ENGINEDRIVER 2ND-GRADE –*BRAKE* EXAMINATION
TYPICAL Q & A

01. If you had difficulty maintaining Main Reservoir pressure when descending a grade, what action would the driver take?

Stop the train as quickly as possible and arrange with the guard for a sufficient number of handbrakes to be applied to hold the train until the Main Reservoir and the (train) Brake Pipe are recharged, or to enable the journey to be continued without the use of air braking. If it is unsafe to continue without air braking, assistance must be sent for.

02. (a) How would you introduce dynamic braking (DB) and control the train down a steep grade with it?

(b) What action would you take if DB failed when on a downgrade?

(a) Reduce power gradually then drift, before moving the Selector lever to BRAKE. Hold lowest possible DB amperage for a few seconds, and then increase slowly. When half of the maximum possible DB effort is applied, it can be increased more rapidly. If operating with a multiple consist, increase effort more slowly.

When entering upon the top of a downgrade, DB should be 'in' with minimum current held before speed exceeds 30 km/h. Amperage could then be increased as necessary. When the train enters upon a slight levelling-out of the gradient, or enters into a curve, DB effort can be slightly reduced to compensate for the increased speed retardation experienced.

If speed should become too high with DB fully applied, make an Automatic (train) brake application, reduce speed to that required, then release and readjust DB effort to suit. At the foot of the grade, reduce DB effort slowly and allow sufficient time after completely releasing it to allow slack to run out before gently applying power.

(b) Apply Independent (locomotive) brake with sufficient force to prevent the locomotive surging away from the train, and then make a minimum Automatic reduction, increasing if necessary. Proceed cautiously using serial braking.

03. Describe the method of braking a heavy goods train down a long, steep grade using air only (serial braking).

Go over the top of the grade slowly. When descending, make substantial brake applications to bring the speed down quickly and to hold the train at a moderate speed. Each initial reduction must not be less than 70 kPa (10 psi). Do not hold the train brakes applied too long as there could be danger if there is excessive Brake Pipe leakage. Keep the locomotive brakes bled off.

Before releasing the train brakes, reduced speed to that specified in the working timetable. Ample time must be allowed for complete release and recharge before speed again climbs too high. Apply the Independent brake to 70-105 kPa (10-15 psi) before releasing train brakes. Release Independent brakes when again about to apply train brakes.

Use curves and grade easements to assist in holding the train at a low speed while releasing and recharging. If difficulty is experienced, stop, release, and recharge before continuing. Use handbrake's if necessary.

If the locomotive has an air flow meter, wait one minute after it has stopped blowing before restarting. With the № 4 and AH7 brake valves, use the RELEASE position as long as possible to get the quickest release and recharge.

Overcharge the Brake Pipe if necessary to get higher braking pressures, but ensure pressures are reduced to normal at the foot of the grade. Aim to keep train speed low and air pressure high at all times.

04. When the train brakes have been applied from the van or carriage or by a burst hose or parted hosebag, what action would the driver take?

Do not close the throttle immediately. If the grade is such that the train will stop with the brake valve in RUNNING or RELEASE position, the throttle should be gradually closed and the Independent brake kept released until stopped. This will prevent harsh run-in and pinch-off of empty or lightly-loaded wagons.

If assistance to stop is needed, the throttle must be left open (or opened if closed) and the brake valve cut-off valve turned to OUT (26L) or the brake valve handle placed in LAP on other brake equipments. Gradually close the throttle as the train comes to a stand, keeping the Independent brake released.

05. (a) Describe the normal way of starting a train on an upgrade.
(b) State what other method can be used.

(a) Fully-apply the Independent brake and release the Automatic brake. When the train is stretched, reduce locomotive brake cylinder pressure but retain enough to hold the train stationary.

Open the throttle and release the Independent brake. If the locomotive does not move, advance the throttle until it begins to move slowly forward. Increase power so as to ensure a smooth acceleration and never leave the throttle too long in any one notch with the locomotive stationary. Wait until the ammeter stops rising before advancing the throttle to another notch.

If the train does not move when maximum amperage is reached, return the throttle to Notch 1, pause, and then shut off and apply the Independent brake. Watch for wheelslip, and lay sand or operate the wheelslip brake as necessary.

