ENGINEDRIVER 1ST-GRADE – *AIR BRAKE* EXAMINATION
TYPICAL QUESTIONS & ANSWERS

1. What are the two most important new features of the 26C[1] Automatic brake valve?

i. Self-lapping: whereby the Regulating portion will maintain a pressure in the Equalising Reservoir (ER) consistent with the degree of Automatic brake valve (ABV) handle movement in the Service zone.

ii. Pressure-maintaining: Whereby Brake Pipe (BP) pressure is maintained to ER pressure against BP leakage.

2. What component parts does the 26C brake valve consist of?

i. The Relay valve portion.
ii. The Regulating valve portion.
iii. The BP cut-off valve.
iv. The Vent valve.
v. The Emergency valve.
vi. The Suppression valve.
vii. The ER cut-off valve.
viii. The Brake Valve cut-out valve.

3. State the function of the BP cut-off valve and what will cause it to close.

It cuts off the flow of air from the Relay valve portion to the BP in the event of an Emergency application or operation of the brake valve cut-out valve to the OUT position.

4. State the function of the Vent valve.

It enables a rapid reduction of BP pressure when the brake valve handle is placed in the EMERGENCY position, whether the brake valve cut-out valve is IN or OUT.

5. State the function of the Emergency valve.

When the ABV handle is placed in EMERGENCY this valve is operated by a cam to supply Main Reservoir (MR) air to operate the automatic sanding, and to the Selector valve to place it to LEAD if the locomotive is set up for TRAIL. Operation of the Emergency valve also exhaust air from the ER.

6. Describe the operation of the Regulating valve and state what occurs in RELEASE and APPLICATION positions.

It is operated by a cam attached to the ABV handle, or by variations of spring and air pressure across its diaphragm.

RELEASE: when Regulating valve spring pressure becomes higher than ER pressure, its inlet valve is forced open and MR air flows to the check valve in the ER cut-off valve, to the ER, and the face of the Regulating valve diaphragm. When the ER pressure on the face of the diaphragm reaches the setting of the Regulating valve spring, the assembly will move to close the inlet valve. This will cause the Relay valve to react and charge the BP.

[1] The 26C brake valve is the Automatic portion of the 26L schedule of air brake equipment. It is often referred-to, erroneously, as 'the 26L brake valve'.

APPLICATION: with a reduction in Regulating valve spring pressure (by movement of the ABV handle and cam), the Regulating valve is positioned to allow its exhaust valve to open and exhaust ER pressure to atmosphere (at the primary exhaust port) until spring pressure and ER pressure again balance the Regulating valve assembly which will now move to close its exhaust valve. This — in turn — causes the Relay valve to react and exhaust BP air (at the secondary exhaust port) until pressures across the Relay valve diaphragm equalise and the valve Laps.

7. Why is it necessary to reduce Control Reservoir (CR) pressure when an Independent release is made after an Automatic service application?

CR pressure must be reduced to equalise with the BP so that the Service valve can move to its RELEASE position, otherwise the brakes may reapply when the Independent Brake Valve (IBV) handle is released.

8. How does the Relay valve portion supply or exhaust BP pressure?

The Relay portion consists of a large diaphragm attached to the BP exhaust valve by a spindle. The spindle projects past the exhaust valve and touches against the supply valve, which has MR pressure against it. If BP pressure is less than ER pressure, then the diaphragm will move to force the spindle against the supply valve, opening it and allowing MR air to flow to the BP. When BP pressure on the inner face of the diaphragm equals ER pressure on the outer face, the assembly will Lap, cutting off the supply of MR air. If ER pressure is reduced — as occurs in a brake application — the diaphragm moves in the other direction, pulling the spindle with it. This action opens the exhaust valve, which then vents the BP to atmosphere until BP and ER pressures equalise, when the Relay valve assembly will Lap and close the exhaust port.

9. To what parts of the 26C brake valve is MR air supplied when the brake valve is in RELEASE position?

i. To the Relay valve supply valve.
ii. To the Regulating valve inlet valve.
iii. To the brake valve cut-out valve.
iv. To the ER cut-off valve and check valve.
v. To the Suppression valve.
vi. To the Emergency valve.
vii. To the Independent Brake Valve.

10. What is the purpose of the ER cut-off valve and what occurs when air is supplied and exhausted from its operating piston?

It prevents the ER, and thus the BP, from being charged unless the ABV handle is in RELEASE position. When the *brake valve cut-out valve* is IN, the *ER cut-off valve* is held open when the ABV handle is in RELEASE but is closed whenever the handle is moved away from RELEASE. If the brake valve cut-out valve is in PASS position, the ER cut-off valve is held open at all times (note that PASS position is only used when rollingstock is equipped with graduated-release control or triple valves). When MR air is supplied, the ER cut-off valve piston is forced up allowing MR air from the Regulating valve inlet valve to flow past the ER check valve to the ER and the face of the Relay valve diaphragm. MR air from the Regulating valve inlet valve also flows to the face of the Regulating valve diaphragm. The MR pressure on this diaphragm increases until it reaches the setting of the Regulating valve spring and the inlet valve is positioned to cut off the MR supply. The supply to the ER cut-off valve is exhausted when the ABV handle is moved away from RELEASE position (unless the brake valve cut-off valve is in PASS position). The Suppression valve cuts off the supply of MR air to the ER cut-off valve's

operating piston and at the same time allows the air already there to be exhausted, thus the ER check valve closes.

