# NS-1

# RULES FOR EQUIPMENT OPERATION AND HANDLING

**EFFECTIVE JANUARY 1, 2015**

# NORFOLK SOUTHERN CORPORATION

Further instructions may be issued by proper authority.

**MARK D. MANION**
Executive Vice President and Chief Operating Officer

**EFFECTIVE:**
**JANUARY 1, 2015**

# NS-1 RULES

**THIS BOOK IS THE PROPERTY OF**

## NORFOLK SOUTHERN

**AND ITS RAILROAD SUBSIDIARIES**

**ISSUED TO**

| NAME | EMPLOYED AS |
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who must return it to the proper officer when called for, or when leaving the service.

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# TABLE OF CONTENTS

# TABLE OF CONTENTS *(continued)*

# TABLE OF CONTENTS *(continued)*

# TABLE OF CONTENTS *(continued)*

# GENERAL NOTICE

Employees whose duties are prescribed by these rules must provide themselves with a copy and have it accessible to them while on duty. Conditions not covered by these rules demand the exercise of sound judgment to maintain safety, efficiency and economy. Past practices not in conformity with these rules are unacceptable as an excuse for noncompliance.

**MARK D. MANION**

Executive Vice President and Chief Operating Officer

# AIR BRAKES

## A-1. AIR PRESSURE SETTINGS

Standard air pressure settings are as follows:

**(a)** Main reservoir .....130–140 PSI

The minimum main reservoir pressure should be at least 15 PSI above regulating valve setting. If the pressure falls below this figure, with the locomotive standing, open generator field switch and advance the throttle to an intermediate position, not greater than notch 4, to help restore main reservoir pressure. On Dash8, and newer GE series locomotives, place in Notch 1 and on SD70-2 and newer EMD series locomotives, place in Notch 2.

**(b) Brake Pipe Pressure:** Regulating valve will be adjusted to the pressure indicated for the service in which a locomotive is to be used.

**1.** Passenger ….....110 PSI

**2.** Road freight, Remote Control, and Terminal Transfer .....90 PSI

**a.** When a run-through train is received in interchange and the train consist remains intact, it may be operated at the same brake pipe pressure used by the delivering road but not less than 90 PSI.

**b.** To avoid a potential overcharge, when handling cars that are to be attached to rear of another train and brake pipe pressure is not 15 PSI below that authorized for the train, the engineer must make a 35 PSI or greater reduction before detaching.

**3.** Yard service .....75 PSI

**4.** Communicating signal line .....50 PSI

**5.** Control valve safety valve .....60 PSI

## A-2. VERIFYING THE ACCURACY OF HAND-HELD GAUGES

**(a)** Train service personnel will have accessible while on duty a hand-held air gauge to determine the brake pipe pressure at the rear of a train. Use of the hand-held gauge is required in the absence of a caboose equipped with an air gauge or an End-Of-Train Device.

**(b)** The accuracy of the hand-held gauge must be verified at least 1 time every 90 days.

**(c)** Train service personnel will verify the accuracy of a hand-held gauge that has not been checked within the preceding 90 days by the following procedure:

**1.** Before departing from the reporting location, the employee in possession of the hand-held gauge will, after communicating with an employee at the locomotive controls, attach the gauge to train line of the leading end of the locomotive.

**2.** The employee will slowly open the angle cock, noting the air pressure reading on the gauge.

**3.** After the gauge has reached the maximum pressure reading, the employee making the test will communicate with the Engineer and compare the hand-held gauge reading with the locomotive brake pipe gauge reading at the locomotive control stand. The employee will note any variation and record as outlined in **Item (c) 5.**

**4.** After comparing the hand-held gauge reading, the employee making the test will close the angle cock and release the pressure on the gauge before disconnecting from the train line.

**5.** The employee in possession of the hand-held gauge will record the date the gauge was checked and the difference, if any, on one of the following in a timetable in his/her possession: 1) a page formatted to record this information, 2) a page marked “notes,” or 3) the inside back cover page.

**(d)** A hand-held gauge that varies from the locomotive brake pipe gauge reading by more than ±3 PSI must be exchanged for a gauge that is within the ±3 PSI tolerance.

**(e)** Hand-held gauges that have been physically damaged must be removed from service and replaced immediately.

**(f)** Replacement gauges may be obtained from the employees' immediate supervisor.

### A-3. COMMUNICATING SIGNAL SYSTEM — PASSENGER TRAINS

Communicating signal system on passenger trains, when equipped, must be tested and known to be in a suitable condition for service before leaving terminal.

### A-4. PERCENTAGE OF OPERATIVE AIR BRAKES

Each train must have the air brakes in effective operating condition, and at no time must the number of operative air brakes be less than 85%.

### A-5. CONDENSATION

Condensation must be blown from the pipe from which air is taken before connecting yard line or locomotive to train.

### A-6. CLASS I BRAKE TEST — INITIAL TERMINAL INSPECTION

Each train and each car in the train must be given an inspection and test by a qualified person at the following points:

**(a)** Where the train is originally assembled (Initial Terminal).

**(b)** Where the train consist is changed other than by:

**1.** Adding a single car or a solid block of cars.

**2.** Removing a single car or a solid block of cars.

**3.** Removing a "bad order(s)" car(s).

**4.** A combination of the changes listed in **Items 1.** through **3.**

**NOTE:** Except as provided in the Class II brake test provision, each car or solid block of cars that has not received a Class I brake test or has been off air for more than 4 hours must receive a Class I brake test when added to a train. A Class III Train Line Continuity Inspection must then be performed on the train.

**(c)** Where a train is off air for a period of more than 4 hours.

**(d)** Where a unit or cycle train has traveled 3,000 miles since its last Class I brake test.

**(e)** Where a consist is received in interchange, if the train consist is changed other than by:

**1.** Removing a car or solid block of cars from the train.

**2.** Adding a previously tested car or solid block of cars to the train.

**3.** Changing the locomotives.

**4.** Removing or changing the caboose.

**5.** Any combination of changes listed in **Items 1.** through **4.**

If changes other than those contained in **Items 1.** through **5.** are made to the train consist when it is received in interchange and the train will move 20 miles or less, a Class II brake test may be performed on those cars added to the train.

**(f)** Where a solid block of cars comprised of cars from only 1 previous train is added to another train, the cars must remain continuously and consecutively coupled together. The train line must remain connected except for removing defective equipment or when necessary to separate into multiple solid blocks due to track constraints. The solid block of cars must have previously received a Class I brake test and must not have been off air for more than 4 hours.

Multiple solid blocks of cars must be added to a train in the same relative order as when removed from the previous train except for the removal of defective equipment.

**(g)** Train air brake system must be charged to the required air pressure, angle cocks and cut out cocks must be properly positioned, air hoses must be properly coupled and must be in condition for service. An examination must be made for leaks and necessary repairs made to reduce leakage to a minimum. Retaining valves and retaining valve pipes must be inspected and known to be in condition for service.

**(h)** Train air brake system must be charged to the pressure at which the train will be operated, and the pressure at the rear of the train must be within 15 PSI of the regulating valve setting, but not less than 75 PSI, as indicated by a gauge or End-Of-Train Device at the rear of the train. **NOTE:** When using yard air supply, brake pipe pressure at rear of train must be at least 60 PSI for a freight train and not less than 70 PSI for a passenger train.

**(i)** The brakes on each car must apply in response to a 20 PSI brake pipe service reduction and must remain applied until a release of the air brakes has been initiated from the controlling locomotive or yard test device. The brakes must not be applied or released until the proper signal is given. A car found with brakes that fail to apply or remain applied may be retested and remain in the train if

the retest is conducted at an air pressure that is within 15 PSI of the pressure in which the train will be operated. The retest may be conducted from either the controlling locomotive, at the head end of the consist, or from a suitable test device positioned at the car(s) being retested. The brakes must remain applied until a release is initiated after a period that is not less than 3 minutes. If the retest is performed at the car(s) being retested with a suitable device, the compressed air in the car(s) must be depleted prior to disconnecting the hoses between the car(s) to perform the retest.

**(j)** An Air Flow Method (AFM) test as prescribed in **Rule A-6-1** or a Brake Pipe Leakage test as prescribed in **Rule A-6-2** must be performed. Each side of each car must be inspected to determine that:

**1.** Angle cocks and cut out cocks are properly positioned.

**2.** Brakes are applied on each car.

**3.** Piston travel is observed to be correct.

Correct piston travel:

- for cars equipped with 8-1/2 inch or 10 inch diameter brake cylinders, piston travel must be within 6 to 9 inches. (Per FRA waiver) If piston travel is less than 6 inches or more than 9 inches, adjust to 7-1/2 inches
- for cars not equipped with 8-1/2 inch or 10 inch diameter brake cylinders, piston travel must be within the limits indicated on stencil, sticker, decal or badge plate
- for truck-mounted brake cylinders, the minimum brake cylinder piston travel must be sufficient to provide proper brake shoe clearance

**4.** Brake rigging does not bind or foul and that all parts of the air brake equipment are properly secured.

**NOTE: The inspector must take a position on each side of each car at sometime during the inspection to be able to examine and observe the functioning of all moving parts of the brake system on each car.**

**(k)** Before proceeding, it must be known that the brake pipe pressure as indicated at the rear car of the train is being restored.

**NOTE:** When the controlling locomotive or yard test device initiates a release, the brakes on each freight car must be inspected to verify the release. This may be performed by a "roll-by" inspection. When a "roll-by" inspection of the brake release is performed, train speed must not exceed 10 MPH. The successful completion of the release portion of the brake test must be noted by the Operator of the train and made part of the required record that the brake test was successfully performed.

**(l)** The Engineer must be notified that the Class I brake test was satisfactorily performed. A written or electronic record of the information must be retained in the cab of the controlling locomotive until the train reaches its destination. The record must contain the date, time, number of freight cars inspected, the name of the person(s) performing the tests, and the location where the Class I brake test was performed.

### A-6-1. AIR FLOW METHOD TEST (AFM)

The Air Flow Method Train Brake test must be used on trains when the controlling locomotive is equipped with an operative:

**(a)** Self-lapping, pressure maintaining locomotive brake equipment;

**(b)** Air flow indicator;

**1.** The AFM test will be conducted as follows:

**a.** Observe brake pipe flow indicator and note that the indicator is at or below 60 CFM.

**b.** Make a 20 PSI brake pipe service reduction after receiving the proper signal. (Do not cut out brake valve cut out cock.) Employees assisting the test will observe the car or cars of the train for the application of the brakes as required by the type of test being performed. After the proper signal, the Engineer will release the brakes and each brake will be inspected to see that all have released. Train may proceed upon indication that brakes have released, air pressure is increasing and air flow is decreasing.

**2.** If at any time the air flow indicator becomes inoperative, the Engineer will revert to a brake pipe leakage test as prescribed in **Rule A-6-2**.

## A-6-2. BRAKE PIPE LEAKAGE TEST

**(a)** When signal is given to apply brakes for test, a 20 PSI brake pipe service reduction must be made. After the service exhaust stops blowing, the brake valve must be lapped or cut out; then, allow 1 minute to permit pressure equalization. During the second minute, the brake pipe gauge must be observed to note that leakage does not exceed 5 PSI.

**(b)** When the leakage test has been completed, the brake pipe cut out must remain in the cut out position during the inspection of the application.

**(c)** When the inspection has been completed:

**1.** Move cut out cock to IN position.

**2.** Release brakes. Each brake must be inspected to see that all have released.

## A-7. NOTIFICATION OF A CLASS I BRAKE TEST

When a train has been precharged and pretested, a qualified person participating in the test and inspection or who has knowledge the test was made must notify the Engineer that the Class I brake test was satisfactorily performed.

A written or electronic record of the information must be retained in the cab of the controlling locomotive until the train reaches its destination. The record must contain the date, time, number of freight cars inspected, the name of the person(s) performing the test, and the location where the Class I brake test was performed.

## A-8. CLASS IA BRAKE TEST — 1,000 MILE INSPECTION

When the crew is changed one or more times with no change in the train consist, locomotive consist, or caboose, no intermediate air brake tests are required.

Except as provided in the extended haul brake test provision, each train will receive a Class IA brake test by a qualified person at a location that is not more than 1,000 miles from the point where any car in the train last received a Class I or Class IA brake test. The most restrictive car or block of cars in the train will determine the location of the test.

When a train will be operated in excess of 1,000 miles, inspection of the train must be made within limits not to exceed 1,000 miles to determine that:

**(a)** Air flow does not exceed 60 CFM or brake pipe leakage does not exceed 5 PSI per minute.

The air brake system must be charged to the pressure at which the train will be operated. The pressure at the rear of the train must be within 15 PSI of regulating valve setting, but not less than 75 PSI, as indicated by a rear car gauge device. Tests of air brakes must be made on the entire train.

**(b)** Brakes apply on each car from a 20 PSI brake pipe service reduction and remain applied on each car until the release signal is given. Any car whose brakes release prior to the signal being given to release the brakes may be retested and a determination made that the brakes will remain applied until a release is initiated for a period of no less than 3 minutes. **NOTE:** If the brakes fail to remain applied when retested, the defective car may be moved only in accordance with **Rule C-113.**

**(c)** Brake rigging is properly secured and does not bind or foul. All parts of the brake equipment must be properly secured. **NOTE:** The inspector must take a position on each side of each car at sometime during the inspection to be able to examine and observe the functioning of all moving parts of the brake system on each car.

**(d)** All brakes have released, air pressure is increasing and air flow is decreasing. The release inspection may be made either while standing or as the train departs at a speed not exceeding 10 MPH to allow inspection of entire train.

When a train remains intact except for detachment of the locomotive and is not kept charged, and the total time between the relief of 1 crew and the taking charge of the train by another crew is 4 hours or less, **Rule A-9** or **Rule A-10**, as applicable, will govern. If the time exceeds 4 hours, the train must be tested as required by **Rule A-6** or **Rule A-11**, as applicable.

**A-9. CLASS II BRAKE TEST — INTERMEDIATE INSPECTION**

*Cancelled 11/28/17*

## A-10. CLASS III BRAKE TEST — TRAIN LINE CONTINUITY INSPECTION

**(a)** A Class III brake test must be performed on a train by a qualified person at the location where any of the following changes in the make-up of the train occurs:

**1.** Where a locomotive or a caboose is changed.

**2.** Where a car or block of cars is removed from the train with the consist otherwise remaining intact.

**3.** At a point other than the initial terminal for the train, where a solid block of cars that is comprised of cars from only 1 previous train is added to another train. The cars must remain continuously and consecutively coupled together with the train line remaining connected except for removing defective equipment or when necessary to separate into multiple solid blocks due to track constraints. The solid block of cars must have previously received a Class I brake test and must not have been off air for more than 4 hours.