(b) Another method is the bunch start, whereby the Automatic brake is applied and the train is pushed back until completely bunched. The Automatic brake is then released and the locomotive is notched up slowly, using the slack provided to gain momentum.

06. How would you stop a train using both air and dynamic brakes?

Keep the train bunched. DB must be held on until the train has almost stopped and—as speed drops below 15 km/h (when dynamic effort will fade)—the Independent brake must be applied to compensate for this. At 15 km/h, apply 35 kPa (5 psi) of Independent brake pressure, increasing to 105 kPa (15 psi) at 8 km/h. Stop the train with the Automatic brake, according to circumstances. The first reduction must be of about 50 kPa (7 psi).

If applied before speed falls to 15 km/h, only DB is necessary on the locomotive until speed falls below 15 km/h, when the Independent brake should be applied as described above. The final Brake Pipe reduction is made on top of the Independent application and at a point that will stop the train with the Automatic brake valve exhausting.

07. How would you handle the train when setting back to a stop?

Make sure brakes are fully released. Use the least amount of power as will move the train and keep power on when the brakes are applied to prevent the slack running out. Make a minimum Brake Pipe reduction, increasing if necessary. Keep power on until almost stopped and keep the Independent brake released until stopped.

Reduce the throttle as the locomotive comes to a stand. At the moment of stopping, close the throttle and apply the Independent brake. If backing downhill, keep the Independent brake applied so that the train remains fully stretched. Do not use power.

08. Describe how you would handle a train down a grade with the maintaining brake method.

Start down the grade with the locomotive in dynamic brake and with amps at ½ to ¾ of maximum before using the Automatic brake. As speed approaches the desired figure, make a minimum Brake Pipe reduction (or more if necessary). While the Automatic brake is taking effect it may be necessary to increase DB to maximum until the air brake makes an impression on the speed of the train, when DB may be reduced to ¾.

Road knowledge must then be called-upon to regulate the amount of braking necessary when rounding curves and entering upon easement of the gradient, so that train speed remains as uniform as possible.

09. How would you stop a train when travelling at low speed using the power brake method (all couplings stretched)?

If the train is longer than 50 total, the throttle must not be closed below Notch 2 (8-notch locomotives) until the minimum Brake Pipe reduction is made. Keep the Independent brake released until the train is stopped. After the minimum reduction has taken effect reduced power to Notch 1. A further light Brake Pipe reduction may be made if necessary, to stop the train at the correct point. Just prior to stopping, close the throttle completely, and at the instant of stopping apply the Independent brake fully.

After the train has stopped, ensure that a total application of at least 105 kPa (15 psi) has been made before releasing the Automatic brake.

10. How would you power-bunch a train and start off up a steep grade?

Make a minimum Brake Pipe reduction to stop the train and run sand over the last engine length or so. Release the Independent brake and push back into the train while running sand, until it is bunched.

Increase the existing Brake Pipe reduction to Full-Service. Place reverser to Forward, release the Automatic brake, and start counting slowly. At 25, apply the Independent brake fully, open the throttle several notches, and release the Independent brake slowly (to between 70 and 105 kPa). If the train is longer than 80 total, count to 30.

As the Independent brake is released, the locomotive should begin to move forward. Keep the sanders operating and let driving current build to slightly above that required. Advance the throttle to keep the train moving. Keep the Independent brake likely applied until the train is completely stretched and moving, then release. Keep the sand running to give the locomotive a firm footing and prevent wheelslip, and operate the manual wheelslip button (if fitted) as necessary.

11. Explain why the Automatic brake should not be released at low speeds with long trains (power braking not being used).
The brakes at the front of the train will be releasing while those at the back are still applied, and this could result in a run-out of slack at the front which could cause severe coupling shock and possibly a break-in-two.

12. What are the most difficult conditions for releasing the Automatic brake?
After a very light reduction or after a reduction considerably greater than a fully-equalised one (Brake Pipe pressure very low).

13. Explain how a stop from normal speed should be made with a long goods train (level track - no dynamic brake).
Make a minimum Brake Pipe reduction. keeping power on and the Independent brake released. Follow this with further reductions if necessary. Reduce power slowly as the train slows. At the instant of stopping, close the throttle and fully-apply the Independent brake, ensuring that at least 105 kPa (15 psi) have been taken out of the Brake Pipe before releasing the Automatic brake.

