links and remove all bolts and washers from the terminals.

1.2 Clean the connecting links, nuts, bolts and washers with hot, clean water and a bristle brush, or soak in white spirit and wipe dry.

1.3 Examine the connecting links, nuts, bolts and washers for damage and corrosion. Discard any defective items.

1.4 Discard any monobloc or cell with any of the following defects:

1.4.1 Cracked cell case or lid.

1.4.2 Loose or damaged terminal pillars.

1.4.3 Signs of overheating, i.e. bitumen runs, distorted filler plugs.

1.5 Renew or repair any fractured or splintered crates.

1.6 Clean off dirt, grease and corrosion from the cell terminals using hot, clean water and a bristle brush or approved alternative method. Clean inside the holes of the terminal pillars with a bottle brush. Wipe dry with a clean cloth.

1.7 Clean the monobloc/cell case/crate using a cloth damped in hot, clean water.

1.8 Clean the float level indicator (BR cells) and vent/filler plugs. Renew the level indicator if it is damaged or does not operate correctly. Ensure that all vent holes are clear.

1.9 Check the stability of the electrolyte level for indication of leakage. If leakage is suspected, dry the monobloc, cell or crate externally and stand it on dry paper. Discard the cell if wet patches appear.

1.10 Examine the bitumen seal. If cracked repair in accordance with Section 4 Additional Procedure No. 1.

1.11 Fit any missing level indicator or vent/filler plugs.

2. Charging

2.1 Connect the cells in series for charging. The number of cells will be dependent on the charging source but battery units removed from vehicles should whenever possible be kept together.

2.2 Top up the electrolyte in each cell with topping-up water until the level is just above the plates.

2.3 Charge the battery for 48 hours at the constant current given in Section 3 Table 2.

2.4 After 24 hours of charging top up the electrolyte level of each cell to the maximum mark given in Section 3 Table 2.

2.5 During the final 3 hours of charging measure the temperature, electrolyte SG and voltage of each cell.

2.5.1 Discard any cell with a temperature above 48°C.

2.5.2 Discard any cell with voltage or SG readings outside the limits given in Section 3 Table 3 for the measured cell temperature.

Discarded cells are to be either returned to the manufacturer or collected under the scrap procedure for the contract concerned.

2.6 Check the date of manufacture of each cell crate or monobloc. See Section 3 Table 4 for age identification.

2.7 Top up the electrolyte level of each cell with topping-up water to the maximum mark.(See Figure 1 for operation of WN6/7 float/filler caps.)

2.8 Fit the vent/filler caps where necessary.

2.9 Wipe any water or acid from the tops and sides of the cells.

2.10 Grease all terminals, connecting links, nuts, bolts and washers with petroleum jelly.

3. Storage

3.1 If the cells are to be stored they are to be given a top-up charge every 4 weeks at the charging rate specified in 2.3 for at least 6 hours.

Continue the charge until the cells begin to gas. Switch off and check that the vent/filler plugs are tight.

3.2 Storage areas for batteries are to be clean, dry and protected from rain and frost.

3.3 The electrolyte specific gravity must not be allowed to fall below 1200 under any circumstances.

4. Age Restrictions (See Section 3 Table 4 for date codes)

4.1 Class 43

4.1.1 The maximum age of monoblocs fitted to power cars is 5 years. Monoblocs are not to be fitted if they are likely to become life expired before the next scheduled Classified Repair.