11. What is the purpose of the MU-2A valve? Name its positions and state what occurs in each.
It is used to set up the brake equipment so that locomotives with the 26L brake may operate in multiple with other types of brake equipment. It has 3 positions;

i. LEAD OR DEAD: the Independent Brake Valve (IBV) is functional. Locomotives with an F1 Selector valve will have that valve positioned to LEAD. Relay valves within the consist are connected for operation by the IBV.
ii. TRAIL 6 OR 26: the IBV is not functional. This position is used when the locomotive is coupled behind another locomotive to operate in multiple. Selector and Relay valves are set to work as Trail units. Locomotive brakes may be applied and released from the Lead locomotive.
iii. TRAIL 24: this position is used in New Zealand to enable a 3-pipe locomotive to trail a 4-pipe locomotive.

12. How is BP pressure maintained after a Service application?
Should leakage in the BP reduce the pressure on the BP side of the Relay valve diaphragm, ER pressure on the opposite side will cause the assembly to move towards the BP side, opening the supply valve and admitting MR air to the BP until it's pressure is again equal to that in the ER. When this state of balance is achieved, the diaphragm and assembly will move slightly back, and the supply valve will close. The Relay valve is now in a LAP position.

13. What valves in the 26C automatic brake valve are affected when it is in Emergency?

i. The Emergency valve.
ii. The Relay valve exhaust valve.
iii. The Regulating valve exhaust valve.
iv. The Vent valve.
v. The Suppression valve.
vi. The BP cut-off valve.
vii. The ER cut-off valve.

14. Name the pipe connections between locomotives in multiple and state their purpose (26C brake valve, 3-pipe system).

i. Brake Pipe (BP): this pipe is provided so that the application and release of brakes can be controlled throughout the train.
ii. Main Reservoir Equalising pipe (MR or MREq): this pipe couples together all main reservoirs in the consist so that MR air on the Trail unit (s) can be supplied to the Lead unit for braking purposes.
iii. Brake Cylinder Equalising Pipe (ER or EP): this pipe conveys air at brake cylinder pressure from the Relay valve on the Lead unit to the Relay valve on the Trail unit(s) to control brake cylinder pressure on the Trail unit(s).

15. Describe the function of the F1 Selector valve (26C brake valve, 3-pipe system).
This valve arranges the brake equipment on one locomotive to Lead or Trail other types of brake equipment. It also provides protection of brake equipment on trailing units in case of a break-in-two between units, by automatically setting the brake control to LEAD.

16. Describe what occurs when an Independent release of locomotive brakes is made (bail-off).

MR air flows to the Independent Release (Actuating) pipe 13, to the Quick Release portion of the locomotive control valve, and to the underside of the small diaphragm of the high-pressure valve. The spring pressure is overcome, and the diaphragm assembly and stem move up. This enables Control Reservoir (CR) pressure to flow—via the spool valve of the now-raised high-pressure valve—to the underside of the large diaphragm in the Quick Release portion. With BP pressure above the diaphragm being lower, the assembly and stem move up. Both diaphragm assemblies are now in the uppermost positions, and J1 Relay and CR pressures can vent slowly to atmosphere at their respective chokes in the Quick Release portion. CR pressure will continue to exhaust until it is less than BP pressure when the large diaphragm and assembly of the Quick Release valve will move down and cut off the escape of CR air. This decrease in CR air pressure is necessary to equalise BP pressure to prevent a reapplication of the locomotive brakes when the IBV handle is released. Depression of the IBV handle in the Application Zone will release the locomotive brakes only by an amount corresponding to the position of the handle in the Application Zone.

17. A locomotive with 26L brakes trails a locomotive with A7EL brake equipment. Why must there be an Independent release made after the Automatic brake is released?

Prolonged use by the driver of the FULL RELEASE position on the A7EL-equipped locomotive may overcharge the CR on the 26L-equipped locomotive and cause its brakes to apply. For charging the Independent Release pipe by means of the Quick Release portion, the driver can exhaust the excessive CR pressure on the Trailing (26L) locomotive so that the brakes will release. Always make an Independent release after a Full-Service application (A7EL) has been made. Wait until BP pressure has settled, then hold the Independent release for at least 5 seconds.