14. Describe how you would slow a long, heavy goods train for a speed restriction on level track.
Keep power on and make a suitable Brake Pipe reduction. Keep the Independent brake released. Release the Automatic brake at a speed which, when fully released, will give the desired final speed. On locomotives fitted with AH7 or № 4 brake valves, use FULL RELEASE position for several seconds, then follow with a 2-second kick-off into FULL RELEASE after pressures have settled.

Sometimes, a moderate slowing may be made using DB alone. If an Automatic reduction is also necessary, the Independent brake should be applied when the Automatic brake is released, to compensate for lack of DB effort at low speed, and to keep the train bunched. DB must be eased off gently and power applied slowly.

Slowing down can also be done by shutting off power and allowing speed to coast down to that required for the speed restriction.

15. If the Brake Pipe on a train became overcharged, what is likely to happen and how can the pressure be reduced?
The train brakes will apply when the Automatic brake valve is placed in RUNNING position. Pressure can be reduced by making several successive Full-Service reductions. Stop the train to do this. Before each release, wait for the Main Reservoir pressure to fully recharge and for the Brake Pipe and Auxiliary Reservoir pressures to equalise.

16. A long goods train has been stopped with a light Brake Pipe reduction. What care is necessary to ensure the release of all brakes?
Brake Pipe pressure must be further reduced to at least 400 kPa before the brakes are released.

17. What are the most favourable conditions for releasing the brakes?
Having maximum Main Reservoir pressure and brakes almost fully applied.

18. Describe the terminal brake test.
With the air brake system fully charged, the driver must be verbally requested to apply the brakes. The member doing the test then proceeds to the rear of the train, inspecting each wagon as he passes, seeing that the brakes are applied and coupling cocks are open. Upon reaching the rear of the train, signal “release brakes” to the driver.

If a van is attached, observe the Brake Pipe air pressure gauge and see that the standard pressure of 550 kPa is restored. Then proceed back to the locomotive on the opposite side of the train if practicable, seeing that all brakes are properly released. Any fault found must be rectified and the test repeated.

Upon reaching the locomotive after a successful test, advise the driver of the results of that test, and also how many vehicles have inoperative brakes or are piped only. During this test, the driver must carry out a Brake Pipe leakage test.

19. If, when descending a steep grade using serial breaking, heavier reductions are necessary to pull speed down each time following a Release, what is the trouble and what should be done?

The Auxiliary Reservoirs are not being recharged to a satisfactory pressure. Stop the train, making an Emergency application if necessary, and recharge. Allow one minute after the flowmeter shows 'full charge' before moving off. Proceed down the grade bringing speed much lower than previously prior to each release.

20. How would you control a long, heavy goods train over undulating country?

Running downhill into a dip must be done in such a manner that the locomotive goes through the dip and starts up the grade on a light throttle as fast as safely possible. Now advance the throttle one notch at a time as the train comes onto the grade to prevent run-in of the rear, which is still on the downgrade into the dip.

Use of DB under these conditions must be careful. The train should be gently bunched as it comes over the top by introducing DB effort slowly, and then 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.

Any braking used must be released well before the bottom of the dip. The best method, using air, is to go over the top fairly hard, throttle back slowly to about ½ throttle and when the whole train is on the downgrade make a sufficient Brake Pipe reduction to pull speed down, leaving power on and Independent brake released. A release at the correct point will then bring the train through the bottom of the dip with brakes released, slack out, and throttle about ½ open and being advanced notch-by-notch to prevent the front of the train from slowing unduly.

21. How would you set up the following brake equipments in the various positions?

(a) **26L**

LEAD:
Automatic brake valve – RELEASE
Independent brake valve – RELEASE
Brake valve Cut-off valve – IN
MU2A valve – LEAD
Dead-Engine Device – Closed

DEAD:
Automatic brake valve – HANDLE OFF
Independent brake valve – RELEASE
Brake valve Cut-off valve – OUT
MU2A valve – LEAD
Dead-Engine Device – Open
Reduce No. 2 Main Reservoir to 350 kPa

TRAIL:
Automatic brake valve – HANDLE OFF
Independent brake valve – RELEASE
Brake valve Cut-off valve – OUT

