FRONZ / ONTRACK

APPROVED CODE OF PRACTICE
FOR
HERITAGE NETWORK OPERATORS

Mechanical Code of Practice B3.2.1.01

AIR BRAKE SYSTEMS TESTING

Issue	Prepared (P), Reviewed (R), Amended (A)	Approved by	Effective Date
1	P McCallum (P)	Heritage Technical Committee	27 June 2006
1.1	P McCallum (A)		7 May 2007

Reference Material

Source	Description	Date
Tranz Rail Ltd	Loco-hauled Passenger Car and Van Brake Manual	5 June 1996
Tranz Rail Ltd	M9103 - Standard Test Code, Locomotive Brake All Classes (Except Ef)	Sep 1996
New Zealand Railways	Standard Test Code For A.6-E.T. And A.7-E.L. Air Brake Equipments	24 April 1959
New Zealand Railways	Testing Standard Automatic And Non-Automatic Air Brake Equipment On Locomotives And Rail Type Shunting Tractors	21/14/1959
Steam Incorporated	COP 6 - Air Brake Code For Steam Locomotives	2 September 2002
Mainline Steam	MSHT002 - Test Results for A6ET Brake	
New Zealand Railways	Steam Driven Air Compressors (Extract only)	28 April 1958
New Zealand Railways	Drawing Y21170 – Air End Test. Orifice Nut. Air Compressors.	18 March 1966
New Zealand Railways	Standard Test Code for Railcars prepared by Jim Nichols, Vehicle Inspector	

Amendment History

Version	Section	Amendment
Draft		Released 22/12/2005
1.0	Index	Amended
	7	Added 6SI brake test code
	A1	Added 6SI brake test record
1.1	5	Corrected Steam End Test table.

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Introduction
The purpose of these tests is to ensure that vehicle brake system are working correctly and comply with the standards for operation on the National Rail System.

Notes
1 Deletions from the original codes are showing by strikethrough eg ~~95 lbs~~
2 Additions to the original codes are shown in brackets eg [550 kPa]

Section 1
Brake System Testing
Efficiency (Functional) Tests

Source
Toll Rail Operating Code
Steam Inc COP 6 - Air Brake Code For Steam Locomotives; 2 September 2002

Contents

1.1 Introduction
Brake efficiency (or functional) tests are to be done as called for in the various codes and regulations.

In general they are performed when rail vehicles are being prepared for operation.

1.2 Locomotives
Check that brakes apply by observing that the piston travels are within the range specified for the brake cylinder type and that the blocks press firmly on the wheels. Check that they release correctly. Both the automatic and independent brakes are to be tested in turn.

With the automatic brake, a reduction of approximately 100 kPa (15 psi) is to be made, and with the independent brake a full application is to be made.

Perform a brake pipe leakage test by:-
- Close the headstock coupling cocks.
- Using the automatic brake valve make a 75 kPa (10 psi) reduction.
- Cut out the automatic brake.
- The brake pipe pressure must not drop more than 20 kPa (3 psi) in one minute.
- Cut in the automatic brake and release it.

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Perform a main reservoir leakage test by:
- Make sure the handbrake is applied.
- Place the independent valve in the release position.
- Cut out the automatic brake.
- Allow the compressor to charge the main reservoir to its upper limit and then stop it.
- The main reservoir pressure must not drop more than 20 kPa (3 psi) in one minute.
- Cut in the automatic brake and re-apply the independent brake. Restart the compressor.

Remedy any readily detectable air leaks.

Test the operation of the hand-brake by applying it firmly and check that the blocks press firmly against the wheels. Check that the hand-brake releases correctly.

Test the operation of the vigilance device (if fitted).

Check that the event recorder is functioning correctly.

1.3 Cars and Wagons

This test may be applied to an individual vehicle or to a group of coupled vehicles.

With a locomotive attached (or a single car tester if only one vehicle), make a reduction in train pipe pressure of 100 kPa. Make a visual inspection of each vehicle and ascertain that the brakes are applied, brake piston travel is within limits, and there are no audible air leaks.

While at the furthest vehicle from the locomotive, have the brake pipe recharged to normal working pressure. Check that the brakes start releasing promptly at the rear vehicle. Make a visual inspection of each vehicle and ascertain that the brakes have released, and there are no audible air leaks.

For a complete train perform a brake pipe leakage test (this is usually done by the loco engineer as part of the train examination brake test.).

- From the locomotive make a brake pipe pressure reduction of 100 kPa.
- After the vehicle brakes are stabilised, cut out the loco brakes and observe the brake pipe pressure gauge. Leakage should not exceed 35 kPa per minute and the train cannot depart if the leakage is excess of 50 kPa per minute.
- Cut in the loco brakes and release the brakes.

Section 2
Brake System Testing
Cars and Service Vehicles on Passenger Trains

Source Material – Tranz Rail Loco-hauled Passenger Car and Van Brake Manual, 5 June 1996

Contents

2.1 Assumptions

These tests do not cover freight only equipment such as Empty/Load systems, accelerated release or retarded recharge features.

2.2 Equipment Requirements

- Single car brake tester or equivalent capable of
  - Measuring the air pressure in the vehicle brake system. (The gauge should be graduated to 20 kPa divisions or better).
  - Supplying air to the vehicle brake pipe at 550 kPa. [Charge]
  - Isolating the vehicle brake system for leakage tests.
  - Exhausting air from the vehicle to atmosphere through a 1.5 mm diameter choke. [Apply]
  - Supplying air to the vehicle through a No 74 drill (nearest metric equivalent = 0.58 mm) diameter choke. [Sensitive Release]
  - Supplying air to the vehicle brake pipe at 475 kPa. [Brake Pipe Maintenance]
  - Have prescribed daily and annual test procedures.
- Stopwatch
- Dummy hose coupling(s).

Test Procedures

2.3 Visual

- A complete visual and audible inspection should be first made for worn brake blocks, missing or damaged rigging, etc. All faults should be repaired before continuing with testing.
- The triple valve should be checked to ensure the valve size, and its exhaust choke, match the cylinder. (Triple valves get changed between inspections and mistakes get made.)

2.4 Charge vehicle

- Test single car tester to daily test code.
- Couple tester to vehicle via a brake hose.
- Open all brake cocks and fit dummy coupling(s) to the unused hose(s). (This allows the brake cocks and hoses to be included in the tests.) Check that cocks move freely.
- Charge brake pipe to 550 kPa. (Allow 10 minutes to charge an uncharged vehicle).
- Check for air leaks in the piping etc.

2.5 Brake Pipe Leakage

- Charge brake system to 550 kPa and close off air supply.
- Measure the drop in brake pipe pressure over 1 minute. The total drop should ideally be zero but must be less than 15 kPa over 1 minute.
- If the leakage is too high close the feed valve to the water lifting gear, air doors, etc (if fitted). If the leakage decreases the leak is in the auxiliary apparatus.
- The leakage must be reduced to less than 15 kPa before continuing with the remaining tests.

2.6 Piston Travel

- Reduce the train pipe pressure to 400 kPa (150 kPa reduction) by exhausting air via a 1.5 mm diameter choke and observe if the brakes apply.
- The piston travel should be between limits for the cylinder type.

Long-stroke cylinders (about 300 mm long):

No slack adjuster (new blocks):	125–200 mm
Manual slack adjuster (new blocks):	125–200 mm
SAB slack adjuster and single stage braking:	125–130 mm
SAB slack adjuster and two-stage braking:	140 mm in load condition
Pneumatic slack adjuster:	150 - 165 mm

Short-stroke cylinders (about 200 mm long):

Manual slack adjuster (new blocks):	65–125 mm
SAB slack adjuster and two-stage braking:	100 mm in load condition
AUSCOPAC systems:	28–32 mm with new blocks

Possible faults are:-

Fault	Possible Reasons
Brakes do not apply	• Faulty triple valve • Faulty automatic release valve diaphragm
Piston travel too short	• Hockey stick adjusting nuts at fault
Piston travel too long	• Hockey stick adjusting nuts loose • Automatic slack adjuster not working • Automatic slack adjuster at end of travel • Faulty brake rigging (eg pin missing)
Brakes do not release	• Faulty triple valve • Faulty release valve • Seized brake rigging

- Check at brake cylinder for audible air leakage.

2.7 Rigging & Handbrake Test

- With the brakes applied (150 kPa reduction) check all rigging and levers to ensure they are at the correct angles and will not foul on any obstructions as the blocks wear. (Pay particular attention to bogie brake levers as their movement can be restricted; the yokes around the bogie centre to ensure they won't hit the centre casting as the blocks wear; and the shoe hangers. On 25140 bogies with small tyres these hangers can foul the frame as the blocks wear.)
- Check the handbrake operation.
  - On carriages with automatic slack adjusters handbrakes should apply after 6 - 8 turns.
  - On carriages and vans with manual slack adjusters handbrakes should apply after 5 - 10 turns, depending on type and brake block wear.
  - Van (FM type) handbrakes should apply after 1 - 6 turns.
  - Wagon handbrakes (lever type) should not bottom with weight applied to the lever.

2.8 Automatic Slack Adjuster (when fitted)

- When the piston travel is correct (see Piston Travel Test) release the brakes and screw the slack adjuster out (both SAB and pneumatic types), so that the travel will increase.
- Make a 150 kPa reduction. On pneumatic adjusters check the piping for leaks.
- Release the brakes and check that the adjuster works. (If you can't watch the adjuster move use a chalk witness mark.)

2.9 Minimum Reduction Test

Test that the brakes will operate on the minimum reduction in brake pipe pressure that occurs during brake application.. The minimum reduction applied by a locomotive brake system (or the driver) should be 50 kPa so the test is done at 40 kPa reduction to allow a safety margin.

- Charge vehicle brake system fully to 550 kPa.
- Make a reduction of 40 kPa. The brakes should apply and remain applied for 1 minute.
- Possible faults are:-

Fault	Possible Reasons
Brakes do not apply	• Faulty triple valve • Faulty release valve
Brakes release in less than 1 minute	• Air leak from auxiliary reservoir (this should have been detected during the Brake Pipe Leakage Test)

- Check for air blow at the triple valve exhaust. Only a slight blow is allowed.

2.10 Slow Release Test

Test that the brakes will correctly release when the train pipe pressure rises slowly (this simulates the case of a vehicle at the rear of a long train).

- Reduce brake pipe pressure to 465-480 kPa.
- When the pressure gauge is steady open the Slow Release Valve to supply air at 550 kPa to the brake pipe via a No 74 drill choke (0.58 mm diameter) and note the time until the air starts exhausting from the triple valve. The time must be less:-

Bogie vehicles with 1¼ " dia brake pipe	25 seconds*
Bogie vehicles with 1" dia brake pipe	15 seconds
4 wheel vehicles	15 seconds

[* Modern code is 25 seconds. The figures for other vehicles are derived from older codes and advice from railway staff.]

Possible faults are:-

Fault	Possible Reasons
Brakes do not start releasing in prescribed time	• Excessive brake pipe leakage • Faulty triple valve • Leaking automatic release valve diaphragm

- When brakes are fully released, check for air blow at the triple valve exhaust. Only a slight blow is allowed.

2.11 Passenger Emergency Valve Test

- Fully charge system to 550 kPa
- Operate each Emergency Valve in turn and check that the brakes apply and the valves move freely. Restore each valve after testing.

