

**GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
RESEARCH DESIGN & STANDARD ORGANISATION
MANAK NAGAR, LUCKNOW 226001**

No. EL/3.2.61

Date 22.3.99

**SPECIAL MAINTENANCE INSTRUCTIONS NO RDSO/ELRS/SMI/
0208-99(REV-0)**

- 1. TITLE:**
MAINTENANCE SCHEDULES FOR VACUUM CIRCUIT BREAKER (VCB) TYPE 20 CB OF M/S. ALSTOM
- 2. BRIEF HISTORY:**
Maintenance schedule for Vacuum Circuit Breakers (VCB) type 20 CB of M/s. ALSTOM were circulated vide RDSO's letter No. EL/3.2.61 dt. 31-1-91. These were based on OEM's recommendation and limited service experience of railways. After maintaining these VCBs for almost ten years, need has been felt to review these schedules. For this purpose, after collecting necessary data from the railways, detailed discussions were held with the OEM and the maintenance schedule issued earlier revised. The revised **MAINTENANCE SCHEDULE** is enclosed as **ANNEXURE**.
- 3. APPLICATION:**
Electric locos and EMUs fitted with VCB type 20 CB of M/s. ALSTOM.
- 4. OBJECT**
To standardise the maintenance schedule the double bottle VCB type 20CB of M/s. ALSTOM and make it realistic and practicable for adoption by railways.
- 5. INSTRUCTION:**
MAINTENANCE SCHEDULE to be followed **during IA, IB, IC, AOH, IOH, and POH** indicating parts to be inspected and details of inspection to be carried out are enclosed as **ANNEXURE**.
- 6. INSTRUCTION DRAWING :**
Nil.
- 7. AGENCY OF IMPLEMENTATION:**
All Electric Loco and EMU car sheds and POH workshops. Periodicity Inspection shall be as per **ANNEXURE**
- 8.0 DISTRIBUTION**
As per list enclosed.

Encl: **ANNEXURE**.



(SIYA RAM)
For Director General/Elect.

ANNEXURE

INSPECTION SCHEDULE FOR VACUUM CIRCUIT BREAKER TYPE 20 CB

‘⊖’ -indicates items to be attended

Sl. No	inspected Details	Inspection Details	IA	IB	IC	ID (AOH)	IOH	POH
1	Vacuum Interrupter	<p>I. Check the distance between cylinder & each of the moving contact assembly connectors with breaker open. The gaps are to be balanced and are of the order of 2mm each, if the interrupter is sound. If the gap is unequal, HV test as per Item. (v) is to be conducted.</p> <p>II. Check the distance of datum line on the moving contact stem from the edge of interrupter body. For new contact this gap = 3mm and fully worn contact = 0.1 mm, when VCB is closed. Change vacuum interrupter with fully worn-out contacts.</p> <p>III. Check the contact travel. New interrupter contacts = 8-9 mm With interrupter contacts = 11-12 mm</p> <p>iv. Check the piston over travel. This should be 3mm after contacts close.</p> <p>v. Check the soundness of interrupter by earthing the VCB base and applying 40 kV, 50Hz for 1 minute across each interrupter, in turn, in breaker open condition.</p> <p>vi. Check the soundness of insulation of air pipes and auxiliary contact operating rod inside the vertical porcelain, by applying 40kV, 50Hz for 1 minute between the cradle and base.</p>	---	---	---	⊖	⊖	⊖
			---	---	---	⊖	⊖	⊖
			---	---	---	⊖	⊖	⊖
			---	---	---	⊖	⊖	⊖
			---	---	---	⊖	⊖	⊖
			---	---	---	⊖	⊖	⊖
			---	---	---	⊖	⊖	⊖
2	Insulators	<p>I. Check for cracks, chips, flash marks.</p> <p>II. Clean with soft, clean and dry cloth.</p>	⊖	⊖	⊖	⊖	⊖	⊖
			⊖	⊖	⊖	⊖	⊖	⊖
3	Cradle, Cover and End Cap	<p>I. Check that the 4 drain holes are clear (2 nos on cradle and 2 nos on the cap)</p> <p>II. Seal the cradle cover using silicone elastomer compound as per SMI -161(Rev.-1)</p> <p>III. Fit bolted design of cradle cover as per Modification sheet RDSO/WAM4/209</p>	⊖	⊖	⊖	⊖	⊖	⊖
			---	---	---	⊖	⊖	⊖
			---	---	---	---	⊖	⊖
			@	@	@	@	@	@
4	Pressure Switch	<p>i. Check that it: closes at 4.65 kg./cm² Opens at 4.00 kg/cm²</p>	--	---	⊖	⊖	⊖	⊖
			---	---	⊖	⊖	⊖	⊖
5	Pressure Regulator	<p>i. Check the setting of regulator using a master pressure gauge. This should be set at 5.0 kg/cm² (70 p.s.i.).</p> <p>ii. Dismantle clean the parts with denatured alcohol and blow out the body with clean compressed air. Re-assemble the parts.</p> <p>iii. Change all components provided in replacement kit.</p>	⊖	⊖	⊖	⊖	⊖	⊖
			--	--	--	⊖	⊖	⊖
			--	---	--	⊖	⊖	⊖