18. Describe the operation of a 26D locomotive control valve in its RELEASE position.

i. BP air flows to the Auxiliary Reservoir (AR) charging check valve, lifts the valve, and charges the AR and the spring chamber of the supply valve.
ii. BP air also flows to the CR charging check valve to charge the CR diaphragm chamber in the Service valve and the CR. Meanwhile, BP air is flowing via a choke and the spool of the charging valve to charge the CR system to 550 kPa after the CR charging check valve has closed, aided by a spring.
iii. BP air flows also to the BP diaphragm chamber of the Service valve and to the top of the large diaphragm in the Quick Release valve portion.

When the system is fully charged, pressures above and below the large diaphragm in the Service valve are identical. The diaphragm assembly is held down by a large spring, permitting Relay valve air to exhaust from the Service valve spool, the chamber above the charging valve, and the Service valve spring chamber.

19. Describe the operation of a 26D locomotive control valve in its APPLICATION position.

When a BP reduction is made, the pressure in the BP chamber above the large diaphragm in the Service valve is reduced. CR pressure below the diaphragm can now push the assembly up to open the supply valve and admit AR air. This AR air will flow to the chamber above the charging valve diaphragm which will move its spool down to cut off the supply of BP air to the CR system. The AR air will now flow also to the spring chamber of the Service valve and via the spool of the high-pressure valve in the Quick Release portion to the J1 Relay valve. The continued build-up of AR pressure in the Service valve spring chamber combines with the

forces of the spring itself, and BP diaphragm chamber pressure, to move the Service valve assembly and steer them down against CR pressure below the large diaphragm. The supply valve cuts off the admission of AR air, and the Service valve will assume a LAP position.

20. What is the function of the Auxiliary Reservoir in a 26D locomotive control valve?
It stores BP pressure to be used by the control valve in APPLICATION and to supply the J1 Relay valve to operate it during an Automatic application.

21. What occurs in the J1 Relay valve if a leakage of brake cylinder pressure occurs?
Brake cylinder pressure below the diaphragm will be reduced, permitting the assembly and stem to move down under the influence of control air pressure above, and open the supply valve. MR air can now flow into the spring chamber and brake cylinders until pressure below the diaphragm is equal to that above, when the assembly and stem will move up and the supply valve will seat.

22. How is it possible to obtain a graduated release of brake cylinder pressure with a J1 Relay valve?
By moving the IBV handle towards RELEASE position, or by depressing the IBV handle within the Service Zone when the Automatic brake is applied. This reduces control air pressure above the diaphragm in the J1 Relay valve and allows the assembly and stem to move up and permit brake cylinder air to escape to atmosphere via the hollow spool valve. As brake cylinder pressure reduces, so will the pressure in the spring chamber below the diaphragm until it is slightly less than control pressure above the diaphragm. The assembly and stem will now move down until the spool seats on the supply valve. At the same time, the escape of brake cylinder air is cut off and the Relay valve assumes its LAP position. By doing this in steps, a graduated release of locomotive brakes is obtained.

23. Describe what occurs when the IBV handle on an AH7[2] brake valve is placed in RELEASE position after an Automatic application.
Reducing-valve air flows via the Independent Release pipe to the underside of the independent release valve diaphragm in the distributing valve to lift it and its exhaust- and check-valves. Relay chamber air can now flow past these valves to the independent release valve exhaust, and from the control pipe to the IBV exhaust. The reduction of relay chamber pressure below the relay piston allows brake cylinder air to move the piston and 'Release' slide valve down to RELEASE and open the brake cylinder exhaust port. Brake cylinder air will now exhaust to atmosphere at the distributing valve exhaust and locomotive brakes will release. Locomotive brakes can be fully or partially released depending on how long the IBV handle is held in RELEASE. The Automatic brake remains applied. Reducing valve air blows from a port in the IBV to give an audible warning of the IBV handle position.

24. What is the function of the Regulating valve in the 26C brake valve?
It regulates the development of pressure to the ER and to the ER face of the Relay valve diaphragm. The Regulating valve is self-lapping and automatically maintains pressure against overcharge and leakage with the ABV handle in RELEASE when the brake valve is conditioned to the FRT position, and in both RELEASE and SERVICE when the brake system is conditioned for PASS.

[2] It should be understood that both the 6SL and A7EL air brake schedules incorporate the AH7 Automatic brake valve. The Independent portion of the A7EL schedule is the AS7 but is usually referred-to interchangeably as the 'AH7 Independent brake valve'.

25. What effects on brake operation would the following broken pipes have on a locomotive with 26L brake equipment?

i. Brake Pipe (1): the Automatic brake will be inoperative unless the fracture is located in a branch pipe (other than the brake valve branch pipe) in which case the Automatic brake will operate but some of its functionality is lost. The Independent brake will operate.
ii. Brake cylinder pipe: locomotive brakes will be inoperative unless the broken pipe can be blanked, in which case operation of some of the brake cylinders may be restored.
iii. Relay control pipe (16): the Automatic brake will not apply on the locomotive but the Independent brake will if the pipe is broken between the Double Check Valve and the Volume Reservoir (VR). The Automatic brake will still operate on the train.
iv. Independent Application & Release pipe (20): the Independent brake will be inoperative but the Automatic brake will operate. An Independent release after an Automatic Service application will still be obtainable.
v. Actuating or Independent Release pipe (13): there will be no independent release available after an Automatic Service application.
vi. Equalising Reservoir control pipe (5): the Automatic brake will be inoperative but the Independent brake will function.