2.12 Release Valve Test

Manual Type

- Apply the brakes
- Operate the cock and check that air exhausts from the reservoir and the brakes release.

- Release the cock and check that it closes.

Automatic type

- Apply the brakes (150 kPa reduction).
- Operate the cock and check that air exhausts from the reservoir and the brakes release.
- Release the cock and check that it closes.
- Exhaust the brake pipe (reduce the pressure to zero)
- Operate the cock and release it. It should remain open until the reservoir empties.

2.13 Final Leakage Test

A repeat of the leakage test on page 2 is advisable, as it will reveal if the emergency valve cocks, relay valve or release valve have increased leakage after operation. (The only time these normally get used is during these brake tests.)

2.14 Brake Pipe Maintenance and Auxiliary Leakage (10 Minute Application Test)

- Charge vehicle brake system fully to 550 kPa
- Reduce brake pipe pressure to 475 kPa and maintain this for 10 minutes. The brakes must apply and remain applied for the10 minutes.
  Possible faults are:-

Fault	**Possible Reasons**
Brakes release with no sound of escaping air from triple valve	• Severe brake cylinder leakage • Leakage from gasket between reservoir and brake cylinder (combined sets)
Brakes release due to triple valve releasing (sound of air escaping from triple valve)	Air leak from auxiliary reservoir from:- • triple valve mounting gasket • release valve and its piping

2.15 Recording

- The results of each test should be recorded on an appropriate record sheet.

For sample test records see Appendix A

Section 3
Brake System Testing
26L and No 4 Locomotive Brakes

Source Material

Tranz Rail Ltd M9103 - Standard Test Code, Locomotive Brake All Classes (Except Ef) - Sep 1996
(First Issued as Code Ml 1-7 September 1990. Reissued June 1995)

New Zealand Railways Mechanical Branch - Testing Standard Automatic And Non-Automatic Air Brake Equipment On Locomotives And Rail Type Shunting Tractors; 21/14/1959

Contents

3.1 General

A locomotive is to be given this code test prior to 'Passing Out" after major servicing and when called for in the servicing schedule or when doubt exists as to the correcting functioning of the brake equipment

When a locomotive has two sets of controls then the test must be repeated for each set.

The brake valves must be returned to the release position at the completion of each test.

Not all locomotives are fitted with all the equipment covered by this test code.

Test gauges must be tested annually for accuracy by a certified testing agency.

All test equipment must be kept in suitable containers to prevent damage between use.

A manifold, which couples the master gauge to the various pressure sources, may be used for the code test.

3.2 Test 1: Charging

Ensure that main reservoirs are drained, that oil level is correct in the compressor, that brake valve cut off valve is at 'in' or 'open' position and MU valve, is fitted, is at "Lead position". All brake valves in the cab being tested should be in release position.

Start the compressor and note the pressure rises steadily with no undue noise or vibration.

With steam driven compressors see that the cylinder drain cocks are open and run the compressor slowly until about 30 lb main reservoir pressure is obtained, then close the drain cocks and increase the speed. Check compressor(s) for pounding and uneven stroking.

3.3 Test 2 : Pressure Gauge

(1) *Main Reservoir:* Place standard test gauge on MR hose at headstock or drain from reservoir or at test location point if provided. Full pressure on locomotive gauges must be correct to within ± 20 kPa of indicated pressure on test gauge.

(2) *Brake pipe and equalising reservoir:* Place standard test gauge onto BP hose at headstock. Pressure on locomotive gauges must be correct to within ± 15 kPa of test gauge at 550 kPa. Leave test gauge on until all tests are completed.

(3) *Brake cylinder:* Place test gauge on brake cylinder equalising hose or control pipe at headstock or onto brake cylinder delivery line. Make a full service application with independent brake valve and compare locomotive gauge with test gauge at 350 kPa. Pressure must be within ±10 kPa.

3.4 Test 3 : Compressor Governor Or Unloader Setting

Except where stated all locomotive Governors must load the compressor when the main reservoir pressure has dropped to 875 kPa and unload when the pressure has

risen at least 75 kPa but not more than 100 kPa. Locomotives fitted with a governor having the differential readily adjusted should be set at 100 kPa differential.

Dsc class locomotive governors will be set to load at 650 kPa and to cut out at not greater than 750 kPa.

EO, DJ class locomotives set governor to load at 725 kPa, cut out at 800-825 kPa. DE, DSA, DSC class locomotives governors will be set to load at 650 kPa and to cut out at not greater than 750 kPa.

TR class locomotives compressors cut in at 575 kPa and cut out at 700 kPa.

For steam locomotives the governor should cut out at 700 kPa (100 psi) and cut in when the pressure has dropped by between 15 and 35 kPa (2.5 and 5 psi).

3.5 Test 4 : Main Reservoir Leakage

(1) Stop compressor and adjust main reservoir pressure to 550 kPa, place brake valve cut off valve into cutout position. Main reservoir pressure must not drop more than 20 kPa in one minute and any leakage must be reduced to this amount before continuing with test. On remote control locomotives set the cut over cocks to manual.

(2) On locomotives fitted with check valve between No.1 and No.2 reservoirs the leakage must be observed on both sides of valve. Couple the standard test gauge to No. 1 main reservoir unless the locomotive is fitted with a gauge on the line from the compressor to No.1 reservoir.

3.6 Test 5 : Reservoir Check Valve

Blow down the pressure in No.1 reservoir as shown by the test gauge to about 200 kPa below the pressure in No.2 reservoir as shown in cab gauge. Time over 1 minute, pressure in No.2 reservoir should not drop greater than 50 kPa in 1 min. No.1 reservoir should not rise greater than 50 kPa. This would indicate a defective check valve between reservoirs.

3.7 Test 6 : Brake Pipe Leakage

Make a 75 kPa brake pipe reduction. Place cut off valve in cut out position. Brake pipe pressure must not drop more than 15 kPa in one minute. Leakage must be reduced to that amount before continuing the tests. Note the brake pipe pressure must not rise during the one minute.

3.8 Test 7 : Air Compressor Check

These may be tested either by orifice test or by the time taken to charge the main reservoir from 0 kPa to 550 kPa.

For steam driven compressors see Appendix A for test procedures.

After a compressor change the replacement must be tested. TR class must be orifice tested on all occasions.

Electric locomotives must be tested at normal line voltage.

Where required check oil pressure is not less than 100 kPa and that there is no oil, air or water leak at the compressor or its piping.

3.8.1 Charging Test

On locomotives fitted with more than one compressor each compressor is timed separately. All pressures are recorded from the test gauge.

Compressor Type	Locomotive	Test Range	Maximum allowable time
C2000A	DSJ	0 - 500 kPa	4 min 15 sec
EC 72C	DSG	0 - 500 kPa	7 min 45 sec
C2000A	DSG	0 - 550 kPa	6 min
AC4I*	DSC	0 - 500 kPa	7 mins 50 sec

* No.4 brake valves must be cut out (cut in after test).
Engine idle set to 550 rpm, on Dsc locomotives.

3.8.2 Orifice Testing – Diesel Locomotives

(1) Screw the appropriate orifice into the main drain or cock.

(2) With main reservoir adjusted to the test pressure and the engine speed or compressor speed adjusted to the rpm indicated, open orifice cock fully. The compressor must maintain the test pressure for a period of two minutes. Failure to do so indicates a defective compressor.

(3) The orifice size, test pressure, engine or compressor speed for various locomotives are as follows:

Compressor	**Locomotive**	**Orifice**	**Test Pressure**	**Speed**
4E26	TR	2.8 mm	525 kPa	1000 rpm compressor
Worthington Simpson	DSC	2.0 mm	400 kPa	500
WBO	DFT, DF, DC	5.6 mm	500 kPa	Idle
WBO	DX	7.0 mm	525 kPa	Idle
C2000M	EO	5.6 mm	500 kPa	N.A.
WBO	DH	6.4 mm	585 kPa	Idle
2CDM	DJ	6.4 mm	500 kPa	Idle
-	DE	3.6 mm	525 kPa	Idle
4C200	DG	6.4 mm	500 kPa	Idle
WBO 8021	DI	7.0 mm	525 kPa	Idle
-	DSA	2.0 mm	525 kPa	1200 rpm
WXE	DQF, DQC	5.6 mm	500 kPa	Idle

3.8.3 Orifice Testing Steam – Locomotives

Perform air end test and steam end test as per Section 5.

3.9 Test 8 : Automatic Brake Valve Test

Check that cut out valve is at “In” or “Open” position. The brake handle must operate freely and must not be slack on spindle.

3.9.1 No. 4 Drivers Brake Valve

Test for leakage at the direct exhaust port in release, running and lap positions. In release position test for leakage at cap nuts, chamber caps and equalising reservoir connections and piping. In running position test for leakage at secondary exhaust port. Rotary valve spindle lift must not exceed 3 mm.

Check as follows:

(1) Move handle from running to service position.

Equalising piston must lift before a 15 kPa reduction has taken place and pressure must reduce from 475 -350 kPa in not more than 9 seconds.

(2) With brake pipe pressure reduced to 350 kPa leave handle in lap. Observe that brake pipe pressure does not increase more than 15 kPa in one minute. An increase above this figure indicates a defective rotary valve.

(3) With brake pipe pressure at 350 kPa close the brake pipe isolating cock and move handle to running position. Brake pipe pressure must not increase during one minute. Any increase in caused by a defective isolating cock.

(4) With handle in running position open isolating cock. Brakes must release and brake pipe pressure rise and settle at the correct figure.

(5) Place handle in release position, the brake pipe pressure must rise to main reservoir pressure.

(6) Place handle in emergency position, the brake pipe pressure as shown on test gauge attached to the brake pipe must be rapidly exhausted to zero. During these tests note that the brake valve handle latch engages firmly in the notch at all positions.

3.9.2 Other Types

(1) Move brake valve to minimum reduction position and note that brake pipe pressure drops at least 40 kPa but not more than 50 kPa and that brakes apply. Brake cylinder pressure should be no more than 100 kPa but may be appreciably less.

(2) Move brake valve in steps towards full service and note that brake pipe pressure decreases and brake cylinder pressure increases at each step.

In full service brake pipe pressure should be about 390 kPa and brake cylinder pressure 425-450 kPa. Leave brake applied for one minute.

(3) Move brake valve to ‘Suppression”. No further reduction in brake pipe pressure should occur.

DSJ locomotives. Move brake valve (A9) to 'Over Reduction' position. Brake pipe should drop to about 270 kPa.

(4) Move brake valve to 'Handle Off" and note that brake pipe and equalising reservoir decrease at service rate and that brake pipe settles at about 75 kPa.

(5) Move brake valve slowly to release position and note that brake pipe pressure does not increase nor brakes release until handle is in the release position.

Equalising reservoir should charge from 375-525 kPa within three seconds and brake cylinder pressure drop from 350-25 kPa within nine seconds, on 26L brake systems.

Dsj the brake cylinder pressure should drop to 25 kPa within 11 seconds.

(6) With system fully charged move brake valve to 'Emergency' position and note that brake pipe and equalising reservoir pressures fall quickly. Brake cylinder pressure should build up from zero - 350 kPa in 6-9 seconds (2 seconds - A9) and reach a maximum of approximately 440 kPa.