Multiple solid blocks of cars must be added to a train in the same relative order as when removed from the previous train except for the removal of defective equipment.

**4.** At a point other than the initial terminal for the train, where a car or a solid block of cars has received a Class I or Class II brake test at that location, prior to being added to the train and has not been off air for more than 4 hours.

**5.** Whenever a car or block of cars, which have been pre-charged and pretested in accordance with **Rule A-6**, are added to a train at a terminal.

**(b)** A Class III brake test consists of the following requirements:

**1.** The train brake system will be charged to the pressure at which the train will be operated, and the pressure at the rear of the train must not be less than 60 PSI, as indicated at the rear of the train by an accurate gauge or End-Of-Train Device (EOTD).

**2.** The brakes on the rear car of the train must apply in response to a 20 PSI brake pipe service reduction and will remain applied until the release is initiated by the controlling locomotive.

**3.** When the release is initiated, the brakes on the rear car must be inspected to verify the release.

**4.** Before proceeding, it must be known that the brake pipe pressure at the rear is being restored.

**(c)** As an alternative to the rear car brake application and release portion of the test, it must be determined that the brake pipe pressure of the train is being reduced, as indicated by a rear car gauge or End-Of-Train Device, and the brake pipe pressure of the train is being restored, as indicated by the rear car gauge or End-Of-Train Device. If an electronic or radio communication link between a controlling locomotive and a remotely controlled locomotive coupled to the rear end of the train is utilized to determine that brake pipe pressure is being restored, the Operator of the train must know that the air brakes function as intended on the remotely controlled locomotives.

**(d)** When the continuity of the brake pipe is broken or interrupted and the train consist remains unchanged, it must be determined that the brake pipe pressure of the train is being restored as indicated by a rear car gauge or End-Of-Train Device prior to proceeding. In the absence of a rear car gauge or End-Of-Train Device, it must be determined that the brakes on the rear car of the train apply and release from the controlling locomotive.

## A-11. EXTENDED HAUL TRAINS AND TRANSFER TRAIN BRAKE TESTS

### A-11-1. EXTENDED HAUL TRAINS

**(a)** A train designated as an Extended Haul Train may be moved up to, but not exceeding, 1,500 miles between brake test and inspection.

**(b)** Trains designated as Extended Haul Trains are required to have the following:

**1.** A Class I brake test must be performed at the initial terminal for the train by a qualified mechanical inspector.

**2.** A freight car pre-departure inspection must be conducted by a qualified mechanical inspector.

3. All freight cars having a condition not in compliance with the above pre-departure inspection at the initial terminal for the train must be either repaired or removed from the train.
4. The train must have no more than 1 pickup and set out en route, except for the set out of defective equipment.
5. Cars added to the train en route must be inspected pursuant to **Items 1.** through **4.** of this section at the location where they are added to the train.

## A-11-2. TRANSFER TRAIN BRAKE TESTS

Transfer trains, not exceeding 20 miles, must have the air brake hoses coupled between all cars, and after the brake system is charged to not less than 60 PSI as indicated by a gauge at the rear, a 15 PSI brake pipe service reduction must be made. An inspection must be made by a qualified person to determine that the brakes on each car are applied and remain applied until the release is initiated from the controlling locomotive. A car found with brakes that fail to apply or remain applied may be retested and remain in the train if the retest is conducted as prescribed in **Rule A-6(i)**.

Cars added to transfer trains en route must be inspected pursuant to the requirements contained in this rule at the location where the cars are added to the train.

Transfer train movements exceeding 20 miles must have brake inspection in accordance with **Rule A-6**.

## A-12. PASSENGER TRAIN TEST

When the locomotive of a passenger train has been detached and is recoupled to the train, the following test must be performed:

Brake system must be recharged to required air pressure. Before proceeding and upon receipt of proper request or signal, application and release tests of brakes on rear car must be made using automatic brake valve on locomotive. It must be determined that brakes on rear car of train properly apply and release.

## A-13. YARD AIR SUPPLY

### (a) Brake Test from Yard Air Supply

The following instructions govern when a train air brake system is tested from a yard air supply:

1. The train's air brake system must be charged and tested according to the requirements of a Class I brake test.

2. An Engineer's brake valve, or a suitable test device must be used to provide an increase and a reduction of brake pipe pressure at the same or slower rate as an Engineer's brake valve.
3. Except where authorized by Special Instructions, the yard air test device must be connected to the end of the cars that will be nearest to the controlling locomotive.
4. Yard air pressure must be at a minimum 60 PSI at the end of the cars opposite from the yard test device and must be within 15 PSI of the regulator valve setting on the yard test device.
5. If the air pressure of the yard test device is less than 80 PSI, then an air flow or brake pipe leakage test must be conducted at the operating pressure of the train when the locomotives are attached.

**(b) After the Brake Test is Completed**

1. When practicable, the cars should be kept charged until the locomotive consist is coupled. After coupling, a Class III brake test must be performed.
2. Cars that are off air for more than 4 hours must be retested in accordance with the requirements of a Class I brake test.

**(c) Removing the Yard Air Supply**

When the yard air supply is removed and the equipment will be left:

**Unattended** – Brake pipe pressure must be reduced to zero (0) PSI at no less than a service rate. Once the yard air supply has been removed at least 1 end angle cock must remain open. The cars must be properly secured.

**Attended** – If the outbound crew is physically present to couple directly to the cars the brake pipe may remain charged by closing the angle cock prior to removing the yard air supply. The handbrakes must not be released until after the locomotives are coupled.

After coupling and properly connecting the end hoses, the angle cock must be opened and a Class III brake test performed.

## A-14. TOTAL LEAKAGE AMOUNT

When a train is made up of two or more cuts and a leakage test is required, the highest leakage value noted for the given cut will determine the total leakage for the complete train when assembled. Amount of leakage noted for each of the cuts is not to be added together for determining total train brake pipe leakage. Maximum leakage permitted is 5 PSI per minute measured during the second minute of a prescribed leakage test.

## A-16. BRAKE PIPE

The position of the indicator pointer or the integrated display should be noted at the time of departure. Any increase indicates a greater air flow into the brake pipe.

During train operation, if air flow does not return to the limits established in the initial terminal air brake test (60 CFM or less) within a reasonable time or the 15 PSI brake pipe gradient cannot be maintained, the train crew will notify the Train Dispatcher and will arrange to inspect the train for leaks.

## A-17. GENERAL INSPECTION OF TRAINS ON ARRIVAL

At points where inspectors are employed to make a general inspection of train upon arrival at terminals, visual inspection must be made of retaining valves and retaining valve pipes, release valves and rods, brake rigging, safety supports, hand brakes, hose and position of angle cocks and make necessary repairs or mark for repair tracks any cars to which yard repairs cannot be promptly made.

## A-19. BRAKE RELEASE TIME

Except when it is known that the brakes have released, before any attempt is made to start a train, sufficient time must be allowed for the air brakes to release on the entire train. Average release time for a freight train if the brakes have been previously applied in full service application is:

2 minutes for 100 cars

4 minutes for 150 cars

6 minutes for 200 cars

*Add 2 minutes to these times if brakes have been applied in emergency.*

These times reflect only average times required for brakes to release and do not indicate train line charging.

## A-20. RUNNING BRAKE TEST

**(a) Passenger Trains** — When locomotive, engine crew or train crew has been changed, angle cocks have been closed except for cutting off one or more cars from the rear end of train, running test of train air brakes on a PASSENGER TRAIN must be made as soon as speed of train permits by use of automatic brake. Power must not be shut off unless required and running test must be made by applying train air brakes with sufficient force to determine whether or not brakes are operating properly. If air brakes do not operate properly, train must be stopped, cause determined and corrected and running test repeated.

**(b) Freight Trains** — During inclement weather conditions which may cause snow or ice build up to occur between brake shoes and wheels, periodic running tests must be performed to ensure proper braking effort is being provided.

When snow is up to or above the top of the rail and trains are approaching heavy descending grades, meeting or waiting points, or has received a signal indication requiring the train to approach a location prepared to stop, the Engineer must make an automatic brake application sufficiently in advance of the location to determine that brakes are working properly.

If brakes do not provide sufficient braking effort, the train must be stopped by a full service brake application with dynamic brake fully applied. (If, in any crewmember's judgment, circumstances require an emergency brake application, this is to be done without hesitation). After stop is made, train will be inspected to determine that brake shoes are free of snow and ice buildup before proceeding. Additional running tests on freight trains may be required as specified in Timetable Special Instructions.

## A-21. LOCOMOTIVE BRAKES

**(a)** Engineers must prevent pressure building up in the locomotive brake cylinders to the extent of sliding the wheels.

With a locomotive consist, to assure complete release of all locomotive brakes with automatic brake applied while in power or in dynamic braking, after each air brake application, the independent brake handle must be depressed frequently and held at least 4 seconds for each locomotive in the consist and until brake pipe exhaust ceases.

**(b)** Norfolk Southern locomotives having CLASP TYPE RIGGING with composition brake shoes can be identified by stenciling on the side sill reading "2 IN COMP BRAKE SHOES," and by stenciling inside the cab reading "FULL SERVICE 23 PSI." When standing or at speeds up to 10 MPH, the independent brake provides normal braking ability. At speeds in excess of 10 MPH, extreme caution must be used when applying independent brake and brake cylinder pressure must not be permitted to exceed 25 PSI.

## A-22. PENALTY AND SERVICE BRAKE APPLICATIONS

If a penalty brake application or an automatic service brake application from the train occurs while in dynamic braking, the independent brake must be bailed off to prevent excessive braking forces or sliding locomotive wheels. When train speed reduces to the point where the dynamic brake is no longer effective, the independent brake should be applied to a safe level to prevent train slack from running out as the train comes to a stop. Care must be taken to prevent excessive braking forces and to prevent locomotive wheels from sliding.

If operating light locomotive(s) and a penalty brake application or an automatic service brake application from the locomotive consist occurs while in dynamic braking, the independent brake may be used to bring the locomotive(s) to a safe stop. The Engineer must be aware that when using the independent brake and brake cylinder pressure is 15 pounds or greater, extended range dynamic braking is nullified thus reducing effective dynamic braking force at low speeds. Care must be taken to prevent locomotive wheels from sliding.

## A-23. EMERGENCY BRAKE APPLICATION

When the speed of train cannot be controlled properly from use of the dynamic and/or service brake application, an emergency brake application must be initiated without hesitation. **NOTE:** Any train descending a grade of 1% or greater over a distance of 3 continuous miles must be immediately brought to a stop by an emergency brake application, if necessary, when the movement exceeds the maximum authorized speed at that location by more than 5 MPH.

If an emergency brake application is initiated from the automatic brake valve or emergency brake valve in the Operator's cab of a locomotive, the two-way EOTD, if so equipped, will be activated to initiate an emergency brake application from the rear.

A running release must not be made after an emergency brake application. When the PC switch activates following an emergency application, the automatic brake valve must be placed in emergency position and left in that position until the train stops.

When employees are positioned at the rear of a moving train and radio communication is available, the Engineer in control of the train must be notified immediately when the air brakes are applied:

- in emergency from the rear end of the train
- due to an emergency brake application

When so notified, the Engineer in control of the train must immediately place the automatic brake valve in the emergency position.

When an emergency brake application occurs, the locomotive brake(s) must be bailed off if the locomotive(s) is in “power throttle” to prevent jackknifing the train.

If an emergency brake application occurs while in dynamic braking, the independent brake must be bailed off to prevent excessive braking forces or sliding locomotive wheels. When train speed reduces to the point where the dynamic brake is no longer effective, the independent brake should be applied to a safe level to prevent train slack from running out as the train comes to a stop. Care must be taken to prevent excessive braking forces and to prevent locomotive wheels from sliding.

If operating light locomotive(s) and an emergency brake application occurs while in dynamic braking, the independent brake may be used to bring the locomotive(s) to a safe stop. The Engineer must be aware that when using the independent brake and brake cylinder pressure is 15 pounds or greater, extended range dynamic braking is nullified thus reducing effective dynamic braking force at low speeds. Care must be taken to prevent locomotive wheels from sliding.

## A-24. BACKUP VALVE/HOSE — TEST

At points where backup valve or backup hose is to be used, brakes must be tested before starting movement by applying the brakes with the backup valve or backup hose, after which the brakes will be placed in emergency from the backup valve or backup hose before being released from the locomotive.

## A-25. CONDUCTOR VALVES/BACKUP HOSES

Conductor valves, backup valves and backup hoses must be used only when necessary to stop a train or cut of cars from the end opposite the locomotive. When used, except in case of emergency, the valve handle must be partially moved to set the brakes in service and then quickly moved to full open position and left there until a stop is made.

In case of emergency, the valve handle must be promptly moved to full open position and left in this position until a stop is made.

Unnecessary use of whistle on caboose platforms is prohibited as this may cause a brake application.

## A-26. RETAINING VALVES

Where the timetable or special instructions require the use of retaining valves, it must be known that they are in the proper position.

The handle positions are designated by raised letters on the retaining valve body as follows:

EX — Exhaust — Vertical downward (normal exhaust, non-retain)

HP — High Pressure — 45° below horizontal (retain 20 PSI)

SD — Slow Direct Exhaust — 45° above horizontal
(slow exhaust, non-retain )

## A-27. CUTTING OUT BRAKE

A brake must not be cut out unless defective, and when cut out, the proper authority must be notified. The brake must not be cut out on more than 2 consecutive cars, and the brake on the car next to the locomotive and on the rear car must be cut in and operative. **NOTE:** Multi-unit articulated cars such as spine and container cars are equipped with a multiple brake system. Concerning the application of this rule, each individual brake system is considered to be 1 car.

On articulated cars equipped with more than 1 control valve, 2 consecutive control valves must not be cut out. If 2 consecutive individual control valves on 1 car are inoperative, the car must be set out. Also, if an end control valve on an articulated car must be cut out, it must not be coupled to an adjacent car with the control valve cut out.

## A-28. PASSENGER CAR AIR BRAKES

**(a)** Employees must not cut a brake out unless the brake is defective.

**(b)** The Conductor will notify the Chief Train Dispatcher if the brakes are cut out on a passenger car after leaving a terminal.