26. How do you respond if a penalty brake application occurs from operation of the vigilance equipment?

i. Stop the train, keeping it stretched if possible.
ii. Place the ABV handle in LAP (with the 26C brake valve, place the handle in HANDLE OFF).
iii. Fully-apply the Independent brake.
iv. Operate the reset device (cancelling switch) when the BP has exhausted all pressure.
v. Allow the BP to fully recharge before proceeding.

27. Describe the responsibilities of locomotive crews regarding the Vigilance Control equipment.

The driver must ensure that the equipment is operating correctly and at the correct time cycle before leaving the depot and when changing over. No locomotive may be taken into service with any vigilance system defect. The driver must ensure that the VC equipment is not tampered with in any way. If there is reason to isolate the VC while on the road, the TCO must be advised so that arrangements may be made to replace the locomotive if necessary. In the event of this happening, a written report must be rendered to the locomotive supervisor at the end of the shift. Book the defect in the 54D repair book. The driver must ensure his assistant remains alert and operates his cancelling switch correctly, and that he checks on the driver's alertness when doing so.

28. With the brake valve cut-out valve at PASS, how is a graduated release of brakes accomplished?

When the brake valve handle is moved back toward RELEASE the operating cam increases tension on the Regulating valve spring. The spring pressure—now being greater than ER pressure—causes the diaphragm assembly to move and open its inlet valve, allowing MR air to flow to the ER via the open ER cut-off valve check valve (note that this valve is held open at all times with the brake valve cut-off valve in the PASS position). ER pressure on the Relay valve diaphragm now overcomes BP pressure and the diaphragm assembly will move to open the supply valve and allow MR air to charge the BP. The amount of increase in BP pressure depends on how far the brake valve handle has been moved back toward RELEASE.

29. Explain the terms 'Serial', 'Power', and 'Maintaining' braking.

i. Serial braking: a substantial BP reduction is made to slow the train to the releasing speed for the grade. The brakes are released, and the BP is recharged by which time speed will have increased to a point at which another brake application must be made. This sequence is repeated during the descent, with the aim of keeping speed low, and air pressures high at all times.
ii. Power (stretch) braking: the Automatic brake is applied, the throttle is kept open and the locomotive brake is kept released. The intent is to keep the train stretched.
iii. Maintaining braking: both Dynamic Brake (DB) and the Automatic brake are used together to ensure a steady descent of the grade. Curvature and grade easements are usually compensated-for by adjusting the DB effort. Usually, only a Minimum Reduction is necessary, combined with about ¾ DB effort. *Maintaining braking* is only possible when the locomotive has both DB and 26L brake equipment.

30. What are the advantages of 'maintaining braking'?

The dangers of BP leakage when *serial braking* do not exist with *maintaining braking*. Should an emergency arise while 'maintaining braking' is being used, all brake cylinder pistons are out and brake blocks are already against the wheels. Movement of the brake valve handle to EMERGENCY will provide a rapid result. Conducting *maintaining braking* also provides a more-even control of speed at a constant rate when descending the gradient.

31. Describe how you descend a grade using 'maintaining braking'.

Start down the grade in DB with amperage at ½ to ¾ of maximum before using the Automatic brake. As speed approaches the desired figure, make a Minimum Reduction or more if necessary. While the Automatic brake application is taking effect, it may be necessary to increase DB to maximum until the BP reduction makes an impression on the speed, at which point DB may be reduced to ¾ effort. The driver must then make use of road knowledge to regulate the braking effort needed when on curves and gradient easements so that speed remains as uniform as possible. If it is found that full DB effort is needed to hold the train speed steady, this indicates that the BP reduction is not heavy enough. In this case, make a further light BP reduction and allow it to take effect before readjusting DB effort. All DB adjustments should be made slowly and gently.

32. If during the conduct of 'maintaining braking' it is found that full DB effort is necessary to hold speed steady, how should the driver respond?

Make a further light BP reduction by gently tapping the ABV handle further into the Service Zone. Allow this extra BP reduction to take effect and then adjust DB effort to control train speed.

33. What conditions are suitable for 'maintaining braking'?

Where a significant descending grade is at least 3 km long, the train is heavy, and where—under *serial braking*—a 70 to 80 kPa BP reduction and full DB effort would be or had been found necessary to control train speed.