MU2A valve – TRAIL
Dead-Engine Device – Closed

ASSIST: (BP only coupled)
Automatic brake valve – HANDLE OFF
Independent brake valve – RELEASE
Brake valve Cut – OUT
MU2A valve – LEAD
Dead-Engine Device – Closed

(b) **A7EL**

LEAD: Automatic brake valve – RUNNING
Independent brake valve – RUNNING
Brake valve isolating cock – Open
Dead-Engine Device – Closed

DEAD: Automatic brake valve – RUNNING (remove handle)
Independent brake valve – RUNNING
Dead-Engine Device – Open

TRAIL: Automatic brake valve – RUNNING (remove handle)
Independent brake valve – LAP (remove handle)
Brake valve isolating cock – Closed
Dead-Engine Device – Closed

ASSIST: Automatic brake valve – RUNNING
Independent brake valve – RUNNING
Brake valve isolating cock – Closed
Dead-Engine Device – Closed

(c) **6SL**

LEAD: Automatic brake valve – RUNNING
Independent brake valve – RUNNING or RELEASE
Brake valve isolating cock – LEAD
Dead-Engine Device – Closed

DEAD: Automatic brake valve – RUNNING
Independent brake valve – RUNNING
Brake valve isolating cock – DEAD
Dead-Engine Device – Open
Reduce No. 2 Main Reservoir to 350 kPa

TRAIL: Automatic brake valve – RUNNING
Independent brake valve – RUNNING
Brake valve isolating cock – TRAIL
Dead-Engine Device – Closed

ASSIST: (BP only coupled)
Automatic brake valve – RUNNING

Independent brake valve – RUNNING
Brake valve isolating cock – DEAD
Dead-Engine Device – Closed

22. What is the purpose of the Dead Engine device?

To supply Brake Pipe air to the Main Reservoir when the locomotive is being hauled "Dead". It is necessary to provide this air to operate the brakes on the dead locomotive.

23. How would you test a train for Brake Pipe leakage?

(a) A7EL and 6SL:

Observe the Brake Pipe air gauge with brakes applied and the Automatic brake valve handle in LAP position. Calculate the amount of leakage against time for the minimum amount allowed.

(b) Nº 4:

Apply brakes and close the brake valve isolating cock. Move the Automatic brake valve handle to RUNNING position. Observe Brake Pipe leakage from the duplex gauge.

(c) 26L:

Turn the brake valve cut-off valve to OUT when the train examiner reaches the rear of the train. Observe leakage from the duplex gauge (a 30-second test is sufficient). Cut the brake IN and release immediately. Brake Pipe leakage should not exceed 35 kPa (5 psi) per minute.

24. How would you cut out the air brakes on a vehicle?

Place the handle of the cut-out cock on the branch pipe to the triple valve in a horizontal position in line with the branch pipe. Fully open and secure the release valve and ensure that all air exhausts from the Auxiliary Reservoir.

25. Before entering service with a locomotive, how must the vigilance device be tested?

1. Press the hand button to charge the equipment
2. Release the air brakes
3. Allow full rundown cycle to develop. After about three minutes the locomotive assistant's light should flash and the buzzer sound
4. Cancel the locomotive assistant's VD and wait for the driver's cycle to run down. After about 60 to 75 seconds, the drive's light will flash. Wait until the warning whistle sounds before cancelling
5. If the cycle times are not correct report to the Officer in Charge
6. Check that the driver's VD indication can be stopped by either the manual button, or by operating the sanders, throttle, and horn.

26. What action must the driver take if the Vigilance Device becomes defective (a) when preparing a locomotive, and (b) when on the road?

(a) Inform the OIC and book the defect in the Loco 54D
(b) If the device has to be isolated, report the fact to the TCO as soon as possible. Render a report to the locomotive supervisor as soon as possible. Book the defect in the Loco 54D.

27. (a) What are the essential details to be observed and how must the brakes be tested before taking a locomotive into traffic?
(b) Describe the air brake leakage tests that must be made in a locomotive before entering service.

(a) All hand and air brake apparatus on the locomotive must be in such a condition as to ensure satisfactory operation. Operate both brake valves in all positions and observe all brake cylinders to see that the brakes apply with the correct piston travel and that they fully release.

Observe brake blocks to see that they are of adequate thickness and that they press firmly against the wheels when applied.

