

AIR BRAKE SECTION

LESSON NO. 10

THE VIGILANCE SYSTEM

Purpose:

A number of accidents have occurred on railways throughout the world as a result of drivers falling asleep while in charge of a locomotive. Various warning systems were therefore devised to ensure that the driver maintained a state of vigilance at all times that the locomotive was in motion.

Vigilance systems vary according to the conditions applying on a particular railway and the one described in this section is the one most commonly used in New Zealand.

This system fulfils the following requirements:

1. Require the driver to take some action at no more than one minute intervals.
2. Require the Locomotive Assistant to take some action approximately every 3 minutes.
3. Give a warning signal if either the Assistant or the driver fails to take action.
4. Apply the brakes if the warning is ignored for more than 10 seconds.
5. Minimise distraction of the driver particularly in the event of an emergency.
6. Be as far as practicable, fail safe and tamper proof.

Because the vigilance is related to the brakes, it is considered to be part of the brake equipment, although it is equally related to the rest of the locomotive operation.

VIGILANCE DEVICE:

This device is fitted to locomotives for the protection of the crews and may be the means of saving a life. Any unauthorised interference of any sort whatsoever will be regarded most seriously and the person or persons responsible will be recommended for severe disciplinary action.

No locomotive is to be taken into service with inoperative vigilance equipment.

OPERATION

When stepping on to the locomotive check that the isolating cock glass is intact. Failure to do this may result in you being held responsible for breaking this seal.

Only the Enginedriver can cancel the vigilance device. He can do this by operating various switches but the Locomotive Assistant must first set up the circuit by pressing a push button switch on his side of the cab. This switch must be operated every three minutes. At the end of the three-minute cycle, the warning lights on the Locomotive Assistant's side of the cab will be illuminated and a buzzer will sound, indicating to the Locomotive Assistant that he must press the button.

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The indication to the Enginedriver to cancel the vigilance device is given by his warning lights illuminating 5 seconds before a whistle sounds. If action is not taken within approximately 10 seconds from the whistle sounding a penalty brake application will occur.

The Enginedriver must ensure that his Assistant remains alert, that he operates the transfer button correctly and that when he does operate it that he also checks on the Enginedriver's alertness. This is most important.

THE WESTINGHOUSE BRAKE:

A Locomotive Assistant should at least have an elementary knowledge of how the Westinghouse Automatic brake works. He should also be able to name and identify the various parts of the equipment.

There are now several different types of Westinghouse brakes in operation but they all work on the same principle, so in this lesson we will describe the brake and equipment that is fitted to a DE diesel-electric locomotive which utilizes the No. 4 brake valve.

Briefly the Westinghouse Air Brake works as follows:-

It is continuous throughout the train and is operated by air compressed by a compressor. This is stored in main reservoirs on the locomotive at a pressure of 775 Kilo Pascals. On other locomotives this pressure could be as high as 975 kilo pascals. The air from the main reservoir is supplied via the Enginedriver's brake valve and a feed valve into the brake pipe at a pressure of 560 kilo Pascals when the brake valve is in the "running position". From the brake pipe the air passes into the triple valve and then into the auxiliary reservoir on each locomotive and vehicle. When the pressures in the brake pipe and auxiliary reservoirs equalise at 560 kilo Pascals, the brake system is fully charged.

The brake is applied by reducing the air pressure in the brake pipe. This causes the higher pressure that exists in the auxiliary reservoir to force the triple piston to the application position and allows auxiliary reservoir air to flow into the brake cylinders. The brake cylinder pistons are forced outward by the air pressure from the auxiliary reservoirs and, by a system of levers which are attached to the pistons, the brake blocks are forced on to the wheels.

The brake is released by restoring the pressure in the brake pipe. This air pressure which comes from the main reservoir when the brake valve is placed in "release position", moves the triple valve to the release position. This closes communication between the auxiliary reservoir and the brake cylinder and opens a port in the triple valve slide valve to allow brake cylinder air to escape to the atmosphere. The spring in the brake cylinder behind the brake cylinder piston pushes the piston back to withdraw the brake blocks from the wheels. The auxiliary reservoirs now start recharging in readiness for the next brake application.

The brakes are usually applied by the Enginedriver by means of the brake valve. In cases of emergency the brakes can be applied by the Guard or a passenger by means of the "emergency valve" in each van or car. The same result follows if a train should part, if a hose bursts, or if through any other accident, the air from the brake pipe is allowed to escape to the atmosphere.

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The following is the equipment on the locomotive:-

A Compressor, which compresses the air.

A Compressor Governor, which automatically controls the compressor so that main reservoir pressures are kept between 665 - 775 kilo Pascals.

The Main Reservoir stores compressed air which is delivered to it from the compressor. This air is used to charge the brake system through the train. The air from the main reservoir has a free passage to the Enginedriver's Brake Valve Isolating Cock which, when open, permits air to flow to the Enginedriver's brake valve and can be closed to isolate the main reservoir pressure from the brake valve and brake pipe. When a locomotive is assisting on a train the brake valve isolating cock is closed.

The Enginedriver's Brake Valve is the means by which the brakes on the locomotive and vehicles are applied and released, or held applied or released. It controls the passage of air to the Feed Valve which, when the brake valve handle is in the "running position", charges the Equalising Reservoir and the brake pipe to 560 Kilo Pascals.

