

PRACTICE EXAM 16: ASE T4 BRAKES SIMULATION

1. A driver reports the brake pedal feels normal during the first stop after starting the engine, but successively stiffer with each subsequent stop. The vehicle has a vacuum brake booster. The MOST likely cause is:

- A. A failed vacuum check valve at the booster inlet — reserve vacuum is being lost between applications
- B. Air entering the hydraulic lines
- C. Failed master cylinder
- D. Worn brake pads

2. A heavy-truck technician is testing a wheel speed sensor with a multimeter. The sensor reads 2,200 ohms. The technician should:

- A. Conclude the sensor is shorted to ground
- B. Conclude the sensor is open-circuited
- C. Conclude the sensor is within the typical operating range and the fault may lie elsewhere
- D. Replace the sensor immediately

3. A heavy-truck driver complains that the brakes feel "spongy" only after the truck has been parked overnight. The pedal returns to normal feel after 30 minutes of driving. The MOST likely cause is:

- A. Failed master cylinder
- B. Internal flex hose delamination that becomes more pronounced when fluid is cold
- C. Failed wheel speed sensor

D. Excessive brake pad wear

4. A heavy-truck wheel bearing inspection reveals the rollers and races have become a uniform satin gray color with no pitting or scoring. This finding indicates:

- A. The bearing has reached the end of its service life
- B. The bearing has been over-greased
- C. The bearing was installed incorrectly
- D. The bearing is healthy and operating normally with proper lubrication

5. A heavy-truck driver complains of a "metallic squeal" from the front brakes during light braking. The squeal disappears under firmer pedal application. The MOST likely cause is:

- A. Worn brake pad wear indicator contacting the rotor — pad is approaching minimum thickness
- B. Failed wheel bearings
- C. Compressor failure
- D. ABS modulator failure

6. A heavy-truck air brake system shows that the compressor unloads at 130 psi and reloads at 120 psi. This 10 psi differential is:

- A. Within normal specifications
- B. Acceptable for cold-weather operation only
- C. Too small — the typical normal differential is 20 to 25 psi, and a 10 psi differential indicates governor adjustment is needed
- D. Too large — the typical differential is 5 psi maximum

7. A driver complains that the trailer brakes apply during stops but release noticeably slower than the tractor brakes. The MOST likely cause is:

- A. Failed compressor on the tractor
- B. Restriction in the trailer service line preventing rapid air exhaust during release
- C. Excessive driver pedal pressure
- D. Worn brake shoes on the trailer

8. A heavy-truck wheel bearing endplay measurement of 0.020 inches indicates:

- A. The bearing is properly adjusted
- B. The bearing is too tight
- C. Normal operation
- D. The bearing has excessive endplay and requires readjustment to specification

9. A driver complains that the parking brake "drags" during normal driving — the spring brakes appear partially applied even with the dash valve pushed in. The MOST likely cause is:

- A. Insufficient air pressure reaching the spring chamber control ports — possibly due to line restriction or marginal system pressure
- B. Failed master cylinder
- C. Wheel bearing failure
- D. ABS modulator failure

10. A heavy-truck driver complains of a "groaning" sound from the front brakes only on the first application after parking overnight. The sound disappears after the first stop. The MOST likely cause is:

- A. Failed wheel bearings

- B. Worn brake pad wear indicator
- C. Light surface rust on the rotor friction surface that gets cleaned off by the first application
- D. ABS modulator failure

11. A heavy-truck driver reports that the brake pedal feels firm but the brakes are "weak" — stopping distance has increased noticeably. After verifying air pressure is normal, the technician should:

- A. Replace the master cylinder immediately
- B. Check brake adjustment at each wheel — out-of-adjustment brakes produce weak braking despite normal air pressure
- C. Replace all brake hoses
- D. Replace the compressor

12. A heavy-truck air brake system's safety relief valve typically opens at:

- A. 150 to 175 psi
- B. 80 to 100 psi
- C. 60 psi
- D. 250 to 300 psi

13. A heavy-truck driver complains that the brakes feel different but cannot describe the change precisely. All measurements are within specification, and the road test confirms normal brake response. The technician should:

- A. Replace the master cylinder as a precaution
- B. Replace all brake calipers preventively
- C. Replace the vacuum booster
- D. Document findings, discuss observations with the driver, and monitor at the next service interval

14. A heavy-truck wheel speed sensor that has corroded internal connections will produce:

- A. Improved sensor signal
- B. Weak or intermittent signal output, possibly producing intermittent or persistent ABS faults
- C. Activation of the parking brake automatically
- D. Higher-than-normal output voltage

15. A heavy-truck driver reports that during a recent panic stop, the brake pedal traveled unusually deep before the brakes engaged. After the stop, normal pedal feel returned. The MOST likely cause is:

- A. Master cylinder failure
- B. Air entering the lines during the panic stop
- C. ABS activation during the panic stop produced characteristic pedal travel that resolved when normal driving resumed
- D. Failed wheel bearings

16. A heavy-truck driver complains of a "vibration in the steering wheel" during braking from highway speed. The vibration disappears at lower speeds. The MOST likely cause is:

- A. Front rotor thickness variation that produces vibration amplified at higher rotational speeds
- B. Failed wheel bearings
- C. Failed power steering pump
- D. ABS modulator failure

17. A heavy-truck air brake system's air dryer is positioned:

- A. Inside the cab
- B. Between the trailer and the tractor

C. Downstream of the supply reservoir

D. Between the compressor and the supply reservoir, where it removes moisture from the discharge air

18. A heavy-truck driver complains of a "scraping" sound from the rear brakes during application. Inspection reveals the brake shoe linings have been worn down to the rivet heads. The shoes:

A. Can be reinforced with new friction material

B. Must be replaced as a matched axle set immediately

C. Should be machined to remove the rivet heads

D. Can be returned to service if measurement is within specification

19. A heavy-truck driver reports that the brake pedal "pulses" only on the first application after overnight parking. The vehicle has front disc brakes. The MOST likely cause is:

A. Failed master cylinder

B. Worn caliper slide pins

C. Surface rust on rotor friction surface that gets cleaned off by the first application — disappears after the first stop

D. Failed wheel speed sensor

20. A heavy-truck driver reports that when the brakes are applied lightly, the trailer brakes engage normally, but during firm pedal application, the trailer brakes seem weak. The MOST likely cause is:

A. Reduced trailer relay valve effectiveness under high signal pressure — possibly worn internals

B. Excessive driver pedal pressure

C. Failed compressor

D. Worn wheel bearings

21. A heavy-truck wheel bearing service interval is:

- A. Every brake service
- B. Every 5,000 miles regardless of design
- C. Calendar-based at 6 months
- D. Determined by the manufacturer — often 100,000 to 250,000 miles for sealed/oil-bath designs

22. A heavy-truck driver complains of a "hissing" sound that occurs only during hard braking. The hissing stops when the pedal is released. The MOST likely cause is:

- A. Air dryer purge cycle activating
- B. Air leak at a chamber location during application — likely a torn diaphragm or cracked supply line
- C. Tire road noise
- D. Engine vacuum loss

23. A heavy-truck driver complains that the brake pedal feels normal but the brakes feel "weak" during emergency braking. After verifying brake adjustment is within specification at all wheels, the technician should:

- A. Replace the master cylinder
- B. Replace the compressor
- C. Inspect for contaminated friction material on one or more wheels — contamination reduces friction coefficient even with proper brake adjustment
- D. Replace all brake hoses

24. A heavy-truck driver reports that during normal driving, the air system pressure gauge fluctuates between 120 psi and 100 psi. This is:

- A. Normal operation — the compressor is cycling between cut-in and cut-out pressures

- B. Indicative of a major air leak
- C. A sign of compressor failure
- D. Grounds for immediate vehicle shutdown

25. A heavy-truck driver complains that during emergency braking on wet pavement, the brakes feel "different" — the pedal pulses and there's a clicking sound. The MOST likely cause is:

- A. Failed master cylinder
- B. Air in the hydraulic lines
- C. Loose wheel bearings
- D. ABS activation during the wet-road hard stop — pedal pulsation and modulator clicks are normal operation

