Train Air Brake Tests and Inspections

MARCH 25, 2019
100.0 Train Air Brake Tests and Inspections

100.1 Compliance with FRA and Transport Canada Regulations

Inspect and test brake equipment on locomotives and cars according to Federal Railroad Administration (FRA) regulations contained within these rules. In Canada comply with Transport Canada regulations.

Trains destined through to the United States from Canada must have received a brake test as per US regulations.

Trains destined through to Canada from the United States must comply with additional Canadian regulations in addition to the US requirements.

Trains operating entirely in one country will comply with that country’s requirements.

Inspections when required, must be performed on both sides at some point during an inspection and air brake test to be able to examine and observe the functioning of all moving parts of the brake system on each car as necessary, as well as to comply with all parts of 100.2. Roll-by inspections may only be utilized to determine that all brakes have released and may not be used to perform all other inspection requirements for either side of the train.

100.2 Safety Inspection of Freight Cars

Perform a safety inspection on all cars at the initial terminal or that are added en route as follows:

Either, a “Qualified Person” or a “Qualified Mechanical Inspector” may perform inspections and air brake tests.

- A “Qualified Person” refers to a trainman given fundamental training on freight car inspections and air brake tests.
- A “Qualified Mechanical Inspector” or “Certified Car Inspector” refers to a person such as carman who has been given more extensive training that provides for a more detailed inspection.

Each car placed in the train may be moved after it receives a safety inspection as follows:

Cars must be checked for:

- Leaning.
- Sagging.
- Improper position on the truck.
- Objects hanging or dragging from the car or extending from the side.
- Insecurely attached doors.
- Broken or missing safety appliances.
- Contents leaking from placarded hazardous material car.
- Insecure coupling device.
- Overheated wheel or journal.
- Broken or cracked wheel.
- Brake that fails to release.
- Staff type brake not in fully raised position.
- Any apparent hazard that could cause an accident.

Open top loads, including trailers and containers on flat cars, must be loaded safely. If width or height approaches clearance restrictions, movement must be cleared with the proper authority.

- A freight car with any defect that makes movement unsafe must be corrected or set out of the train.
- A freight car with three bad order tags indicating that the car is safe to move may be moved to the nearest car repair point. The conductor will remove one bad order tag from the side with two tags. The conductor will use this written information from the tag to inform other crew members of the restrictions.

100.3 Coupling and Securing Air Hoses

Before coupling air hoses between locomotives and/or cars, employees must:

- Shake debris out of the hoses.
- Blow all condensation from the locomotive brake pipe or yard air line.

Whenever possible, secure air hoses on locomotives and cars during all movements to prevent the hoses and glad-hands from dragging and becoming damaged.

100.4 Operative Brakes - US Only

These requirements apply to air brake tests and inspections:

- Unless brakes fail en route, air brakes on all cars must be operative unless being moved for repairs and properly tagged. Qualified Mechanical Inspectors will provide three tags on cars given to train crews to be moved to repair facilities. Cars with defective air brake equipment will be tagged on each side and the third tag will be retained on locomotive. This information may also be provided in train documentation. Tags will only be required on one side of the car and on the locomotive when no crossover platform is available to crossover between cars or when adjacent tracks are involved which could present risk of injury. EXCEPTION: Scale test cars are not required to be equipped with air brakes, but if equipped must be operable.

- Cars discovered with brakes that fail en route must be tagged on both sides of the car and noted on space provided on train documentation and left in controlling locomotive cab form holder for relieving crew. Tags will only be required on one side of the car and train documentation noted when no crossover platform is available to crossover between cars or when adjacent tracks are involved which could present risk of injury. (Reference ABTH Rules 102.7 and 102.9 on procedures for handling cars with cut out air brakes.) Tags must include the following information: (the back of locomotive defect tags provided on locomotives or in crew packs may be used if no defective air brake tags are available).

  Reporting Mark and Number of the defective locomotive or car
  Name of the inspecting or discovering Railroad
  Name and Job Title of Inspector
  Inspection Location and Date
  Type of Defect
Movement Restrictions
Repair Destination
Signature

- Train documentation may also reflect such cars by electronic means to subsequent crews after defective brakes are initially discovered and reported.

At least 85 percent of the cars in a train must have operative brakes under all circumstances.

When departing terminals, engineers must allow their trains to be inspected where required.

