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Technical circular NO. RDSO/2019/EL/TC/0153 (REV. '0')

Sub: Acknowledgement of Vigilance Control Device (VCD) through PVEF in Microprocessor based control and fault diagnostic system (MPCS) version-3.

Ref: SER's letter no. TRS/BNDM/T/22/156 dated 21.01.2019.

1.0 Background:

1.1 SER vide letter under reference had informed that the function of VCD was getting acknowledged/Reset through PVEF in MPCS V3 and requested to eliminate the acknowledgment of VCD through PVEF.

1.2 In conventional electric locomotives not equipped with MPCS and in conventional electric locomotives equipped with MPCS V2, VCD is a standalone device provided in the locomotive. In conventional electric locomotives equipped with MPCS V3, the functionality of VCD is incorporated in MPCS itself and no separate VCD device is provided in the locomotive. In 3-phase electric locomotives also, the functionality of VCD is incorporated in Brake System itself and no separate VCD device is provided in the locomotive.

1.3 This technical circular examines and clarifies the issue of VCD acknowledgment in Electric Locomotives equipped with MPCS V3.

2.0 VCD acknowledgement in conventional electric locomotives not equipped with MPCS and in conventional electric locomotives equipped with MPCS V2:

2.1 In conventional electric locomotives not equipped with MPCS and in conventional electric locomotives equipped with MPCS V2, VCD is a standalone device provided in the locomotive as per specification no. RDSO/2008/EL/SPEC/0025 Rev.-5 (March'2010).

2.2 As per clause 1.0 of specification no. RDSO/2008/EL/SPEC/0025 Rev.-5 (March'2010), "***The VCD is for monitoring alertness of the engine crew through a multi-resetting system which gets reset by specified normal operational activities of the crew,*** *in addition to acknowledgement of the vigilance check by pressing a pedal switch or push button provided for driver and assistant driver respectively for this purpose. Absence of the normal driving functions or the acknowledgement at specified intervals shall activate vigilance control system to flash an indication which if still not acknowledged shall cause audio warning. If audio warning is also not acknowledged, it shall result in emergency brake application. This shall also take care of problem of operation of locos by unauthorised persons getting into unattended loco cab. This shall be designed as a fail-safe system."*

2.3 The acknowledgement of VCD is defined in Clause 2.2.2 of specification no. RDSO/2008/EL/SPEC/0025 Rev. -5 (March'2010) as given below:

"Vigilance Cycle/Delay Cycle

The cycle has a preset period normally set at 60 seconds. This cycle is automatically restarted whenever the vigilance unit detects one of a number of external inputs derived from other vehicle functions under the driver's control from the active cab, the presence of which automatically infers that the driver has taken some positive action and is therefore vigilant.

- *The control functions include Notch-up / Notch-down by the master controller (MP) or EEC;*
- *Operation of the sander, horn, Train Brake (A-9), Loco Brake (SA9), MPS-1;*
- *Operation of the vigilance pedal (foot) switch available for driver or vigilance push button available for assistant drive.*

In normal circumstances, provided that the driver is periodically performing some positive action, the cycle shall be continually reset and shall never run to completion. Only if the driver fails to perform such an action within the cycle period, the cycle period shall be completed.

When such an event occurs, a second time cycle, i.e. action cycle shall be initiated and audible and visual warnings shall be given to the driver".

2.4 Thus, in conventional electric locomotives not equipped with MPCS and in conventional electric locomotives equipped with MPCS V2, VCD acknowledged/ reset by PVEF is not specified in the specification and VCD is not acknowledged/ reset by PVEF.

3.0 VCD acknowledgement in 3-phase electric locomotives:

3.1 In 3-phase electric locomotives no separate VCD device is provided and VCD functionality is incorporated in brake electronics.

3.2 The acknowledgement of VCD is defined in Chap. 3, Clause no. 3.7.1.3 on page 39 of WAG-9 Driver's manual (Indent no. 3EHW411172 en) as given below;

- Within a period of 60 seconds the train crew must press the "VIGILANCE foot switch or
- Initiate sanding by pressing the "SANDING" foot switch or
- While train is in motion alter the position of the TE/BE throttle in such a way that a difference of at least 3% appears between the first and second value or
- The train crew must press the green push-button 'BPVG", on panel "D".

3.3 If any one of these four conditions is achieved, the monitoring cycle is reset and the 60 second cycle starts again.

3.4 If none of these conditions is met within 60 seconds, an alarm is triggered and yellow vigilance warning indication lamp 'LSVW' is lit continuously. Alarm can be acknowledged by pressing and releasing the 'Vigilance' foot switch or push button 'BPVG'.

3.5 If the alarm is not acknowledged within 8 seconds, rapid braking is initiated.

3.6 The acknowledgement of VCD is also defined in Clause no. 6.1 on page 21 of 26 of specification no. RDSO/2017/EL/SPEC/0126 Rev. -0 of Feb. 2017, (Specification of Computer/Microprocessor Controlled Air Brake System with Advanced Features for 3-phase Electric locomotives) as given below;

"Multi-Resetting Vigilance Control Device

The Vigilance Control Device (VCD) feature is provided to enhance the safety of locomotive operation by ensuring alertness of the crew all the time. The system shall be of multi-resetting type i.e. acknowledgement of the system is not only by means of pressing reset push button but by the other normal driving activities (i.e. throttle handling, dynamic brake application, operation of sanders or application of brakes), of the driver during the train operation. This reduces the strain on the driver, as he is not required to press the reset push button always when operating other controls of the locomotive."