3.10 TEST 9 : Brake Pipe Maintaining Feature Test (Not On No. 4 Brake)

Place 4.8 mm orifice fitting on the brake pipe hose and check that cut-off valve is at 'in' or "Freight", MU-2A valve at 'Lead' and engine speed at "Idle".

(1) Make a 75 kPa brake pipe reduction with automatic brake valve.

(2) Open brake pipe cock and note that brake pipe pressure does not drop more than 25 kPa nor brake cylinder pressure increase more than 60 kPa. Hold in this position for one minute and note that gauges remain steady and that flow indicator settles and remains steady after an initial drop.

3.11 Test 10: Independent Brake Test

(1) Move the brake valve in steps towards full application position and note that 50 kPa increments of brake cylinder pressure can be obtained.

Full pressure should be 350 kPa.

(2) Move brake valve towards release in steps and note that pressure can be decreased in 50 kPa steps.

(3) Double check valve check.

Charge automatic brake, when pressures settles, make a 150 kPa reduction, note brakes apply, move independent brake handle to mid position, release automatic brake and note brake cylinder pressure reduces to between 150 kPa and 200 kPa. Release brakes using the independent quick release.

(4) Quick release test (not on W type)

Make a 150 kPa automatic reduction, allow pressure to settle, move independent brake handle to quick release, note brake cylinder pressure drops quickly to zero pressure.

(5) On “W type’ move handle to emergency position (beyond full service) when brake cylinder pressure must rise to a reducing valve setting (400 kPa). Failure to rise indicates stop screw incorrectly adjusted and must be corrected before locomotive enters service.

3.12 TEST 11: Cut Off Valve Test

Place cut-off valve to cut-off position and move automatic brake valve to full service. Brakes must not apply. Move brake valve to emergency position. Brakes must apply.

3.13 TEST 12: Lead Or Trail Selector Test

MU 2A valve

(1) Place valve in ‘Trail 6 or 26”. (1st trail position)

(2) Check the independent brake valve does not apply brakes in any position of the brake valve

(3) On locomotive fitted with the Fl selector valve move automatic brake valve through all positions. Brake should only apply when brake valve is in Emergency.

(4) On Locomotives fitted with an F1 selector valve, couple a reducing valve set to 350 kPa and a 3 way cocks or 2, 1 way cocks, between the MR and EP hoses. The reducing valve outlet and cock should be on the EP hose side. With the MU2A valve in trail 6 or 26 open the cock to feed air into the EP hose and observe the brakes to ensure they apply within 6 seconds. Switch the cock over to cut off the regulated air supply and exhaust the EP hose. Observe the brakes to ensure they release within 6 seconds.

Alternatively this test can be carried out using the independent brake valve of a second locomotive as the 3 way valve with both EP pipes coupled.

Other types:

Place valve into trail position check that independent brake valve does not apply brakes in any position.

3.14 Test 13 : Dynamic Interlock

Da, Dbr, Dc, Df, Dft, Dx, Dxr, DQF, DQC Locomotives.

(1) Set locomotive up for normal operation and direction. Make a full service reduction with the automatic brake.

(2) Move controller to “B” position and after a short delay move into braking range. Brakes must release.

(3) Move automatic brake valve to emergency. Check that brakes apply and dynamic brake is suspended.

(4) Move controller back to ‘B’ position; dynamic braking must be suspended and automatic brake re-applied. Check at dynamic interlock for air leakage. No leakage allowed in either position.

Eo, Dj Locomotives

(1) Select dynamic/rheostatic brake.

(2) Using the independent brake slowly build up brake cylinder pressure and note that at 175 kPa the dynamic brake interlock opens.

(3) Reduce brake cylinder pressure and note that at 150 kPa the dynamic interlock closes.

3.15 Test 14: Brake Cylinder Leakage Test

(1) Screw test gauge into brake cylinder isolating cock exhaust or test point provided.

(2) Make a full application with independent brake valve.

(3) Move isolating cock to isolated position and check reading on gauge.

(4) Pressure drop must not exceed 35 kPa per minute.

Repeat test on other bogie.

On locomotives not fitted with tapped exhaust, apply brake then close J.1 relay isolating cock. Record the leakage figure.

3.16 Test 15: Break-In-Two Test: Locomotives Fitted With Fl Selector

3.16.1 As Leading Locomotive

(1) Open EP. cock at headstock.

(2) Open BP. cock until a blow occurs at EP hose

(3) Open MR cock fully and check that flow at EP hose ceases.

(4) Close MR cock and check that blow at EP hose recommences.

Should blow from EP hose not cease when MR cock is opened a fault will be found in the selector valve or in the check valve and choke.

3.16.2 As Trailing Locomotive

Place cut-off valve in cut out position, MU-2A valve in ‘Trail 6 - 26”.

Open MR, BP and EP cock in turn. Brakes should apply and remain applied for one minute. Close MR cock. Air should now flow from EP hose and brakes release.

3.16.3 Locomotive not fitted with Fl Selector

With brake valves in release position open and close each brake pipe cock at the headstock in turn. Brakes must apply and then release when cocks are closed.

3.17 Test 16: Main Reservoir Safety Valve Test

Close governor isolating cock and check safety valve setting. On Da, Dh, Df, Dbr, Dxr, DxCHEC, Dc, DQF, DQC and Dft set lower valve to 1050 kPa and upper valve (if

fitted) to 1110 kPa. On DxE set safety valve on compressor side of No.1 main reservoir to 1175 kPa. Dsc, Dsa, De and Tr set MR safety valve to 775 kPa, Dsg, Dsj set MR safety valve to 1050 kPa. All other classes set to 900 kPa. On Eo and Dj set MR safety valve to 900 kPa.

3.18 Test 17: (Vigilance Control):

All control switches and circuit breakers must be set up as normal power operation. Switch radio circuit breaker OFF (if fitted with alarm call facility).

(1) Brake cylinder pressure reduced to below 160 kPa.

(2) Reverser handle placed in forward or reverse position.

Cycle times are not adjustable.

Drivers Side

Reset to Light	50 seconds ± 3 seconds
Light to Whistle	10 seconds ± 2 seconds
Whistle to Penalty Brake	10 seconds ± 2 seconds

Assistant's Side (where fitted)

Buzzer and Light	180 second ± 15 seconds

(1) Time is to be taken from operation of cancelling device to light. From light to whistle or buzzer, from whistle to penalty brake. Wait 47 secs after penalty brake application. The vigilance system must not reset itself.

(2) Check operation of all cancelling switches.

(3) Hold a switch closed and note that warning whistle or buzzer sounds. (Not all electronic types)

(4) Note the brake cylinder pressure required to suppress vigilance system (225 - 250) on rising pressure.

(5) Check that isolating glass is intact and sealed.

(6) On Dc, Df, Dft, Dx, Dxr, DQF, DQC locomotives test the driver's push button in single man and two man modes.

[Section on remote control locomotives omitted.]

3.19 Test 18 : General

(1) Examine brake rigging and piping and hoses. Check piston travel is between 40 mm -125 mm. Check handbrake.

(2) Check sand in both directions, horns, window wipers.

(3) Check operation of main reservoir automatic drain valve.

(4) Check operation of following switches where fitted:

Da, Dc, Dbr, Dx, Dxr DQF, DQC, Dsg, Dsj, De, Dj Locos	Pcs or Ccg	Open 250 kPa Close 375 kPa
Df Loco PCS (emergency)		Open 140 kPa Close 245 kPa
LPB (Handle Off)		Open 250 kPa Close 350 kPa

3.20 Test 19 : Main Reservoir Protection

On locomotive fitted with duplex check valve in the line to main reservoir equalising pipe: Shut down compressor. Place reverser in 'Forward'. Open and close each main reservoir equalising pipe cock in turn. Note that a good flow of air is present. Leave last cock open and note that when main reservoir pressure falls to 600 kPa the low air alarm sounds and the flow of air from the cock ceases.

Section 4
Brake System Testing
A.6-E.T. And A.7-E.L. Locomotive Brake Equipment

Source Material

New Zealand Railways - Standard Test Code For A.6-E.T. And A.7-E.L. Air Brake Equipments - 24 April 1959
Steam Incorporated - COP 6 - Air Brake Code For Steam Locomotives - 2 September 2002
Mainline Steam – MSHT002 - Test Results for A6ET Brake

Contents

Introduction
On the completion of the installation or overhaul of A.6-E.T. Brake Equipment on locomotives, or after reassembly of brake parts at the specified milage examination, the whole of the brake equipment must be submitted to the following standard test code before the locomotive is released for service.

Should any of the air brake equipment prove defective on test, it is to be replaced with spare tested equipment.

NOTE: Class “Df”, “Ed” and “Ew” locomotives are to be tested at each driving compartment.

Standard Test Code.

4.1 Pressure Gauge Testing.

Prior to making any test the main reservoir and brake pipe pressure gauges are to be tested in place by means of a Standard Pressure Gauge. If the gauges register within ± 3 lbs. [20 kPa] they may be regarded as correct. Check that the equalising reservoir gauge indications correspond within ± 3 lb. [20 kPa] of the brake pipe gauge.

4.2 Main Reservoir Leakage Test.

The main reservoir and relative piping must be tested for leakage by stopping the engine and adjusting the main reservoir pressure to 80 lbs. [550 kPa]. Close B.V. isolating cock and place automatic brake valve handle in “Lap” position. Observe the main reservoir pressure gauge. Leakage must not exceed 2 lbs. [20 kPa] in one minute.

4.3 Air Compressor Tests.

(a) Diesel-electric locomotives:

With compressor running, check the oil pressure which must not be less than 35 lbs. [240 kPa]. Check the moving parts for unusual noise or vibration. Check for air and oil leakage.

Intercooler safety valve setting 50 lbs. [345 kPa]

Check the cut-in and cut-out pressure of the compressor governor which should be 85 lbs. [590 kPa] and 100 lbs. ± 1½ lbs. [690 kPa ± 10 kPa]

(b) Electric locomotives:

With compressor running check moving parts for unusual noise or vibration. Check for air and oil leakage.

Check the cut-in and cut-out pressure of the compressor governor which should be 85 lbs. [590 kPa] and 100 lbs. ± 1½ lbs. [690 kPa ± 10 kPa]

(c) Capacity Test by Orifice:

The tests are to be carried out with the air strainers in position, the governor correctly set and the main reservoir tested.

In the case of locomotives with two compressors, each must be tested separately.

(1) Screw the appropriate orifice fitting and pressure gauge into the cock provided on the main reservoir or piping and see that other reservoirs and piping are isolated to minimise leakage.

(2) With orifice cock and brake valve isolating cock in closed position, start the compressor to be tested.

(3) When air pressure in the main reservoir reaches 75 lbs/sq. in [520 kPa]., open orifice cock fully. After a duration of two minutes, check that the main reservoir pressure has not dropped below 75 lbs/sq. in. [520 kPa]

(4) The orifice and engine speeds for various locomotives are as follows -

Class "Df" and "Dg"	¼" orifice	450 r.p.m.
Class "Ew" and "Ed"	$^{9}/_{64}$" orifice	1300 r.p.m.

NOTE: When two compressors are fitted each compressor is to be tested separately.

