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EL /3.2.19/3 Phase

Dated 29.03.2012

Chief Electrical Engineer,

- Central Railway, Mumbai, CST-400 001.
- Northern Railway, Baroda House, New Delhi-110001.
- North Central Railway, Block A2, Allahabad- 211 033
- Eastern Railway, Fairlie Place, Kolkata -700 001.
- East Central Railway, Hazipur-844101.
- East Coast Railway, Chandrashekharpur, Bhubaneshwar-751016
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- South Central Railway, Secunderabad-500 371.
- South Eastern Railway, Garden Reach, Kolkata -700 043.
- South East Central Railway, Bilaspur-495004
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- West Central Railway, Jabalpur-482001.
- Chittaranjan Locomotive Works, Chittaranjan – 713 331 (W.B.)

TECHNICAL CIRCULAR NO. RDSO/2012/EL/TC/0113, Rev.'0', Dated 29.03.2012.

Sub:- Pneumatic testing of Three Phase Electric Locomotives in Electric Loco Sheds / Workshops.

There have been few cases of MR air pressure not maintaining in 3-phase Locomotives due to failure of one compressor. Investigation revealed that other compressor was also not able to maintain MR air pressure due to its de-rated capacity. The rated free air delivery of the compressor can be verified in-situ by recording MR air pressure build up time by each compressor. MR air pressure build up time by each compressor mentioned as 12 minutes in the test specification of D & M (E-70 brake system) is on very higher side, which can be achieved even with the de-rated compressor.

Hence it has been felt necessary to formulate pneumatic test procedure for 3-phase locomotives as deliberated during 34th MSG vide item no. (9) of Railway board letter no 2011/Elect (TRS)/138/2 dated 16.08.2011.

Theoretical calculation to work out MR air pressure build up time has been carried out by taking into account total permissible air leakage and total volume of reservoirs and pipe line as well. The time taken by each compressor to build up MR air pressure from 0 to 10 kg/cm^2 has been theoretically worked out in the range of 06 minutes. In order to validate theoretical calculation, Railways have been advised to carry out MR air pressure build up time test in at least 5 Locomotives and furnish details as per format vide letter No. EL/3.2.19 (G) dated 10.10.2011. The test report furnished by Railways has been examined & it has been noted that MR air pressure build up time by each compressor was observed in the range of 6 to 7 minutes as per test carried out by Railways (Central Railways vide letter no. L.253.AC.46 dated 06.06.2011 & EC Railway vide letter no. letter ECR/ELE/RS/034/MSG dated 22.03.12.)

In view of above vital pneumatic test parameters of 3- phase Locomotives have been formulated based on D&M static test specification catalogue no. AT 371/I Part no. MM 3946 (Issue no. 2) for WAG9 locomotive, catalogue no. AT 366 Part no. MM 3882 (issue no. 3) for WAP5 Locomotives, CLW's Pneumatic & brake system check sheet no F60.812 version(2) and test reports received from Railways. Vital pneumatic test parameters of 3-phase locomotives fitted with E-70 brake system are appended below:

Pneumatic test parameters of 3-phase electric locomotives

SN	Parameters	Value	Reference
1.	**Auxiliary Air supply system (Pantograph & VCB)**		
1.1	Ensure, Air is completely vented from Pantograph Reservoir (Ensure Panto Pressure Gauge reading is zero)		
1.2	Turn ON BL Key. Now MCPA starts. Record Pressure Build Up time (8.5 Kg/cm^2)	60Sec. (Max.)	
1.3	Auxiliary compressor Safety Valve 23F setting	8.5±0.25Kg/cm^2	Faively Doc. No. DMTS-014-1 & CLW's check sheet no F60.812 Version 2
1.4	Check VCB Pressure switch setting	**Opens** 4.5 ± 0.15 kg/cm^2 **Closes** . 5.5 ± 0.15 kg/cm^2	CLW's check sheet no F60.812 Version 2
1.5	Set Pantograph Selector Switch is in Auto, open Pan-1&2 Isolating Cocks & KABA Cock by Key (KABA Key).		
1.6	Set Cab-1 Pan UP in Panel A.	Observed Pan-2 Rises.	
1.7	Close Pan-2 Isolating Cock, Open Pan-2 Isolating Cock,	Panto-2 Fall Down Panto-2 Rises	
1.8	Record Pantograph Rise Time	06 to 10 seconds.	
1.9	Record Pantograph Lowering Time	06 to 10 seconds	
1.10	Panto line air leakage	0.70 kg/cm^2 in 5 Minutes	
2.0	**Main Air supply system**		
2.1	Ensure air is completely vented from locomotive. Drain out all the reservoirs by opening the drain cocks and then closed drain cocks. MR air pressure build up time by each compressor from 0 to 10 kg/cm^2 **i) With 1750 LPM Compressor** **ii) With 1450 LPM Compressor**	**i) 7 Mts. Max.** **ii) 8.5 Mts. Max.**	Theoretical calculation and test performed by Railways.
2.2	Drain air below MR 8 Kg/cm^2 to start both the compressors	Check Starting of both Compressors	
2.3	Drain air from main Reservoir up to 7 Kg/cm^2. Start	30 Sec.(Max)	