26. A heavy-truck driver reports the brakes feel slightly "soft" during normal driving but the soft feel becomes more pronounced during firm application. The MOST likely cause is:

- A. Failed master cylinder
- B. Internal flex hose deterioration that allows greater hose ballooning under higher pressure
- C. Worn brake pads
- D. Failed compressor

27. A heavy-truck wheel speed sensor has been damaged by impact during wheel-end service. The MOST likely consequence is:

- A. The parking brake activates automatically
- B. The compressor cycles continuously
- C. ABS warning lamp illumination and stored DTC for that sensor
- D. The engine ECU shuts down

28. A heavy-truck air brake system uses a "blue gladhand" for what purpose?

- A. Trailer service signal air
- B. Trailer supply (emergency) air
- C. Trailer mud flaps connection
- D. Trailer ABS electrical connection

29. A heavy-truck driver complains that the brakes feel "weak" but the pedal feels normal. The driver reports that this is a recent change. The MOST likely cause is:

- A. Compressor failure
- B. ABS modulator failure
- C. Wheel bearing failure
- D. Out-of-adjustment brakes that have progressively drifted out of specification, possibly due to a failed or non-functioning slack adjuster

30. A heavy-truck driver reports a "metallic clunking" sound from the rear brakes during braking. The vehicle has rear drum brakes. The MOST likely cause is:

- A. Failed wheel bearings
- B. Worn brake hardware (return springs, hold-downs, anchor pins) — components are loose and contacting during application
- C. ABS modulator failure
- D. Compressor failure

31. A heavy-truck driver complains of a "rattle" from the front brakes during light bumps in the road. The rattle disappears during braking. The MOST likely cause is:

- A. Worn caliper slide pins or anti-rattle clips, allowing components to vibrate during normal driving

- B. Failed wheel bearings
- C. ABS modulator activation
- D. Loose wheel lug nuts

32. A heavy-truck driver reports that the trailer brakes apply during stops but the trailer pulls slightly to the right. The MOST likely cause is:

- A. Failed compressor
- B. Excessive wheel bearing endplay
- C. Brake imbalance between trailer wheels — typically contaminated or worn friction material on one wheel
- D. ABS warning lamp circuit issue

33. A heavy-truck wheel bearing race shows uniform discoloration to bright blue. This indicates:

- A. Normal coloration from manufacturing
- B. The bearing has been properly lubricated
- C. Slight overheating that is acceptable
- D. The bearing has been overheated, the steel has lost its temper, and the bearing must be replaced

34. A heavy-truck driver reports that the brake pedal travels unusually deep — far deeper than normal — during all brake applications. The MOST likely cause is:

- A. Air pressure has dropped to dangerous levels
- B. Excessive flex hose age combined with internal hose deterioration that has progressed gradually
- C. Compressor failure
- D. ABS modulator failure

35. A heavy-truck driver complains that the brakes feel "weak" during all stops, not just emergency stops. After verifying brake adjustment is correct, the technician should:

- A. Inspect for contaminated friction material — contamination reduces friction coefficient and produces weak braking even with proper adjustment
- B. Replace the master cylinder
- C. Replace all wheel speed sensors
- D. Replace the compressor

36. A heavy-truck wheel bearing pre-load adjustment that produces excessive bearing tightness will:

- A. Improve bearing service life
- B. Reduce noise during operation
- C. Generate excessive heat during operation, leading to lubricant breakdown and accelerated bearing failure
- D. Improve braking performance

37. A heavy-truck driver complains of a "scraping" sound from the front brakes during application. Inspection reveals the brake pads have been worn down to metal-to-rotor contact. The rotor:

- A. Should be reinforced with new friction material
- B. Can be returned to service if dimensions are within specification
- C. Should be machined to remove the metal-to-rotor scoring
- D. Should be inspected for damage from metal-to-rotor contact and likely replaced if scoring exceeds the discard limit

38. A heavy-truck driver reports that the brakes feel "weak" during emergency braking. After verifying brake adjustment is correct and friction material is in good condition, the technician should next inspect:

- A. The master cylinder
- B. The brake balance and proportioning — the system may have a failed proportioning valve or imbalance between axles
- C. The compressor
- D. The wheel speed sensors

39. A heavy-truck wheel bearing has been operating with insufficient lubrication. The MOST likely outcome is:

- A. Rapid bearing failure — friction generates excessive heat that destroys the lubricant and damages the bearing surfaces
- B. Improved bearing service life
- C. Quieter operation
- D. Reduced wheel hub temperature

40. A heavy-truck driver complains that the brakes feel "spongy" only during emergency braking. The pedal feels firm during normal stops. The MOST likely cause is:

- A. Failed master cylinder
- B. Worn brake pads
- C. Hose or hydraulic component compliance under high pressure that becomes more apparent under firm application
- D. Failed compressor

41. A heavy-truck driver complains that the trailer brakes apply normally during stops, but during emergency braking, the trailer brakes feel "weak." The MOST likely cause is:

- A. Excessive driver pedal pressure
- B. Normal trailer brake variation
- C. Failed compressor
- D. Reduced trailer relay valve effectiveness under high signal pressure — possibly worn internals reducing the amplification ratio

42. A heavy-truck driver reports that the brakes feel normal during light braking but produce a "pulsation" through the pedal during firmer applications. The vehicle has front disc brakes. The MOST likely cause is:

- A. Failed master cylinder
- B. Rotor thickness variation that becomes more pronounced under higher caliper pressure
- C. Worn caliper slide pins
- D. Failed wheel bearings

43. A heavy-truck driver complains that the brake pedal "rises" — meaning the pedal moves higher in the cab — over the course of weeks. The vehicle has hydraulic drum brakes. The MOST likely cause is:

- A. Drum brake self-adjusters compensating for shoe wear by automatically tightening clearance
- B. Failed master cylinder
- C. Excessive flex hose age
- D. ABS modulator stuck closed

44. A heavy-truck wheel bearing is being installed using the TMC RP 618 procedure. After pre-seating with 200 lb-ft while rotating, the next step is to:

- A. Apply final torque immediately
- B. Install the cotter pin
- C. Back the nut off completely, then re-tighten to approximately 50 lb-ft while rotating to establish the measurement baseline
- D. Apply 1,000 lb-ft of torque

45. A heavy-truck driver reports that the brakes feel "weak" during all stops. The pedal feels firm and there are no fluid leaks. After verifying brake adjustment is within specification at all wheels and friction material is in good condition, the technician should next inspect:

- A. The compressor
- B. The wheel bearings
- C. The ABS warning lamp circuit
- D. The brake balance and proportioning — the system may have a failed proportioning valve, causing imbalanced brake force distribution between axles

46. A heavy-truck driver complains of a "vibration" felt through the steering wheel only during braking from highway speed. The MOST likely cause is:

- A. Failed wheel bearings
- B. Front rotor thickness variation that produces vibration amplified at higher rotational speeds
- C. Failed power steering pump
- D. ABS modulator failure

47. A heavy-truck wheel bearing is being adjusted. The technician should NOT:

- A. Use the manufacturer's specified procedure
- B. Verify endplay with a dial indicator
- C. Pre-seat the bearing with 200 lb-ft while rotating
- D. Tighten the spindle nut to maximum torque without using the proper procedure

48. A heavy-truck driver complains that the brake pedal feels normal during the first stop but progressively softer with each subsequent stop. The vehicle has a hydraulic brake system. The MOST likely cause is:

- A. Air entering the hydraulic system through normal use, requiring system bleeding
- B. Failed master cylinder
- C. Worn caliper slide pins
- D. ABS modulator failure

49. A heavy-truck driver reports that the brakes feel "weak" during emergency braking. After verifying brake adjustment, friction material, and proportioning are all within specification, the technician should next inspect:

- A. The wheel bearings
- B. The ABS warning lamp circuit
- C. The supply pressure at the chambers during application — pressure drop during application may indicate restricted air supply to the chambers
- D. The wheel speed sensors

50. A heavy-truck driver complains that the brake pedal feels "spongy" and the issue has gradually worsened over months. The vehicle has a hydraulic brake system. The MOST likely cause is:

A. Failed master cylinder

B. Worn brake pads

C. Failed wheel bearings

D. Internal flex hose deterioration that has progressed gradually — hoses should be inspected and replaced if internal damage is present

PRACTICE EXAM 16 — ANSWER KEY AND EXPLANATIONS

1. A — A failed vacuum check valve at the booster inlet — reserve vacuum is being lost between applications. The check valve holds reserve vacuum in the booster between engine cycles, providing 2 to 3 assisted stops after the engine stops. When it fails, reserve vacuum bleeds away rapidly — the first stop uses the remaining vacuum, and subsequent stops feel progressively stiffer as reserve depletes.
2. C — Conclude the sensor is within the typical operating range and the fault may lie elsewhere. Most heavy-truck ABS wheel speed sensors read between approximately 900 and 2,000 ohms at room temperature. A reading of 2,200 ohms is at the upper end of the typical range, suggesting the sensor coil itself is electrically functional and the diagnostic search should expand to wiring, gap, and tone ring conditions.
3. B — Internal flex hose delamination that becomes more pronounced when fluid is cold. Cold-stiff hose with internal delamination produces increased compliance (sponginess) when fluid is cold. As fluid warms during operation, the hose conforms differently and pedal feel returns to normal. This temperature-correlated symptom is the distinctive fingerprint of progressing flex hose deterioration.
4. D — The bearing is healthy and operating normally with proper lubrication. A uniform satin gray appearance with no pitting or scoring is the signature of a healthy bearing operating normally on the recommended lubricant. This is a positive finding suggesting the bearing has reached normal break-in condition and can return to service if no other defects are present.
5. A — Worn brake pad wear indicator contacting the rotor — pad is approaching minimum thickness. The metallic squeal during light braking that disappears under firm pressure is the distinctive signature of a brake pad wear indicator contacting the rotor. The indicator is designed to alert the driver that pad replacement is needed before metal-to-rotor contact occurs.
6. C — Too small — the typical normal differential is 20 to 25 psi, and a 10 psi differential indicates governor adjustment is needed. The standard differential between governor cut-in and cut-out is 20 to 25 psi. A 10 psi differential is too small and produces excessive compressor cycling, which stresses the compressor and reduces braking reserve. Governor adjustment is required.
7. B — Restriction in the trailer service line preventing rapid air exhaust during release. Slow trailer release indicates restricted air flow during the exhaust phase. The restriction in the service line

limits the rate at which the chamber air can return to the tractor's exhaust port, delaying the release. Fast application but slow release is the diagnostic fingerprint of an exhaust-side restriction.

8. D — The bearing has excessive endplay and requires readjustment to specification. The standard endplay specification is 0.001 to 0.005 inches. A reading of 0.020 inches is significantly above this range, indicating the bearing is too loose. Continued operation with excessive endplay produces hub wobble, accelerated wear, and potential safety issues — readjustment is required.
9. A — Insufficient air pressure reaching the spring chamber control ports — possibly due to line restriction or marginal system pressure. Parking brake "drag" (partial application) indicates the spring chambers are not receiving adequate control air to fully release the power springs. Lines may be partially blocked, system pressure may be marginal, or there may be an upstream restriction reducing the pressure delivered to the chambers.
10. C — Light surface rust on the rotor friction surface that gets cleaned off by the first application. Light surface rust forms on rotor friction surfaces during overnight parking. The first brake application after starting produces a "groaning" sound as the rust is mechanically cleaned from the surface. The sound disappears as rotor surfaces normalize — a normal, harmless symptom.
11. B — Check brake adjustment at each wheel — out-of-adjustment brakes produce weak braking despite normal air pressure. Out-of-adjustment brakes produce weak braking even with normal air pressure delivered to the chambers. The reduced mechanical advantage at the slack adjuster means the chamber force is not converted efficiently to braking torque. Brake adjustment verification is fundamental to "weak brakes" diagnosis.
12. A — 150 to 175 psi. Heavy-truck air brake safety relief valves are typically set to open at approximately 150 to 175 psi. This pressure threshold is well above normal operating ranges (120-135 psi cut-out) but below the failure threshold of system components, providing safety protection without normal operational interference.
13. D — Document findings, discuss observations with the driver, and monitor at the next service interval. Vague complaints with no measurable findings should not result in unnecessary parts replacement. The technician should document findings, discuss observations with the driver, and monitor at the next interval. This approach protects the customer from unnecessary expense while allowing early detection if symptoms develop.
14. B — Weak or intermittent signal output, possibly producing intermittent or persistent ABS faults. Corroded internal connections in a wheel speed sensor weaken the electrical signal output. Depending on the corrosion severity, the symptom may be intermittent ABS faults (when corrosion makes intermittent connections) or persistent faults (when connections are completely interrupted). The sensor must typically be replaced.
15. C — ABS activation during the panic stop produced characteristic pedal travel that resolved when normal driving resumed. ABS activation during a panic stop produces characteristic pedal travel