Ensure the following:

- that the compressor is operating correctly and is properly lubricated
- that the compressor government is operating correctly
- that all air pressures are correct
- that all cocks are positioned correctly
- that all spare hoses are supplied
- drain all reservoirs
- test Main Reservoir and Brake Pipe for leakage

(b) Make a 70 kPa Brake Pipe reduction, then;

- No. 4 - Close the brake valve isolating cock and place the brake valve handle in RUNNING position
- 6SL and A7EL - Leave the brake valve handle in LAP position. Observe Brake Pipe pressure for one minute and check that it does not reduce more than 20 kPa (3 psi). Test for Main Reservoir leakage by noting the pressure reduction with the Automatic brake valve cut OUT and the brakes released during the time the compressor is stopped (if electric driven) or unloaded (if engine driven). Loss of pressure in this instance must not exceed 20 kPa per minute
- 26L: - turn the brake valve cut-off valve to OUT.

28. Describe how the governor controls the Main Reservoir on a DA locomotive and state how a quick build-up of pressure can be obtained on the locomotive

The compressor is driven by the engine crankshaft and is controlled by an air-operated, spring-loaded, compressor governor. When Main Reservoir pressure reaches that for which the governor is set, it opens a spring-loaded valve in the governor and flows to unloaders set in each compressor cylinder head. This air pressure—acting against the spring-loaded piston—forces it down, holding open the compressor intake valves so that the compressor pumps to atmosphere.

When Main Reservoir pressure drops to 900 kPa (130 psi), the compressor governor releases the pressure in the unloader valves and the intake valves work normally, again allowing the compressor to charge the Main Reservoir system.

29. (a) Explain what action must be taken if Brake Pipe leakage is excessive.
(b) What effect would excessive Brake Pipe leakage have on a train?

(a) If the leakage is on the locomotive the fact must be immediately reported to repair staff and entered in the repair journal. If the leakage is on the train, it must not depart until the leak is rectified. The train examiner must be advised and if there is no train examiner then the driver must try to fix the leak. If unable to do so, the vehicle must be removed from the train and the TCO and nearest train examiner advised.

(b) The brakes may creep on when not desired. If the brakes are applied by the driver, the leaks may cause them to apply harder than desired, owing to Brake Pipe pressure falling while the brake valve handle is in LAP position. Brake Pipe leakage also slows down the rate-of-recharge of Auxiliary Reservoirs throughout the train. This could result in a dangerous situation where the train might not be able to be stopped when required. Also, the compressor is made to work excessively.

30. What should the driver do if the vigilance device whistle sounds continuously?

(1) If the whistle sounds, but the indicating lights are not illuminated, an overcharge has occurred. Do not operate any cancelling switches and wait 30 seconds for the device to correct itself.

(2) If the device continues to sound, press and release the hand button once only. Wait at least 30 seconds as the system will be charged to Main Reservoir pressure and this must discharge to 630 kPa (90 psi) before the warning whistle will cease.

(3) If the device is still not restored, either the driver's button is stuck or a magnet valve or air valve is defective. Isolate the device and book it in the Loco 54D. Provide a report to the locomotive supervisor at the end of the shift.

(4) On locomotives not fitted with an impulse relay (such as on 10-notch locomotives) all cancelling devices must be operated once followed by a 30-second wait to allow the overcharge to decrease.

(5) If the overcharge is not corrected, any one of the cancelling micro-switches could be stuck closed, and if so, isolate the device and proceed as in (3) above.

31. Name the pipe connections between locomotives that allow them to operate in multiple on;
(a) locomotives with a Selective valve
(b) locomotives without a Selector valve

(a) Brake Pipe (BP)
Main Reservoir Equalising pipe (MR)
Brake Cylinder Equalising pipe (ER)

(b) Brake Pipe (BP)
Main Reservoir Equalising pipe (MR)
Control pipe (CP)
Independent Release pipe (IR)

32. How would you test the self-lapping straight-air brake?

Operate the brake in all positions. Observe that brakes apply with the correct piston travel and pressure, and that they fully release. Observe that the brake blocks press firmly on the locomotive wheels when the brake is applied. When releasing in steps, check that brake cylinder pressure drops accordingly and then remains constant after each movement of the handle. When moving the handle to EMERGENCY position, check that brake cylinder pressure rises at least 35 kPa above Full-Service pressure for that particular class of locomotive.