**(c)** Passenger cars with the brakes cut out must not be:

**1.** Handled next to the locomotive.

**2.** Handled as the rear car of the train.

**3.** Added to a passenger train.

**(d)** A passenger train MUST NOT have 2 consecutive cars with the brakes cut out.

**(e)** A passenger car with the brakes cut out must be repaired or removed from the train at the next forward point equipped for the repair of passenger cars.

**(f)** The air brake control valves on passenger cars will be positioned for direct release of the brakes. Commuter passenger trains and passenger trains operated by Amtrak may operate with the release feature set for graduated release where provided for in the operating company's instructions.

## A-29. ADJUSTING PISTON TRAVEL OR WORKING ON BRAKE RIGGING

Before adjusting piston travel or working on brake rigging, cut out cock in brake pipe branch must be closed and air reservoirs must be drained. When cut out cocks are provided in brake cylinder pipes, these cut out cocks only may be closed and air reservoirs need not be drained.

## A-30. BRAKE CYLINDER RELEASE VALVE

Brake cylinder release valve or "bleed cock" on freight cars must not be blocked open. The rod must not be bent to hold valve open. In releasing "ABD" type air brakes, the release valve needs to be opened only for a few seconds. If held open too long, it will reduce brake pipe pressure in a train and apply the brakes.

Air bleeders or other employees must not cut out air brakes on locomotive trucks when bleeding air on trains in yards.

**A-31. END-OF-TRAIN DEVICE**

**(a) Requirements for Two-Way End-Of-Train Devices (EOTDs)**

**1.** An EOTD is required for:

**a.** All freight trains operating at speeds greater than 30 MPH.

**b.** Freight trains operating with 4,000 trailing tons or less over a section of track with an average grade of 2% or greater over a distance of 2 continuous miles.

**c.** Freight trains operating with greater than 4,000 trailing tons over a section of track with an average grade of 1% or greater over a distance of 3 continuous miles.

**d.** Freight trains (includes locals) handling 20 or more tank car loads of crude oil.

**2.** The following freight trains are not required to have an EOTD:

**a.** Trains with a locomotive consist at the rear of the train that is capable of making an emergency brake application either through a two-way device or by a crewmember in radio contact with the controlling locomotive.

**b.** Trains with an operational caboose equipped with an emergency brake valve. The caboose must be placed at the rear of the train and must be occupied with one or more crewmembers who are in radio contact with the controlling locomotive.

**c.** Local trains that:

- Perform switching enroute, and
- Operate with 4,000 trailing tons or less, and
- Do not operate over a section of track with an average grade of 2% or greater over a distance of 2 continuous miles.

  **NOTE:** EOTD requirement remains for locals handling 20 or more tank car loads of crude oil.

**d.** Work trains that:

- Operate with 4,000 trailing tons or less, and
- Do not operate over a section of track with an average grade of 2% or greater over a distance of 2 continuous miles.

**e.** Trains that must be divided into 2 sections in order to traverse a grade (e.g., doubling a hill). This exception applies only to the extent necessary to traverse the grade and only while the train is divided in 2 for such purpose.

**(b) Operational Status for Trains Using EOTDs**

The EOTD must be armed and operable from the lead and controlling locomotive from the time the train departs the point where a device was installed until the train reaches its destination.

**(c) Inspection and Testing of EOTDs**

**1.** The Engineer must determine that the identification code entered into the HOTD is identical to the unique identification code on the EOTD before the train departs.

**2.** The Engineer must compare the air pressure displayed on the HOTD with the air pressure displayed on the EOTD before the train departs. The EOTD must not be used if the difference between the 2 readings exceeds 3 PSI.

**3.** The EOTD must be tested at the initial terminal or other point of installation to ensure that the device can initiate an emergency brake application from the rear end of the train.

**4.** If the test of an EOTD is conducted by a person other than a member of the train crew, the Engineer must be notified that the test was performed. A written or electronic record of the notification must be maintained in the cab of the controlling locomotive and will include the date and time of the test, the location where the test was performed, and the name of the person conducting the test. The requirements set forth above must be recorded on Form 1043-BT.

**(d) Train Air Brake Tests**

**1.** The air-powered EOTD must be properly installed and operable before performing the Air Flow Method (AFM) pre-departure brake test.

**2.** Brake pipe flow indicator must remain at or below 60 CFM while performing the AFM test.

**(e) Use of the End-Of-Train Device to Ensure Continuous Train Line Pressure when Trains Stop**

**1.** The Engineer will make a brake pipe reduction sufficient to hold the train, minimum 10 PSI.

**2.** Determine that the train line pressure is reducing as indicated on the HOTD.

**3.** When the train is ready to proceed, release brakes and determine that the brake pipe pressure is increasing by indication on the HOTD display.

**4.** After the train starts, observe for an end-of-train unit signal loss or pressure reduction of 5 PSI or more on the HOTD display.

**(f) Cutting Away**

When cutting away from a train, the Engineer will observe the HOTD to ensure that brake pipe pressure on the rear car is reduced to zero (0) PSI to determine that an angle cock is not closed on the portion of train to be left standing. If zero (0) pressure is not displayed by the HOTD after locomotive is detached, the Engineer must immediately arrange to have the portion of the train left standing inspected for improperly positioned angle cock(s).

**(g) Helper Locomotives**

Helper locomotives coupled ahead of the original hauling consist are not required to be armed to the train's EOTD provided employees on the helper locomotives establish and maintain two-way voice radio contact with employees on the original hauling consist. Employees must confirm radio contact before train resumes operation or reaches crest of grade. If radio contact is lost, the train must be stopped. If radio contact cannot be maintained, the helper locomotive must be armed to the train's EOTD and tested to ensure an emergency function can be initiated before proceeding.

**(h) Removal, Handling, Use and Transport of EOTDs**

**1.** Trains Arriving at Terminals and Yards:

**a.** When a train arrives at its final terminal, the EOTD must be removed and stored within 4 hours. **NOTE:** The EOTD may be left in place for 8 hours if that portion of the train will continue through on an outbound train.

**b.** When a train terminates in forwarding, receiving or classification yards, the appropriate Transportation

Department supervisor will coordinate with the Mechanical Department for the timely removal and storage of the device.

**c.** Upon removal of an EOTD, the device will be placed on the appropriate storage rack within the designated storage area. The employee placing the EOTD on the storage rack will promptly report the EOTD's initial and number to the Mechanical Department or to the designated transportation supervisor.

**d.** When a Mechanical or Transportation Department employee observes an unassigned EOTD within the terminal or yard, the employee must immediately notify either the mechanical or appropriate transportation authority who will arrange for the EOTD to be delivered to the designated storage area within 4 hours.

**2.** Handling, Use, and Transportation

**a.** The use of multiple EOTDs to facilitate either yarding or making set outs or pickups, is prohibited.

**b.** An EOTD will not be stored in or on a:

- Locomotive operating compartment, engine room, running board, or walkways
- Building where access to the device may be restricted.
- Vehicle.

**c.** An EOTD, if properly mounted or secured, may be transported on or by a:

- Coupler
- Bracket specifically designed for EOTDs.
- Vehicle.

**3.** At locations where Transportation or Mechanical Department personnel are not assigned, the inbound Conductor is responsible for the proper handling of the EOTD.

**(i) Failure of an EOTD**

**1.** The Engineer will promptly report any EOTD malfunction to the Train Dispatcher.

**2.** If a loss of communication occurs at the location where the device is installed, the train may depart the location at Restricted Speed for a distance of no more than 1 mile in order to establish communication. When communication is established, the Engineer must compare the air pressure displayed on the HOTD with the air pressure displayed on the EOTD before the train

departs. The EOTD must not be used if the difference between the 2 readings exceeds 3 PSI. The device must be tested unless the test was performed prior to installation.

**3.** If EOTD signal is lost or a loss of brake pipe pressure of 5 PSI or more is observed on the HOTD display, the Engineer or train crew will:

**a.** Inspect the train to ensure continuous train line pressure through the rear car, and

**b.** Determine that the EOTD is in place.

**EXCEPTION:** Inspection is not necessary for freight trains if EOTD or HOTD fails, and:

- The train is a Triple Crown train operating in any type of territory, or
- The train is operating in 251, 261, or 271 Main Track, on a signaled siding, or on a yard track.

**(j) Freight Train Operations with a Failed EOTD**

**1.** Train speed must not exceed 30 MPH if an EOTD fails enroute.

**2.** The train must not operate over a section of track with an average grade of 2% or greater over a distance of 2 continuous miles, unless one of the following alternative measures is provided:

**a.** The Engineer on the head end of the train must initiate and maintain two-way voice radio communication with the helper locomotive Engineer or a train service employee in the caboose; this contact must be verified just before the head end passes the crest of the grade.

**b.** The brake pipe of the helper must be connected and cut into the train line or the caboose must have a functioning brake valve capable of initiating an emergency brake application from the caboose.

**NOTE:** As an alternative, a radio-controlled locomotive at the rear of the train under continuous control of the Engineer on the head end but only if such radio- controlled locomotive is capable of initiating an emergency application on command from the controlling locomotive.

**c.** If there is a loss of communication with the helper locomotive or caboose before descending the grade, the head end Engineer and helper Engineer or a train service employee in the caboose

must immediately take action to stop the train until they resume voice communication, if this can be done safely.

**d.** If there is a loss of communication once the train has begun descending the grade, the helper locomotive Engineer or a train service employee in the caboose and the head end Engineer must act to stop the train if the speed cannot be controlled properly.

**NOTE:** If an EOTD fails while the train is operating over a section of track with an average grade of 2% or greater for a distance of 2 continuous miles, the train must be brought safely to a stop at the first available location in accordance with the rules. *Revised 9/29/17*

## A-32. TABLE OF MAXIMUM RECOMMENDED TRAIN LENGTH — COLD WEATHER

When the ambient temperature is 34°F or less, recommended train lengths are indicated below:

**TRAINS WITH HEAD END BRAKE PIPE SUPPLY ONLY**

| Ambient Temp. °F | Feet |
|---|---|
| 32° to 34° | 10 ,000 feet |
| 29° to 31° | 9,250 feet |
| 26° to 28° | 8,750 feet |
| 20° to 25° | 8,000 feet |
| 15° to 19° | 7,500 feet |
| 10° to 14° | 7,000 feet |
| 5° to 9° | 6,500 feet |
| 0° to 4° | 6,000 feet |
| -1° to -5° | 5,500 feet |
| -6° to -10° | 5,000 feet |
| -11° to -15° | 4,500 feet |
| -16° to -25° | 4,000 feet |

## A-34. NOTIFICATION CONCERNING THE TRAIN BRAKE SYSTEM

Each crew taking charge of a train must be informed of and maintain a written or electronic record in the cab of the controlling locomotive of the following information:

**(a)** The total weight and length of the train, based on available information.

**(b)** Any special weight distribution that would require special train handling procedures.

**(c)** The number and location of cars with cut out or otherwise inoperative brakes and the location where repairs will be made.

**(d)** If a Class I or Class IA brake test is required prior to the next crew change point, the location where the test will be performed.

**(e)** Any train brake system problems encountered by the previous crew of the train.

## A-35. AIR BRAKE AND AIR SIGNAL EQUIPMENT

Supervisors are jointly responsible with inspectors, Engineers and Trainmen for condition of air brake and air signal equipment on locomotives and cars to the extent that it is possible to detect defective equipment by required air tests.

Engineers must render necessary assistance in testing air brake or air signal appliances and be assured that they function properly.

# CARS

## C-100. FREIGHT CAR INSPECTION

At each location where freight cars are added to a train which have not been inspected at that point, in addition to making required air brake test, the car(s) must be inspected by the train crew for the following conditions:

**(a)** Carbody

- **1.** Leaning or listing to side.
- **2.** Sagging downward.
- **3.** Positioned improperly on truck.
- **4.** Object dragging below.
- **5.** Object extending from side.
- **6.** Door insecurely attached.
- **7.** Broken or missing safety appliance.
- **8.** Lading leaking from a placarded hazardous material car.

**(b)** Insecure coupling.

**(c)** Overheated wheel or journal.

**(d)** Broken or cracked wheel.

**(e)** Brake that fails to release.

**(f)** Any other apparent safety hazard likely to cause an accident or casualty before the train arrives at its destination.

When performing inspection of freight cars in compliance with this rule, the train crewmember(s) must inspect both sides. If an inspection cannot be safely made of both sides of the equipment because of terrain, a one-side inspection is acceptable. The train may be moved to the nearest available location where the necessary inspection of the opposite side can be performed.

This inspection MUST NOT be performed while the freight cars being inspected are moving.

**NOTE:** Employees must not make a **Rule C-100** inspection while riding on a locomotive, freight car, caboose or other On-Track equipment.

## C-101. PASSENGER CONDUCTORS AND TRAINMEN

Passenger Conductors and Trainmen will familiarize themselves with passenger car equipment to assure passengers' safety and comfort.

They must have a thorough knowledge of the various valves and controls operating the air brakes, communicating air signal, lighting and air conditioning system.

They must know the location of Conductor's emergency valve, air signal valve, and the method of cutting out brake equipment on passenger train cars.

Trainmen will preserve, as far as possible, a uniform comfortable temperature throughout each car.

## C-102. EQUIPMENT LEFT UNATTENDED

Air brakes must never be depended upon to hold unattended standing equipment.

When equipment is left unattended, the following procedure must be performed to determine that the applied hand brakes will secure the equipment with the air brakes released.

Prior to leaving the equipment unattended, all crewmembers must have verbal communication to confirm that the equipment has been properly secured."

**EXCEPTION:** Division or Terminal instructions will govern where it has been verified that the required number of operative hand brakes will secure the equipment with the air brakes released. NOTE: This provision does not apply to Key Trains or cars meeting the definition of a Key train. When securing Key Trains or cars meeting the definition of a Key Train, a test must always be performed to determine the applied hand brakes will secure the equipment with the air brakes released.

**(a)** Securing unattended cars with locomotives detached:

**1.** When cars are left unattended, at least 1 end angle cock must remain open to ensure that an undesired brake release does not occur.

**2.** Make a brake pipe reduction sufficient to hold the equipment if the cars are being handled with operative air brakes.

**3.** Apply sufficient number of hand brakes to secure the cars left standing.

**4.** Test the effectiveness of the hand brakes on the cars left standing:

**a.** On a grade descending AWAY from the location where the train separation will be made, or on level grade:

**(1)** Release the automatic brake, if applicable, and locomotive brakes and advance throttle, if necessary, to slowly bunch or push the slack in at the coupler where the uncoupling is to be made.