34. How would you control a long, heavy goods train over undulating track?

Running downhill into a dip must be done in such a manner that the locomotive starts up the grade on a light throttle as fast as is safely possible. Advanced the throttle one notch at a time as the train comes onto the grade to prevent a run-in of slack (remember, most of the train is still on the downgrade). Use of DB under these conditions must be cautious. If used, the train should have been gently bunched as it came over the top—by DB effort being introduced

slowly—and stretched at the bottom of the dip by easing DB effort slowly and applying power gently. It is better not to use DB unless the grades are fairly long. Using the air brake, the best method is to go over the top fairly hard, notch back slowly to ½ throttle, and when the train is completely on the downgrade, make an Automatic reduction sufficient to pull speed down. Keep the throttle open and the Independent brake released. Release the brake to bring the train through the bottom of the dip with brakes released, slack out, and throttle advancing notch-by-notch to prevent run-in from the rear.

35. Stopping a passenger train.

Always use *power braking* to ensure a smooth stop and a smooth start. Hold the Independent brake released at the first reduction and the throttle in 1 or 2 (or fully-closed on small trains). The Independent brake may be allowed to apply at the second and following reductions if necessary. This is to keep the train stretched but not so tightly as to cause the rear cars to move up after the stop. Initiate an Automatic brake Release just prior to the stop so that there is no final jerk and so that the drawgear may adjust to a likely-stretched condition before stopping. Apply the Independent brake at the instant of stopping. When stopping on a downgrade and the brake has been released to give a smooth stop, reapply immediately the train has stopped to prevent slack from coming in. Where a 'double-application-and-release' method is used, ensure that after the first application, brakes are released at such a speed that the train will run along the platform at approximately 30 km/h. Never allow the train to creep along the platform, as passengers will attempt to jump off the moving train.

36. Power bunching and starting if the train has stalled on a steep grade.

Make a Minimum Reduction (or more if necessary) and push back to bunch the train. Keep the Independent brake released and sanders open while pushing back. Increase the BP reduction to Full-Service. Move the reverser to FORWARD, release the Automatic brake, and start counting slowly. At 25 apply the Independent brake to between 70 and 100 kPa and open the throttle several notches. If the train is more than 80-total in length[3], count to 30. If the locomotive doesn't move, release the Independent brake slowly until it does. Keep sand running. Normal driving current may be exceeded for short periods as the throttle is advanced to keep the train moving. Keep the Independent brake lightly-applied to prevent the locomotive from jerking ahead and to aid in preventing wheelslip. When the whole train is stretched and in motion, completely release the Independent brake. Run sand up to about 10 km/h. Operate the wheelslip brake manual override (if fitted) every few seconds until the locomotive has gained a firm footing.

37. What is the indication to the driver of a burst brake hose and what should be the response?

The BP gauge will register a reduction in pressure. There will be a charging air-flow noise at the Automatic brake valve. The flowmeter will register BP charging air movement. The throttle must not be closed immediately. If the grade is such that the train will stop with the brake valve in RUNNING (or RELEASE) it should be left there and the throttle gradually closed to prevent run-in and pinch-off. If conditions are such that assistance to stop is required, the throttle should be open and the brake valve cut-off valve turned to OUT on a 26C brake valve or the brake valve handle placed in LAP on other brake valves. The throttle should be gradually closed as the train comes to a stop. The Independent brake should be held released during the stop and applied at the instant of stopping.

[3] Approximately 450 m.

38. Maximum advisable Service reduction.
Note that wagon brakes are fully-applied with a BP reduction of 125 kPa (125 mm piston travel) or 170 kPa (225 mm piston travel). Any greater reduction than a 170 kPa fully-equalised reduction will not increase brake cylinder pressure but will only waste air and make the recharge take longer.

39. When a crew-change stop has been made and the train must move up for a guard-change, what precautions must be taken before the train is moved and how should the stop be made?
Do not move ahead until the BP is completely recharged. If over 50-total[4], keep the Independent brake released and power applied during the stop. Use as little power as will move the train and stay in this notch until the brakes are applied. Make a Minimum Reduction first. A further reduction of no more than 20 kPa may be made if necessary. Reduce the throttle during the stop and shut off just before stopping. Apply the Independent brake at the instant of stopping. If on a downgrade and the train is held by the Independent brake alone, allow the train to drift forward by easing the Independent brake slowly off. Keep speed low. To stop, increase the Independent application and make an Automatic Minimum Reduction. After stopping, increase the BP reduction to 100 kPa to ensure a good release.

40(a) State the advantages of Dynamic Braking.
(b) Describe how to prevent the bad jolts that can be caused when using DB.
(a) DB provides more even control of train speed at a constant rate, it saves wear-and-tear on brake blocks and other brake equipment, and it is a valuable backup brake system.

(b) DB can produce a force that can cause a severe run-in of slack if applied too rapidly, or a severe run out of slack if released too quickly. Before applying DB, drift the train to allow the slack to settle, and after applying it, maintain minimum braking effort until the slack has gently gathered. Then increase the DB effort in steps of about 50 A, pausing between each step. When speed reduces while in DB, the braking effort decays also, and under these conditions, the Independent brake should be used to keep the locomotive from surging away from the train.[5] When coming out of DB, reduce effort in steps, pause between the steps, and allow the train to drift before applying power in a low notch to pull the slack out quietly.