sensations including longer-than-normal pedal travel, pulsation, and audible modulator clicks. After the stop, normal pedal feel returns as the system returns to standby — exactly the described pattern.

16. A — Front rotor thickness variation that produces vibration amplified at higher rotational speeds. Front rotor thickness variation produces vibration at each wheel that is transmitted through the steering knuckle and steering linkage to the steering wheel. The vibration amplitude is amplified at higher rotational speeds because the alternating clamping force occurs at higher frequency.
17. D — Between the compressor and the supply reservoir, where it removes moisture from the discharge air. The air dryer is positioned between the compressor and the supply reservoir, where it processes the hot, moisture-laden discharge air from the compressor. The dryer removes moisture, oil, and particulate contamination before the air reaches the supply reservoir, protecting downstream components.
18. B — Must be replaced as a matched axle set immediately. Brake shoes worn to the rivet heads have reached the end of useful life. Continued use produces metal-to-drum contact, which damages the drum and creates safety risks. Shoes must be replaced as a matched axle set, not just on one wheel, to maintain balanced braking torque.
19. C — Surface rust on rotor friction surface that gets cleaned off by the first application — disappears after the first stop. Light surface rust forms on rotor friction surfaces during overnight parking. The first brake application after starting produces pedal pulsation as the rust is mechanically removed by the pads. The pulsation disappears after one or two applications — this is normal and harmless.
20. A — Reduced trailer relay valve effectiveness under high signal pressure — possibly worn internals. A trailer relay valve with internal wear may deliver normal pressure under light signal but reduced pressure under high signal. The valve cannot maintain proper amplification across the full pressure range, producing weak braking specifically during firm applications when high pressure is needed.
21. D — Determined by the manufacturer — often 100,000 to 250,000 miles for sealed/oil-bath designs. Wheel bearing service intervals vary based on hub design (sealed/oil-bath vs. grease) and operating conditions. Modern sealed designs often go 100,000 to 250,000 miles between services. Always follow the manufacturer's specified interval rather than generic intervals.
22. B — Air leak at a chamber location during application — likely a torn diaphragm or cracked supply line. Hissing during hard braking that stops on release is the diagnostic fingerprint of a chamber-related leak that opens up under high pressure. Possible causes include a torn chamber diaphragm or a cracked air supply line that leaks only under application pressure.
23. C — Inspect for contaminated friction material on one or more wheels — contamination reduces friction coefficient even with proper brake adjustment. Contaminated friction material reduces the

coefficient of friction at the affected wheel, producing weak braking even with proper adjustment. The contamination may come from oil, grease, or brake fluid leakage. Contamination inspection is the next step after adjustment is verified.