4.4 Air Compressors (Steam Driven).

The air compressor must be submitted to an air end test and a steam end test as set out in the Instructions for Testing Standard Automatic and Non-Automatic Air Brake Equipment on Locomotives. Particulars of equipment for tests and the speeds at which the compressor shall run are set in Drawings Y. 21170 and Y. 21190.

4.5 Feed and Reducing Valve Test.

Observe, the operation or the M.3 feed valves by making a number or brake applications; if any irregularity of operation is observed the feed valve must be removed from the locomotive for examination.

Feed valve setting	~~70~~ {80} lbs. [550 kPa]
Reducing valve	45 lbs. [310 kPa]

4.6 Compressor Governors.

(a) The governor must stop the compressor(s) when the correct air pressure is attained in the main reservoir.

The correct air pressures are as follows —

Steam locomotives A6ET equipment.	~~95~~ {100} lbs/sq.in. [690 kPa] with brake handle in running position and 120 lbs/sq.in. [830 kPa] with the brake handle in other positions.
All electric locomotives.	100 lbs/sq. in. [690 kPa]

(b) The governor must restart the compressor(s) when the pressure has fallen below its maximum pressure:

(1) Not more than 2 to 5 lbs/sq.in. [15 to 35 kPa] in the case of steam locomotives.
(2) 15 lbs/sq.in. [100 kPa] in the case of electric locomotives.

(c) In the case of Single Head Governors the brake valve isolating cock is to be closed and the governor adjusted to stop the compressor when the main reservoir pressure reaches 95 lbs/sq.in. 100 psi [700 kPa]

(d) (1) With Double Headed Governors the brake valve isolating cock is closed, the automatic brake handle placed in lap position, and the high pressure head adjusted to stop the compressor when the main reservoir pressure reaches 120 lbs/sq.in. [830 kPa]

NOTE: It is important that the high pressure head of the governor be set first and will ensure that the low pressure head can be set correctly, which will be impossible in the event of the high pressure head setting being below ~~95 lbs/sq.in~~. 100 psi [700 kPa].

(2) When the high pressure head is set, the automatic brake valve handle is placed in running position and the main reservoir pressure reduced to about 90 lb/sq. in. [620 kPa] The low pressure head is then set to stop the compressor when the main reservoir pressure reaches 95 lbs/sq.in. 100 psi [700 kPa]]

(e). The independent brake handle shall at all times be in its running position.

4.7 Brake Pipe Leakage Test.

To test for brake pipe leakage, make a 10 lb. [70 kPa] "Service" reduction and "Lap" the brake valve handle. Observe the fall in brake pipe pressure as indicated by brake pipe pressure gauge. The leakage must not exceed 2 lbs. per minute.

4.8 Automatic Brake Valve Test.

(a) The handle of the automatic brake valve must operate easily, and the lift of rotary valve spindle must not exceed 1/8".

(b) Test rotary valve leakage by making a 20 lb. [140 kPa] reduction and "Lap" brake valve handle. Observe during a period of one minute, that the brake pipe pressure does not increase more than 2½ lbs., [15 kPa]or the brakes release.

(c) Place the automatic brake valve handle in "Lap" position and observe the equalizing reservoir gauge. See that the 'Minimum Reduction" and "Equalizing" feature are functioning correctly and that and equalizing reservoir reduction of 6 to 8 lbs. [40 to 55 kPa] is indicated on the gauge. The brake cylinder gauge should indicate a pressure of 10 to 15 lbs. [70 to 100 kPa].

(d) Make a number of small reductions and note that the equalizing piston lifts promptly after movement of brake valve handle to "Service" position and seats promptly upon return to "Lap" position. Observe by the pressure gauge that the equalizing piston again opens the discharge valve with an indicated service reduction of not more than 5 lbs. [35 kPa]. Also see that there is no leak from the brake pipe exhaust port after the equalizing discharge valve seats.

(e) Place the automatic brake valve in "Emergency" position, and observe that the brake pipe pressure falls at a rapid rate, also that a continuous discharge of air occurs at the exhaust port. See that the usual increase in brake cylinder pressure over that obtained with a Service application is obtained, and that the safety valve on the distributing valve is blowing.

Check that sanding equipment operates (not "Ed" class and steam locomotives).

Emergency application 0 - 55 lb. [380 kPa] = 10 seconds.

4.9 Independent Brake Valve Test.

(a) The handle of independent brake valve must operate easily, and the lift of rotary valve spindle must not exceed 1/8". The brake valve handle must return from "Quick" Application and "Quick" Release to "Slow" Application and "Running" Position respectively when the handle is released.

(b) Test rotary valve leakage by making a 20 lb. independent application; "Lap" brake valve handle, and the brake cylinder pressure must not increase more than 5 lbs. [35 kPa] per minute.

(c) Place independent brake valve handle in (1) "Quick" Application, (2) "Slow" Application and see that a maximum brake cylinder pressure of 45 lbs. [310 kPa] is indicated. "Lap" brake valve handle end observe over a period of 1 minute that the brakes do not leak off.

"Quick" Application 0 - 45 lbs. [310 kPa] **=** 5 seconds max.
"Slow" Application 0 - 45 lbs. [310 kPa] = 10 seconds max.

(d) Place independent brake valve handle in (1) Release (2) Running position and the brakes must release. Release Rate 45 - 10 lbs. in 5 seconds max. for both positions.

(e) Make a service application with the automatic brake valve and place the handle in "Lap" position. Move independent brake valve handle to "Release" position. See that the brakes release and that the independent "Warning" air discharge occurs at the exhaust port. Return the independent brake valve handle to 'Running" position for 1 minute and the brakes must not re-apply.

4.10 Equalizing Reservoir Control Valve Test.

Place the automatic brake valve handle in "Service" position until both brake pipe and equalizing reservoir pressures are reduced to zero, then place brake valve handle in "Running" position. With a constant brake pipe pressure of 80 lbs., note the time required to charge the equalizing reservoir to 60 lbs. [415 kPa] This must not be less than 54 seconds or more than 64 seconds.

4.11 Distributing Valve Test.

(a) Check for leakage at exhaust port of distributing valve in the application and release position. No leakage allowed.

During the brake valve test No. 8 and 9, any defects in the operation of the distributing and independent release valve can be the cause of the tests not being satisfactory.

With reference to the distributing valve, leakage or blow at distributing valve exhaust in release position only, indicates application valve or application valve cage seal leakage. Leakage in application position, indicates exhaust valve leakage.

(b) Place the automatic brake handle in "Emergency" position and observe on the brake cylinder gauge, the pressure at which the safety valve on distributing valve opens. This should be 55 lbs. [380 kPa]. Return brake valve handle to "Lap" position and note the closing pressure of the safety valve, which should be within 3 lbs. of the opening pressure.

4.12 Brake Valve Isolating Cock Test.

To test for brake valve isolating cock leakage make a 10 lbs. [70 kPa] service reduction, close the isolating cock, and the brake pipe pressure must not increase when the brake valve handle is placed in "Running" position. (1 minute test).

4.13 Brake Cylinder Leakage Test

Make an independent brake valve application and when 45 lbs. [310 kPa] brake cylinder pressure is obtained close the main reservoir supply cock to the distributing valve. The brake cylinder leakage must not exceed 5 lbs. [35 kPa] per minute.

Open main reservoir supply cock when test is completed, and check brake operation.

4.14 Test Main Reservoir Safety Valve. (If fitted)

Close the $^{3}/_{8}$" isolating cock main reservoir supply to the compressor governor, and allow the main reservoir air pressure to build up until the safety valve blows. Safety valves must be adjusted to the specified setting.

NOTE: When two safety valves are fitted each one is to be tested separately.

4.15 Brake Pipe Application Test.

With both brake valve handles in Running position, open each brake pipe cock in turn at end of locomotive and see that the brakes apply, and release when the cock is closed.

Check signal trip, if fitted.

4.16 Dead Man's Application Test.

Move master switch to "ON" position and press dead man's pedal down, release pedal and the brake must start to apply between 5 - 7 seconds. When the brakes are applied, they must release when the pedal is pressed down.

4.17 General Inspection.

(a) Examine brake rigging, check piston travel and hand brake.
(b) Examine slack adjusters (when fitted).
(c) Check operation of sanding equipment (Manual and Electric).
(d) Operate horn end window wipers.
(e) Check low main reservoir pressure buzzer.
(f) Check dead engine device.
(g) Check control air pressure. 70 lbs. [480 kPa]
(h) Check operation of control circuit governor.

4.18 Dynamic Brake Test (Diesel Electric Locomotives only).

With engine running move master switch to "ON' and reverser handle to forward or reverse. Move the control handle to "L" then to "B" end observe the Driving Ammeter for movement. Apply the independent brake and note that the dynamic brake is suspended as soon as the brake cylinder pressure rises to 23 lbs [160 kPa]. Return controls to "OFF" position.

NOTE: This test is to be made for only a short duration.

4.19 The distributing valve, brake pipe, piston travel and brake cylinder leakage tests can be carried out on a “dead” engine by means of the single vehicle testing device — see standard test code for Automatic and Non-automatic brake equipment on Locomotives.

Section 5
Brake System Testing
Testing Steam Driven Air Compressors

Source Material
New Zealand Railways - Steam Driven Air Compressors (Extract only) - 28 April 1958

Contents

5.1 Steam End Test.

This is a test of the performance of the top head and steam cylinder of the compressor and must be made with the steam valve to the compressor in the fully opened position.

Main reservoir pressure during this test is to be maintained at *75* lbs/sq.in. [520 kPa]. This is carried out by opening and adjusting the cock provided on the reservoir and the air allowed to escape until the main reservoir pressure is steady at *75* lbs/sq.in. [520 kPa].

The number of single strokes must then be counted and must not be LESS than that shown for the particular compressor on Table A, page 5.2 (or the appropriate Running Shed tables on Drawing Y.21190). The test is made for a period of one minute.

If the compressor under the conditions laid down is unable to at least equal the number of strokes shown in the table it is to be regarded as having failed in the test.

Defects that should be looked for are, leaking steam piston rings or gaskets, defective main slide valve or reversing valve, insufficient lubrication, etc.

5.2 Air End Test.

This test checks the performance of the air end of the compressor.

The appropriate orifice (see Drawing Y21170) must be firmly screwed into the cock provided on the reservoir and it should be ascertained that no leakage occurs at the joint. The orifice cock should then be opened fully and the steam supply to the compressor so regulated that a steady air pressure of 60 lb./sq.in. is maintained in the reservoir with the air escaping through the orifice.

Before making any reading the air pressure should be watched for one minute to ensure it remains steady after adjustment of the steam valve.

With the compressor maintaining the air pressure steady at 60 lbs./sq.in. [415 kPa] against the orifice opening, the number of single strokes made during the period of one minute is to be recorded.

The number of single strokes made by the compressor under the above conditions must then be compared with the particular compressor on Table B, page 5.2 (or the appropriate Running Shed tables on Drawing Y.21190). If this maximum number of strokes has not been exceeded, the compressor may be considered to have passed the Air End Test.

Should the number of strokes be exceeded, the air end of the compressor is defective and may be due to faulty air piston packing rings, piston rod packing, air valves or gaskets leaking.