33. What are the instructions regarding the cutting-out of the brakes on locomotives, and the reporting of defects in the air brake equipment?

The air brake on a locomotive must not be cut out unless the brake apparatus is defective, in which case the matter must be noted in the repair journal for immediate attention. If serious, the defect must be reported to depot supervision. On vehicles and locomotives with the № 4 brake, which are fitted with an Auxiliary Reservoir, all air must be drained from the reservoir after cutting out the brake.

34. Briefly explain the action of the Improved Triple Valve when a release of brakes is made.

Pressure is restored in the Brake Pipe by admitting air from the Main Reservoir by means of the driver's brake valve. Air from the Brake Pipe enters the triple valve and forces the piston, slide and graduating valves to the RELEASE position. Air can now flow through the feed grooves into the Auxiliary Reservoir. The brake cylinder is closed to the Auxiliary Reservoir by the graduating and slide valves but is open to the atmosphere, and the brake can release as brake cylinder pressure flows to atmosphere. The Quick Service bulb is cut off from the Brake Pipe and also connected to atmosphere.

35. Name the positions of the 26C Automatic brake valve (26L equipment) and state the maximum Brake Pipe reduction obtainable in the SERVICE zone.

i. Release
ii. Minimum Reduction
iii. Service
iv. Suppression
v. Handle Off
vi. Emergency

Maximum Brake Pipe reduction obtainable in the Service zone (Full-Service) is 175 kPa (25 psi).

36. Name the positions of the brake valve cut-off valve on the 26C brake valve and state when each position would be used.

i. IN: the brake valve will operate in all positions. This position is used on a Lead or single unit.
ii. OUT: the brake valve is isolated from the Brake Pipe except in Emergency. This position is used when the unit is trailing, assisting, or is being towed dead.
iii. PASS: this position is only available on DX locomotives[1] and is only used if the train to be hauled is equipped with graduated-release control valves (as used on the *Silver Star* train sets) instead of standard direct-release triple valves.

37. Describe the operation of the Dead-Engine Device and state what Main Reservoir pressure can be obtained.

With the cock of the Dead-Engine Device open, Brake Pipe air lifts a check valve and passes through a choke to the to the Main Reservoir, charging it to about 455 kPa (65 psi) for use in the air brake equipment of that locomotive. The check valve is spring-loaded to 105 kPa (15 psi). When the Main Reservoir is charged to within about 105 kPa of Brake Pipe pressure, the spring closes the valve preventing any further flow of air. Pressure obtainable in the Main Reservoir is about 455 kPa.

38. Describe the movement of air through the № 4 Automatic brake valve in each of the following positions:

<u>Release:</u>

Main Reservoir air flows from the top of the rotary valve to the chamber above the equalising piston and feeds into the Equalising Reservoir. Also, Main Reservoir air passes to the Brake Pipe and the chamber below the equalising piston.

<u>Running:</u>

Main Reservoir air flows from above the rotary valve to the feed valve where it is reduced to 550 kPa (80 psi) and thence to the Brake Pipe and under the equalising piston, and to the chamber above the equalising piston and to the Equalising Reservoir.

<u>Lap:</u>

There is no flow of air.

<u>Service:</u>

Air from above the equalising piston and from the Equalising Reservoir escapes to atmosphere through the preliminary exhaust port. The greater Brake Pipe pressure lifts the equalising piston unseating the secondary exhaust port allowing Brake Pipe air to escape to atmosphere.

[1] The PASS position is nowadays also provided on the DFB Class of locomotives (modified DF) used by KiwiRail on their *Great Journeys of New Zealand* passenger services, as the rollingstock used on these services is equipped with Wabtec Australia WG-type graduated-release triple valves.

Emergency:
Direct communication between the Brake Pipe and atmosphere is established, allowing a rapid reduction of the Brake Pipe pressure. Equalising Reservoir pressure, including from above the equalising piston also escapes to atmosphere.

39. Briefly explain the action of the Improved Triple Valve when an application of the brakes is made.
When Brake Pipe pressure is reduced, the greater Auxiliary Reservoir pressure will move the triple valve piston to first close the feed grooves and then open the graduating valve. Auxiliary Reservoir pressure then moves the slide valve to first close the exhaust port, then connect the Quick Service bulb to the Brake Pipe to give a local Brake Pipe reduction, and then to connect the Auxiliary Reservoir to the brake cylinder via the graduating, slide, and regulating valves to give a brake application.