100.4.1 Operative Brakes – Canada
- At Safety Inspection Locations, where No. 1 test is performed by a Certified Car Inspector, 95% of brakes must be operable.
- At non-Safety Inspection Locations, where No. 1, 1-a, No 2 or No 3 tests are made, 85% of brakes shall be operable.
- En route, trains requiring a brake test must have no less than 85% operable brakes at any time.

100.5 Person in Charge of Air Brake Test
The person performing the air brake test is in charge of the train while the test is being conducted. Before permission is given to apply or release the brakes, the person in charge must determine that all employees are safely positioned.

The employee at the controls of the locomotive must not apply or release train brakes without permission from the person performing the air brake test.

100.6 Standard Brake Pipe Pressures
Regulating valve must be set as follows:
- Yard or Freight service - 90 psi
- Trains consisting entirely of business car or passenger equipment - 105 psi.

100.7 Charging Air Brake System
Charge the air brake system to ensure that the system functions as needed. When charging the system:
- Do not charge a train’s air brake system with more than one automatic brake valve cut in.
- Do not increase diesel engine RPM to maintain main reservoir pressure unless the pressure fails to stay 10 psi above the regulating valve setting.
- If engine RPM must be increased, do not exceed throttle position 4.

In yards where trains are made up, unattended locomotives may be used to charge the brake system when ambient temperature requires additional charging time.

100.8 Air Brake Tests Using End-of-Train Telemetry Devices (ETD) Continuity Tests
When a continuity or air brake test requires determining if brake pipe pressure is restored or air brake system is to be charged to a specified pressure at the rear end of train, this can be determined by any of the following:
· An accurate gauge.
· An ETD.

When an air brake test requires an inspection to determine that the brakes apply and release on the rear car of the train (integrity or continuity test), this requirement is considered fulfilled when an ETD attached to the rear of the train indicates the following:
· A brake pipe pressure decrease of at least 5 psi, the brakes are applied.
· A brake pipe pressure increase of at least 5 psi, the brakes are released.

100.8.1 Air Brake Tests Using Handheld Gauges
Handheld gauges used for air brake test purposes must be determined to be accurate within the last 92 days. A method of checking accuracy of the hand held gauge is outlined below:

1. Utilizing a locomotive brake pipe gauge, have engineer release automatic brake valve and charge brake pipe to 90 psi.
2. Attach handheld gauge to brake pipe of the controlling locomotive.
3. Compare pressure indicated by the handheld gauge to locomotive brake pipe gauge.
4. If pressure indicated by handheld gauge is within 3 psi of locomotive brake pipe gauge reading, the handheld gauge may be used to conduct air brake tests.
5. The date of the most recent pressure comparison must be noted on a sticker applied to the gauge or on a document in the possession of the user.

Note: Gauges that are not within 3 psi of the locomotive reading must not be used to conduct air brake tests and must be turned in to the mechanical department for repair or recalibration.

100.9 Brake Pipe Leakage Test
Brake system leakage can be tested by utilizing either the Air Flow Method (AFM) or the Brake Pipe Leakage Method. The Air Flow Method is the preferred method when required equipment is available.

A. Location of Test
A brake pipe leakage test is required when:
- Conducting a Rule 100.10 (Initial Terminal and Road Air Brake Test)
- Conducting a Rule 100.10.1 (Canadian No. 1 and No 1-A Brake Test)
- Conducting a Rule 100.12 (Intermediate Brake Test)
and
- Adding cars that have not been pre-tested to a train.

B. Air Flow Method (AFM)
To qualify a train’s air brake system using AFM, the train must be equipped as follows:
1. The controlling locomotive has a pressure maintaining-type automatic brake valve.
2. The train has a gauge or device at the rear of the train.
3. The locomotive has an air flow indicator with:
a. Orange or red calibration mark which identifies 60 cubic feet per minute (CFM).

or

b. A direct reading of air flow in increments no greater than 10 CFM.

Conduct an AFM test as follows:
1. Charge the brake system to within 15 psi of the regulating valve setting as indicated by a gauge or device at the rear of the train.
2. When air flow does not exceed 60 CFM, test is complete. If air flow exceed 60 CFM, train must be inspected for leakage.

C. Brake Pipe Leakage Method
If the train does not meet AFM test conditions conduct a brake pipe leakage test as follows:
1. Charge the brake system to within 15 psi of the regulating valve setting as indicated by a gauge or device at the rear of the train.
2. Wait for the signal to apply the brakes.
3. When you receive the signal, reduce brake pipe pressure by 20 b psi.
4. Allow the brake pipe exhaust to stop.
5. Wait 1 minute.
6. Cut out the automatic brake valve.
7. Wait an additional 1-minute for the brake pipe pressure to equalize.
8. Time the brake pipe leakage for 1 minute. If the leakage does not exceed 5 psi the test is complete. If the leakage exceeds 5 psi train must be inspected for leakage and re-tested.
9. When you receive the signal to release the brakes, move the automatic brake valve to RELEASE position and cut the automatic brake valve in.