Sl. No	inspected Details	Inspection Details	IA	IB	IC	ID (AOH)	IOH	POH
6	Auxiliary Switch	i. Clean the contacts. ii. Check the tightness of all fixing bolts. nuts and connections. iii. Check the proper operation of contacts. iv. Check the contact pressure (crushing). v. Replace worn out contacts.	---	---	⊖	⊖	⊖	⊖
			---	---	⊖	⊖	⊖	⊖
			---	---	⊖	⊖	⊖	⊖
			---	---	⊖	⊖	⊖	⊖
			---	---	---	⊖	⊖	⊖
7	Air Filter	i. Porous filter element to be washed with denatured alcohol. ii. Blow-out with clean compressed air. iii. Wash the bowl with household soap. iv. Change all components provided in replacement kit.	---	---	---	⊖	⊖	⊖
			---	---	---	⊖	⊖	⊖
			---	---	---	⊖	⊖	⊖
			---	---	---	⊖	⊖	⊖
8	Magnet Valve	i. Check the tightness of all connections and fixing screws. ii. Check the air leakage when operated manually.	---	---	---	⊖	⊖	⊖
			---	---	⊖	⊖	⊖	⊖
9	Relay Valve	i. Replace 2 nos. PTFE valve discs. ii. Overhaul and lubricate the relay valve as per SMI-162 Rev-1.	---	---	---	⊖	⊖	⊖
			---	---	---	⊖	⊖	⊖
10	Air Reservoir	i. Check the condition of desiccant. If colour changed from blue to pink, replace the silicagel. Also weigh the air dryer.	---	---	⊖	⊖	⊖	⊖
11	Air- Dryer	i. Weigh the air dryer. if increase in weight is more than 0.8kg from new weight, replace molecular sieve or regenerate by heating as per SMI-137.	---	---	⊖	⊖	⊖	⊖
12	Electrical Connections	i. Check for proper tightness ii. Check the condition and tightens of end connections of the flexible connector (shunt provided between two interrupters) iii. Check the condition of fixed contact end connectors. Fit new ones, if necessary	---	---	⊖	⊖	⊖	⊖
			---	---	---	⊖	⊖	⊖
			---	---	---	⊖	⊖	⊖
13	Air Connections	After opening cradle cover and base plate cover, i. Check for proper air piping. ii. Check for air leakage from the exhaust port of air control valve and from manifold port, by operating magnet valve manually. iii. Check for air leakage, at all joints. iv. Measure air leakage at 6.5 kg/cm ² for 10 minutes in open and close position of breaker. Pressure should not decrease by more than 10% of the net value. v. Replace Control & Main Air Pipes. vi. Replace all nylon air pipes.	---	---	---	⊖	⊖	⊖
			---	---	---	⊖	⊖	⊖
			---	---	---	⊖	⊖	⊖
			---	---	---	⊖	⊖	⊖
			---	---	---	---	---	⊖
			---	---	---	---	---	⊖
14	Surge Suppressor (Magnet Valve)	i. Check its healthiness by applying 110 V AC, 50 Hz across it. Current shall be between 14.0 to 19.4 mA. Replace if not in range.	---	---	---	⊖	⊖	⊖
15	Operating Rod Assembly	i. Check that collar, pin and operating lever bonded at ends of rod is not loose. ii. Replace operating rod assembly.	---	---	---	⊖	⊖	⊖
			---	---	---	---	---	⊖