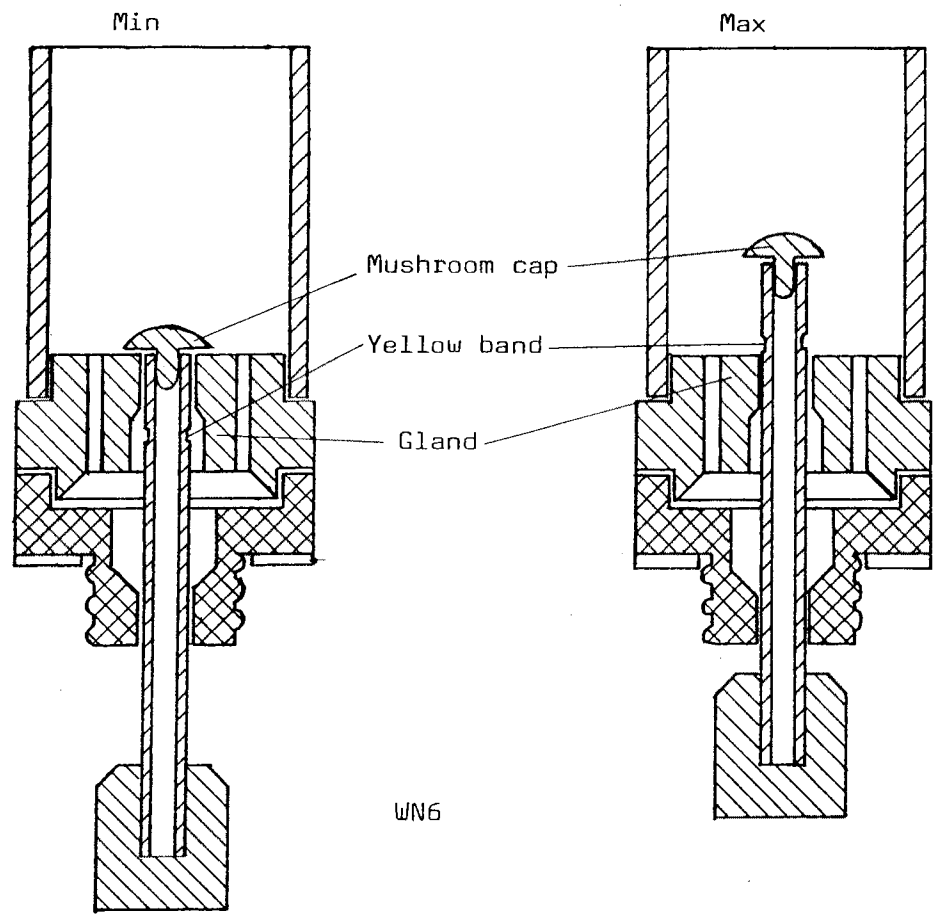
4.1.2 Monoblocs which are life-expired, or are not required as spares at main works or depots due to their small remaining life are to be marked with a band of yellow paint on one of the top corners of the monobloc case. These monoblocs are to be made available for use on Class 20 locomotives.

4.2 Classes 101-122 Motor Cars fitted with BRA2M Batteries.

4.2.1 Batteries older than 2.1/2 years must not be fitted at Classified Repairs.

5. Assembly

5.1 Assemble the cells/monoblocs/crates into the appropriate number to form the required battery. See Section 3 Table 1. Wherever possible, the battery must not contain cells/monoblocs/crates from different makers. All cells/monoblocs in the battery are to be of the same age $\pm$ 1 year. See Section 3 Table 4 for date codes.