24. A — Normal operation — the compressor is cycling between cut-in and cut-out pressures. Air system pressure that fluctuates between 120 psi (cut-out) and 100 psi (cut-in) is normal compressor cycling behavior. The 20 psi differential is exactly what is expected with proper governor function. This is normal operation, not a fault.
25. D — ABS activation during the wet-road hard stop — pedal pulsation and modulator clicks are normal operation. ABS activation during a wet-road hard stop produces characteristic pedal pulsation from the modulator cycle and an audible ticking sound from the modulator solenoids. The system intervened to prevent wheel lockup, which is exactly what it is designed to do — this is normal operation, not a malfunction.
26. B — Internal flex hose deterioration that allows greater hose ballooning under higher pressure. A hose with internal deterioration becomes more compliant under pressure — the higher the pressure, the more the hose balloons. This produces sponginess that is more pronounced under firm application than under light braking. Hose replacement is required.
27. C — ABS warning lamp illumination and stored DTC for that sensor. A damaged wheel speed sensor produces ABS warning lamp illumination and stored DTC for the affected wheel. The ABS ECU detects the missing or weakened signal during its monitoring routine and stores the appropriate diagnostic code, alerting the technician to the specific sensor needing replacement.
28. A — Trailer service signal air. The blue gladhand on a heavy-truck tractor carries the service signal air to the trailer. This signal commands the trailer's relay emergency valve to apply the trailer brakes. The blue gladhand is paired with the red gladhand (supply air), and federal standardization ensures color coding is consistent across all heavy-truck applications.
29. D — Out-of-adjustment brakes that have progressively drifted out of specification, possibly due to a failed or non-functioning slack adjuster. Progressively weak braking with normal pedal feel typically points to brakes that have drifted out of adjustment. The drift may be caused by a failed automatic slack adjuster, worn manual slack adjuster, or worn brake hardware. Diagnosis should focus on the adjustment system.
30. B — Worn brake hardware (return springs, hold-downs, anchor pins) — components are loose and contacting during application. A "metallic clunking" sound from rear drum brakes during braking is the distinctive fingerprint of worn brake hardware. Loose components contact each other during the application, producing the characteristic clunking sound. Hardware should be inspected and replaced as needed during shoe service.
31. A — Worn caliper slide pins or anti-rattle clips, allowing components to vibrate during normal driving. A "rattle" from front brakes during light bumps that disappears during braking points to

worn slide pins or missing/damaged anti-rattle clips. The pads vibrate freely during driving but stop when caliper pressure clamps them against the rotor. Hardware replacement resolves this.

32. C — Brake imbalance between trailer wheels — typically contaminated or worn friction material on one wheel. Trailer pull during braking indicates one trailer brake is doing more or less work than the others. The most common cause is contaminated or worn friction material on one wheel, shifting the balance of braking force and causing the trailer to pull toward the side with stronger braking.
33. D — The bearing has been overheated, the steel has lost its temper, and the bearing must be replaced. Bright blue discoloration on bearing rollers and races indicates the steel has been heated beyond tempering temperature, permanently reducing hardness. The bearing is structurally weakened regardless of apparent surface condition and must be replaced — continued use will result in rapid failure.
34. B — Excessive flex hose age combined with internal hose deterioration that has progressed gradually. Gradual increase in pedal travel typically indicates progressive component deterioration, with flex hose internal deterioration being the most common cause. The hose loses its internal reinforcement progressively, allowing more compliance under pressure. Hose inspection and replacement is the recommended diagnostic and repair path.
35. A — Inspect for contaminated friction material — contamination reduces friction coefficient and produces weak braking even with proper adjustment. Contaminated friction material reduces the coefficient of friction at the affected wheel, producing weak braking even with proper adjustment. The contamination may come from oil, grease, or brake fluid leakage. Contamination inspection is the next step after brake adjustment is verified.
36. C — Generate excessive heat during operation, leading to lubricant breakdown and accelerated bearing failure. Excessive bearing pre-load produces continuous friction at the contact surfaces. Heat generated by this friction breaks down the lubricant, accelerates wear, and eventually causes bearing seizure. Proper endplay adjustment is essential to avoid this failure mode.
37. D — Should be inspected for damage from metal-to-rotor contact and likely replaced if scoring exceeds the discard limit. Metal-to-rotor contact damages the rotor friction surface. The rotor must be inspected for scoring and dimensional integrity. If scoring exceeds the discard limit (typically 0.060 inches over nominal) or the rotor is below minimum thickness, replacement is required.
38. B — The brake balance and proportioning — the system may have a failed proportioning valve or imbalance between axles. After verifying brake adjustment and friction material are correct, the next step is to inspect brake balance and proportioning. A failed proportioning valve or imbalanced air distribution between axles can produce weak emergency braking even with all individual brake components in good condition.