	compressors, Check pressure build time of individual compressor from 8 kg/cm^2 to 9 kg/cm^2		
2.4	Check Low MR Pressure Switch setting (37)	**Closes at** 6.40±0.15 Kg/cm^2. **Open at** 5.60±0.15 Kg/cm^2	D & M test spec.MM3882 & MM3946
2.5	Check Compressor Pressure Switch RGCP setting (35)	**Opens at** 10 ±0.20 Kg/cm^2 **Close at** 8.0 ±0.20 Kg/cm^2	D & M test spec.MM3882 & MM3946
2.6	Run both the compressors Record Pressure build up time.	3.5 Minutes Max.	Trial results
2.7	Check Unloader valve operation time	Approx. 12 Sec.	
2.8	Check Auto Drain Valve functioning (124 & 87)	Operates when Compressor starts	
2.9	Check CP-1 delivery Safety Valve setting (10/1). Run CP Direct by BLCP.	11.50 ± 0.35 Kg/cm^2	D & M test spec.MM3882 & MM3946
2.10	Check CP -2 deliveries Safety Valve setting. (10/2) Run CP Direct by BLCP.	11.50 ± 0.35 Kg/cm^2	D & M test spec.MM3882 & MM3946
2.11	Switch 'OFF' the compressors and ensure that the safety valve to reset at pressure 1.2 Kg/cm^2 less than opening pressure.		D & M test spec.MM3882 & MM3946
2.12	BP Pressure: Switch 'OFF' Compressor, Drain MR pressure by drain cock of 1st Main Reservoir. Start Compressor Check setting Pressure of Duplex Check valve 92F.	5.0 ± 0.10 Kg/cm^2	CLW's check sheet no F60.812 Version 2
2.13	FP pressure: Fit Test Gauge in Test Point 107F FPTP. Open Isolate cock 136F. Check pressure in Gauge.	6.0 ± 0.20 Kg/cm^2	CLW's check sheet no F60.812 Version 2
3.0	**Air Dryer Operation**		
3.1	Open drain Cock 90 of 2nd MR to start Compressor, leave Open for Test. Check Air dryer Towers to change	Tower to change i)Every minute (FTIL & SIL) ii)Every two minute (KBIL)	
3.2	Check Purge Air Stops from Air Dryer at Compressor stops		
3.3	Check condition of humidity Indicator	Blue	
4.0	**Main Reservoir Leakage test**		
4.1	Put Auto Brake (A-9) in Full Service. Check MR Pressure air leakage from both cabs.	Should be less than 1kg/cm^2 in 15 minutes	D & M test spec. MM3882 & MM3946
4.2	Check BP Air leakage (Isolate BP charging cock-70)	0.15kg/cm^2 in 5 minutes	D & M test spec.MM3882 & MM3946
5.0	**Brake Test (Automatic Brake Operation)**		
5.1	Record Brake Pipe & Brake Cylinder pressure at Each Step.		