Table A

Steam End Test For Running Sheds

Minimum No. Of Single Strokes Per Minute Against 75 Lbs Per Square Inch [520 kPa] Air Pressure

Steam Pressure In Lbs Per Square Inch							
Size Of Compressor	**150**	**155**	**160**	**165**	**170**	**175**	**180**
10" x $10^{5}/_{8}$"	77	80	82	84	86	88	90
10" x 10"	87	90	92	94	96	98	100
8" x 8½ "	95	97	99	101	103	105	107
8" x 7½ "	130	133	136	139	142	145	148
7" Cross Cpd.	96	99	102	105	107	109	111

Table B

Air End Test

"A" Test (Running Shed)

Maximum number of single strokes per minute against 60 Lbs Per Square Inch [420 kPa] Air Pressure

Size Of Compressor	**Size Of Orifice**	**Maximum Single Strokes Per Minute**
10" x $10^{5}/_{8}$"	$^{7}/_{32}$"	158
10" x 10"	$^{13}/_{64}$"	158
8" x 8½ "	$^{11}/_{64}$"	158
8" x 7½ "	$^{9}/_{64}$"	158
7" Cross Cpd.	¼"	158

Tables extracted from Drawing Y 21190 - W.H.B. Steam Driven Air Pumps Speed Tables For Tests

Section 6
Standard Test Code for Brakes and Air Operated Equipment On Railcars (Except Silver Fern)

Source Material
Standard Test Code prepared by Jim Nichols, NZ Railways Vehicle Inspector, from old railcar brake codes.

Contents

6.1 Introduction

A locomotive is to be given this code test prior to 'Passing Out" after major servicing and when called for in the servicing schedule or when doubt exists as to the correcting functioning of the brake equipment.

When a vehicle has two sets of controls then the test must be repeated for each set.

Test gauges must be tested annually for accuracy by a certified testing agency.

All test equipment must be kept in suitable containers to prevent damage between use.

6.2 Test 1: Charging

Ensure that

- Main reservoirs are drained
- Oil level is correct in the compressor(s)
- Compressor belt tensions are correct

Start the compressor and note the pressure rises steadily with no undue noise or vibration.

With the throttle closed and the engine speed set to correct value (580 … 620 rpm) measure the time taken to charge the main reservoir from 0 to 400 kPa (0 to 60 psi)

Maximum times are

Vulcan railcars	9 minutes
Standard railcars	13 minutes

6.3 Test 2 : Pressure Gauges

Connect test gauges to the coupling hoses (MR, EP, BC/SA) and suitable point on the control reservoir or piping.

Cab gauges (both ends) must correct to within ± 20 kPa of indicated pressures on test gauges at maximum working pressure.

6.4 Test 3 : Main Reservoir Leakage

(1) Stop compressor and adjust main reservoir pressure to 550 kPa (80 psi), place brake valve handle in "handle off" position. Main reservoir pressure must not drop more than 20 kPa (3 psi) in one minute and any leakage must be reduced to this amount before continuing with test.

6.5 Test 4 : Compressor Governor Settings

The compressor should load when the main reservoir pressure has dropped to 600 kPa (85psi) and unload when the pressure has risen to 700 kPa (100 psi).

6.6 Test 5 : Air Compressor Orifice Test

On railcars fitted with more than one compressor each compressor is tested separately.

(1) Screw the appropriate orifice into the main drain or cock.

(2) With main reservoir adjusted to the test pressure and the engine speed or compressor speed adjusted to the rpm indicated, open orifice cock fully. The compressor must maintain the test pressure for a period of two minutes. Failure to do so indicates a defective compressor.

(3) The orifice size, test pressure, engine or compressor speed for various locomotives are as follows:

Compressor	Orifice	Test Pressure	Engine Speed
4E26	1.6 mm (1/16 in)	400 kPa (60 psi)	Idle
E13C	1.2 mm (3/64 in)	400 kPa (60 psi)	Idle

Faults may include - insufficient lift in valves or leaking air valves, broken springs, piston rings or gaskets leaking.

6.7 Test 6: Main Reservoir Safety Valve Test

Isolate the governor check main reservoir safety valve(s) setting. It should open at 750 kPa (110 psi).

6.8 Test 7: Brake Valve

(1) With system charged, move brake handle to full service position. Brake cylinder pressure must rise from 0 to 300 kPa (45 psi) in not more than 2.5 seconds.

(2) Move brake handle to relapse position. Brake cylinder pressure must fall from 300 to 75 kPa (45 to 10 psi) in not more than 3.5 seconds.

(3) Move the brake valve in steps towards full service position and note that 50 kPa (5 – 10 psi) increments of brake cylinder pressure can be obtained.

Full pressure should be 350 kPa (50 psi).

(4) Move brake valve towards release in steps and note that brake cylinder pressure can be decreased in 50 kPa (5 – 10 psi) steps.

(5) Check that the brake handle operates smoothly without stiffness or excessive chattering.

(5) Move handle to emergency position and note that the emergency pipe pressure falls rapidly to zero.

(6) Move brake handle slowly away from emergency and note that at least 12 mm (½ “) movement is made before the emergency pipe starts to charge. The time taken to charge the pipe from 0 to 400 kPa (60 psi) should not exceed 25 seconds.

6.9 Test 8: Emergency System, Service Brake Piping and Brake Cylinders

(1) Place brake valve in full service position and check relay valve exhaust for leakage. Only a small bubble is allowed.

(2) Block down deadmans pedal, release brakes, close straight air and emergency cocks to all bogies. Check relay valve exhaust for leakage. Only a small bubble is allowed.

Each bogie is to be tested separately.

(3) On the bogie being tested, drain emergency reservoir, fit pressure gauge to the reservoir, open emergency cock and note time to charge reservoir from 0 to 400 kPa (60 psi). This must not exceed

Vulcan railcars	110 seconds
Other railcars	80 seconds

(4) With reservoir charged to 500 kPa (70 psi) make an emergency application and check blocks press firmly on all wheels.

(5) Check that the pressure holds steady with leakage not exceeding 35 kPa (5 psi) over one minute.

(6) Open straight air isolating cock to bogie being tested and place brake valve in release position. When the emergency pipe pressure is raised above 35 kPa (5 psi), the emergency valve must exhaust air at relay valve.

(7) With reservoir charged, move brake handle to service position until 350 kPa (50 psi) is built in brake cylinders. Move brake handle to emergency position and the brake cylinder will rise, causing the safety valve to lift. This should open at 425 kPa (60 psi).

(8) Charge system. With deadman pedal depressed move the brake handle to handle off position, pausing to allow 150 kPa (20 psi) brake cylinder pressure to build up. Check that the emergency pressure does not drop more than 15 kPa (2 psi) over one minute.

6.10 Test 9: Throttle and Deadmans Pedal

(1) Place test gauge on throttle pipe headstock hose, apply straight air brake fully, all deadmans pedals released. Open throttle and note that engine speed increases. Close throttle and note that engine speed decreases.

(2) Open throttle to ¾ engine speed on Standard and Vulcan railcars. Release the brake and deadmans pedals to vent the emergency pipe. Note that the engine speed returns to idle.

(3) With brake applied, open throttle valve fully and check the pressure in the throttle pipe. This should be 375 kPa (55 psi). Check auxiliary valve for leakage at both ports.

6.11 Test 10: Water Raising Equipment

Connect test pressure gauge to air line. Pressure should be between 50 and 70 kPa (7 to 10 psi).

6.12 Test 11: Air Pressure Switches and Alarms

(1) Check that the air pressure alarms and switches operate.

(2) Low main reservoir switch should cut out at 525 kPa (75 psi).

(3) Emergency pipe pressure switch should operate at 300 kPa (55 psi)

(4) Control air pressure switch should operate at 375 kPa (55 psi)

(5) Straight air brake pressure switch should operate at 75 kPa (10 psi)

6.13 Test 12: General

(1) Check that the passengers and guards emergency stop valves operate.

(2) Check that the sanding equipment operates correctly with pipes aligned with the rails.

(3) Check that the horns and window wipers operate correctly.

(4) Test the handbrake operation. With handbrake on the railcar should not move when in 1st gear. Note the number of turns to operate the handbrake.

(5) Check the condition of the brake rigging.

(6) Check that the brake piston travel is within limits for the type.

Section 7
Brake System Testing
6SL Locomotive Brakes

Source Material

Tranz Rail Ltd M9103 - Standard Test Code, Locomotive Brake All Classes (Except Ef) - Sep 1996
(First Issued as Code Ml 1-7 September 1990. Reissued June 1995)
Steam Incorporated – COP 08; Air Brake Code For Diesel Locomotives; 24/08/1998
NZ Railways – Air Brake Handbook
Various test forms and notes

Contents

7.1 General

A locomotive fitted with a 6SL brake system is to be given this code test prior to 'Passing Out" after major servicing and when called for in the servicing schedule or when doubt exists as to the correcting functioning of the brake equipment

When a locomotive has two sets of controls then the test must be repeated for each set.

The brake valves must be returned to the release position at the completion of each test.

Not all locomotives are fitted with all the equipment covered by this test code.

Test gauges must be tested annually for accuracy by a certified testing agency.

All test equipment must be kept in suitable containers to prevent damage between use.

A manifold, which couples the master gauge to the various pressure sources, may be used for the code test.

7.2 Test 1: Charging

Ensure that main reservoirs are drained, that oil level is correct in the compressor, that brake valve cut-off cock (3 way cock) is at the "Lead" position. All brake valves in the cab being tested should be in release position.

Start the compressor and note the pressure rises steadily with no undue noise or vibration.

7.3 Test 2 : Pressure Gauge

(4) *Main Reservoir:* Place standard test gauge on MR hose at headstock or drain from reservoir or at test location point if provided. Full pressure on locomotive gauges must be correct to within ± 20 kPa of indicated pressure on test gauge.

(5) *Brake pipe and equalising reservoir:* Place standard test gauge onto BP hose at headstock. Pressure on locomotive gauges must be correct to within ± 15 kPa of test gauge at 550 kPa. Leave test gauge on until all tests are completed.

(6) *Brake cylinder:* Place test gauge on brake cylinder equalising hose or control pipe at headstock or onto brake cylinder delivery line. Make a full service application with independent brake valve and compare locomotive gauge with test gauge at 350 kPa. Pressure must be within ±10 kPa.

7.4 Test 3 : Compressor Governor Setting

6SL locomotive governors must load the compressor when the main reservoir pressure has dropped to 875 kPa and unload when the pressure has risen by 75 kPa to 100 kPa. Locomotives fitted with a governor having the differential readily adjusted should be set at 100 kPa differential.

7.5 Test 4 : Main Reservoir Leakage

(3) Stop compressor and adjust main reservoir pressure to 550 kPa, place brake valve cut-off cock into “Dead” position. Main reservoir pressure must not drop more than 20 kPa in one minute and any leakage must be reduced to this amount before continuing with test. On remote control locomotives set the cut over cocks to manual.

(4) On locomotives fitted with a check valve between No.1 and No.2 reservoirs the leakage must be observed on both sides of valve. Couple the standard test gauge to No. 1 main reservoir unless the locomotive is fitted with a gauge on the line from the compressor to No.1 reservoir.