**(2)** Apply the locomotive brakes when slack has been observed bunched.

**(3)** Observe the car(s) to be left standing for 1 minute to determine that the slack does not pull out or stretch indicating that the hand brake(s) is effective and the car(s) will remain secured.

**b.** On a grade descending TOWARDS the location where the train separation will be made:

**(1)** Release the automatic brake, if applicable, and advance throttle, if necessary, to slowly stretch or pull the slack out at the coupler where the uncoupling is to be made.

**(2)** Apply the locomotive brakes when slack has been observed stretched.

**(3)** Observe the car(s) to be left standing for 1 minute to determine that the slack does not push in or bunch indicating that the hand brake(s) are effective and the car(s) will remain secured.

**c.** When grade or tonnage will not permit releasing the automatic brake, after stopping with the slack positioned as required:

**(1)** Close the angle cock in front of the cars to be left standing.

**(2)** Bleed the brake system on the cars behind the closed angle cock.

**(3)** Observe the car(s) to be left standing for 1 minute to determine that the slack does not adjust indicating that the hand brake(s) are effective and the car(s) will remain secured.

**d.** When grade or tonnage will not permit releasing the automatic brake, after stopping and unable to position the slack as required:

**(1)** Sufficient hand brakes must be applied on the cars that will NOT be left standing to permit the release of the automatic brake to adjust the slack as required.

**(2)** Apply the locomotive brakes when slack has been observed adjusted as required.

**(3)** Observe the car(s) to be left standing for 1 minute to determine that the slack does not adjust with the grade, indicating that the hand brake(s) is effective and the car(s) will remain secured.

**5.** After determination is made that the hand brakes are effective, the equipment may be uncoupled from the cars to be left standing.

**6.** When grade and tonnage conditions permit, Engineers will reduce brake pipe pressure to 20 PSI above zero (0) with the automatic brake before locomotive is cut off or any angle cock is turned, when:

**a.** Trains or cuts of cars being handled with operative air brakes arrive at a terminal where facilities are available and instructions provide for immediate brake inspection.

**b.** Locomotive is to be detached from any train when the temperature is below 32°F.

**(b)** Securing unattended cars with locomotives attached.

When cars are left unattended with locomotives attached:

**1.** Make a brake pipe reduction sufficient to hold the equipment if the cars are being handled with operative air brakes.

**2.** Apply sufficient number of hand brakes to secure the cars left standing. All locomotive parking brakes must remain in the off or unapplied position until the completion of the testing.

**3.** Release the automatic brake, if applicable, and allow the train slack to adjust.

**4.** Gradually release the Independent brake allowing slack between locomotives and cars to adjust according to grade conditions.

**5.** After the slack has fully adjusted, observe the equipment for 1 minute to determine that there is no movement indicating that

the hand brakes are effective and the equipment will remain secured.

**6.** After determination is made that the hand brakes are effective, the independent and automatic brakes must be fully applied and all locomotives properly secured.

**EXCEPTION:** If there are an equal number or more locomotives than cars in the equipment to be tested, or if locomotive tonnage is greater than train tonnage where hand brakes on cars will not hold the entire consist, after applying a sufficient number of hand brakes to hold the cars the instructions in part (c) "Securing unattended locomotives without cars attached" will govern the test.

**(c)** Securing unattended locomotives without cars attached.

Before locomotives are left unattended on any track the effectiveness of the parking brakes must be tested as follows:

**1.** Apply the parking brake on each locomotive.

**2.** Place the Independent and the Automatic brakes in the RELEASE position. The locomotive consist must remain stationary for 10 seconds.

**3.** Place throttle in the No. 1 power position or higher, if necessary, until movement occurs. **NOTE:** If the locomotive(s) is standing on a grade, the movement must be in a descending direction.

**4.** Place the throttle in IDLE when the locomotive consist begins to move. Locomotive consist must stop within 25 feet.

If the locomotive consist:

- stops within 25 feet, reapply the Independent and the Automatic brakes (Consider the parking brake(s) effective)
- does NOT Stop within 25 feet, place the Independent brake in FULL APPLICATION.

If the locomotive consist does not:

- stand for the required 10 seconds
- stop within 25 feet

immediately notify the Chief Train Dispatcher and arrange for an alternate means of securement or a different location to leave the locomotive consist.

**(d)** Securing unattended Triple Crown trains (with locomotives attached):

**1.** Apply the parking brake on each locomotive.

**2.** Place the Independent and Automatic brakes in the RELEASE position, allowing slack to adjust according to grade conditions.

**3.** After the slack has fully adjusted, observe the equipment for 1 minute to determine that there is no movement, indicating that the locomotive parking brakes are effective and the equipment will remain secured.

**4.** If the equipment remains stationary, consider the locomotive parking brakes effective to secure the equipment left standing.

**5.** Fully apply the independent brake and make a full service automatic brake pipe reduction.

**6.** If the equipment does not remain stationary, immediately notify the Chief Train Dispatcher and arrange for an alternate means of securement or a different location to leave the train.

*Added 7/17/15*

## C-103. HAND BRAKE RELEASE

Conductors and Trainmen, while checking train at initial terminal or along line-of-road, will see that all hand brakes are released.

**NOTE:** When inspecting cars, if painted hand brake chain links are not visible, then it must be determined if the hand brake is released. Painted links hidden from view is not an indication of a fully applied hand brake.

Hand brakes must be released before cars are moved unless necessary to control movement. When handling cars with air, the hand brakes must not be released until it is known that the air brake system is properly charged.

## C-104. END OF CAR HAND BRAKE

A number of jumbo tank, covered hopper, high cube and multi-level cars are equipped with hand brakes which are coupled only to the truck on the end at which the hand brake wheel or lever is located. When checking to determine if hand brakes are released, this end of the car must be observed.

## C-105. HIGH CAPACITY CARS

High capacity cars used for special shipments are frequently equipped with a hand brake wheel or lever at each end. When checking to determine if hand brakes are released on such cars, both ends must be observed.

## C-106. DOUBLE-STACK OR ARTICULATED CONTAINER CAR

When necessary to set out a loaded or partially loaded double stack or articulated container car, the following procedures must be observed before the car is uncoupled:

**(a)** Advise Train Dispatcher or proper terminal authority.

**(b)** Initiate an emergency application of the air brakes on the car being set out.

**(c)** Tighten the hand brake securely (or both hand brakes if so equipped) while the car is in emergency.

**(d)** Couple a buffer car (other than a double-stack or articulated container car) to the car being set out if the grade exceeds 1%. The hand brake on the buffer car must also be applied. If there is doubt as to the percent of grade, it must be determined from the Chief Train Dispatcher or other division or Terminal Officer.

**(e)** Contact the Chief Train Dispatcher if the grade exceeds 1% and a suitable buffer car is not available. The Chief Train Dispatcher will contact a Mechanical Department representative for instructions.

## C-107. RAPID DISCHARGE DUMP SYSTEM

**(a)** All dump system air hoses on trains consisting entirely of air-operate quick-dump (rapid discharge) hopper cars operating in unit train service, loaded or empty, must be coupled. **EXCEPTION:** Unit trains received without dump system air hoses coupled may continue to a location designated by special instructions where the dump system air hoses will be coupled.

**(b)** Prior to departing any loading or unloading facility with an air-operated quick-dump (rapid discharge) unit coal train, loaded or empty, crews must ensure the locomotive cut-out cock is closed by cutting out the main reservoir hose connected to the dump line. The dump system will not be charged until the loaded train arrives at the unloading facility.

## C-108. PASSENGER CAR DIAPHRAGMS

To prevent damage to passenger car diaphragms, such equipment must not be coupled to by:

**(a)** The snowplow end of locomotives so equipped unless specifically authorized by the Mechanical Department. **EXCEPTION:** Does not apply to Research Cars NS-32, NS-33, NS-34, NS-36, and NS-37.

**(b)** Tank cars or other cars having couplers with top and bottom shelves.

## C-109. DERRICK

NS 540037 is a 250-ton capacity derrick, self-propelling, and roller bearing equipped.

**(a)** For line-of-road movement, derrick cars must be handled:

**1.** Separated from any locomotive by at least 1 spacer car.
**2.** Not coupled to any car weighing more than 90,000 pounds.
**3.** On the head end of the train within the first 10 cars from the hauling locomotive.
**4.** With the boom trailing.

**EXCEPTION:** If the derrick is to be picked up on line-of-road and turning facilities are not available, the boom may be in leading position. A derrick with the boom properly secured and in the leading position will be moved at a speed not to exceed 25 MPH.

**5.** With the outriggers and the swinging or rotating mechanisms properly secured.

**6.** At a speed not exceeding 45 MPH.

**(b)** Specific authority must be granted for derrick cars to be operated over and under structures on industrial tracks.

**(c)** Derrick cars operating in the self-propelling mode must not be moved over humps or through retarders.

**(d)** Where applicable, Retarder Operators or Hump Conductors must be contacted before the derrick enters retarders to ensure that such retarders are in fully open position during passage.

**(e)** Derrick car Operators and train and engine personnel must use particular care to avoid contact with overhead or side obstructions when work train movements are being made with the derrick car in service.

**(f)** Division timetable special instructions must be consulted for additional instructions.

## C-111. HOT JOURNAL — FORM ME-569

When a car (or locomotive) is set out account a hot journal, a journal tag (reverse side of LOCOMOTIVE ISOLATION OR SHUT DOWN REPORT, FORM ME-569) must be completed by a crewmember and attached to or as close as possible to the defective journal.

## C-112. CARS REPAIRED ON LINE-OF-ROAD

**(a)** The Conductor will report material used to make repairs to cars on line-of-road. This report will be submitted on NS Form 11239, *Conductor's Report of Material Applied to Cars in Transit.*

**(b)** Conductors will forward completed Form 11239 to the supervisor in charge of car repairs at the end of the trip.

**(c)** Conductors destined to an off-line point should turn in Form 11239 at their home terminal on the return trip.

## C-113. MOVEMENT OF DEFECTIVE CARS FOR REPAIR

**(a)** A freight car with one or more defective components or defective air brakes may be moved to the nearest available location where necessary repairs can be performed after the following procedure has been complied with:

**1.** A qualified person has determined (a) that moving the car is safe and (b) the maximum speed and other restrictions necessary for safe movement.

**2.** The person in charge of the train in which the car is to be moved will be notified by a copy of the "Home Shop" tag (NS Form ME -613).

The person in charge of the train will notify all other crewmembers of the presence of the defective car. All crewmembers will be informed of the maximum speed and other restrictions determined under **Item (a) 1.**

**NOTE:** If the person in charge of a train in which the car is being moved is relieved before the completion of a trip, that person must arrange to deliver the copy of the "Home Shop" tag to the relieving person. If the copy of the "Home Shop" tag cannot be personally delivered, the person in charge will leave the copy of the "Home Shop" tag in an envelope at a location specified by the Train Dispatcher. The designation of the train, date, location and signature of the person leaving the "Home Shop" tag will be shown on the envelope.

**(b)** A copy of the "Home Shop" tag will be attached to each side of the defective car and must contain the following information:

**1.** Car initial and number.

**2.** Name of the inspecting railroad.

**3.** Inspection location and date.

**4.** Nature of each defect.

**5.** Movement restrictions.

**6.** Destination for shopping or repair.

**7.** Name and job title of the inspector.

**8.** Signature of the person making the inspection under **Item (a) 1.**

**(c)** Handling of "Home Shop" tags.

**1.** Only a Mechanical Department employee may remove a "Home Shop" tag.

**2.** A record or copy of each tag attached to or removed from a freight car will be retained for 90 days.

**3.** Each tag removed from a car will contain a notation stating the date, location, reason for its removal and the signature of the person who removed the tag from the car.

**NOTE:** "Home Shop" tags are to have a notation of "moving under 215.9" for cars with Freight Car Safety Standard Defects or "moving under 232.15" for cars with air brake defects.

**4.** "Home Shop" tags are not required for cars moving within a terminal for repairs.

**(d)** When necessary, Transportation Department employees will complete (reverse side of NS Form ME-569) and attach the defective air brake tag to each side of a car with defective air brakes. If NS Form ME-569 is not available, a similar foreign line tag may be used.

**(e)** A defective freight car loaded with Hazardous Material or containing Hazardous Material residue may not be placed for unloading or purging unless:

**1.** Necessary for the safe repair of the car.

**2.** A qualified person has determined:

**a.** That moving the defective car is safe.

**b.** The maximum speed and other restrictions for safe movement.

**(f)** When a bad order tag, Form ME-597 (orange tag), is attached to a trailer or container loaded on a flat car, the flat car will be considered to be bad ordered and must not be moved in a train. When a bad order tag is applied to a trailer or container, the tag will be attached to the nose end.

## C-114. TRAIN OR AIR HOSE SEPARATION

**(a)** If a train separates or air hoses come uncoupled twice between the same 2 cars, both cars are to be set out at a point authorized by the Train Dispatcher.

**EXCEPTIONS:** 1) If there is clearly a defect on 1 car (such as a defective air hose support on the car), only that car will be set out; 2) if a Mechanical Department representative inspects the cars and finds them suitable for movement, the cars may continue in the train.

**(b)** All train or air hose separations must be reported to the Train Dispatcher.

**(c)** Information concerning train or air hose separations must be furnished to the relieving crew at designated crew change points or if trains receive a new crew en route.

## C-115. FLAT SPOTS

If a flat spot on a wheel of a car (or engine) develops en route, a member of the crew must inspect it. Upon completion of inspection, the train will be governed as follows:

**(a) Proceed at Authorized Speed:** The train may continue at Authorized Speed if no other defects affecting movement are observed, AND if:

**1.** The flat spot is less than 2-1/2 inches in length.

**2.** If there are 2 adjoining spots, each is less than 2 inches in length.

**(b) Proceed at 10 MPH:** If a flat spot is found in excess of either of the above dimensions, but less than 4 inches, and no other defect is observed, 2 actions must be taken:

**1.** Speed must not exceed 10 MPH.

**2.** A report must be made promptly to the Train Dispatcher.

**(c) Remain Stopped:** If a flat spot of 4 inches or greater is found, the train must remain stopped until a report is made to the Train Dispatcher. When determined safe for movement, the car (or engine) must be set out at the first available siding or terminal.

## C-116. PLACEMENT OF SHIFTABLE LOADS

**(a)** Poles or similar loads on a flat car or in open-top equipment loaded above ends of cars must not be handled in trains next to open shipments subject to damage by shifting loads on adjacent cars.

**(b)** Any open type car where lading may shift and fall to track surface (such as loaded regular flats, gondolas loaded above sides or ends) must not be used as rear car of any train being operated without a caboose.