Sl. No	inspected Details	Inspection Details	IA	IB	IC	ID (AOH)	IOH	POH
16	R-C Network	i. Measures current value across individual R-C Network at 380 V AC (50Hz). Value should be between 2.5 A to 3.5A. Replace if not in range.	---	---	---	⊖	⊖	⊖
17	Lubrication	i. Lubricate air cylinder by injecting grease through its small hole, when relay valve is removed, as per SMI-162 Rev-1.	---	---	---	⊖	⊖	⊖
18	Rubber Components	i. Replace all rubber kit items. ii. Replace other rubber items not covered in rubber kit.	---	---	---	⊖ ----	⊖ ⊖	⊖ ⊖
19	Complete V.C.B. Assembly	i. Check the closing speed with the help of contact travel recorder as per SMI-136.	---	---	---	⊖	⊖	⊖

NOTES:

- 1 Overhauling of VCB should be carried out as per instructions laid down in the Instruction, Operation and Maintenance Manual, provided by ALSTOM Limited, Naini Works, Allahabad.
- 2 @ Older latching arrangement of cradle cover is to be replaced with modified bolted design, in line with Modification Sheet No. RDSO.WAM4/209, during inspection.
- 3 This Inspectin Schedule for VCB type 20 CB supersedes earlier Schedule circulated by RDSO vide letter No.EL/3.2.61 dt. 31.1.91.

**GOVERNMENT OF INDIA
(MINISTRY OF RAILWAYS)
RESERARCH DESIGNS & STANDARDS ORGANISATION
MANAK NAGAR, LUCKNOW-226011**

No.EL/3.2.61

Dated:16.11.1999

**SPECIAL MAINTENANCE INSTRUCTIONS NO.RDSO/ELRS/SMI/0208
(REV.1)**

1. TITLE

MAINTENANCE SCHEDULES FOR VACUUM CIRCUIT BREAKER (VCB) TYPE 20CB OF M/S.ALSTOM

2. BRIEF HISTORY

Maintenance Schedule for vacuum circuit breakers (VCBs) type 20CB were circulated through Special Maintenance Instructions No.RDSO/ELRS/SMI/208-99 (Rev.0) dtd. 22.03.99. A need has been felt to revise the same after issue of the guide lines for procurement of 'Over hauling kit' from the OEM(Ref. EL/3.2.61 dt. 29.09.99). The revised Maintenance Schedule to fall in line with the above guide lines is enclosed as Annexure.

3. APPLICATION

Electric Locos & EMUs fitted with VCB type 20CB of M/s. Alstom.

4. OBJECT

To standardise the maintenance schedule for double bottle VCB type 20CB of M/s. Alstom and make it fall in line with the guide lines for procurement of 'Over hauling Kits'.

5. INSTRUCTIONS

Maintenace Schedule to be followed during IA, IB, IC, AOH, IOH and POH indicating parts to be inspected to be carried out are enclosed as Annexure.

6. INSTRUCTION DRAWING: Nil.

7. AGENCY OF IMPLEMENTATION

All Electric Loco Sheds and EMU Car Sheds and POH Workshops. Periodicity of Inspection shall be as per Annexure.