7.6 Test 5 : Main Reservoir Check Valve

Blow down the pressure in No.1 reservoir as shown by the test gauge to about 200 kPa below the pressure in No.2 reservoir as shown in cab gauge. Time over 1 minute, pressure in No.2 reservoir should not drop greater than 50 kPa in 1 min. No.1 reservoir should not rise greater than 50 kPa. This would indicate a defective check valve between reservoirs.

7.7 Test 6 : Brake Pipe Leakage

Make a 75 kPa brake pipe reduction and leave the brake handle in “Lap”.. Place cut-out cock in “Dead” position. Brake pipe pressure must not drop more than 15 kPa in one minute. Leakage must be reduced to that amount before continuing the tests. Note the brake pipe pressure must not rise during the one minute.

7.8 Test 7 : Air Compressor Check

(4) Screw the appropriate orifice into the main reservoir drain or MR headstock cock hose.

(5) With main reservoir adjusted to the test pressure and the engine speed or compressor speed adjusted to the rpm indicated, open orifice cock fully. The compressor must maintain the test pressure for a period of two minutes. Failure to do so indicates a defective compressor.

Compressor	Locomotive	Orifice	Test Pressure	Speed
WBO	DFT, DF, DC	5.6 mm	500 kPa	Idle

7.9 Test 8 : Feed Valve

Check operation of the feed valve by making several automatic applications and releases. Brake pipe pressure should settle at 550 kPa each time. If any sluggishness or irregular operation is evident, the feed valve must be removed for attention.

7.10 Test 9 : Automatic Brake Valve Test

(1) The handle of the brake valve must operate freely and must not be slack on the rotary valve spindle. Rotary valve spindle lift must not exceed 3mm.

(2) Make a 40 kPa brake pipe reduction. Brake must apply with at least 60 kPa of brake cylinder pressure and equalising piston must have lifted prior to 35 kPa reduction being reached.

(3) Make a further small reduction of 20 - 25 kPa and note that equalising piston lifts and re-seats and that brake cylinder pressure rises.

(4) Brake pipe pressure will now be just below 500 kPa. Place brake valve handle in Service and note time to blow down equalising reservoir pressure from 475 kPa to 350 kPa. This must not be more than 10 seconds. Note that after each brake pipe reduction the equalising piston seats and brake cylinder pressure rises.

(5) With brake pipe pressure at 350 kPa, leave the brake valve in "Lap" and note that over one minute the brake pipe pressure does not rise more than 15 kPa nor the brakes release.

(6) Whilst brake is applied, test for leakage at port D (elbow) on brake valve filling piece. Leakage indicates:

- Leaking upper valve of FA4 magnet valve.
- Leaking equalising slide valve of distributing valve.
- Leaking application check valve on independent brake valve.
- Leaking valve on dynamic valve.

(7) With brake pipe pressure still at 350 kPa, place cut-out cock in "Trail' position, return brake valve to running position and check brake pipe over one minute. Pressure should not increase or brake release. Repeat test with cut-out cock in "Dead" position. At completion of tests, place brake valve in "Lap" and cut-out cock in "Lead".

(8) Recharge system and then move brake valve into "Emergency" position. Note that brake pipe pressure falls quickly to zero and that brake cylinder pressure rises from 0 - 450 kPa in 3 – 5 seconds. Safety valve must open at 475 kPa and seat when pressure drops to 450 kPa. Check that emergency sand has operated.

7.11 Test 10: Independent Brake Test

(6) Move the independent brake valve in steps towards full application position and note that 50 kPa increments of brake cylinder pressure can be obtained.

Full pressure should be 350 kPa.

(7) Move brake valve towards release in steps and note that pressure can be decreased in 50 kPa steps.

(8) Quick release test

a. Make a 150 kPa automatic reduction, leaving the handle in "Lap". Depress the independent brake handle to quick release position and note that the brake cylinder pressure drops quickly to zero pressure.

b. Place automatic brake valve in running position and recharge system. When charged, make a 150 kPa automatic reduction then move independent handle to “Full Service”. Depress handle and move to “Release” position. Brakes must not release until the handle has reached the depression at the release position.

7.12 TEST 11: Distributing Valve

Check at exhaust port in application and release positions. A slow bubble only is allowed.

- Leakage with brake released indicates a leaking application valve.
- Leakage with brake applied indicates a leaking exhaust valve.

Note: - During brake valve test, should brakes fail to apply at 40 kPa reduction or should brake cylinder pressure be abnormally low following a 150 kPa reduction, the distributing valve could be defective. If any doubt arises as to the condition of the distributing valve, it is to be replaced with a tested unit.

7.13 Test 12 : Dynamic Brake Interlock

(1) Make a 100 kPa brake pipe reduction and return the brake valve to LAP.

(2) Place engine ‘on-line’ and Reverser Handle in either direction.

(3) Move selector to B position and wait for cam switch to throw (11 seconds).

(4) Bring throttle handle into braking range and brakes must release and engine speed increase.

(5) Release dynamic brake and the automatic brake must reapply. (Brake cylinder pressure will be about 25 kPa lower on each re-application.)

7.14 Test 13: Brake Cylinder Leakage Test

(5) Screw test gauge into brake cylinder isolating cock exhaust or test point provided.

(6) Make a full application with independent brake valve.

(7) Move isolating cock to isolated position and check reading on gauge.

(8) Pressure drop must not exceed 35 kPa per minute.

(9) Repeat test on other bogie.

7.16 Test 14: Break-In-Two Test:

As Leading Locomotive

(1) Open EP cock at headstock.

(2) Open BP cock until a blow occurs at EP hose.

(3) Open MR cock fully and check that flow at EP hose ceases.

(4) Close MR cock and check that blow at EP hose recommences.

Should blow from EP hose not cease when MR cock is opened a fault will be found in the cut out valve or in the check valve and choke.

As Trailing Locomotive

(1) Place the 3 way cock in the “Trail” position.

(2) Open MR, EP and BP cock in turn. Brakes should apply and remain applied for one minute with no blow from the EP hose.

(3) Close MR cock. Air should now flow from EP hose and brakes release.

7.16 Test 15: Main Reservoir Safety Valve Test

Close the compressor governor isolating cock and check the safety valve settings.

Locomotive	Lower Valve	Upper Valve (if fitted)
Da	1025 kPa	1150 kPa

Notes

(1) Test upper valve first. Test by either blanking lower valve (preferred) or set lower valve higher than upper. Remove blanking plate after test.

(2) If adjustment to safety valves is necessary, always replace the cap before checking pressure as the valve setting may alter when cap is tightened.

7.17 Test 16: Vigilance Control

All control switches and circuit breakers must be set up as normal power operation. Switch radio circuit breaker OFF (if fitted with alarm call facility).

Pneumatic Vigilance

(1) Check that time cycle from operation of a cancelling switch to sounding of warning whistle is 60 - 75 seconds and that emergency warning or brake application occurs after a further delay of no more than 25 seconds.

(2) Check operation of all cancelling switches.

(3) Hold a switch closed and note that the warning whistle sounds on overcharging of the system.

(4) Note that applying locomotive brake fully or placing 3 way valve in “trail” will suppress the vigilance.

(5) Check that the isolating cock glass is intact and sealed.

Note: - Should the time cycle need adjustment by more than 15 seconds, a pressure gauge must be fitted to the timing reservoir to check operation of the various pressure switches.

Electronic Vigilance

(3) Brake cylinder pressure reduced to below 160 kPa.

(4) Reverser handle placed in forward or reverse position.

Cycle times are not adjustable.

Drivers Side

Reset to Light	50 seconds ± 3 seconds
Light to Whistle	10 seconds ± 2 seconds
Whistle to Penalty Brake	10 seconds ± 2 seconds

Assistant's Side (where fitted)

Buzzer and Light	180 second ± 15 seconds

(5) Time is to be taken from operation of cancelling device to light. From light to whistle or buzzer, from whistle to penalty brake. Wait 47 secs after penalty brake application. The vigilance system must not reset itself.

(6) Check operation of all cancelling switches.

(7) Hold a switch closed and note that warning whistle or buzzer sounds. (Not on all electronic types)

(8) Note the brake cylinder pressure required to suppress vigilance system is between 225 – 250 kPa on rising pressure.

(9) Check that isolating glass is intact and sealed.

7.18 Test 17 : General

(5) Examine brake rigging and piping and hoses. Check piston travel is between 40 mm -125 mm.

(6) Check handbrake operation.

(7) Check sanders (in both directions), horns, window wipers.

(8) Check wheel-slip sand delay switch or wheel-slip brake.

(9) Check position of Dead Engine Device handle.

(10) Check control air pressure = 625 +/- 20 kPa.

(11) Check operation of PCS (Pressure Control Switch).

Open	250 kPa
Close	375 kPa

Appendix A
Brake System Testing
Sample Record Sheets

Contents

Introduction

The Appendix includes several sample record sheets as used by existing Heritage Network Operators. They have not been verified as complying with the approved codes.

Principles

In preparing a record sheet the following principles should be followed.

- The record sheet should include reference to the code being used.
- The layout should follow the code being used to reduce the chance of confusion.
- The tests should show minimum and /or maximum limits for the test or what needs to be verified.
- The date of the test, vehicle ID and vehicle type must be recorded.
- The name and signature of the person doing the test must be recorded.

Sample Forms

Air System Test Record
Passenger Cars and Service Vehicles
(Extract from FRONZ / ONTRACK Inspection Record B3.1.6.21)

Vehicle ID _____ **Vehicle Operator** _____

Air Tests

Initial charging	
Charge brake system to 550 kPa. No audible leaks in piping and equipment	
Brake pipe leakage (at 550 kPa)	
Max = 15 kPa in 1 min (Must be below this before continuing tests)	kPa
Piston travel and rigging (150 kPa reduction in brake pipe pressure)	
Travel. Limits = 150 – 165 mm for auto slack adjusters, 125 to 200 mm for manual.	mm
No audible leaks at cylinder	
All rigging and levers at correct angles. Will not foul as the blocks wear.	
Handbrake	
Applies. (Lever type should not bottom.)	
No of turns (6 – 8 for auto slack adjuster, 5 – 10 for manual adjuster, 1 – 6 for van)	turns
Automatic Slack Adjuster (when fitted) (Pneumatic or SAB type) (Screw adjuster out to test)	
No audible leaks at 150 kPa reduction (pneumatic type only)	
Adjuster rotates when brakes release	
Minimum Reduction (40 kPa reduction)	
Brakes remain applied for 1 min.	
Nil or only slight air blow at triple exhaust	
Slow Release Test (brakes released from 75 kPa reduction)	
Time to release through 0.58 mm choke. Max = 25 secs for 1¼" train pipe, 15 secs for 1" train pipe	secs
Nil or only slight air blow at triple exhaust after brakes fully released.	
Passenger Emergency Valve Test (brakes charged to 550 kPa)	
Brakes apply – No 1 valve	
Brakes apply – No 2 valve	
Release Valve (at 150 kPa reduction)	
With cock open, air exhausts and brakes release. Cock closes when released.	
With train pipe pressure exhausted, cock remains open (auto type only)	
Brake pipe leakage (at 550 kPa)	
Max = 15 kPa in 1 min (Must be below this before continuing tests)	kPa
Brake Pipe Maintenance and Auxiliary Leakage	
Brakes remain applied for 10 minutes at 75 kPa reduction.	