	Check Proportionality of Auto Brake System				
	Auto Controller Position	BP Pressure Kg/cm^2	BC (WAG9 & WAP7) Kg/cm^2	BC (WAP5) Kg/cm^2	CLW's check sheet no F60.812 Version 2
	Run	5.0±0.1	0.00	0.00	
	Initial	4.60±0.1	0.40±0.1	0.75±0.15	
	Full Service	3.35±0.2	2.50±0.1	5.15±0.30	
	Emergency	Less than 0.3	2.50±0.1	5.15±0.30	
5.2	Record time to BP Pressure drop to 3.5 Kg/cm^2. Ensure Automatic Brake Controller handle is Full Service from Run.			8 ± 2 Sec.	D & M test spec.MM3882 & MM3946
5.3	Operate Asst. Driver Emergency Cock,			BP Pressure falls rapidly to Below 2.5 Kg/cm^2.	D & M test spec.MM3882 & MM3946
5.4	Check Brake Pipe Pressure Switch 69F Operates			**Closes at** BP 4.05 – 4.35 Kg/cm^2 **Opens at** BP 2.85 – 3.15 Kg/cm^2	CLW's check sheet no F60.812 Version 2
5.5	Move Auto Brake controller handle from "Running to Emergency" BC filling time from 0.4Kg/cm^2 i.e. 95% of Max. BC developed WAP$_5$ BC 5.15 ± 0.3 Kg/cm^2 apply time WAP$_7$ BC 2.50 ± 0.1 Kg/cm^2 WAG$_9$-BC 2.50 ± 0.1Kg/cm^2			4±1 sec 7.5±1.5 Sec 21±3 Sec.	D & M test spec.MM3882 & MM3946
5.6	Move Auto Brake controller handle to Full service and allow BP pressure 3.5 Kg/cm^2. Move Brake controller to Running Position BC Release time to fall BC Pressure up to 0.4Kg/cm^2 i.e. 95% of Max. BC developed BC Release time WAP$_5$ & WAP$_7$ WAG$_9$			17.5±2.5 sec 52.5±7.5 Sec.	D & M test spec.MM3882 & MM3946
5.7	Move Auto Brake controller Handle to Release, Check BP Pressure Steady at 5.50 ±0.2 Kg/cm^2 time.			60 to 80 Sec.	CLW's check sheet no F60.812 Version 2
5.8	**Auto brake capacity test:** The capacity of the A9 valve in released condition must conform to certain limit in order to ensure compensation for air leakage in the train without interfering with the automatic functioning of brake. • Allow the MR pressure to build up to maximum stipulated limit. • Close brake pipe angle cock and charge brake pipe to 5 kg/cm^2 by A9 (Automatic brake controlling) at			BP pressure should not fall below 4.0 kg/cm^2 with in 60 sec.	RDSO Motive Power Directorate report no. MP Guide No. 11 July 1999 Rev.1

	run position. • Couple 7.5 dia leak hole to the brake hose pipe of Locomotive. Open the angle cock for brake pipe. The test shall be carried out with all the compressors in working condition.		
5.9	Keep Auto Brake Controller (A-9) in Full Service. Press Driver End Paddle Switch. (PVEF)	BC comes to '0'	
6.0	**Direct Brake (SA-9)**		
6.1	Apply Direct Brake in Full Check BC Pressure WAP_7, WAG_9 WAP_5	3.50±0.20 Kg/cm² 5.15±0.3 Kg/cm² sec.	CLW's check sheet no F60.812 Version 2
6.2	Apply direct Brake. Record Brake Cylinder charging Time.	8/Max.	D & M test spec.MM3882 & MM3946
6.3	Check Direct Brake pressure switch setting 59 (F)	0.2±0.1 Kg/cm²	D & M test spec.MM3882 & MM3946
6.4	Release direct brake & BC Release time to fall BC Pressure up to 0.4Kg/cm²	10-15 Sec.	
7.0	**Dynamic Brake (Brake blending)**		
7.1	This test is to be done by forcing signal by laptop 06H Actual BE E1 = 100%	WAP_7 & WAP_9 2.5 Kg/cm² WAP_5 5.15 Kg/cm².	D & M test spec.MM3882 & MM3946
7.2	This test is to be done by forcing signal by laptop 06H Actual BE E1 = 50%	WAP_7 & WAP_9 1.25 Kg/cm². WAP_5 . 2.55 Kg/cm².	D & M test spec.MM3882 & MM3946
8.0	**Parking Brake**		
8.1	Press BPPB to Release Parking brake	PB released Lamp Off in Panel Pressure In Parking Brake gauge 6.0 Kg/cm²	D & M test spec.MM3882 & MM3946
8.2	Press BPPB to apply Parking brake	PB applied, Lamp ON In Panel Pressure in Parking Brake gauge 0.0 Kg/cm²	
8.3	Manually release and apply Parking Brake by pressing solenoid valve 30F	Verify release and application of Parking Brake.	

8.4	Check pressure in PB Gauge	6.0±0.15 Kg/Cm^2	
8.5	Check Brake Block Clearance	10 mm in TBU 3 mm in Disc Brake (WAP_5)	D & M test spec.MM3882 & MM3946
9.0	**Sanding Equipment**		
9.1	Check Isolating Cock–134F is in open position. Press sander paddle Switch. (To confirm EP Valves Operates)	Sand On Rail	
10.0	Test Vigilance Equipment : As per D&M test Specification		

(A. K. Goswami)
for Director General/Elect.

Encl.: NIL.

Copy to: As per Standard Mailing List No. EL/M/0019

(A. K. Goswami)
for Director General/Elect.

Encl.: NIL.