39. A — Rapid bearing failure — friction generates excessive heat that destroys the lubricant and damages the bearing surfaces. A wheel bearing operating without adequate lubrication generates excessive friction at the rolling contact surfaces. The friction generates heat that destroys the lubricant and damages the bearing surfaces, leading to rapid mechanical failure. Continued operation produces catastrophic damage.
40. C — Hose or hydraulic component compliance under high pressure that becomes more apparent under firm application. Sponginess that is more pronounced under firm application points to compliance in the hydraulic system that responds to pressure. The components are absorbing pedal effort through compliance rather than transmitting hydraulic pressure efficiently. Hose inspection and replacement may be required.
41. D — Reduced trailer relay valve effectiveness under high signal pressure — possibly worn internals reducing the amplification ratio. A trailer relay valve with internal wear may deliver normal pressure under light signal but reduced pressure under high signal. The valve cannot maintain proper amplification across the full pressure range, producing weak braking specifically during firm applications when high pressure is needed.
42. B — Rotor thickness variation that becomes more pronounced under higher caliper pressure. Rotor thickness variation produces pedal pulsation that is amplified by higher caliper pressure. Light braking may not produce noticeable pulsation, but firmer applications generate the characteristic pulsation as the caliper pistons cycle with the rotor's thickness variations.
43. A — Drum brake self-adjusters compensating for shoe wear by automatically tightening clearance. Drum brake self-adjusters automatically compensate for lining wear by tightening shoe-to-drum clearance over time. As linings wear, the adjuster engages slightly, causing the pedal to rise as the shoes are positioned closer to the drums. This is a normal operational pattern.
44. C — Back the nut off completely, then re-tighten to approximately 50 lb-ft while rotating to establish the measurement baseline. After the initial 200 lb-ft pre-seating and complete back-off, the TMC RP 618 procedure calls for re-tightening to approximately 50 lb-ft while rotating the hub. This establishes the measurement baseline, after which the adjusting nut is backed off the specified amount to achieve the final endplay.
45. D — The brake balance and proportioning — the system may have a failed proportioning valve, causing imbalanced brake force distribution between axles. After verifying brake adjustment and friction material are correct, the next step is to inspect brake balance and proportioning. A failed proportioning valve or imbalanced air distribution between axles can produce weak braking even with all individual brake components in good condition.
46. B — Front rotor thickness variation that produces vibration amplified at higher rotational speeds. Front rotor thickness variation produces vibration at each wheel that is transmitted through the steering knuckle and steering linkage to the steering wheel. The vibration amplitude is amplified at higher rotational speeds because the alternating clamping force occurs at higher frequency.

47. D — Tighten the spindle nut to maximum torque without using the proper procedure. Tightening the spindle nut to maximum torque without using the proper procedure (pre-seating, back-off, and final torque steps) produces incorrect bearing adjustment. The bearing will be over-preloaded and will fail prematurely from heat-induced damage. The proper procedure must always be followed.
48. A — Air entering the hydraulic system through normal use, requiring system bleeding. Pedal that becomes progressively softer with each subsequent stop indicates air being pushed forward in the hydraulic system, redistributing through the lines. This is the classic symptom of air in the hydraulic system, requiring proper bleeding to remove the trapped air.
49. C — The supply pressure at the chambers during application — pressure drop during application may indicate restricted air supply to the chambers. After verifying brake adjustment, friction material, and proportioning are within specification, the next step is to inspect the supply pressure at the chambers during brake application. Pressure drop during application indicates restricted air supply that limits chamber force.
50. D — Internal flex hose deterioration that has progressed gradually — hoses should be inspected and replaced if internal damage is present. Gradual sponginess on a hydraulic-braked vehicle that has not had recent service typically points to flex hose internal deterioration. The hoses lose their internal reinforcement progressively, producing increasing compliance under pressure. Hose inspection and replacement is the recommended diagnostic and repair path.