**(c)** The equipment listed below must not be placed and handled in a train immediately behind an occupied locomotive or immediately ahead of an occupied caboose:

1. Open end flat cars loaded with poles, pipe, lumber, or similar lading that might shift and protrude beyond the car ends.
2. Open-top cars or bulkhead flats loaded with similar lading that extends above the car ends or beyond the car sides.
3. Flat bed or stake-body trailers loaded with similar lading when the open end is toward the locomotive or caboose or when the lading extends above the end toward the locomotive or caboose.

## C-117. BANDS

Cars equipped with chain tie-down devices must not be moved unless chains are properly secured. Cars with bands improperly secured are not to be moved.

# DISTRIBUTED POWER (DP) OPERATIONS

## DP OPERATING MODES

- **NORMAL –** all remote traction and dynamic brake functions are enabled for control. All remote air brake functions are enabled and the brake valve cut in.
- **IDLE –** the remote throttle remains in IDLE. All remote air brake functions are enabled and the brake valve may be cut in.
- **ISOLATE –** the remote throttle does not respond to commands and remains in IDLE. The remote's emergency air brake application function and independent brake functions are enabled for control. All other brake functions are disabled and the brake valve is cut out. NOTE: This condition may automatically occur during a COMM LOSS.
- **SYSTEM MODE RUN –** normal DP system mode. All throttle, dynamic brake, and air brake functions available. Synchronous and Independent control are available.
- **SYSTEM MODE IDLE –** initial mode after linking. All airbrake functions are available. No throttle control is available. Successful brake pipe continuity test required before mode can be changed.
- **SYNCHRONOUS CONTROL –** remotes duplicate traction, dynamic brake, and air brake commands from lead DP locomotive. Commands are sent instantly but may take up to 20 seconds to update on the controlling locomotive's screen.
- **SET OUT –** the remote throttle does not respond to commands and remains in IDLE. The remote's throttle and dynamic functions are disabled and the brake valve is cut out. All other air brake functions are disabled and the brake valve is cutout. NOTE: This condition may automatically occur during a COMM LOSS.
- **FENCED –** allows remote locomotive to be commanded independently of the lead locomotive. All automatic and independent braking remain under the control of the lead locomotive.
- **BV OUT –** all remote traction and dynamic brake functions are enabled for control. The emergency and independent air brake functions are enabled for control. The remote automatic air brake functions are restricted by cutting out the brake valve.

**MOMENTARY COMM LOSS (DP) -** a loss of communication between a controlling lead locomotive and a controlling remote locomotive lasting less than 45 seconds. This type of communication loss will be displayed on the controlling lead locomotive with the word “COMM” displayed in yellow letters above the controlling remote locomotive with which the controlling lead locomotive cannot communicate.

**SUSTAINED COMM LOSS (DP) –** a loss of communication between a controlling lead locomotive and a controlling remote locomotive lasting 45 seconds or longer, or in 10 seconds if an automatic brake application is made. A sustained COMM LOSS will be displayed on the controlling lead locomotive with the word “COMM” in red letters above the controlling remote locomotive with which the controlling lead locomotive cannot communicate.

**TRAIN CHECK –** an automated feature that ensures continuity and integrity of the brake pipe specifically for COMM LOSS communications.

## DP-1. SET-UP

**(a)** Before beginning DP set up, each locomotive consist, lead and remotes must be set up as a lead consist for conventional train operation.

**(b)** The automatic brake handle on the controlling remote locomotive must be pinned (if equipped) and the seat locked or secured from contacting the controls.

**1.** The cab doors on the remote consist must be locked (if equipped).

**2.** Linking DP locomotive consists:

**a.** The train and locomotives must be properly secured.

**b.** After conditioning and linking consists, a DP Brake Pipe Test must be performed.

## DP-2. VERIFICATION

After a link is established, a load test in FENCED mode must be performed individually on each remote consist to confirm each remote consist is loading in the intended direction. This test is not required if conditions such as grade or curvature could compromise safe train handling.

**DP-3. AXLE LIMITS**

Unless otherwise specifically authorized by special instructions:

**(a)** Powered axle count for remote DP consists must conform individually to axle limits under power as follows:

i) Mid-train – no more than the equivalent of 18 powered axles,

ii) Rear of train – must conform to L-248 Helper/Pusher Service limits.

**(b)** Dynamic brake axle count for DP remote consists must conform individually to axle limits for dynamic brake as applicable for a head-end consist.

**(c)** Amperage restrictions applicable to head-end consists also apply to mid-train remote consists. *Revised 9/8/17*

**DP-4. DP OPERATION**

**(a)** When DP is being utilized, the operator must use the DP Screen to observe and monitor the remote locomotives.

**(b)** Except when operating in FENCED mode to improve train handling or other operating conditions, the normal DP operating mode is SYNCHRONOUS CONTROL.

**DP-5. MOVEMENT OF REMOTE LOCOMOTIVE CONSISTS**

**(a)** Remote consists may not be operated from the lead consist unless the brake pipe is connected and open between the lead and remote consists.

**(b)** Remote locomotives must be unlinked and set up for conventional operation when necessary to move separate from the lead DP locomotive consist.

**DP-6. TRAIN CHECK**

**(a)** A TRAIN CHECK must be performed immediately before movement:

**1.** Anytime the train stops.

**2.** By the outbound crew at the initial terminal and at all crew change points.

**(b)** A TRAIN CHECK is not required:

**1.** During brief stops within yards/terminals.

**2.** On descending grades where train handling techniques require automatic air brakes to remain applied when initiating movement.

**3.** If movement of the train immediately follows a Brake Pipe Continuity test or DP Leakage Test.

**(c)** TRAIN CHECK Failure

**1.** No Communication Failure:

**a.** Perform a second TRAIN CHECK. Train may proceed if a second TRAIN CHECK is successful.

**b.** If the second TRAIN CHECK is unsuccessful, and there is no indicated communication failure, the train may proceed after:

- Making a 10 PSI brake pipe reduction,
- Placing all remote consists in BV OUT, verifying BV OUT, and returning all remote consists to NORMAL mode, and
- Releasing the automatic brake and verify a rise of at least 5 PSI at the rear of the train.

The Locomotive Help Desk must be notified if any remote consist brake valves do not cut back in with a rise in brake pipe pressure of at least 3 PSI.

**c.** A failure of the above two methods indicates brake pipe blockage, excess brake pipe leakage, or an interruption in communications between the Lead and Remote(s). A visual inspection of the train is required. After correcting and reporting any defects, a new TRAIN CHECK must be performed.

**2.** Communication Failure or interruption:

If necessary, the train may proceed, not exceeding 10 MPH, for a distance of no more than 2 miles in order to establish communication. Proper precautions must be taken to ensure remote locomotive brakes are released.

**3.** When communication is re-established, the train may proceed after a successful TRAIN CHECK is performed.

## DP-7. USING REMOTE DP EQUIPMENT IN PLACE OF AN EOTD

**(a)** DP locomotives may be used as an EOTD when placed at the rear of the train. The location of the controlling DP locomotive in the remote consist does not affect use as a telemetry device.

**(b)** When utilizing a DP locomotive as an EOTD, a DP COMM LOSS is the same as a conventional EOTD COMM LOSS.

## DP-8. SET OUT MODE

**(a)** Remote locomotives left unattended in the train must be left in SET OUT mode and are not required to be individually secured provided a sufficient number of brakes are applied to secure the equipment left standing.

**(b)** When the continuity of the brake pipe is broken or interrupted, the train must not be moved until any remote consists to be left are placed in SET OUT mode.

**(c)** Upon initial movement of the lead locomotive consist in SET OUT mode, the operator must confirm that the brake cylinder pressure remains at full application on the remote locomotives, and that the controlling remote locomotives are not:

**1.** Responding to the brake release, or

**2.** Developing tractive effort in response to throttle commands.

## DP-9. COMM LOSS

**(a)** While Moving

**1.** During DP COMM LOSS, the remote consist will continue to operate according to the last command received up to 90 minutes, OR:

**a.** Until communication is restored OR,

**b.** If the COMM LOSS occurred in power or idle, until there is a change in brake pipe pressure of a minimum application from a fully charged brake pipe or an additional 10 PSI reduction from a non-fully charged brake pipe OR

**c.** If the COMM LOSS occurred while operating in dynamic braking, the train is brought to a stop and the brake pipe is reduced to zero via an emergency brake application and brake pipe pressure is restored.

2. After communication is re-established, the remote consist must be placed back in NORMAL. Releasing the automatic brake will cut the brake valve back in on the DP remote consist.

**(b)** While Stopped

1. Anytime COMM LOSS occurs while the train is stopped, the remote locomotives independent brakes will remain in the applied position. Before movement, the independent brakes must be released by reducing the brake pipe pressure to zero with an emergency brake application and the pressure restored.
2. If the COMM LOSS occurs after the remote consist has been placed in SET OUT mode, there is no procedure to release the independent brakes. Communication will have to be restored or the remote locomotives will need to be returned to a conventional state to release the independent brakes.

## DP-10. ENDING DISTRIBUTED POWER

To end Distributed Power set up, consists must be unlinked and DP ended from the operator controls. The DP circuit breaker must not be opened until these steps are completed.

## DP-11. AIR BRAKES — DISTRIBUTED POWER

Air brakes are not to be cut out on Distributed (mid-train) Power when bleeding air on trains in terminals or yards.

## DP-12. PLACEMENT AND OPERATION OF DP CONSISTS

**(a)** All trains scheduled to operate with distributed power must, if power is available, operate in DP configuration.

**(b)** For all trains, the maximum length of train between the lead and DP remote consist is 8500 feet.

**(c)** Merchandise trains (mixed freight) must be built with the DP remote consist placed mid-train behind 50-75% of the train's tonnage, observant of tonnage ratings, and not exceeding 8500 feet between consists.

**EXCEPTION:** Merchandise (mixed freight) trains received in interchange with rear DP remote consists may operate to destination, as configured.

**(d)** Lead and DP remote consists must not vary by more than one locomotive, i.e. 2 locomotive lead consist with 1 locomotive DP remote consist. Variation by more than 1 locomotive must be specifically authorized by the Control Center.

**(e)** Engineers must operate DP trains in FENCED mode when cresting grades, in undulating territory and to set-up DP remote consists prior to entering areas where communication loss occurs, consistent with fuel conservation guidelines.

*Added 9/8/17*

# ELECTRONICALLY CONTROLLED PNEUMATIC ( ECP) BRAKES

## E-1. AIR BRAKE TESTS AND INSTRUCTIONS

**(a)** Trains operating in ECP brake mode shall receive a Class I brake test and pre-departure inspection by a Qualified Mechanical Inspector (QMI) at initial terminal.

**(b)** Except for a unit or cycle train, a train operating in ECP brake mode shall not operate a distance that exceeds its destination or 3,500 miles, whichever is less, without receiving another Class I brake test and pre-departure inspection by a QMI.

**(c)** A unit or cycle train operating in ECP brake mode shall receive a Class I brake test and pre-departure inspection by a QMI at least every 3,500 miles.

**(d)** When performing brake tests on ECP equipped trains, the following will govern:

**1.** 85 % ECP application = 20 PSI reduction on conventional

**2.** 80 % ECP application = 15 PSI reduction on conventional

**(e)** When performing a Class III brake test on ECP equipped trains, the operator shall verify that the brakes have applied and released on the rear car by:

**1.** **RUN MODE** — observing the ECP brake system's display in the locomotive cab, or

**2.** **SWITCH MODE** — visually observing the last car application / release.

**(f)** A freight train operating in ECP brake mode shall receive a Class I brake test by a qualified person (QP) at a location where the train is off air for a period of more than 24 hours or 80 hours if the train is located at an "Extended Off-Air Facility".

**(g)** ECP equipped cars added to a train operating in ECP brake mode while en route must receive a Class I inspection by a QP unless all of the following are met:

**1.** The car(s) have previously received a Class I brake test and pre-departure inspection by a QMI within the last 3,500 miles.

**2.** The prior brake test information is furnished to the train crew.

3. The car has not been off air for more than 24 hours or 80 hours if at an Extended Off-Air Facility.

4. A visual inspection of the car's brake system is conducted to ensure the brake system is intact and secured.

ECP equipped cars added to a train en route must be documented on the back of Form 1043-BT or applicable document. The documentation must include the name and craft (QP or QMI) of the inspector performing the brake test.

## E-2. INITIALIZATION

**(a)** ECP equipped trains must be initialized when ECP is powered on and when performing any of the following:

1. Class I brake test.
2. Class III brake test.

**(b)** ECP equipped trains shall be initialized in sequential order, and

1. The Engineer must ensure the Load/Empty status is correct on the ECP display.
2. When flood loading, the train status is to be set for "LOAD" when the head car is first spotted under the load-out.

**(c)** After an ECP train is initialized, the total number of cars on the printed Wheel Report must correspond with the total number of cars identified by the ECP system. If the ECP system indicates fewer cars than the printed Wheel Report, the printed Wheel Report will govern. When this occurs, the Engineer must use the onboard functions of the ECP system to increase the total number of cars in the train consist to reflect the same as the printed Wheel Report.

**NOTE:** No changes are necessary if the ECP system indicates more cars than the printed Wheel Report.

**(d)** Cars that fail to initialize on the Engineer's display must be visually inspected, tagged, pneumatically cut out and the reservoirs completely drained.

**(e)** When necessary to cut the air out of an ECP car, cut out cock must be closed and all pressure released from the reservoir.

To ensure all air is depleted from the system, hold the release rod in the open position for 5 seconds after the sound of exhausting air is no longer audible.

*Revised 11/18/15*

## E-3. EQUIPMENT HANDLING

**(a)** Before coupling or uncoupling ECP intercar cables, employees must receive confirmation from the Engineer that protection is in place. The Engineer must establish protection by:

**1.** Placing the locomotive brake handle in the full service position.

**2.** De-energizing the electrical train line by switching power to "OFF".

**(b)** An ECP equipped train must not be left unattended with locomotives attached, until:

**1.** The train and locomotive(s) are properly secured.

**2.** The ECP system status is placed in "Switch Mode".

**3.** The ECP intercar cable is disconnected between the lead car and the locomotive consist.

**4.** The locomotives are shut down in accordance with current fuel conservation instructions.

**(c)** ECP trains must be properly secured prior to deactivating the ECP system. To prevent an unintentional brake release on all cars in the train simultaneously, the "End ECP" function key must not be activated until:

**1.** The locomotives are detached, or

**2.** The train has been placed into emergency from the lead locomotive.

**(d)** A locomotive capable of performing the same functions as an ECP EOTD may be used in lieu of an ECP EOTD as the rear vehicle in the consist.