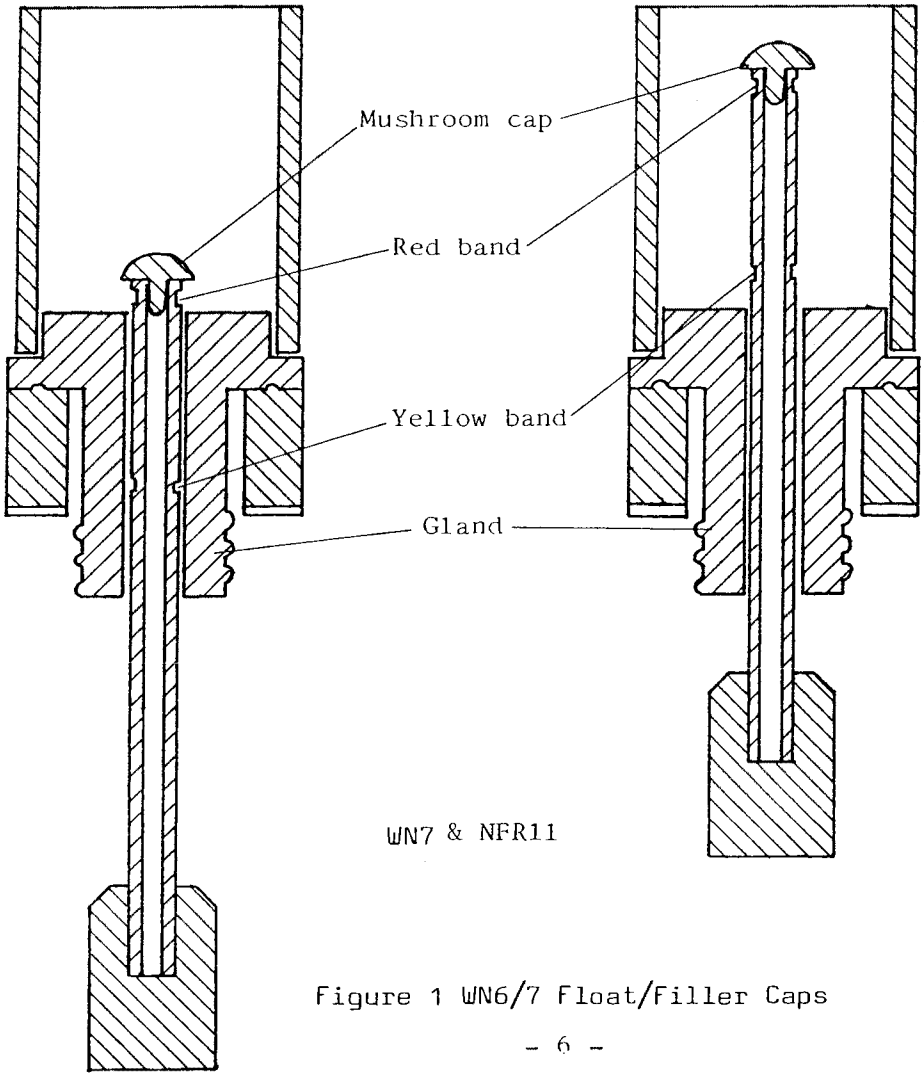


Figure 1 WN6/7 Float/Filler Caps

SECTION 3 TECHNICAL DATA

Table 1 Vehicle Classes and Battery Details

Battery Manufacturers are:-

A = Chloride Power Storage
B = Crompton Batteries Ltd
C = Chloride Automotive
D = BR
E = Chloride Motive Power

Class	No of Cells	Mfr. (see above)	Type	BR Cat Nos. Complete	BR Cat Nos. Unit	Unit Constrn.
03	12	A B	RK144 DC13	77/524	77/544	4 cell crate
08, 904	40	B	DA11/M4	17/771	17/1150	4 cell monobloc
09 (1504	48	B	DA11/M4	17/776	17/1150	
20	48	A	RSKA123/M4	51/16483	51/2176	4 cell monobloc
25	48	A B	RK144 DC13	61/17261	61/42308 61/24372	4 cell crate
26 27	48	A	RK144	61/12010	61/42308	4 cell crate
31	48	B A	DC17/M4 RK192/M4	51/85580	51/87134 52/41648	4 cell monobloc
33	48	B A	DB17 RSKB158	61/24141	61/42307	6 cell crate
37	48	B A	DB17/M3 RSKB158/M3	51/323	51/87135	3 cell monobloc
43	48	A	RSKA123/M4	51/322	51/2176	4 cell monobloc
45	96	B	DA23/M3	61/17378	61/24371	3 cell monobloc

Table 1 Continued...

Class	No of Cells	Mfr. (see above)	Type	BR Cat Nos. Complete	BR Cat Nos. Unit	Unit Constrn.
47 56 58	48	B A	DB23/M4 RSKB217/M4	72/6643	72/7363 72/6644	4 cell monobloc
50	48	B A	DC17/M4 RK192/M4	51/87081	51/87134 52/41648	4 cell monobloc
73	48	B A	DA11/M4 RSKA77/M4	17/775	17/1150	4 cell monobloc
101-05 108-19 121-22	12	D B	BRA2M NFX19BR	-	52/8447 18/29489	Single cell
108	12	B	NFR25	Exprmntl		2 cell crate
Start 141	12	B	RSKA123/M4	15/81759	51/2176	4 cell monobloc
Aux	12	B	NFR13	15/81760		4 cell crate
150	12	C	PSV703	15/78085	15/78086	4 cell monobloc
201-07	40	B A	DA13/M4 RSKA92/M4	17/770	17/1102 -	4 cell monobloc
Contr	30	E	BKF7A			
419 Tract	88	E	XVF21A			
Mk 1	12	D B	BRA1 NFX13BR	-	52/8441 18/29490	Single cell
Mk 2	12	D B	BRA2M NFX19BR	-	52/8447 18/29489	Single cell
Mk 3	48	D	WN6	63/7702	63/7703	3 cell monobloc
		D	WN7	850/003001	850/003002	3 cell monobloc
		B	NFR11		63/8865	3 cell crate