Air Test Completed and system is FIT / NOT FIT for service (delete one)**:-**

Name _____ Date / /

Signature _____ Depot _____

Locomotive DJ **Date of Test** _____

Use with Code 633 - Standard Code - Dj Locomotive - Air Brake & Equipment Test

	Test	Limits	Measured	Pass	Fail
1	Compressor charges correctly.				
2	Pressure gauges – Main reservoir	± 20 kPa @ full press	kPa		
	- Brake pipe	± 15 kPa @ 550 kPa	kPa		
	- Equalising reservoir	± 15 kPa @ 550 kPa	kPa		
	- Brake cylinder	± 10 kPa @ 350 kPa	kPa		
3	Governor settings - Cut in @	725 kPa	kPa		
	- Cut out @	800 – 825 kPa	kPa		
4	Main reservoir leakage - No 1	20 kPa in 1 min	kPa		
	- No 2	20 kPa in 1 min	kPa		
5	Reservoir check valve - No 1	+ 50 kPa in I min	kPa		
	- No 2	- 50 kPa in I min	kPa		
6	Brake pipe pressure	+0 / - 15 kPa in 1 min	kPa		
7	Air compressor (6.4 mm @ idle)	500 kPa for 2 mins	kPa		
8	Automatic brake valve - Minimum reduction	BP 40 – 50 kPa	kPa		
		BC applies (<100 kPa)	kPa		
	- Incremental application				
	- Full service	BP ≈ 390 kPa	kPa		
		BC 425 – 450 kPa	kPa		
	- Suppression	No reduction in BP			
	- Handle off	BP & ER drop @ service rate. BP ≈ 75 kPa	kPa		
	- Release – intermediate positions	No release			
	- Full release	ER 375 → 525 kPa < 3 sec	sec		
		BC 350 → 25 kPa < 9 sec	sec		
	- Emergency	BP & ER fall rapidly			
		BC 0 → 350 kPa in 6–9 sec	sec		
		BC ≈ 440 kPa max	kPa		
9	Brake pipe maintaining feature (4.8 mm orifice)	B.P. – 25 kPa	kPa		
		B.C. + 60 kPa	kPa		
		Steady over 1 minute			

	Test	Limits	Measured	Pass	Fail
10	Independent brake valve - Application	BP apply in 50 kPa steps			
		BC = 350 kPa	kPa		
	- Release	BP decrease in 50 kPa step			
	- Double check valve	Ind. holds 150 – 200 kPa after auto release.			
	- Quick release	BC drops rapidly to 0 kPa			
11	Cut off valve (cut-out)	Auto brakes do not apply in service position			
		Brakes apply in emergency			
12	MU2A valve (Trail 6 or 26)	Ind brakes do not apply			
13	Dynamic interlock	Opens @ 175 kPa rising	kPa		
		Closes @ 150 kPa falling	kPa		
14	Brake cylinder leakage - Bogie 1	35 kPa in I min.	kPa		
	- Bogie 2		kPa		
	- Bogie 3		kPa		
15	Break in two (open all BP cocks in turn)				
16	Main reservoir safety valve	900 kPa	kPa		
17	Vigilance System - Drivers - Reset to light	50 secs ± 3 ses	secs		
	- Light to whistle	10 secs ± 2 secs	secs		
	- Whistle to penalty brake	10 secs ± 2 secs	secs		
	- Penalty brake reset	Must not self reset (wait 47 s)			
	- Suppression pressure	225 – 250 kPa	kPa		
	- Assistants - reset to light	180 secs ± 15 secs (total cycle)	secs		
	- Light to buzzer		secs		
	- General - all switches cancel / glass intact				
18	General – Brake rigging / hoses / piston travel (40 – 125 mm) / handbrake / sand / horns / wipers				
	- Main reservoir auto drain				
	- CCG	Open 250 kPa	kPa		
		Close 375 kPa	kPa		
19	Main reservoir protection	600 kPa	kPa		

This vehicle's brake system has been inspected in accordance with Code 633 and is:-

FIT / NOT FIT for service. (delete one)

Name _____

Signature _____

Mainline Steam Trust

MSHT 002 **Test Results for A6ET Brake**

__Locomotive _____ Date _____

1.**Charging -**

See that all reservoirs have been drained.

Start compressor and note that pressure rises steadily and the compressor operates evenly without undue noise or vibration.

Fit a standard pressure gauge to the brake pipe and leave on for tests.

2. **Pressure Gauges-**

Check all brake gauges against the standard test gauge, gauges must be correct within + or - 15kpa.(3psi)

PASS / FAIL

3. **Main Reservoir Leakage-**

Stop the compressor and adjust main reservoir pressure to 550 kpa (80psi). Close brake valve isolating cock.

Main reservoir pressure must not drop more than 20kpa (3psi) per minute and leakage must be reduced to this amount before continuing the tests.

PASS / FAIL **LEAKAGE_____per/min**

4. **Brake Pipe Leakage-**

With the Brake valve isolating cock still closed make a 75kpa (10 psi) brake pipe reduction leaving the brake valve handle lapped.

Brake pipe pressure must not drop more than 15kpa (2psi) per minute and leakage must be reduced to this amount before continuing with the tests.

PASS / FAIL **LEAKAGE_____per/min**

5. **Compressor Governor-**

On all locomotives the governor must load the compressor when the main reservoir pressure

has fallen to 655kpa (95psi) and unload at 690kpa (100psi)

PASS / FAIL **RESET REQUIRED Y/N**

Place the Automatic Brake valve handle in the minimum reduction position, the main reservoir pressure must rise to 828kpa (120psi)

PASS / FAIL **RESET REQUIRED Y/N**

6. **Feed and Reducing Valves-**

Check operation of M3 valves by making several automatic reductions and releases. Brake pipe pressure must return to 550kpa (80psi) each time.

PASS / FAIL **RESET REQUIRED Y/N**

Make several full independent applications and releases. Brake cylinder pressure must rise to 350kpa (50psi) each time.

PASS / FAIL **RESET REQUIRED Y/N**

7. **Automatic Brake Valve Test-**

The handle of the brake valve must operate freely and must not be slack on the rotary valve spindle. Rotary valve lift must not exceed 3mm.

PASS / FAIL

Place Automatic brake valve in LAP position and note equalising reservoir gauge. See that MINIMUM REDUCTION feature functions correctly and that an equalising reservoir reduction of 40-55kpa (6-7psi) occurs and that brake cylinder pressure indicates 75-100 kpa (10-14psi).

PASS / FAIL **REDUCTION _____**
CYLINDER PRESSURE _____

Mainline Steam Trust
Test Results for A6ET Brake

7.contin

Place handle in SERVICE note that the equalising piston lifts promptly and that equalising reservoir pressure reduces from 475 to 350kpa (70 to 50psi) in not more than 10 seconds.

Lap the brake valve when pressure is reduced to 350kpa (50psi)**.**

PASS / FAIL **TIME _____ SEC**

Note that there is no blow at the brake pipe exhaust after the equalising valve seats and that brake cylinder pressure increases with the brake pipe reduction.

PASS / FAIL

Having made a reduction to 350kpa (50psi) leave the brake valve in LAP position. Note that over one minute brake pipe pressure does not rise more than 15kpa (2psi) or the brakes release. This will test for rotary valve leakage.

PASS / FAIL **LEAKAGE _____PSI**

Recharge the brake pipe then move the brake valve to EMERGENCY position. Note that the brake pipe pressure falls at a rapid rate. Check that brake cylinder pressure rises above normal service application pressure and that the Distributing valves safety valve is blowing at 375kpa (55psi) brake cylinder pressure and that it seats when pressure is lowered 25kpa (4psi) on release of brakes.

PASS / FAIL **RESET Y/N**

Emergency application rate 0 to 375kpa (55psi) in the brake cylinder in ten seconds.

PASS / FAIL **TIME _____ Sec**

8. **Equalising Reservoir Control Valve Test-**

With the brake pipe and equalising reservoir reduced to zero place brake valve in RUNNING. Note time taken to charge the equalising reservoir from 0 to 400kpa (60psi) this must be between 45 and 60 seconds.

PASS / FAIL **TIME _____Sec**

9. **Independent Brake Valve Test-**

The brake valve handle must operate freely and must not be slack on the rotary valve spindle. Rotary valve valve spindle lift must not exceed 3mm. The brake valve handle must return promptly from QUICK APPLICATION to SLOW APPLICATION and from RELEASE to RUNNING when the handle is released.

PASS / FAIL

Check rotary valve leakage by making a 150kpa (21psi) application, lap the brake valve and check that the brake cylinder pressure does not increase more than 35kpa (5psi) per min.

PASS / FAIL **LEAKAGE _____per min**

With brake valve in LAP note that pressure does not decrease more than 35kpa (5psi) per min from 150kpa (21psi). A drop in pressure indicates control pipe leakage.

PASS / FAIL **LEAKAGE _____per min**

Check SLOW and QUICK applications and RUNNING and RELEASE positions.

0 to 300kpa (42psi) in 10 seconds maximum **TIME _____ sec**

0 to 300kpa (42psi) in 5 seconds maximum **TIME _____ sec**

300 to 75kpa (42-10psi) in 5 seconds maximum in running and release positions

TIME _____ sec

Maximum pressure 350kpa (50psi)

Mainline Steam Trust
Test Results for A6ET Brake

9.contin

Make a full Service application with the automatic brake valve leaving the handle in LAP. Hold the independent handle in RELEASE when brake must release and a warning blow must discharge at exhaust port.

PASS / FAIL

Return the independent brake valve to RUNNING and over a period of 30 seconds brakes must not re- apply.

PASS / FAIL

10. **Distributing Valve Test-**

Check for leakage at exhaust port in application and release position, Slow bubble allowed. Leakage in release position indicates defective valve seat seal. Leakage in application position indicates defective release slide valve or application piston cage bush seal.

PASS / FAIL

During test 9 and 10 failure to meet any of the requirements as to times or pressure may be caused by defective Distributing valve, if any doubt exists as to the correct functioning of the Distributing valve it must be fully serviced.

11. **Independent Release Valve Test-**

Close the brake valve isolating cock and with both brake valves in RUNNING position make a 75kpa (10psi) brake pipe reduction at a brake pipe headstock cock. Brakes must apply and stay applied over one minute. If brakes release during this test a defective check valve is indicated. First make sure by means of test 12 that the brake valve isolating cock is not defective.

PASS / FAIL

12. **Brake Valve Isolating Cock-**

Following test 11 with the Isolating cock still closed make a further 50kpa (7psi) reduction with the Automatic brake valve. Return handle to RUNNING position. Observe brake pipe pressure which must nit rise during one minute.

PASS / FAIL

13. **Brake Cylinder Leakage Test-**

With the Independent brake apply 350kpa (50 psi) to the brake cylinders. Close main reservoir supply cock to the Distributing valve, observe any drop in pressure on the brake cylinder gauge. Leakage must not exceed 35kpa (5psi) per minute

PASS / FAIL **LEAKAGE _____per min**

At the completion of this test open the supply cock and test operation of brakes.

14.**Brake pipe Application Test-**

With brake valves in RUNNING position open each brake pipe headstock cock in turn. Brakes must apply and release again when cock is closed.

PASS / FAIL

15. **General Inspection And Tests**

Examine brake rigging, piping, and hoses for signs of damage, rubbing and chaffing.