**(e)** Extended operation of ECP equipment in Switch Mode without train line power and an active ECP EOTD can shorten the battery life on the ECP equipment being handled.

When this occurs and the battery is discharged to a certain level, the air brakes will electronically cut out on the affected car(s) causing them to be ineffective in other than an emergency brake application.

To prevent this from occurring, ECP equipped cars must not be operated in excess of 1 hour without both train line power and an active ECP EOTD attached.

## E-4. MOVING DEFECTIVE EQUIPMENT

**(a)** At locations where a Class I brake test is required on the entire train, ECP equipped trains must not depart with less than 95% effective and operative brakes.

**(b)** An ECP equipped freight car, or locomotive operating in ECP brake mode, discovered with inoperative or ineffective brakes during a Class I brake test, or en route, may be moved to destination not to exceed 3,500 miles.

If the ECP brake system is not able to display the location of the car with defective or inoperative brakes, the car must be visually inspected, tagged, pneumatically cut out and the reservoirs completely drained.

It is permissible for a car equipped with defective or inoperative ECP brakes to be considered electronically tagged if the ECP brake system is able to display the location and identification of the equipment.

**(c)** A freight car equipped with an ECP brake system that is known to have arrived with ineffective or inoperative brakes at the initial terminal of the next train which the car is to be included or at a location where a Class I brake test is required shall not depart that location with ineffective or inoperative brakes unless:

**1.** The location does not have the ability to conduct the necessary repairs.

**2.** The car is hauled only for the purpose of repair to the nearest forward location where necessary repair can be performed.

**(d)** An ECP equipped train in “Switch Mode” may be moved to the nearest or nearest forward location where necessary repairs or changes to the consist can be made, provided:

**1.** The train is visually inspected.

**2.** The brakes apply and release on the rear car.

**3.** A qualified employee determines it is safe to move.

**(e)** ECP equipped train line cables shall be considered defective if any of the following exists:

**1.** Badly chafed or broken insulation.

**2.** Broken plugs, receptacles or terminals.

**3.** Broken or protruding strands of wire.

**(f)** The brakes must not be pneumatically cut out on more than 2 consecutive cars on ECP trains.

**(g)** The brakes must not be electronically cut out on more than 5 consecutive cars or control valves on ECP trains.

**(h)** ECP cars with brakes cut out must not be the rear car of the consist.

**(i)** Inoperative cars, electronic or pneumatic, must be documented on the Form 1043-BT and reported to the Mechanical Operations Center.

**(j)** An ECP car found with a “Dormant” CCD shall have its brakes pneumatically cut out and the reservoirs completely drained. A CCD is dormant if the electronics are not functioning and the car is not identifiable on the engineer’s display screen.

# LOCOMOTIVES

## L-200. EMERGENCY FUEL CUT OFF/DEVICES/VALVES

Engineers must familiarize themselves with the operation of the Emergency Fuel Cut Off and other devices and valves on locomotives, including the location and purpose of electrical switches, circuit breakers, fuses and alarm and protective devices essential to locomotive operation.

Engineers must not remove or replace any fuses until the circuits involved have been isolated.

When necessary to renew fusees, Engineers must make proper report in accordance with LCDI procedures.

## L-201. REPORTING DEFECTS

**(a)** Engineers and remote control operators must report locomotive failures, defects, or any other abnormal conditions regarding locomotives, including unusual odors or excessive smoke, to the proper authority by the quickest means of communication.

**(b)** Engineers and remote control operators experiencing locomotive failure while occupying Main Track will contact the controlling Train Dispatcher and provide details regarding the train's operation. If trains are occupying non-controlled track, the controlling Yardmaster or Supervisor will be contacted.

**(c)** After contacting the Train Dispatcher or Yardmaster, all engineers and remote control operators experiencing a locomotive failure will then contact the Mechanical Operations Center (MOC) via radio **DTMF Code 1-2-3**. **The MOC Desk will capture all details of the delay and assist in troubleshooting any potential fixes in addition to dispatching local Mechanical Department forces to fix diagnosed problems.**

*Revised 7/5/17*

## L-202. TAKING CHARGE OF LOCOMOTIVES

### (a) Calendar Day Inspection (Form ME-65)

Engineers are responsible for ensuring all locomotives in their charge are inspected each calendar day the locomotive is used. On multiple locomotive consists, a current ME-65 on the controlling

locomotive indicates a current Calendar Day Inspection on all locomotives, including DP power.

**1.** When assembling a locomotive consist, the engineer will ensure the ME-65 on all trailing locomotives is dated the same or more recent than the leading locomotive.

**2.** Locomotives picked up en-route must be inspected if the ME 65 is older than the controlling locomotive.

**3.** Locomotives set out en-route must be inspected if the ME-65 is not dated for the current calendar day.

**(b)** Before moving locomotives, it must be known that:

**1.** The independent brakes are in operative condition by observing an application and release of the brakes; and

**2.** The hand brakes are released.

**(c)** Prior to departing the terminal, each controlling locomotive must have an operable radio and horn.

When picking up a locomotive consist from a mechanical facility, the presence of a current and properly completed form ME-114 (Gold Card) will indicate that the required tests and inspections have been successfully completed.

## L-203. TESTING LOCOMOTIVE BRAKES

**(a)** If the brake equipment on a locomotive or a locomotive consist is changed by: 1) uncoupling or coupling MU hoses, 2) adding one or more locomotives to the consist, or 3) removing other than the rear locomotive(s) from the consist, the following brake test must be performed after securing the locomotives with at least one hand brake:

**1.** Locomotive Brake test:

**a.** Release independent brake and observe that locomotive brakes release.

**b.** Make a 20 PSI reduction with the automatic brake valve and observe that locomotive brakes apply.

**c.** Bail brakes off with the independent brake valve and observe that locomotive brakes release

**d.** Make a further automatic brake reduction to reapply the locomotive brakes.

**e.** Return the automatic brake valve to the release position and observe that the locomotive brakes release.

**f.** Apply independent brake and observe that the locomotive brakes apply.

**2.** Single employee locomotive brake test procedure:

**a.** Fully apply independent brake and observe that brakes on each locomotive are applied.

**b.** Place the automatic brake handle in suppression position. On locomotives equipped with electronic air brake equipment, cut out the automatic brake. Release and bail the independent brake. Fully apply then fully release the independent. Observe that brakes are released. Cut in the automatic brake, if applicable (cutting out the automatic brake is necessary to suppress the alerter to observe the release of brakes by a single crewmember).

**c.** Make a further reduction of the automatic brake until cylinder pressure develops, then observe that brakes are applied.

**d.** Release and cut out the automatic brake. Place the automatic brake handle in suppression position. Observe that brakes are released. Cut in the automatic brake.

After reapplying the brakes, release the hand brake(s).

**(b)** When changing operating ends of the consist only, consists previously tested in accordance with **Items (1)** or **(2)** above must be re-tested by use of the locomotive gauges instead of a visual inspection of the locomotive consist.

**(c)** Engineers will make a running test of the automatic and independent air brakes and dynamic brakes (if equipped) as soon as speed and conditions permit.

## L-205. SPEED INDICATORS AND EVENT RECORDERS

### (a) Speed Indicator Requirements

**1.** A locomotive used as a controlling unit at speeds above 20 MPH must be equipped with a speed indicator accurate within:

- ± 3 MPH at speeds between 10 and 30 MPH
- ± 5 MPH at speeds above 30 MPH

**2.** Any on board system may be used as a speed indicator.

**3.** If all speed indicators on a controlling locomotive fail en route, the locomotive may continue as the controlling locomotive:

- To the nearest forward point where repairs can be made or until the next calendar day inspection, whichever occurs first.
- Not exceeding 20 MPH, or where maximum authorized speed is 31 MPH or greater, not exceeding 10 MPH below the maximum authorized speed.

All failures must be reported in accordance with LCDI procedures and to the Train Dispatcher.

**(b) Speed Indicator — Test For Accuracy**

**1.** The Engineer must check the accuracy of the speed indicator on the controlling locomotive at a measured mile and make a proper report of any inaccuracies in accordance with LCDI procedures.

**2.** Locations of measured miles are shown in timetables. Engineers in outlying local freight or branch line service will choose the appropriate location for making tests to check the accuracy of the speed indicator.

**3.** The Engineer must note the speed at which the check was made and MPH fast or slow. If any inaccuracy is detected, appropriate adjustment of speed must be made.

**(c) Table for Determining Train Speeds**

| Sec. Per Mile | Miles Per Hour | Sec. Per Mile | Miles Per Hour | Sec. Per Mile | Miles Per Hour | Sec. Per Mile | Miles Per Hour | Sec. Per Mile | Miles Per Hour |
|---|---|---|---|---|---|---|---|---|---|
| 45 | 80.0 | 58 | 62.1 | 72 | 50.0 | 98 | 36.7 | 124 | 29.0 |
| 46 | 78.3 | 59 | 61.0 | 74 | 48.6 | 100 | 36.0 | 126 | 28.6 |
| 47 | 76.6 | 60 | 60.0 | 76 | 47.4 | 102 | 35.3 | 128 | 28.1 |
| 48 | 75.0 | 61 | 59.0 | 78 | 46.2 | 104 | 34.6 | 130 | 27.7 |
| 49 | 73.5 | 62 | 58.1 | 80 | 45.0 | 106 | 34.0 | 135 | 26.7 |
| 50 | 72.0 | 63 | 57.1 | 82 | 43.9 | 108 | 33.3 | 140 | 25.7 |
| 51 | 70.6 | 64 | 56.3 | 84 | 42.9 | 110 | 32.7 | 145 | 24.8 |
| 52 | 69.2 | 65 | 55.4 | 86 | 41.9 | 112 | 32.1 | 150 | 24.0 |
| 53 | 67.9 | 66 | 54.5 | 88 | 40.9 | 114 | 31.6 | 180 | 20.0 |
| 54 | 66.7 | 67 | 53.7 | 90 | 40.0 | 116 | 31.0 | 240 | 15.0 |
| 55 | 65.5 | 68 | 52.9 | 92 | 39.1 | 118 | 30.5 | 360 | 10.0 |
| 56 | 64.3 | 69 | 52.2 | 94 | 38.3 | 120 | 30.0 | 720 | 5.0 |
| 57 | 63.2 | 70 | 51.4 | 96 | 37.5 | 122 | 29.5 | | |

**(d) Event Recorder Requirements**

1. Locomotives that are equipped with an event recorder have "EVENT RECORDER EQUIPPED" noted in the "REMARKS" section on the back side of Form ME-611 ( FRA Blue card) displayed in the locomotive cab.
2. Locomotives not equipped with event recorders may not be operated as a controlling locomotive in road service.
3. A locomotive with an inoperative event recorder will be tagged by the Mechanical Department and will not be used as a controlling locomotive in road service.
4. Event recorders are located in a protected location and must not be accessed by train and engine crews.
5. The circuit breaker controlling power to the event recorder must be and must remain in the closed or "ON" position on each locomotive in consist. The circuit breaker may be marked "ELECTRONIC DEVICES, SAFETY DEVICE, RECORDER, SPEED RECORDER, or EVENT RECORDER."

**(e) Tampering**

Tampering with or making adjustments to speed indicators or event recorders by train and engine crews is **prohibited**. No one except qualified personnel from the Mechanical Department is authorized to make adjustments. Seals on locomotive event recorders are not to be broken without proper authority.

## L-206. SHORT TIME RATING

When train speed remains below 11* MPH for more than 10 minutes continuously with throttle in maximum position (No. 8), there is danger of damaging the traction motors.

On locomotives so equipped, observe short time operation plate instructions or loadmeter, which has been graduated to show the time in minutes that various loads may be carried. Operation for the lowest short time rating of any locomotive in consist will govern the maximum load to be carried.

The maximum continuous current rating and the short time operating limits were developed for throttle 8 operation. These values must be decreased at lower throttle positions because engine speed and consequently, traction motor cooling air is reduced.

If short time ratings are exceeded, movement must be stopped, reverser centered and throttle advanced to the maximum position (No. 8) for at least 10 minutes to cool traction motors.

*Minimum continuous speed is 9 MPH for locomotive consist made up entirely of 6-axle locomotives.

**EXCEPTION:** Does not apply to locomotive consist made up exclusively of AC Traction Motor locomotives.

## L-207. LOCOMOTIVE AXLE LIMITS UNDER POWER

**(a)** No more than the equivalent of 27 conventional (non-high adhesion) axles may be operated under power on the head end of a train, except:

- Solid loaded unit coal trains are authorized to use the equivalent of 32 conventional powered axles on the head end.
- Other than coal trains, solid loaded bulk commodity unit trains not exceeding 100 cars (plus any required buffer cars) are authorized to use the equivalent of 32 conventional powered axles on the head end.

- Other trains as designated by Special Instructions.

  High adhesion axles are equivalent to 1-1/3 conventional (non-high adhesion) axles. Alternating Current (AC) traction motor-equipped axles are equivalent to 1-1/2 conventional (non-high adhesion) axles.

**(b)** When operating at 10 MPH or less with a locomotive consist of 24 or more conventional (non-high adhesion) axles on line, Engineers must limit maximum tractive effort (TE) to 140 KLBS or 1776 amps as shown on the load meter of the controlling locomotive.

Engineers should further restrict maximum tractive effort when the head 1/3 (one-third) of the train is in any turnout, crossover or curve and contains any empty car or platform or any car longer than 85 feet (loaded or empty).

**(c)** Ample time should be allowed between throttle movements. Throttle must not be advanced to the next higher position until the load meter reading (amperage or KLBS) has stabilized from the last throttle advance.

*Revised 11/6/15*

## L-208. TRACTION MOTORS

### (a) Damage to Traction Motors

Continued application of power to traction motors when locomotive is not moving can result in serious damage to the motors from burns on the commutators. Reversing locomotive(s) to hold train standing on a grade is prohibited.

The reverser handle must not be moved when the locomotive is in motion.

Engineers must avoid the slipping of wheels to the extent possible.

When starting a train, after the brakes are released, the throttle should be advanced to a notch at which the locomotive begins to move or the load meter current approaches a value that may break the train in 2 and/or damage the electrical equipment; otherwise, the throttle must be promptly shut off.

### (b) Mechanical Shock to Traction Motors

When consists containing DC locomotives are operated in power or dynamic braking at a speed in excess of 25 MPH, mechanical shock, which can damage traction motors and trip ground relay,

may occur at railroad crossings. Throttle must be reduced to Notch 4 or lower at least 8 seconds in advance of a railroad crossing and must not be increased until all locomotives have passed over the crossing.