41. Explain how you would enter a loop with a long goods train and come to a stand using both DB and air brakes.
When entering the loop, the train should be under such control as to ensure that the correct speed is maintained through the turnout. Do not use heavy dynamic braking when traversing a turnout, as the curving moment can result in the pinch-off of a lightly-loaded wagon. Keep the train bunched by holding DB until the train has almost stopped. As speed reduces and DB effort fades, apply the Independent brake to compensate and increase the application gradually as required. Come to a stand using the Automatic brake as circumstances dictate, with a Minimum Reduction at first. The ABV should be exhausting as the train stops. Suspend DB just prior to stopping. Allow Independent brake pressure to increase with the final Automatic brake reduction to prevent the locomotive from surging away from the train.

[4] Approximately 250 m.
[5] Locomotives with Extended-Range DB will not require the Independent brake application until they are at a stand.

42. What action would you take if DB should fail during descent of a long, steep grade (AH7 brake valve)?

Make an Automatic reduction of at least 70 kPa, then more if necessary to reduce speed as quickly as possible down to the 'releasing speed'. Bring the locomotive out of DB and apply Independent braking to keep the train bunched. Descend the grade using *serial braking*. When releasing the Automatic brake, reduce Independent brake to about 70 kPa to prevent the front of the train from surging away. As speed begins to rise, increase Independent brake pressure, but do not exceed 100 kPa. At about 30 km/h, ease the Independent brake off so that it is completely released prior to reapplying the Automatic brake. If the grade and load permit recharge without the assistance of Independent brake, it need not be applied above 70 kPa and may be released before 30 km/h. Leave the ABV in FULL RELEASE for 20 to 30 seconds on long trains except during the last release at the foot of the gradient when a normal period for the train length is used, followed by the second 'kick-off' into RELEASE after pressures have settled. Use curves and gradient easements to assist the recharge by holding speed down. If difficulty is experienced with obtaining a full recharge of the brake system, use a lower release speed, or stop and secure the train with handbrakes if necessary, then obtain a full recharge before moving (allow one minute after the flowmeter shows a full charge). Book the defective DB.

43. Describe the BP leakage tests with the different types of brake valve.

i. A7EL and 6SL: observe the BP gauge while the brakes are applied. Calculate the amount of leakage against time for the minimum amount allowed.
ii. No. 4: when the brakes are applied, close the brake valve isolating cock, then move the brake valve handle to RUNNING and observe BP leakage from the brake pipe needle in the Duplex gauge. To release, open the isolating cock and release in the normal manner.
iii. 26L: when the train examiner has signalled for Release, acknowledge the signal then turn the brake valve cut-out valve to OUT. Observe leakage on the BP gauge. At the conclusion of the leakage test, reposition the cut-out valve to IN and release the brakes normally. On longer trains, conduct the leakage test 5 minutes after the examiner's brake test has commenced. Ideally, BP leakage should not exceed 35 kPa per minute to ensure good control of the train. If leakage exceeds 50 kPa per minute, the train must not depart until the leakage is rectified or the defective vehicle(s) is/are removed from the train.

44. Describe the action if the wheelslip brake operates and then won't release.

Stop the train. Close the bogie isolating cock. Close the wheelslip brake isolating cock. Ensure brake cylinder air has exhausted. If not, undo a hose and release brake cylinder pressure then re-tighten the hose. Open the bogie isolating cock. Check brake operation. Book the defect.

45(a) Describe how to test the operation of a Feed Valve.

Place the ABV handle in RUNNING and open the BP cock on the headstock. The flow of air through the cock will indicate the condition of the Feed Valve. It is a good idea when possible to make an occasional check on a sound locomotive to enable a comparison to be made.

(b) If a Feed Valve is defective and cannot be corrected what action do you take to enable the train to proceed (AH7 brake valve)?

Interchange the Feed Valve with the Reducing Valve and use the ABV only. The Reducing Valve may be used as a Feed Valve by screwing-in the regulating nut to give the correct BP pressure. Book the defect.

46(a) Explain the operation of the Quick Service bulb on the Improved Triple Valve when the first BP reduction is made.

The triple valve piston will move under AR pressure to isolate the AR from the BP and unseat the graduating valve to allow AR air to flow to the brake cylinder. At the same time the piston will position the slide valve, which will first isolate the Quick Service bulb from atmosphere, and then connect it to the BP. As there is no pressure in the QS bulb, BP air will rush into it, causing an immediate local reduction of BP pressure over-and-above that occurring at the driver's brake valve. This results in the immediate action of the next triple valve in succession towards the rear of the train, providing an almost-simultaneous operation of all triple valves.

(b) What occurs when the second BP reduction is made?

After the first BP reduction is made, the QS bulb does not perform any further functions and if a second reduction is made to apply the brakes harder, the air in the bulb escapes with the BP air.

47(a) Describe the operation of the Retarded Recharge feature of the AF triple valve.