PASS / FAIL

Check brake cylinder piston travel.

ENGINE _____ mm **TENDER _____mm**

Mainline Steam Trust
Test Results for A6ET Brake

15 contin

Check number of turns to apply handbrake.

TURNS_____

Check for worn, missing or damaged split pins.

CHECK _____

Check date of last service if known.

DATE _____

		LH	**RH**
Compressor test results -	Air end	----------	Strokes/min----------
----	Steam End	----------	Strokes/min----------

Absolute compliance with the above tests is required for a pass, there is to be no benefit of doubt or leaving it to come right, if there is any doubt it is to be noted as a fail..

Comments-

Brakes fit for service **PASS / FAIL**

Signed _____

Date _____

DIESEL TRACTION GROUP

DE LOCOS - BRAKE TEST REPORT (RELAYED No.4 BRAKE EQUIPMENT)

LOCO _____ **DATE** _____

1. CHARGING Correct _____

2. PRESSURE GAUGES

(a) M.R error _____ kPa _____
(b) B.P. error _____ kPa _____
(d) B.C. error _____ kPa _____

3. COMPRESSOR GOVERNOR

Cut in _____ **kPa** **Cut out** _____ **kPa** _____

4. M.R. LEAKAGE _____ kPa _____

5. B.P. LEAKAGE _____ kPa _____

6. AIR COMPRESSOR Gain _____ kPa _____

7. AUTOMATIC BRAKE VALVE

(a) Handle operation correct _____
Leakage within code _____
(b) Service position correct _____
Brake pipe reduction time _____ sec _____
(c) Brake pipe pressure increase _____ sec _____
(d) Isolating cock correct _____
(e) Release correct _____
(f) Emergency position correct _____

8. INDEPENDENT BRAKE VALVE

(a) Application correct _____ Maximum pressure _____ kPa
(b) Release correct _____
(c) Emergency correct _____ Maximum pressure _____ kPa

9. BRAKE CYLINDER LEAKAGE No. 1 bogie _____ kPa _____
No. 2 bogie _____ kPa _____

10. MAIN RESERVOIR SAFETY VALVE Set at _____ kPa _____

11. BRAKE CYLINDER SAFETY VALVES Set at _____ kPa _____

12. GENERAL

(a) Brake piston travels correct _____
(b) Sanders correct _____
(c) Horns and wipers correct _____
(d) Handbrake correct _____
(e) Auto drain valves correct _____
(f) Brake release correct _____

Railcar ID _____ **Railcar Type** _____

Railcar Operator _____

Test			Limits	Measured	Pass	Fail
1	MR drained, oil level OK, belts OK					
	Compressor charges correctly.					
	Charging time (minutes)		Vulcan – 9, Standard – 13	min		
2	Pressure gauges – No 1 end – Main reservoir		± 20 kPa @ full press	kPa		
	- E.P.		± 20 kPa @ working pressure	kPa		
	- B.C / SA		± 20 kPa @ 350 kPa	kPa		
	- Control pipe pressure		± 20 kPa @ working pressure	kPa		
	Pressure gauges – No 2 end – Main reservoir		± 20 kPa @ full press	kPa		
	- E.P.		± 20 kPa @ working pressure	kPa		
	- B.C / SA		± 20 kPa @ 350 kPa	kPa		
	- Control pipe pressure		± 20 kPa @ working pressure	kPa		
3	Main reservoir leakage		≤ 20 kPa in 1 min	kPa		
4	Governor settings	Cut in @	600 kPa (85 psi)	kPa		
		Cut out @	700 kPa (100 psi).	kPa		
5	Air compressor (4E26 – 1.6 mm @ idle) (E13C – 1.2 mm @idle)	No 1	400 kPa for 2 mins	kPa		
		No 2	400 kPa for 2 mins	kPa		
6	Main reservoir safety valve(s)		750 kPa	kPa		
7	Brake valve - Application time		0 → 300 kPa ≤ 2.5 secs	secs		
	- Release time		350 → 75 kPa ≤ 3.5 secs	secs		
	- Incremental Application		BP apply in 50 kPa steps			
			BC = 350 kPa max	kPa		
	- Incremental Release		BP decrease in 50 kPa steps			
	- Operation		Handle operates smoothly.			
	- Emergency – Application		EP falls rapidly to zero.			
	- Recharge		0 → 400 kPa ≤ 25 secs	secs		
8	Emergency and Bogies Relay valve exhaust - full service		Small bubble only			
	- brakes released		Small bubble only			
	Bogie 1 – emergency charging		0 → 400 kPa ≤ 110 secs (Vulcan), 80 secs (all others)	secs		

	- emergency application	All blocks apply firmly			
	- leakage	35 kPa in I min.	kPa		
	- emergency exhaust	Exhaust above 35 kPa EP			
	- safety valve setting	425 kPa	kPa		
	- emergency leakage	15 kPa in I min.	kPa		
	Bogie 2 – emergency charging	0 → 400 kPa ≤ 110 secs (Vulcan), 80 secs (all others)	secs		
	- emergency application	All blocks apply firmly			
	- leakage	35 kPa in I min.	kPa		
	- emergency exhaust	Exhaust above 35 kPa EP			
	- safety valve setting	425 kPa	kPa		
	- emergency leakage	15 kPa in I min.	kPa		
9	Throttle & Deadmans Pedal –throttle response	Speed rises and falls with throttle			
	- emergency response	Engine goes to idle (EP = 0)			
	- throttle pipe pressure	375 kPa at full throttle	kPa		
	- auxiliary valve exhaust	No leakage at both ports.			
10	Water Raising Pressure	50 to 70 kPa	kPa		
11	Air Pressure Switches & Alarms	Correct operation			
	- Low MR switch	Cuts out at 525 kPa	kPa		
	- EP switch	Operates at 300 kPa	kPa		
	- Control press switch	Operates at 375 kPa	kPa		
	- Straight air switch	Operates at 75 kPa	kPa		
12	General – emergency stop valves	Correct operation			
	- sanding equipment	Correct operation			
	- horns and wipers	Correct operation			
	- handbrake	Holds against 1st gear			
		No of turns			
	- brake rigging	Good condition			
	- brake travel	Within limits for vehicle	mm		

Air Test Completed and Passed FIT / NOT FIT for Service:- (delete one)

Name _____ Date / /

Signature _____ Depot _____

Locomotive _____ **Date of Test** _____

(For use with B3.2.1.01- Air Brake Systems Testing; Section 7)

	Test	Limits	Measured	Pass	Fail
1	Compressor charges correctly.	Charges smoothly, no undue noise or vibration			
2	Pressure gauges - Main reservoir	± 20 kPa @ full press	kPa		
	- Brake pipe	± 15 kPa @ 550 kPa	kPa		
	- Equalising reservoir	± 15 kPa @ 550 kPa	kPa		
	- Brake cylinder	± 10 kPa @ 350 kPa	kPa		
3	Governor settings - Cut in @	875 kPa	kPa		
	- Cut out @	75 - 100 kPa above cut-in	kPa		
4	Main reservoir leakage - No 1	20 kPa in 1 min	kPa		
	- No 2	20 kPa in 1 min	kPa		
5	Reservoir check valve - No 1	+ 50 kPa in I min	kPa		
	- No 2	- 50 kPa in I min	kPa		
6	Brake pipe pressure leakage	+0 / - 15 kPa in 1 min	kPa		
7	Air compressor (5.6 mm @ idle)	500 kPa for 2 mins	kPa		
8	Feed Valve	Settles at 550 kPa. Not sluggish or irregular.			
9	<u>Automatic brake valve</u> - Brake valve handle	Moves freely. No slack on spindle. Lift ≤ 3 mm			
	- Minimum reduction (40 kPa reduction)	Brakes apply			
		BC ≥ 60 kPa	kPa		
		Equalising piston lifts < 35 kPa			
	- Incremental application (20 – 25 kPa additional reduction)	Equalising piston lifts			
		BC pressure rises			
	- Service	ER 450 to 375 KPa ≤ 10 sec	sec		
		Equalising piston lifts, BC rises			
	- Lap (BP = 350 kPa)	BP rise (≤ 15 kPa in 1 min)	kPa		
		Brakes remain applied			
	- Leakage at port D (brakes applied)				
	- Trail position leakage (BP = 350 kPa, handle to running)	No increase in BP pressure			
		Brakes remain applied			
	- Dead position leakage (BP = 350 kPa, handle to running)	No increase in BP pressure			
		Brakes remain applied			

Test		Limits	Measured	Pass	Fail
	- Emergency	BP falls quickly to zero			
		BC (0 - 450 kPa in 3 – 5 secs)	secs		
		Safety valve opens 475 kPA	kPa		
		- closes @ 450 kPA	kPa		
		Sand operates			
10	<u>Independent brake valve</u>	Handle moves freely			
	- Application	BC applies in 50 kPa steps			
		BC = 350 kPa	kPa		
	- Release	BC decreases in 50 kPa step			
	- Quick release (150 kPa reduction)	BC drops rapidly to 0 kPa			
		No release – "Running" to "Release" positions			
11	Distributing Valve	Minimal leakage at exhaust port, application & release positions			
12	Dynamic brake interlock (100 kPa BP reduction)	Dynamic applied – brakes release, engine speed increases			
		Dynamic released – auto brakes re-apply			
13	Brake cylinder leakage - Bogie 1	35 kPa in I min.	kPa		
	- Bogie 2	35 kPa in I min.	kPa		
14	<u>Break in two</u> - Lead	Open EP, then BP – blow at EP			
		MR fully open – blow at EP stops			
		MR closed - blow at EP stops restarts			
	- Trail	Open MR, EP, BP – brakes apply for 1 min, no blow at EP			
		Close MR - blow at EP, brakes release			
15	Main reservoir safety valve	No 1 – 1025 kPa	kPa		
		No 2 – 1150 kPa	kPa		
	<u>Vigilance System – Pneumatic</u> - Cancellation to whistle	60 – 75 secs	sec		
	- Whistle to brake application	≤ 25 secs	sec		
	- Overcharge	Switch closed – whistle sounds			
	- Suppression	Brakes fully applied			
		Cut-out cock in "Trail"			
	- General - all switches cancel / glass intact				

17	<u>Vigilance System - Electronic</u> - Drivers - Reset to light	50 secs ± 3 ses	secs		
	- Light to whistle	10 secs ± 2 secs	secs		
	- Whistle to penalty brake	10 secs ± 2 secs	secs		
	- Penalty brake reset	Must not self reset (wait 47 s)			
	- Suppression pressure	225 – 250 kPa	kPa		
	- Assistants - reset to light	180 secs ± 15 secs (total cycle)	secs		
	- Light to buzzer		secs		
	- General - all switches cancel / glass intact				
18	<u>General</u> – Brake rigging / hoses / piston travel (40 – 125 mm) / handbrake				
	- Sanders / horns / wipers				
	- Wheel-slip sand delay switch or wheel-slip brake.				
	- Position of Dead Engine Device handle.				
	- Control air pressure	625 +/- 20 kPa.	kPa		
	- PCS	Open 250 kPa	kPa		
		Close 375 kPa	kPa		

This vehicle's brake system has been inspected in accordance with the relevant Air Brake Test Code and is:-

FIT / NOT FIT for service. (delete one)

Name _____

Signature _____