For any locomotive consist configuration, railroad crossings that are not subject to mechanical shock and do not require throttle reduction will be designated by timetable. *Revised 8/16/17*

**(c) Traction Motor Damage Due to Water**

To avoid extensive traction motor damage, under no circumstances should diesel locomotives pass through water, which is deeper than 2 inches above the top of the rail. When passing through water less than 2 inches above the top of rail, speed must not exceed 2 to 3 MPH.

## L-210. DYNAMIC BRAKE

**(a) Use of Dynamic Brake** — The dynamic brake is the first priority brake for controlling train speed. It must be applied a sufficient distance in advance to ensure slowing to the desired speed safely.

When dynamic brake is to be used, before moving the selector lever to braking position, it must be left in OFF position for a minimum of 10 seconds.

The dynamic brake amperage must be increased gradually, allowing slack to bunch safely against the locomotive.

The dynamic brake must not be released in severe undulating (rip-rap) terrain or on a heavy descending grade. It can be released with train on level grade or at bottom of grade with the locomotive on ascending grade. When releasing dynamic brake, time must be allowed for slack to adjust before applying power.

If necessary, automatic air brake may be used with dynamic brake applied. After each air brake application, the independent brake handle must be depressed frequently and held at least 4 seconds for each locomotive in the consist and until brake pipe exhaust ceases, in order to keep locomotive brakes released. When making a running release of train air brakes, the dynamic brake must be kept fully applied with maximum amperage until air brakes have released throughout the train.

**(b) Axles of Dynamic Brake**

**1.** When moving through any turnout or crossover restricted to 25 MPH or less and using more than the equivalent of 14-axles of EXTENDED RANGE dynamic brake (as referenced in the NS Locomotive series table), the dynamic brake must not exceed 400 AMPS (40,000 lbs. braking effort on "AC" locomotives) until the lead half of the train is through the turnout or crossover.

**EXCEPTION:** Restriction does not apply to solid loaded bulk commodity trains or to mixed trains with solid block of bulk commodities on head end equaling 50% or more of total cars in train.

When making a planned stop with other than solid loaded bulk commodity trains and using more than the equivalent of 14-axles of EXTENDED RANGE dynamic brake (as referenced in the NS Locomotive series table), the dynamic brake must be reduced to 400 AMPS or less (40,000 lbs. braking effort or less on "AC" locomotives) when applying the train air brake.

**2.** If a locomotive consist includes one or more locomotives equipped with **STANDARD** dynamic brake, not more than the equivalent of 20-axles of dynamic braking may be used on the head end of a train. If ALL LOCOMOTIVE(S) in the consist are equipped with **EXTENDED RANGE** dynamic braking, not more than the equivalent of 18-axles of dynamic braking may be used on the head end of a train.

**EXCEPTIONS:** 1) If all locomotives in the consist are equipped with EXTENDED RANGE dynamic brake, the equivalent of 20-axles may be used for trains handling solid bulk commodities such as coal, grain, potash, phosphate or similar bulk lading; 2) the equivalent of 24-axles of dynamic braking may be used for designated trains handling only loaded 100 ton cars equipped with high tensile (Grade E) knuckles and couplers.

If the locomotive consist is made up of **more** than the equivalent of 18-axles of EXTENDED RANGE dynamic braking, the dynamic brake must be cut out on all in excess of the equivalent of 18-axles (except on designated loaded trains). On EMD locomotives, the dynamic brake may be cut

out by placing the “DYNAMIC BRAKE CUT OUT SWITCH” (located on the engine control panel) in the “CUT OUT” position. On GE locomotives, the dynamic brake cut out switch is located on the engine control panel.

**(c) Operational Status of Dynamic Brakes** — The Engineer must be informed of the operational status of the dynamic brakes on all locomotive(s) in the controlling consist at the initial terminal or point of origin for a train and at other locations where a locomotive Engineer first begins operation of a train. The Engineer will:

- review the completed Form ME-112 that has been left in the cab of the controlling locomotive
- complete a new Form ME-112 indicating the status of the dynamic brake of each locomotive in the controlling consist before going off duty. **NOTE:** Any locomotive checked “Inoperative” must also be tagged with Form ME-109
- leave the form in the cab of the controlling locomotive in the consist
- discard any previously completed forms

**(d) Inoperative Dynamic Brakes** — A locomotive discovered with inoperative dynamic brakes must have a Form ME-109, “Inoperative Dynamic Brake” tag securely attached and displayed on the isolation switch in the cab of the locomotive. The tag must contain the following information:

- locomotive initial and number
- name of the discovering railroad
- location and date where the condition was discovered
- signature of the person discovering the condition

**(e) Inoperative Dynamic Brakes En Route** — If a locomotive consist is intended to have its dynamic brakes used while in transit, a locomotive with inoperative dynamic brakes or not equipped with dynamic brakes must not be placed in the controlling (lead) position of a consist unless the locomotive has the capability of:

- controlling the dynamic brake effort in the trailing locomotives in the consist that are so equipped
- displaying to the locomotive Engineer the deceleration rate of the train or the total train dynamic brake retarding force

## L-211. WHEEL SLIP WARNING LIGHT

Engineers must avoid the slipping of the wheels to the extent possible.

An intermittent flash of the wheel slip light indicates a wheel slip has occurred in the locomotive consist.

A wheel slip light constantly lit or consistently flashing at any speed, may indicate a locked wheel or slipped pinion gear. When this occurs, reduce the throttle or dynamic brake until the light goes out. If the light remains illuminated, or continues to flash after the throttle or dynamic brake has been reduced, stop immediately and perform a roll by inspection to ensure all axles in the locomotive consist are turning freely.

## L-212. ALIGNMENT CONTROL DRAFT GEAR

When the consist includes more than one locomotive that does not have alignment control draft gear, extreme caution must be exercised when applying locomotive or dynamic brake or handling the throttle in back up or shoving movements to prevent locomotives from jackknifing. In addition, a locomotive not equipped with alignment control draft gear, when moving dead-in-tow in a locomotive consist or train, must not be coupled to another locomotive that does not have alignment control draft gear.

**EXCEPTION:** Restriction does not apply to a light locomotive movement.

NS locomotives without alignment control draft gear can be identified by a white stripe painted beneath the locomotive number on the outside of the cab.

# TOWED OR INOPERATIVE LOCOMOTIVES

## L-213. MULTIPLE LOCOMOTIVE SET-UP

Multiple locomotive consists must be set-up as follows:

**1.** Connect MU jumper cables between all locomotives.

**2.** Connect and cut in one each of the following hoses between all locomotives:

- Main Reservoir
- Actuating

**3.** Connect and cut in one each of the Application and Release hoses between all locomotives ahead of the locomotive containing the 36th axle.

## L-213-1. TOWING AND PUSHING SW1500, SW1001 AND MP15DC LOCOMOTIVES

**(a)** Only one SW1500, SW1001 or MP15DC locomotive may be towed on the head end of a train.

**(b)** SW1500, SW1001 and MP15DC locomotives must not be pushed by more than 12 non-high adhesion powered axles, or more than 10 high adhesion powered axles or 9 of the high adhesion alternating current (AC) locomotives, nor towed immediately behind a consist exceeding the equivalent of 14- axles of dynamic brake.

## L-213-2. MOVEMENT OF FOREIGN DEAD-IN-TOW OR PRIVATE OWNERSHIP LOCOMOTIVES

Before accepting a foreign dead-in-tow locomotive at interchange, or before moving a private ownership locomotive dead-in-tow, the crew must know that a Mechanical inspection has been made by the NS Mechanical Department and be informed of any restrictions necessary for its safe movement documented on a Transportation Notice issued by the NS Clearance Department.

A crewmember must notify the Chief Dispatcher when a Transportation Notice authorizing movement, issued by Norfolk Southern Clearance Bureau, is not available. The Chief Dispatcher will contact the Superintendent of Transportation in Atlanta for handling instructions. Until authorization is received, the crew must not move the locomotive.

## L-213-3. NO. 6 OR NO. 14 EL LOCOMOTIVE BRAKE

When a locomotive, which has either the No. 6 or No. 14 EL type locomotive brake is to be towed, the locomotive should be shut down and the main reservoirs drained below 25 PSI. The independent and automatic brake valves must be placed in running position. The brake pipe cut out cock for the automatic brake valve must be cut out and the dead engine feature must be cut in. The dead engine feature is located near the distributing valve between the main reservoir and brake pipe.

## L-214. LOCOMOTIVE(S) DEAD-IN-TOW

Locomotives moving dead-in-tow, when not handled as trailing locomotives in the locomotive consist, must be placed and handled within the head 10 cars of the train, unless specific instructions are received from the Mechanical Department to handle on the rear.

# GENERAL LOCOMOTIVE INSTRUCTIONS

## L-215. AUTHORIZED SPEED

Locomotives in service or in tow, with or without cars, must not exceed the maximum speed authorized for the locomotive having the lowest authorized speed.

## L-216. LOCOMOTIVE CABS

Employees occupying locomotive cabs must keep them neat and orderly and must not place their feet upon or otherwise damage windows, display screens or any other equipment. Trash must be deposited in trash containers where provided.

## L-217. WINDOWS AND DOORS

Locomotive windows and cab entrance doors must be kept closed on all unoccupied locomotives. All carbody doors must be kept closed while locomotive is in service.

Normal position of walkway safety chains and platforms on coupled locomotives is to permit passage between locomotives. Walkways must be closed and safety chains and adjustable platforms must be secured in closed position when operating as a single locomotive and on the non-coupled end of leading and trailing locomotives in a consist. To prevent damage, safety chains and platforms must be secured in closed position before coupled locomotives are separated.

Locomotives must be locked when left unattended at:

- outlying points
- remote points within yard or terminal limits

If locomotive cannot be locked, a crewmember must promptly notify the Chief Train Dispatcher, Yardmaster or other designated person who will notify Mechanical Department personnel.

## L-218. AIR HOSES AND LOCOMOTIVE JUMPER CABLES

### (a) Air Hoses

Locomotive air hoses not in use will be attached to a dummy coupling or placed in pocket where provided.

### (b) Jumper Cables

**1.** Locomotive jumper cables, when not in use, must be stored in the place provided.

2. When not in use, permanently attached jumper cables are to have the free end(s) secured in the proper dummy receptacle(s).

3. When a locomotive is set out at an outlying point or on line-of-road, a jumper cable must be left with the locomotive or at that location, if practicable. If this is not possible for any reason, the Train Dispatcher must be notified promptly.

## L-219. BATTERY KNIFE SWITCHES — OPENING AND CLOSING

**(a)** When opening or closing the battery knife switch, employees:

1. Hands must be free of objects.

2. Must wear gloves that are free of oil or moisture.

**(b)** When a locomotive is to be shutdown, all circuit breakers, except those protected by a hood or shield, should be turned to the "off" position. Then open the battery knife switch using the following procedure:

1. Place feet approximately shoulder width apart to maintain balance.

2. Avoid contact with the copper portions of the knife switch.

3. Firmly hold the top insulated portion of the knife switch with 1 hand.

4. Brace yourself against the control stand or electrical cabinet door with the other hand.

5. Use 1 smooth motion to pull the knife switch completely open.

6. Do not use jerking movements or hesitate while moving the knife switch.

**(c)** When a locomotive is to be restarted, all circuit breakers, except those protected by a hood or shield, should be in the off position. If not, place circuit breakers in the off position, then proceed to close the battery knife switch using the following procedure:

1. Place feet approximately shoulder width apart to maintain balance.

2. Avoid contact with the copper portions of the knife switch.

3. Place the palm of 1 hand against the top insulated portion of the knife switch.

4. Brace yourself against the electrical cabinet door or control stand with the other hand.
5. Using an open palm, use 1 smooth motion to push the knife switch completely closed.
6. Keep fingers clear of all components to avoid pinch points.
7. Restore appropriate circuit breakers to the “on” position for engine operation.

**L-220. PROPER CLEARANCE**

Diesel locomotives must not be operated over humps, car retarders or other special tracks unless it is known there is proper clearance.

**L-221. OPEN FLAME HEATERS/HEAT SOURCES**

Diesel locomotives must not be stopped and permitted to stand over open flame switch heaters or other burning heat sources.

**L-222. FIRE EXTINGUISHERS**

Engineers must be familiar with the location of fire extinguishers on locomotives and how to use them.

Whenever fire extinguishers are used, their use must be reported through the LCDI system. A locomotive must be isolated and shut down before attempting to extinguish a fire in the high voltage cabinet.

**L-223. SHUT DOWN IN AN EMERGENCY**

In case of emergency, all engines of a locomotive consist can be shut down by using MU or Emergency Stop buttons or Throttle Stop position. The Emergency Stop buttons and the Throttle Stop position are not to be used except in an emergency. Engineers must know the location of the stop devices for the different classes of locomotives and how to start the engines after an emergency stop.

In case of fire, fuel oil supply to diesel engine must be shut off by operating the “Emergency Fuel Cut-Off” device.

**L-225. ADDING LOCOMOTIVE COOLING WATER OR OIL BY OTHER THAN MECHANICAL DEPARTMENT EMPLOYEES**

Prior to adding oil or water to a locomotive, the Engineer must contact the Mechanical Operations Center (MOC) for instructions. If unable to communicate with the Mechanical Operations Center, the Engineer will contact the Train Dispatcher who will contact MOC.

If it is necessary to add water to the diesel engine cooling system, this should be done with the engine idling. On locomotives with pressurized cooling systems, the pressure must be relieved before attempting to remove the pressure cap or water tank plugs.

## L-227. RESETTING THE GROUND RELAY

If the ground relay trips, it may be reset. If ground relay trips 3 times within a 30 minute period, the locomotive must be isolated.

On locomotives equipped with automatic ground relay resetting devices, a reset lockout is provided to prevent reset after ground relay trips 3 times. When this occurs, the device must be reset by maintenance personnel. With locomotives equipped with traction motor cut outs, the locomotive need not be isolated until ground relay trips 2 additional times after all traction motor cut out positions have been tried.

The tripping of a ground relay must be reported in the LCDI System, identifying the locomotive on which the ground relay tripped, the location on the road where tripping occurred, the approximate speed at the time and the operation should also be reported.