During recharge, the sudden closure to exhaust (at the driver's brake valve) of the BP may cause a surge of air, or over-pressure, at the front end of the train. If this occurs, those triple valves nearer the front of the train, will be pushed slightly further into the RELEASE position than those nearer the rear due to this BP pressure wave. Those triple valve pistons near the front of the train—being in the FULLY RELEASED position—will have uncovered a smaller feed groove than those near the rear that are not so far into the RELEASE position. Thus, the front Auxiliary Reservoirs will recharge at a slower rate than those at the rear. This prevents BP pressure from flowing too-rapidly into the front ARs and retains more pressure in the BP for use at the rear of the train where a more-rapid rise in pressure results in an earlier and more certain release of brakes.

(b) What effect does this have on the handling of the train?

Brakes will release more evenly throughout the length of the train, and this is a great advantage when serial brake applications are required, as during the descent of a long gradient.

48. What is the function of the Regulating or 'Inshot' Valve in the triple valve?

It permits a rapid but brief inshot of pressure (up to 105 kPa) to the brake cylinder, followed by a gradual build-up of pressure to the desired value. The inshot ensures that the brake blocks move immediately against the wheels, and the slow follow-up prevents undue surging on the train.

49. What ports and passages of the brake equipment are connected by the slide valve in the Improved Triple Valve when the triple valve is in (a) RELEASE and in (b) SERVICE positions?

(a) The brake cylinder and the Quick Service bulb are connected to atmosphere via ports and cavities in the slide valve and slide valve seat.

(b) The QS bulb is connected to the BP and the AR is connected to the brake cylinder via the graduating valve, slide valve, and regulating valve.

50. Explain the function of the brake valve cut-out valve (26C brake valve) and state what occurs in each of its 3 positions.

It is provided to cut the brake valve in or out (i.e. to isolate the brake valve from the BP).

i. IN/FRT: the brake valve will now operate in all positions of the brake valve handle.

ii. OUT: the brake valve is isolated from the BP except that an Emergency application can still be made. When cut OUT, it supplies MR air to the BP cut-off valve to close this valve, or if the locomotive is 'dead' it supplies BP air to and through the BP cut-off valve.
iii. PASS: this position is only used if the train to be hauled is equipped with graduated release triple or control valves. It allows a graduated release of the Automatic brake to be made.

51. How is brake cylinder pressure released with the J1 Relay valve?
A reduction in pressure at port 16, initiated by the driver, will reduce pressure on the upper face of the diaphragm. The assembly will move up under the influence of the now-greater spring and brake cylinder air pressures below the diaphragm, and the hollow end of the spool will move away from the supply check valve allowing air from the brake cylinders to flow via port 30 to atmosphere. As brake cylinder pressure reduces, so will the pressure below the diaphragm, until it is slightly less than that above, and the assembly will move down until the spool seats against the check valve, and the Relay valve assumes a LAP position. By removing all air pressure from the outer face of the large diaphragm, the locomotive brakes will be completely released.

52. What is the purpose of the Equalising Reservoir control valve in the AH7 brake valve?
It enables full use to be made of the FULL RELEASE position of the ABV by retarding the ER recharge to a rate that approximates that of the triple valves at the front of the train. This allows maximum use of the excess pressure in the MR for the prompt and efficient release of brakes on long trains, and reduces the possibility of overcharging (with the resultant reapplication of brakes at the head of the train).

53(a) How are locomotive brakes affected when DB is in use (26L schedule)?
The Dynamic Brake Interlock is energised to prevent the locomotive brakes applying when an Automatic brake application is made. The locomotive brakes will automatically apply if DB is suspended after an Automatic application has been made.

(b) How is DB affected when an Emergency application is made (26L)?
The air brake will apply on the locomotive and DB will be suspended when air pressure in the BP drops low enough to open the PC switch.

54. What valves in the 26C brake valve are affected when the ABV handle is moved into the Service Zone?
i. The Relay valve
ii. The Relay valve exhaust valve
iii. The Regulating valve
iv. The Suppression valve
v. The ER cut-off valve charging check valve

26 L BRAKE EQUIPMENT — DIAGRAMMATIC ARRANGEMENT

LOCOS CLASS D^A

SECTION : 9DE.

LEGEND

4	AUT. BRAKE CONTROL PIPE
12	EMERGENCY PIPE
14	B CYL. ED. PIPE
15	M.R. ED. PIPE
16	APP. PIPE
20	INDEP. APP & REL. PIPE
30	B CYL. PIPE
53	MULT. UNIT CONTROL PIPE
63	MULT. UNIT INTERLOCK PIPE