3.7 Thus, in 3-phase electric locomotives also VCD acknowledged/ reset by PVEF is not specified in the specification and VCD is not acknowledged/ reset by PVEF.

4.0 VCD acknowledgement in MPCS V3 fitted conventional locomotives:

4.1 In conventional electric locomotives equipped with MPCS V3, the functionality of VCD in incorporated in MPCS itself and no separate VCD device is provided in the locomotive.

4.2 The acknowledgement of VCD is defined in Chap. 2, Clause no. 7.1 on page 14 of 40 of specification no. ELRS/SPEC/MPC-FDS/0001 Rev.-3 Apr 2013 as given below;

"7.1 Vigilance cycle/ Delay cycle

The cycle has a preset period normally set at 60 seconds. This cycle is automatically restarted whenever the system detects that one of a number of external inputs is operated by the driver's control from the active cab, the

presence of which automatically infers that the driver has taken some positive action and is therefore vigilant.

- *The control functions include Notch-up / Notch-down by the master controller (MP) or EEC.*
- *Operation of the sander, horn, Train Brake (A-9), Loco Brake (SA9), MPS operation.*
- *Operation of the vigilance pedal (foot) switch available for driver or vigilance push button available for assistant drive.*

In normal circumstances, the driver is periodically performing one of the above positive actions, the cycle shall be continually reset and shall never run to completion. Only if the driver fails to perform such an action within the cycle period, the cycle period shall be completed.

When such an event occurs, a second time cycle i.e. action cycle shall be initiated and audible and visual warnings shall be given to the driver."

4.3 In conventional electric locomotives equipped with MPCS V3, VCD acknowledgement/ resetting by PVEF is not specified in the specification, however, VCD is acknowledged/ reset by PVEF.

5.0 Deactivation of VCD reset control from Assistant Loco Pilot side:

5.1 Railway Board vide letter no. 2003/Elect(TRS)/441/3 Vol. I Pt. dated 11.03.2016 had directed, "*To follow common operational practices in Diesel and Electric locomotives for ensuring safe train operation. VCD reset control from Assistant Loco Pilot (ALP) side in all the Electric locomotives therefore needs to be deactivated as done for Diesel locomotives*".

5.2 Accordingly, RDSO had issued modification sheet no. RDSO/2016/EL/MS/0450 rev. '0' dated 19.05.2016 for deactivation of VCD acknowledgement from ALP side on Electric locomotives.

6.0 Implementation of VCD acknowledgment feature by M/s Medha in MPCS V3

6.1 M/s Medha had considered following inputs for VCD acknowledgment as specified vide their letter no. MCS:RDSO:5285:19 dated 12.7.2019

SN	Input	Required as per Spec.	Additional Inputs	Remarks
	Horn1 (DIP 130)	Yes		Inputs for horn
	Horn2 (DIP 131)	Yes		
	P1 (DIP 78)	Yes		Input for brake
	SWC (DIP 46)		Yes	Input for weight transfer
	BL_MU (DIP 93)			For VCD Suppression in rear loco of MU
	MPPLUS (DIP 26)	Yes		Inputs for Notch UP/Down
	MPMINUS (DIP 29)	Yes		
	BLRDJ (DIP 1)		Yes	Inputs for DJ Closing
	BLDJ (DIP 0)		Yes	
	PSA (DIP 43)	Yes		Input for sander
	PVEF (DIP 42)		Yes	Input for PVEF
	VCDRST (DIP 88)	Yes	-	Input for resetting VCD after application of

				penalty brake
	VCDACK (DIP 86)	Yes		Input for VCD acknowledgement by pedal switch for LP or push button switch for ALP
	MPS1 (DIP 38)	Yes		Input for MPS operatin

6.2 It is observed that for VCD acknowledgment in M/s Medha make MPCS V3, following additional inputs are considered which are not specified in the technical specification:

6.2.1 SWC (DIP 46)

6.2.2 BLRDJ (DIP 1)

6.2.3 BLDJ (DIP 0)

6.2.4 PVEF (DIP 42)

6.3 Limitation on number of inputs for resetting of vigilance cycle may have been imposed due to hardware design of VCD in conventional Electric Locomotives not equipped with MPCS or equipped with MPCS V2. However, there is no such limitation in MPCS V3 hardware design, as it monitoring several other inputs also for controlling of the locomotive.

6.4 Pressing of SWC or BLRDJ or BLDJ or PVEF is a positive action by the Loco-pilot from which it can be inferred that Loco-pilot is vigilant and resetting of vigilance cycle of VCD in MPCS V3 by these additional inputs is acceptable and it does not affect the train operation any way.

6.5 Resetting of vigilance cycle of VCD in MPCS V3 by these additional inputs will also help in avoiding penalty brake application by VCD in cases where Loco-pilot fails to perform any of the predefined actions specified in the technical specification, but presses SWC or BLRDJ or BLDJ or PVEF within the prescribed time limit.

6.6 As VCD in MPCS V3 is getting reset by the specified inputs as per technical specifications, no changes are required for instructions to Loco-pilots on this issue.

7.0 In view of the above, resetting of vigilance cycle by additional inputs of SWC or BLRDJ or BLDJ or PVEF in M/s Medha make MPCS V3 is considered as acceptable.

27.8.19

(P.K. Saraswat)
for Director General (Elect.)

Enclosures: As above

COPY TO: AS PER STANDARD MAILING LIST NO. EL-M-4.2.3-19 (LATEST REVISION).

27.8.19

(P.K. Saraswat)
for Director General (Elect.)