8. DISTRIBUTION: As per list enclosed.



(Arun Srivastava)
For Director

Encl: Annexure

ANNEXURE-I

**INSPECTION SCHEDULE
FOR
VACUUM CIRCUIT BREAKERS TYPE 20CB**

‘⊙’ – indicates items to be

attended

Sl No	Part to be inspected	Inspection Details	IA	IB	IC	ID (AOH)	IOH	POH
1	Vacuum Interrupter	i. Check the distance between cylinder & each of the moving contact assembly connectors with breakers open. The gaps are to be balanced and are of the order of 2 mm each, if the interrupter is sound. If the gap is unequal, HV test as per item (v) is to be conducted. ii. Check the distance of datum line on the moving contact stem from the edge of interrupter body. For new contact this gap = 3mm and fully worn contact = 0-1 mm when VCB is closed. Change vacuum interrupter with fully worn-out contacts. iii. Check the contact travel. New interrupter contacts = 8-9mm With eroded contacts = 11-12mm iv. Check the piston overtravel. This should be 3mm after contacts close. v. Check the soundness of interrupter by earthing the VCB base and applying 40kv, 50Hz for 1 minute across each interrupter, in turn. vi. Check the soundness of insulation of air pipes and auxiliary contact operating rod inside the vertical porcelain, by applying 40kv, 50Hz for 1 minute between the cradle and base.	--	--	--	⊙	⊙	⊙
	Contact-Piston	Vii. Replace piston washer, damper washer, insulation tube & insulation washer.	--	--	--	⊙	⊙	⊙
			--	--	--	⊙	⊙	⊙
			--	--	--	⊙	⊙	⊙
			--	--	--	⊙	⊙	⊙
			--	--	--	⊙	⊙	⊙
2.	Insulator	i. Check for cracks, chips, flash marks. ii. Clean with soft, clean and dry cloth.	⊙	⊙	⊙	⊙	⊙	⊙
			⊙	⊙	⊙	⊙	⊙	⊙
3.	Cradle, Cover and End cap	i. Check that the 4 drain holes are clear (2 Nos. on cradle and 2 nos. on end cap). ii. Replace sealing strip on cradle & cover iii. Seal the cradle cover using silicone elasto-mer compound as per SMI-161 (Rev-1)	⊙	⊙	⊙	⊙	⊙	⊙
			--	--	--	⊙	⊙	⊙
			--	--	--	⊙	⊙	⊙

		iv Fit bolted design of cradle cover as per Modification sheet RDSO/WAM4/209	@	@	@	@	@	@
4.	Pressure Switch	i. Check that it Closes at 4.65 Kg/Cm2 Opens at 4.00 kg/cm2	--	--	⊙	⊙	⊙	⊙

Sl No	Part to be inspected	Inspection details	IA	IB	IC	ID (AOH)	IOH	PO H
5.	Pressure Regulator	i. Check the setting of regulator using a Master pressure gauge. This should be set At 5.0 kg/cm2 (70 p.s.i). ii. Dismantle, clean the parts with denatured Alcohol and blow out the body with clean Compressed air. Re-assemble the parts. iii. Replace diaphragm provided in AOH kit. iv. Replace all components provided in replacement kit.	⊙	⊙	⊙	⊙	⊙	⊙
			--	--	--	⊙	⊙	⊙
			--	--	--	--	--	--
			--	--	--	⊙	⊙	⊙
6.	Auxiliary Switch	i. Clean the contacts. Ii Check the tightness of all fixing bolts, nuts And connections. Iii. Check the proper operation of contacts. Iv. Replace worn out contacts. v. Replace complete auxiliary switch assembly	--	--	⊙	⊙	⊙	⊙
			--	--	⊙	⊙	⊙	⊙
			--	--	⊙	⊙	⊙	⊙
			--	--	--	⊙	⊙	--
			--	--	--	--	--	⊙
7.	Air Filter	i. Porous filter element to be washed with denatured alcohol. Ii. Blow-out with clean compressed air. iii. Wash out with clean compressed air. iv. change all components provided in replacement kit.				--	⊙	⊙
						--	⊙	⊙
						--	⊙	⊙
						--	⊙	⊙
8.	Magnet Valve	i. Check the tightness of all components and fixing screws. ii. Check the air leakage when operated manually.				--	⊙	⊙
						⊙	⊙	⊙
9.	Relay Valve	i. Replace 2 nos. PTFE valve discs. ii. Overhaul and lubricate the relay valve as per SMI-162 Rev-1. iii. Replace poppet valve provided in POH kit.				--	⊙	⊙
						--	⊙	⊙
						--	--	⊙
10	Air Reservoir	i. Check the condition of dessicant. If color Changed from blue to pink, replace the Silicagel. Also weigh the air dryer.				⊙	⊙	⊙
11	Air Dryer	i. Weigh the air dryer. If increase in weight is more than 0.8kg from new weight, replace molecular sieve or regenerate by heating as per SMI-137.	--	--	⊙	⊙	⊙	⊙