The Brake Pipe receives its air from the main reservoir via the Engine-driver's brake valve and the feed valve. This air flows into a branch pipe past a Triple Valve Isolating Cock which can be closed to isolate the triple valve on a vehicle without interference with the brakes on the rest of the train. The air flows past the triple valve isolating cock in the open position to the Triple Valve. The air passes through the triple valve mechanism and flows into the Auxiliary Reservoir where it is stored for applying the brakes. When an application of the brake is made the compressed air from the auxiliary reservoir enters the Brake Cylinders forcing the brake cylinder piston outwards and by a system of levers causes the Brake Blocks to press against the tread of the wheel.

The Brake Rigging is the name given to the system of levers and rods which convey the force from the brake cylinders to the wheels.

A Coupling Cock is provided on the brake pipe at each end of a vehicle near the connection with the Hose Coupling so that it can be opened or closed to allow air pressure to be admitted to, or be stored in, the brake apparatus of each vehicle when it is attached to, or detached from a train.

So that dust and grit will not enter the hose couplings when a vehicle is detached from a train, Dummy Couplings are provided to couple on to the ends of the hoses.

On each locomotive there is a Duplex Pressure Gauge which has a RED hand to indicate the main reservoir pressure, and a BLACK hand to indicate the equalising reservoir pressure. In "release" and "running" positions of the brake valve handle the black hand also indicates brake pipe pressure.

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POSITIONS OF THE ORDINARY BRAKE VALVE:

There are five positions of the brake valve for operating the brakes. They are as follows:-

(1) Release Position:-

In this position the brakes are released and the brake pipe and auxiliary reservoirs are recharged.

(2) Running Position:-

This position is used when the brakes are not being applied or released. The compressed air from the main reservoir can only pass to the brake pipe by going through the feed valve.

(3) Lap Position:-

This position is used to hold the brake applied after a brake application has been made.

(4) Service Position:-

This position is used to make an ordinary service application of the brakes.

(5) Emergency Position:-

Is used when the brakes have to be applied with full force in cases of emergency.

The compressor on the locomotive has an oil sump and the level of oil in this sump must be checked whenever the locomotive is being prepared.

Enginedrivers and Locomotive Assistants must make themselves thoroughly conversant with those rules in the Rule Book which apply to operation of the Westinghouse Air Brake.

Rules 240 to 269 must be studied.

STRAIGHT AIR BRAKE:

The Straight Air Brake is used to apply and release the brakes on the locomotive. It quickens shunting and because of the rapidity with which it can be applied and released reduces or prevents possible damage to vehicles and equipment.

It is also used to hold a train stationary at a station while the auxiliary reservoirs are being completely recharged before the journey is continued and to steady long trains on falling grades while the auxiliary reservoirs are being recharged.

With this brake it is possible to apply the locomotive brakes at any pressure desired by the Enginedriver up to 315 Kilo Pascals. He can also release the brakes partially or fully. A pressure gauge in the cab indicates the pressure in the brake cylinders when the brakes are applied.

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BURST HOSES:

As a Locomotive Assistant you may be called upon to change burst hoses or assist the Guard to do so.

The Road Foreman or Staff Instructor will give you a practical demonstration during the training period.

However, don't forget that some vehicles have 1¼" dia brake pipes whilst others are 1" and on long trains it is adviseable to take a hose of each size as well as the spanners.

ENGINE DRIVER BECOMING INCAPACITATED WHILE RUNNING A TRAIN:

The Locomotive Assistant will stop the train immediately he notices that the Enginedriver is incapacitated.

If there is any danger to the safety of the train, the emergency position of the brake valve must be used, otherwise use the service position. The train should be stopped clear of bridges and tunnels unless there is danger in delaying the stop.

After attending to the comfort of the Enginedriver, the Locomotive Assistant will call the Guard by giving the "Guard Required at Locomotive" whistle signal - one short, one long, one short - repeated if necessary. The Locomotive Assistant will attend to the safety of the locomotive taking the necessary action depending on the type of locomotive:

1. Diesel Mechanical Locomotive

See that the throttle is closed, gear lever in neutral, air and hand brakes applied.

2. Diesel Hydraulic Locomotive

See that the throttle is closed, clutch lever in the disengaged position, air and hand brakes applied.

3. Diesel-Electric Locomotive

See that the throttle is closed, reverse lever in the centre, air and hand brakes applied.

If a portable radio is in use, this should be used to call the Guard. If the Locomotive Assistant is unable to attract the Guard's attention, he will ensure the locomotive and train brakes are applied and go back to the Guard, on the way pinning down sufficient handbrakes to ensure the safety of the train.

The Guard will then contact the Train Running Officer and this Officer will obtain advice from the Locomotive Supervisor of further action to be taken regarding the running of the train. The Locomotive Assistant will return to the locomotive, attend the Enginedriver and wait for further instructions.

Refer to Rule 176 (b) on page 92 of the Rules and Regulations.

Amendment to the instruction regarding the Duties of the Locomotive Assistant if the Enginedriver becomes incapacitated.

Locomotive Trainee to Locomotive Assistant Course 1978, Lesson 10 page 5A.

Insert additional paragraph:

“If the Locomotive Assistant has an Enginedriver’s ticket for the class of locomotive involved, he may take the train to the station in advance with the Guard or another employee in the cab where possible. If he is not qualified, the Locomotive Assistant will remain with the Enginedriver and attend to his comfort and send the Guard for assistance”.

Transcribed from handwritten notes.

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