100.10 Initial Terminal and Road Air Brake Test (Class 1 Air Brake Test) Canadian Class 1 Brake Test and Class 1-A Brake Tests
A qualified employee must conduct an initial terminal air brake test to inspect air brake and safety appliances and to test brake pipe integrity.

At Canadian Safety Inspection Locations the test is performed by a Certified Car Inspector and is designated a No. 1 test (see 100.10.1)

At initial locations in Canada that are not Safety Inspection Locations the test is performed by a Qualified Person and is designated a No. 1-A test (see 100.10.1)

A. Requirement For Test – United States
Test must be conducted:
Where the train is originally assembled (initial terminal).

Where the train consist is changed, other than adding or removing a car or a solid block of cars.

or

Where the train is received in interchange and the train consist is changed. However, an inspection and test is not needed if the train consist is changed by any one or a combination of the following:

- Removing a solid block of cars from train.
- Changing motive power.
- Removing or changing the caboose, if used.

On a portion of the train as specified below:

- On one or more cars added that have not been pre-tested by the initial terminal air brake test.
- On that portion of train that has not been kept charged. (off air for over 4 hours)
- On a solid block of cars being added to train that is comprised of cars from more than one previous train.
- On each solid block of cars that is comprised of cars from only one previous train but the cars of which have not remained continuously and consecutively coupled together with the train line remaining connected, other than for removing defective equipment, since being removed from it’s previous train.

Note: Cars are still considered a “solid block” if from only one previous train and divided into smaller segments to accommodate space or track constraints as long as placed back in same relative order as when removed from previous train.

B. Procedure for Initial Terminal and Road Air Brake Test and Inspection – US & Canada

Inspect before or during Air Brake Test for the following:

- Inspect the angle cocks and verify that they are properly positioned.
- Inspect the air hoses and verify that they are in condition for service and properly coupled.
- Inspect the system for leakage.
- Make necessary repairs to reduce leakage to a minimum.
- Inspect the retaining valves and verify that they are in EXHAUST.

Conduct the test as follows:

1. Charge the air brake system to within 15 pounds of the locomotive regulating valve setting as indicated by a gauge or device at the rear of the train.
2. Perform a leakage test as specified in Rule 100.9 (Brake Pipe Leakage Test).
3. When proper notification is received to apply the brakes for the test, make a 20 pound brake pipe reduction.
4. Inspect the entire train or cars added not pre-tested to determine that:

- Brakes are applied and remain applied until signal is given to release on each car and piston travel meets the requirements of Rule 100.18 (Piston Travel). Make sure 100 percent of the train brakes are operative before departing. Any car whose brakes release prior to signal being given to release the brakes may be re-tested once and a determination must be made that brakes will remain applied until a release is initiated for a period of no less than 3 minutes. (Canadian Brake tests 1 & 1-A see Exception 100.10.1 B 4)
- Brake rigging does not bind or foul.
- All parts of the brake equipment are properly secured.

5. When the test and inspection of the air brake application is complete and the proper notification has been received to release the brakes:

- Place the automatic brake valve handle in the RELEASE position.
- Notify the inspector that the brakes have been released.
- Inspect each brake to make sure all brakes have released. This inspection may be made as the train departs at a speed not exceeding 5 MPH.

   Note: An ETD pressure drop and rise of 5 psi during the air brake test may be used to determine application and release of cars within the train that have been previously tested.

C. Engineer Notification

A qualified person or mechanical inspector/certified carman who participated in the test and inspection or anyone who knows the test was completed must notify the engineer in writing that the initial terminal air brake test has been completed satisfactorily including name, date, time, location and number of cars inspected. Written notification must be made on the approved form.

Engineers receiving written notification of the air brake test must:
1. Accept the notification as authority that the air brake test has been completed satisfactorily.
2. Maintain the written record of all Class 1 inspections and brake test in the cab of the locomotive in the form holder provided until train reaches final destination.

Written notification of the initial terminal inspection and air brake test may be provided the locomotive engineer on the proper form at the initial terminal.

ETD Emergency Test Record

ETD test information is required to be provided the outbound crew only if performed in the absence of all train crew members.