		ii. Replace molecular sieves with fresh ones.	--	--	--	--	--	⊙
12	Electrical Connections.	i. Check for proper tightness. ii. Check the condition and tightness of end connection of the flexible connector (shunt provided between two interrupters). iii. Check the condition of fixed contact end connectors. Fit new ones, if necessary.	--	--	⊙	⊙	⊙	⊙
			--	--	--	⊙	⊙	⊙
			--	--	--	⊙	⊙	⊙

Sl No	Part to be inspected	Inspection details	IA	IB	IC	ID (AOH)	IOH	POH
13	Air Connections	After opening cradle cover and base plate Cover, i. Check for proper air piping. ii. Check for air leakage from the exhaust port of air control valve and from manifold port, by operating magnet valve manually. iii. Check for air leakage, at all joints. iv. Measure air leakage at 6.5 kg/cm ² for 10 minutes in open and close position of breaker. Pressure should not decrease by more than 10% of the net value. v. Replace Control & Main Air Pipes in IOH kit. vi. Replace all nylon air pipes in POH kit.	--	--	--	⊙	⊙	⊙
			--	--	--	⊙	⊙	⊙
			--	--	--	⊙	⊙	⊙
			--	--	--	⊙	⊙	⊙
			--	--	--	--	⊙	⊙
			--	--	--	--	--	⊙
14	Surge Suppressor (Magnet Valve)	i. Check its healthiness by applying 110v AC, 50Hz across it. Current shall be Between 14.0 to 19.4 mA. Replace if not In range. ii. Replace the surge suppressor unit.	--	--	--	⊙	⊙	⊙
			--	--	--	--	--	--
15	Operating Rod Assembly	i. Check that collar, pin and operating lever bonded at ends of rod is not loose. ii. Replace operating rod assembly.	--	--	--	⊙	⊙	⊙
			--	--	--	--	--	⊙
16	R-C Network	i. Measure current value across individual R-C network at 380V AC(50Hz). Value should be between 2.5A to 3.5A. Replace if not in range.	--	--	--	⊙	⊙	⊙
17	Lubrication	i. lubricate air cyclider by injecting grease through its small hole, when relay valve is removed, as per SMI-162 Rev-1.	--	--	--	⊙	⊙	⊙
18	Rubber Components	i. Replace all rubber kit items. ii. Replace other rubber items not covered in rubber kit.	--	--	--	⊙	⊙	⊙
			--	--	--	--	--	⊙
19	Complete V.C.B Assembly	i. Check the closing speed with the help of contact travel recorder as per SMI-136.	--	--	--	⊙	⊙	⊙

Notes:

1. *Overhauling of VCB should be carried out as per instructions laid down in the instruction, operation and Maintenance Manual, provided by ALSTHOM Limited, Naini Works, Allahabad.*
2. *@ - Older latching type arrangement of cradle cover is to be replaced with modified bolted design, in line with Modification Sheet No. RDSO/WAM4/209, Whenever the VCB is available – be it IA, IB, IC, AOH, IOH or POH.*
3. *This inspection Schedule for VCB type 20CB supercedes earlier Schedule enclosed with RDSO SMI No. 0208-99(Rev.0) dated 22.03.99.*