Table 2. Charging Rates and Electrolyte Levels

Maker	Type	Capacity at 5 h rate (Ah)	Constant Current Charge (A)	SG of New Cell Fully Charged	Distance from lid lip to max electrolyte level (mm)
BREL	BRA1	235	12	1.250-1.255	46*
	BRA2	365	20		
	WN6	130	7	1.260-1.265	27*
	WN7	130	7		39*
Crompton Batteries Ltd	DA11	77	4	1.260	35
	DA13	92	4		
	DA17	123	6		
	DA23	169	8		
	DB23	217	10		
	DB29	276	13		
	DC17	192	9		
	NFR13	216	10		
	NFR25	384	18		
	NFR11BR	130	7		
	NFX13BR	235	12		
	NFX19BR	365	20		
Chloride Power Storage	RK144	144	7	1.275	35
	RK192	192	9		
	RK384SA	384	18		
	RKSA77	77	4		
	RSKA92	92	4		
	RSKA123	123	6		
	RSKA169	169	8		
	RSKB158	158	7		
	RSKB217	217	10		
	RSKB276	276	13		
Chloride Automotive	PSV703	200	9	1.275	45
Chloride Motive Power	BKKF7A	57	3	1.280	35
	XVF21A	260	12		

* BR cells and their equivalents are fitted with float level indicators (see Figure 1 for WN6/7).

Table 3 Temperature Compensation

Cell Temperature (°C)	Minimum Cell Voltage	Electrolyte S.G. Limits	
		BRA1, BRA2, WN or equivalent	Chloride/Crompton
15	2.52	1.225-1.285	1.255-1.295
20	2.50	1.220.1.280	1.240-1.290
25	2.48	1.215-1.275	1.235-1.285
30	2.46	1.210.1.270	1.230-1.280
35	2.44	1.205-1.265	1.225-1.275
40	2.42	1.200-1.260	1.220-1.270
45	2.40	1.200-1.255	1.215-1.265

Table 4 Date Codes

4.1 Chloride Power Storage/Crompton Batteries Ltd

Since March 1984 each cell/crate/monobloc is dated by a letter and number following the serial number.

F	Jan	R	Jul
G	Feb	U	Aug
H	Mar	W	Sep
J	Apr	X	Oct
L	May	Y	Nov
M	Jun	Z	Dec

The number is the last digit of the year.

e.g. H4 = March 1984

Before March 1984 the Crompton cell date can be identified by the serial number.

4078-5326	1975	9217-0246	1980
5327-6159	1976	0247-1206	1981
6160-7367	1977	1207-1492	1982
7368-8160	1978	1493-1893	1983
8161-9216	1979		

4.2 Chloride Automotive

A = 1980 01 = Jan
B = 1981 etc 02 = Feb etc

e.g. E11 = November 1984.

5. Specification for Topping-up Water

5.1 The water is to be either distilled or de-ionised.

5.2 The impurity of the water must not exceed 20 Dionic units, or must not exceed the following conditions by chemical analysis.

5.2.1	Total solids	20 p.p.m.
5.2.2	Calcium oxide	10 p.p.m.
5.2.3	Magnesium	10 p.p.m.
5.2.4	Iron Oxide	10 p.p.m.
5.2.5	Lead	10 p.p.m.
5.2.6	Chloride (expressed as chlorine)	10 p.p.m.
5.2.7	Oil	10 p.p.m.

5.3 The water is to be clear and free from suspended matter.

SECTION 4 ADDITIONAL PROCEDURES

1. Repair of Split Bitumen Seals

1.1 Tools and Materials
Electric Hot Plate
Electric Soldering Iron with 1/4" bit
Bitumen BR Cat 7/10770.

1.2 Disconnect the cell/monobloc from the supply and remove it from the charging area.

1.3 Clean and dry the seal and surrounding area. Do not allow water to enter the cell via the defective seal.

1.4 Remove the vent/filler plug for approx 30 minutes to allow gases to escape, then refit firmly.

1.5 Using an electric soldering iron with a 1/4" chisel bit, remove the bitumen from the affected area. Do not allow the iron to damage the case or lid.

1.6 Heat bitumen in a container on an electric hot plate. When liquid, pour into the affected area to a level flush with the lid. Allow to cool to Ambient.