100.10.1 Number 1 Brake Test and Number 1-A – Canada

A Number 1 Brake Tests is performed by a certified car inspector:
- where a train is made up at a safety inspection location,
- and while en-route at any subsequent safety inspection location(s) designated for that train.
• verifies the integrity and continuity of the brake pipe.
• verifies piston travel and the condition of brake rigging on each car in the train.
• verifies the application and release of air brakes on each car in the train.

**Exception:** In Canada, a No. 1 brake test is not required on trains operating over main tracks, between yards, up to a maximum of a 30 mile radius, which are engaged exclusively in the setting off or lifting of equipment at industries and/or the transfer of equipment between yards.

If a train is made up at other than a safety inspection location, a No. 1 brake test will be performed at the first safety inspection location designated for that train.

At locations where a No. 1 brake test has been performed, the results of this brake test may be obtained in writing, in person, or by radio from a person who has immediate access to the test results.

**Canadian No 1-A Brake Test** is performed by a qualified person under the following conditions:

- Where a train is made up at other than a safety inspection location.
- When an en route train is extensively switched, except where solid blocks of 2 or more cars are remarshalled within the same train.
- At an interchange location when Train Brake Status records are not available.
- When cars which have not been previously tested are added to the train.
- on trains operating over main tracks, between yards, up to a maximum of a 30 mile radius, which are engaged exclusively in the setting off or lifting of equipment at industries and/or the transfer of equipment between yards.

- Verifies the integrity and continuity of the brake pipe.
- Verifies the application and release of air brakes on each car in the train.

**Perform a Canadian No. 1 and No. 1-A brake test in accordance with 100.10 B through and including C**

**Exception** – 100.10.B 4 – 1st bullet point is changed to read:

4. Inspect the entire train or cars added not pre-tested to determine that:

Brakes are applied and remain applied until signal is given to release on each car and piston travel meets the requirements of Rule 100.18 (Piston Travel). Make sure 95 percent of the train brakes are operative before departing locations where Canadian Class 1 Brake tests are conducted and 85 percent of brakes where a Canadian 1-A Brake Test is conducted.

**100.11 Transfer Train Movements Test – United States**

Test the air brake system on a train making a transfer train and yard movement that does not exceed 20 miles in one direction. Intermediate switching is permitted on Transfer Train movements.

Test the air brake system on a transfer train as follows:

Couple brake pipe hoses between all cars.
1. Charge the brake system to at least 60 psi as indicated by a gauge or device at the rear of the train.

2. Make a 15 psi brake pipe reduction.

3. Verify that the brakes apply and remain applied on each car until release signal is given. Any car whose brakes release prior to signal being given to release the brakes may be re-tested once and a determination must be made that brakes will remain applied until a release is initiated for a period of no less than 3 minutes.

**Note:** Testing the air brake system as outlined above is also required before proceeding after adding cars during a transfer train and yard movement. If cars are set out during a transfer train and yard movement, determine that brake pipe pressure at the rear car has been restored before proceeding.

100.12 Transfer Movements – Canada

100.12.1 Brake Test

Prior to departure, the locomotive engineer must verify that there is sufficient braking effort to control the transfer. Except where block signals provide protection, transfers must have air applied throughout the entire equipment consist and the last three cars must be verified to have operative brakes.

Transfers carrying dangerous goods must have air applied throughout the consist.

100.12.2 Distance and Speed Restrictions

Transfer movements are restricted to a 20 mile radius over main tracks, unless otherwise provided.

Do not exceed:
• a maximum speed of 15 MPH when the transfer movement is NOT operating with an operative 2-way E.T.D. or a manned caboose.

100.13 Running Air Brake Test

**Requirements for Test**

Conduct a running air brake test of all passenger trains and trains consisting entirely of business cars when:

• The train leaves the initial terminal.

• Locomotive, engine crew, train crew, or operating ends have been changed.

• Any angle cocks or cutout cocks have been closed. However, the running test is not required when cars are cut off from the rear end of the train only.

• A standing air brake test has been conducted.

• The train reaches points designated by the timetable or general order.

or

• The train has struck debris on the track.

**Procedure for Running Air Brake Test**

To conduct a running air brake test:

1. Begin the running test of the brakes as soon as train speed is high enough to
prevent stalling.

2. While using enough power to keep the train stretched:
   a. Apply the train brakes with enough force to make sure the train brakes are operating properly.
   b. Keep the locomotive brakes released during the test.
   c. Verify that the train brakes create a noticeable retarding force.