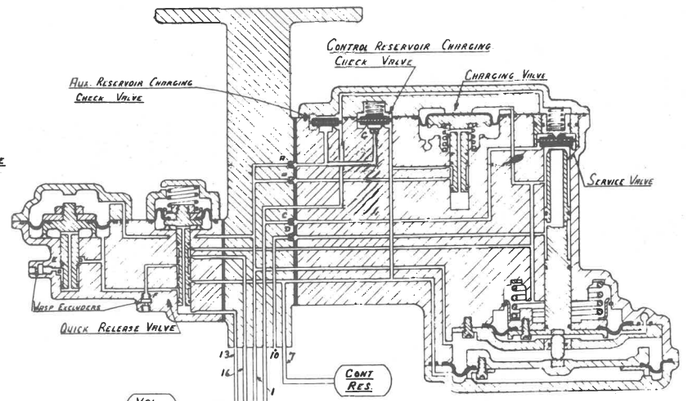
LEGEND

1	BRAKE PIPE
5	AUX. RESERVOIR
7	CONTROL RESERVOIR
10	EXHAUST
13	ACTUATING PIPE
16	RELAY CONTROL PIPE

CHOKES

A - AUX. RESERVOIR CHARGING CHOKE
B CONT. RES. FINAL CHARGE & DISS...ITION CHOKE
C SERVICE BRAKE CYLINDER APPLICATION CHOKE
D BRAKE CYLINDER RELEASE CHOKE
E CONTROL RES. BLOWDOWN CHOKE
F RELAY VALVE EXHAUST CHOKE
G INITIAL CONTROL RES. CHARGING CHOKE

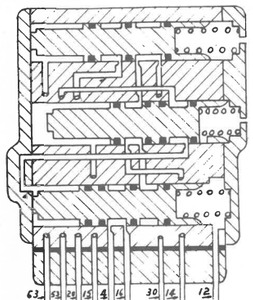
26 D CONTROL VALVE



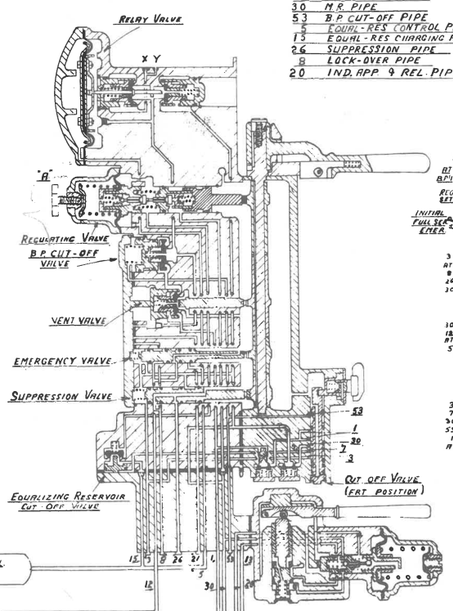
TRAIL 6 OR 26
LEAD OR DEAD

63 53 20 15 4 16 30 14 12

F.1 SELECTOR VALVE

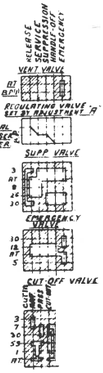


26 C BRAKE VALVE

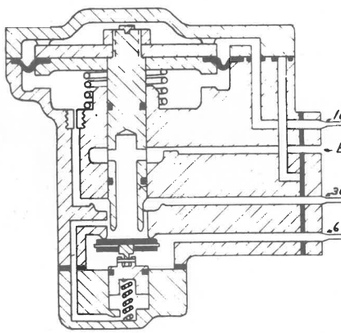


LEGEND

1	BRAKE PIPE
21	SAFETY CONTROL PIPE
3	SWITCH PIPE
13	ACTUATING PIPE
12	EMER. SWITCH PIPE
30	M.R. PIPE
53	B.P. CUT-OFF PIPE
5	EQUAL.-RES. CONTROL PIPE
15	EQUAL.-RES. CHARGING PIPE
26	SUPPRESSION PIPE
8	LOCK-OVER PIPE
20	IND. APP. & REL. PIPE



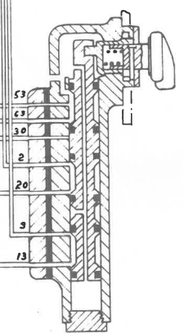
J1 RELAY VALVE



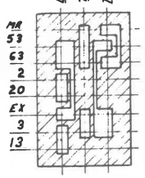
LEGEND

6	SUPPLY
16	CONTROL
30	DELIVERY

MU-2A VALVE



LEAD OR DEAD
TRAIL 6 OR 26
TRAIL 24



LEGEND

2	IND. APP & REL. PIPE (B.V.)
3	ACTUATING PIPE (B.V.)
13	ACTUATING PIPE (B.V.)
20	IND. APP & RELEASE PIPE LINE
30	MAIN RESERVOIR
53	MULTIPLE UNIT CONTROL PIPE
63	MULTIPLE UNIT INTERLOCK PIPE

EMERGENCY SAND
DEAD ENGINE DEVICE
C.O.C. & STRAINER
N° 2 MAIN RES.
C.O.C. & STRAINER
DCV
BRAKE CYLINDER PIPE
CHECK VALVE & CHOKE
N° 1 MAIN RES.
FROM COMPRESSOR
BRAKE PIPE
M.R. EQUALISING PIPE
B.C. EQUALISING PIPE

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