40. What advantages are gained from the use of the Air Flow meter?
- It shows the driver when his train Brake Pipe is almost charged and ready for the brake test, or ready to start off
- It also shows the driver any change in Brake Pipe airflow, and indicates that the brakes have been applied by some source other than his Automatic brake valve (e.g. locomotive break-in-two, train pull-apart, burst hose, or Emergency cock in carriage or guards van opened).

41. If, after an Automatic brake application with the No. 4 brake valve and the handle is in LAP position, the Brake Pipe pressure increased and the brakes released, what would be the cause?
A leaking rotary valve.

42. If there was no increase in brake cylinder pressure when the self-lapping straight-air brake valve was placed in EMERGENCY position, what action would you take, and why? (W-type as on DSC locomotive)
The fault should be reported for attention by fitting staff, as it is possible to lose both Service and Emergency braking should the balance spring fail.

43. What are the three functions of the distributing valve?
1. It permits air pressure to flow to the locomotive brake cylinders
2. It maintains any desired pressure in the brake cylinders
3. It permits air to exhaust from the brake cylinders

44. What are the most common causes of triple valves failing to move to release?
1. Insufficient Main Reservoir pressure
2. Brake valve isolating cock closed
3. Faulty triple valve piston ring
4. Auxiliary Reservoir overcharged
5. 'Release' after an excessively-light application
6. Automatic brake valve not held in RELEASE position long enough (applies to No. 4 and AH7 brake valves)
7. 'Release' after an excessively-heavy Brake Pipe reduction.

45. What defects would you look for if Main Reservoir pressure would not build up on a diesel-electric locomotive (specify one class)?
DA class locomotive:
1. Worn compressor piston rings
2. Faulty intake valves
3. Blocked air filters
4. Faulty pistons

5. Defective governor or unloader
6. Air reservoir drain cocks open
7. Coupling cocks open
8. Manual unload cock in UNLOAD position
9. Driveshaft not intact
10. Safety valves stuck open.

46. If the MU2A valve was left in TRAIL position on a light locomotive or Lead locomotive (3-pipe system), what effect would this have if:
(a) an Independent brake application was made?
(b) an Automatic brake application was made?
(a) there would be no Application or Release
(b) the Automatic brake may only be applied in the EMERGENCY position. All other positions would be non-effective.

47. Describe how the J1 relay valve operates when:
(a) an Application is made?
(b) a Release is made?
(a) Controlled air is fed to the upper face of the relay valve diaphragm, forcing it down against its spring. This downward movement carries with it the spool valve, the hollow face of which sits against the check valve sealing off the hollow portion of the spool. This action cuts off communication to atmosphere at the exhaust.

Further downward movement of the J1 relay valve spool unseats the check valve and its carrier, allowing Main Reservoir air to flow around the outside of the spool and so to the brake cylinders. Some of this air flows via an internal passage to the spring chambers below the check valve carrier and the relay valve diaphragm, to assist the respective return springs.

When pressure in the return spring chamber below the diaphragm builds up to equal that supplied above the diaphragm, the spring is able to move the diaphragm slightly upwards to close the check valve and cut off the supply of Main Reservoir air, but not far enough to lift the hollow face of the spool valve off the check valve. The relay valve is now in a LAP position.

To completely release the brakes, the controlled air above the diaphragm is released, thus initiating an upward movement of the diaphragm and assembly by brake cylinder and spring pressures opening the exhaust valve, and permitting the escape of brake cylinder air to atmosphere at the exhaust port.

48. Name the valves operated by the brake valve camshaft when a 26C Automatic brake valve is placed in:
(a) SERVICE position
Suppression valve and Regulating valve

(b) HANDLE OFF position
Suppression valve and Regulating valve

(c) EMERGENCY position
Suppression valve, Regulating valve, Vent valve, and Emergency valve

49. What additional valve is included in the 3-pipe system that is not in the 4-pipe system (26L brake)?
The F1 Selector valve.

50. Which valve in the Automatic brake valve portion of the 26C brake valve vents Brake Pipe air directly to atmosphere when the Automatic brake valve is placed in EMERGENCY position?
The vent valve.