3. If the train brakes are operating properly, release the brakes and proceed.

**Brakes Not Operating Properly**

If the train brakes are not operating properly, stop the train immediately and:

1. Inspect the brakes to identify and correct the problem.

2. Before proceeding, conduct an application and release test a specified in Rule 100.15 (Application and Release Test).

3. Once the train is proceeding, immediately repeat the running test.

**100.14 Air Brake Test When Cutting Off and Recoupling**

**United States** - When a train is uncoupled, unchanged and then recoupled in 4 hours or less, determine that brake pipe pressure is being restored as indicated by gauge or device at the rear end of the train before proceeding.

If the cars are recoupled in more than 4 hours, conduct a Rule 100.10 (Initial Terminal Air Brake Test) on those cars that did not remain charged.

**Canada** – The 4 hour limits are changed to read 24 hours and may be increased to 48 hours by special instruction. A continuity test must be conducted as per 100.8.

**100.15 Application and Release Test (Class 3 Air Brake Test) United States and Canada**

**Requirement For Test**

Test must be conducted:

- When any change is made to a locomotive consist.
- When a caboose is changed.
- After picking up a block of previously tested cars.
- When helper locomotives are added anywhere in the train or removed from other than the rear end of the train.

or

- When one or more consecutive cars are set out of the train.

**Procedure for Conducting An Application and Release Test**

To conduct an application and release test:

1. Charge the brake system to within 15 psi of the regulating valve setting as indicated by a gauge or device at the rear of the train.

2. Make a 20 psi brake pipe reduction with the automatic brake valve.

3. Verify that brakes on the rear car apply and release. (See 100.8)
100.16 Air Brake Test When Adding Pre-Tested Cars
When adding a block of cars pre-tested by Rule 100.10 (Initial Terminal Air Brake Test United States) or that have been off air 4 hours or less, conduct a Rule 100.15 (Application And Release Test). Apply this rule for all pickups which occur in the United States or that will operate in a train to the United States.
When adding a block of cars pre-tested by Rule 100.10.1 (Canadian No. 1 or 1-A Brake test) that have been off air 24 hours or less, conduct a Rule 100.15 (Application And Release Test). When applying this rule only allow the 24 hour off air provision to pre-tested cars picked up in Canada with a final destination in Canada.

100.17 Inbound Train Inspection
Where Special Instructions dictate, prepare train for inbound inspection as follows:
1. Secure cars with sufficient hand brakes as required.
2. Place the automatic brake valve handle in the HANDLE OFF/CONT SVC position, to reduce brake pipe to near 0 psi.
3. When the brake pipe reduction is complete and the air has stopped exhausting, close the angle cock on the locomotive or on the cars that will be detached with the locomotive.
4. Make sure the angle cock on the portion of the train or cars left standing is left open.

100.18 Piston Travel Limits
Follow the piston travel requirements as outlined by stenciling or badge plate. If no stenciling or badge plate is available, piston travel must be within the following guidelines:

**Truck-Mounted Brake Cylinders**
Piston travel must provide brake shoe clearance when brakes are released.
Piston travel must not exceed 4 inches where the piston acts directly on the brake beam.

**Body-Mounted Brake Cylinders**
At the initial terminal:
— The piston travel must be adjusted to between 7 and 9 inches.
At intermediate inspection points:
— The piston travel must not exceed 10 ½ inches.

100.19 Dynamic Brake Requirements
Locomotives discovered to have inoperative dynamic brakes must be individually tagged and an additional defect tag must be left on the controlling locomotive of the locomotive consist as information to the locomotive engineer. Inoperative dynamic brake information may also be provided to the locomotive engineer by electronic means on the train documentation under locomotive information, which will show for each locomotive whether locomotive dynamic brake is “operative”.
The requirement to identify inoperative dynamic brakes only includes dynamic brakes that are defective or ineffective due to malfunction and does not include tagging dynamic brakes that are simply cut out to comply with dynamic brake axle limitations.
Tags indicating inoperative dynamic brakes should include the following information:

1. Locomotive number.
2. Name of discovering railroad.
3. Location and date condition discovered.
4. Signature of person discovering the condition.

100.20 Inoperative Dynamic Brake on Lead, Controlling Locomotive

On train movements requiring the use of the dynamic brake, the lead, controlling locomotive must be equipped with:

1. An operative dynamic brake.
   or
2. An operative accelerometer that displays current change in speed or predicted change in speed in miles per hour per minute.

   **Note:** Low speed yard and transfer movements on level or near level grade are examples of movements that would not “require” the use of dynamic braking.