## L-228. GROUND RELAY CUT OUT SWITCH

Under no circumstances should anyone open the ground relay cut out switch on any locomotive without first obtaining approval from the proper authority. If this switch is opened, there is no ground relay protection on the locomotive, not only creating a hazardous condition for personnel but also the possibility of extensive damage to main generator, alternator, high voltage cabinet or traction motors.

## L-229. CRANKCASE OVERPRESSURE PROTECTION DEVICE

If the crankcase overpressure protection device trips on a diesel engine so equipped, the engine can be restarted only 1 time. Before restarting the locomotive, it must be known that the cooling water level is normal and the engine has not experienced a crankcase explosion.

## L-230. PROTECTION AND SAFETY DEVICES

Except in the case of an emergency and only when properly authorized, locomotive and engine protection devices and locomotive safety control devices must not be nullified.

Blocking of the independent brake handle in quick release or bail position on the controlling locomotive or any other locomotives in the engine consist with hoses coupled is prohibited.

Engine run, generator field and control and fuel pump switches on trailing locomotives in a locomotive consist must be in open or off position.

When diesel locomotives are picked up as trailing locomotives on line-of-road, after connecting MU cable, Engineers must see that control and fuel pump switch is left in “OFF” position.

Locomotive high voltage cabinets are not to be opened except by Mechanical Department personnel or qualified persons in the performance of their duties.

When locomotives equipped with annunciator panels (generally located inside of the electrical cabinet, to indicate malfunctions of equipment or systems on a locomotive) experience a failure, the annunciator lights should not be reset. Resetting the annunciator will not correct or reset the fault.

## L-231. ISOLATED LOCOMOTIVE(S)

When a locomotive in a consist is isolated for any reason, the locomotive must be observed at frequent intervals while en route to determine that all wheels are turning freely.

**EXCEPTION:** A train may be operated with an isolated locomotive in a remote Distributed Power (DP) consist. If an alarm/alert message from the remote consist is transmitted to the controlling locomotive, the locomotive Engineer must bring the train to a stop as soon as possible consistent with safe train handling procedures. The Distributed Power consist must be inspected to determine the cause of the alarm/alert message and that all locomotive wheels are rotating freely.

If a locomotive in a remote consist must be shut down or has shut down and will not restart, the locomotive must be either switched to the head end and all MU hoses and jumper cables connected or set out at the first available location. Unless the locomotive in the remote consist is under direct observation, the train must not exceed a speed of 15 MPH until the locomotive is either on the head end of the train or set out.

To ensure a remote consist on a Distributed Power train is capable of transmitting an alarm/alert message to the controlling locomotive, only the following locomotives may be used in the remote consist:

- AC locomotives
- General Electric DC locomotives

Foreign line locomotives must not be isolated in a Distributed Power remote consist. Locomotives equipped with an Auxiliary Power Unit (APU) should not be used in a Distributed Power remote consist.

## L-232. SHUT DOWN OR ISOLATION OF DIESEL ENGINE

**(a) A LOCOMOTIVE ISOLATION OR SHUT DOWN REPORT,**

Form ME-569, is to be applied to the Isolation Switch on a locomotive when the diesel engine is shut down or isolated and the engine should not be restarted or placed back on line. The Engineer must state the reason(s) for shutting down or isolating the engine on the report.

**(b) DRAINING LOCOMOTIVES** — The Engineer must contact the Train Dispatcher immediately to determine if draining the locomotive is necessary when a diesel engine is shut down and the danger of freezing is present.

The Engineer must contact the Mechanical Operations Center for draining instructions applicable to the NS Road Locomotive or Foreign Locomotive that is shut down. If unable to contact the Mechanical Operations Center (MOC), the Engineer must contact the Train Dispatcher who will communicate with MOC and advise the crew of the procedure for draining the cooling water.

## L-234. INSPECTION AFTER ACCIDENT OR DERAILMENT

When a locomotive is involved in an accident or after a derailed locomotive has been re-tracked, if there is possibility of damage to traction motors, gear cases, brake rigging, fuel tank or other equipment that would prevent its safe movement, the locomotive must be inspected by a qualified supervisor or inspector before proceeding.

Locomotive should be moved to determine if all wheels rotate freely. If a speed restriction is required for safe movement, the qualified supervisor or inspector will designate that speed.

## L-235. CHANGING OPERATING ENDS OF LOCOMOTIVES

### (a) 26 L or 30 Equipment

1. **Lead to Trail:** To set up 26L or 30 brake equipment for TRAIL, secure locomotive(s) and place handles, switches and cut out cocks in the following positions in the sequence listed:
   - **a.** Place dynamic brake handle or selector lever (if equipped) in OFF position.
   - **b.** Place reverser handle in neutral and remove if possible.
   - **c.** Move automatic brake valve handle to FULL SERVICE position.
   - **d.** After brake pipe exhaust stops, place cutoff valve in OUT position.
   - **e.** Place automatic brake valve in HANDLE OFF position and remove or pin handle.
   - **f.** Apply independent brake valve handle to FULL application.
   - **g.** Place independent cut out (MU-2-A) in OUT OR TRAIL position.
   - **h.** Place independent brake handle in fully RELEASED position, depress handle to ensure brake is cut out properly and remove or pin handle.
   - **i.** Place control and fuel pump switch, engine run switch and generator field switch in OFF position.
2. **Trail to Lead:** To set up 26L or 30 brake equipment for LEAD, secure locomotive(s) and place handles, switches and cut out cocks in the following positions in the sequence listed:
   - **a.** Place the Control and Fuel Pump switch in the ON position.
   - **b.** Leave reverser handle in NEUTRAL position. (Where reverser handle has been removed on AAR standard control stands, reverser handle must be replaced and left in NEUTRAL position.)
   - **c.** Make certain throttle lever is in IDLE, selector lever (if equipped) is in OFF.

**d.** Insert the independent brake valve handle and apply to FULL APPLICATION position.

**e.** Place the independent cut out cock (MU-2-A) in LEAD.

**f.** Insert automatic brake handle or remove pin from automatic brake handle and place in RELEASE.

**g.** Place cut-off valve in FRT or IN position.

**h.** Place engine run and generator field switch in ON position.

**(b) Positioning Electronic Equipment — EMD Locomotives**

**1. Lead to Trail:** To set up ELECTRONIC brake equipment for TRAIL position, secure locomotive(s), and place handles and switches, and operate integrated display keys in the following sequence:

**a.** Place dynamic brake handle in OFF position.

**b.** Place reverser handle in neutral and remove if possible.

**c.** Automatic brake valve handle to FULL SERVICE position.

**d.** Independent brake valve handle to FULL APPLICATION position.

**e.** Press integrated display keys as follows:

**(1)** Press AIR BRAKE SETUP.

**(2)** Press LEAD/TRAIL for TRAIL (Cuts out Independent and Automatic Brake).

**(3)** Press ACCEPT NEW — press twice.

**f.** Move automatic brake valve handle to HANDLE OFF position.

**g.** Move independent brake valve handle to RELEASE position.

**h.** Note that brake cylinder pressure holds.

**i.** Press the EXIT Key to return to the Function Menu.

**j.** Place control and fuel pump switch, engine run switch and generator field switch in OFF position.

**2. Trail to Lead:** To set up ELECTRONIC brake equipment for LEAD position, secure locomotive(s), and place handles and switches, and operate integrated display keys in the following sequence:

**a.** Place the control and fuel pump switch in the ON position.

**b.** Leave or place reverser handle in NEUTRAL position.

**c.** Make certain throttle is in IDLE.

**d.** Apply independent brake valve handle to FULL application.

**e.** Place automatic brake valve handle in RELEASE position.

**f.** Press INTEGRATED DISPLAY KEYS as follows:

**(1)** Press AIR BRAKE SETUP.

**(2)** Press LEAD/TRAIL for LEAD (Cuts in Independent Brake).

**(3)** Press ACCEPT NEW — press twice (Equalizing Reservoir increases).

**(4)** Press AIR BRAKE SETUP.

**(5)** Press CUT IN/CUT OUT for CUT IN (Cuts in Automatic Brake).

**(6)** Press ACCEPT NEW — press twice.

**g.** Adjusting Equalizing Reservoir Pressure.

**(1)** Press AIR BRAKE SETUP.

**(2)** Press EQ RES SETUP.

**(3)** Use preset key for 80, 90, 100 or 110 PSI setting.

**(4)** Press ENTER.

**(5)** Press ACCEPT NEW — press twice.

**h.** Place the engine run and generator field switch in the ON position.

**(c) Electronic Equipment — GE Locomotives**

**1. Lead to Trail:** To set up ELECTRONIC brake equipment for TRAIL position, secure locomotive(s), and place handles and switches, and operate integrated display keys in the following sequence:

**a.** Place dynamic brake handle in OFF position.

**b.** Place reverser handle in neutral and remove if possible.

**c.** Automatic brake valve handle to FULL SERVICE position.

**d.** Independent brake valve handle to FULL APPLICATION position.

**e.** Press integrated display keys as follows:

**(1)** Press AIR BRAKE SETUP (if applicable).
**(2)** Press CHANGE SETUP (if applicable).
**(3)** Press LEAD/TRAIL for TRAIL (Cuts out Independent and Automatic Brakes).
**(4)** Press SAVE SETUP.
**(5)** Press DO IT or CONFIRM.

**f.** Move automatic brake valve handle to HANDLE OFF position.

**g.** Move independent brake valve handle to RELEASE position.

**h.** Note that brake cylinder pressure holds.

**i.** Press the EXIT Key to return to the Function Menu.

**j.** Place control and fuel pump switch, engine run switch and generator field switch in OFF position.

**2. Trail to Lead:** To set up ELECTRONIC brake equipment for LEAD position, secure locomotive(s), and place handles and switches, and operate integrated display keys in the following sequence:

**a.** Place the control and fuel pump switch in the ON position.

**b.** Leave or place reverser handle in NEUTRAL position.

**c.** Make certain throttle is in IDLE.

**d.** Apply independent brake valve handle to FULL application.

**e.** Place automatic brake valve handle in RELEASE position.

**f.** Press INTEGRATED DISPLAY KEYS as follows:

**(1)** Press AIR BRAKE SETUP.

**(2)** Press CHANGE SETUP (if applicable).

**(3)** Press LEAD/TRAIL for LEAD (Cuts in Independent Brake).

**(4)** Press SAVE SETUP.

**(5)** Press DO IT or CONFIRM (Equalizing Reservoir increases).

**(6)** Press CHANGE SETUP.

**(7)** Press CUT IN/CUT OUT for CUT IN (Cuts in Automatic Brake).

**(8)** Press SAVE SETUP.

**(9)** Press DO IT or CONFIRM.

**g.** If Equalizing Reservoir Pressure must be adjusted:

**(1)** Press CHANGE SETUP (if applicable).

**(2)** Press REGULATING VALVE SETUP.

**(3)** Use Up or Down Arrow Keys to adjust pressure setting.

**(4)** Press SAVE SETUP.

**(5)** Press DO IT or CONFIRM.

**h.** Place the engine run and generator field switch in the ON position.

## L-236. SECURING LOCOMOTIVES

**(a)** Before a locomotive is left on line-of-road or at a relieving point, the following precautions must be taken to prevent movement and to protect equipment:

**1.** Place throttle in idle position.

**2.** Leave controlling locomotive's air brakes set up for lead position.

**3.** Make a service application with the automatic brake valve and leave in the service position.

**4.** Leave the independent brake in the full application position.

**5.** Place selector handle (when equipped) in "OFF" position.

**6.** Place reverser in neutral position.

**7.** Remove reverser handle where not pinned and place in holder.

**8.** Open generator field switch or circuit breaker.

**9.** Place isolation switch in "START" position.

**EXCEPTION:** If a locomotive equipped with an "automatic engine Stop/Start system" is the lead locomotive in a consist to be left on a train or cut of cars for the purpose of maintaining brake pipe pressure, the isolation switch should be left in the "RUN" position. The isolation switch on any trailing locomotives must be placed in the "START" position. Locomotive equipped with an "automatic engine Stop/Start

system" can be identified by decals on the outside of the locomotive and in the operating cab.

**10.** Apply the parking brake (manual hand brake or electric brake) on all locomotives.

**EXCEPTION:** Where authorized by the Division Manager Mechanical Operations or Manager Diesel Shop, apply the parking brake on controlling locomotive only when the consist is left on engine servicing track.

**EXCEPTION:** When the lead locomotive consist is detached from a Distributed Power train, the Distributed Power locomotives left unattended in the train are not governed by the requirements of this Item provided the locomotives are properly configured in "SET OUT" mode. A sufficient number of parking brakes must be applied to secure the equipment left standing.

**(b)** Except for when "Freeze Beater" equipped locomotives are connected to trackside plug-in charging stations, to prevent freezing of the water lines, anytime the temperature is 10 degrees or below, or anticipated to drop to 10 degrees or below, the Engineer must leave all unattended locomotives running and throttled up from the controlling locomotive as follows:

- Place the reverser in neutral position with the lever inserted.
- Place the selector handle when equipped, in motoring position.
- Open generator field switch or circuit breaker on each control stand.
- Place the isolation switch in "RUN" position.
- Place throttle in Position 2.

The Train Dispatcher should be contacted as necessary for weather updates.

*Added 12/4/17*

**(c)** When locomotives are shut down and left unattended, open main battery switch (except as provided in **Rule L-238**), apply parking brake on ALL locomotives and, if necessary, block the wheels. In freezing weather, all water systems must be drained.

**NOTE:** Variance from the provisions of **Items (b)** and **(c)** is permitted when provided for by special instructions, which have been approved by the Mechanical Department.

**(d)** If necessary to leave a locomotive on line-of-road on other than a track designated for tying up or setting off locomotives, permission must be obtained first from the Chief Train Dispatcher.

**(e)** Locomotives will, when practicable, be left coupled to other equipment that is also secured by an effective hand brake.

**(f) Testing Hand Brakes — Remote Control Locomotives**

To test the effectiveness of hand brakes on Remote Control Locomotives:

1. Apply parking brake(s) on locomotive(s).
2. Leave the locomotive in Remote status while performing this test.
3. Place locomotive isolation switch to isolate position.
4. Place reverser in desired direction, then:
   - depress reset button
   - move OCU speed selector from stop position to couple speed position
   - verify locomotive(s) brakes release
   - locomotive(s) must remain stationary for 10 seconds
5. Move OCU speed selector from COUPLE speed position to STOP position.
6. Place locomotive isolation switch to “run” position.
7. Depress reset button, move OCU speed selector from stop position to couple speed position or higher, if necessary, until movement occurs.
8. Move OCU speed selector from the couple speed or higher position to coast position (no power and no brakes), applied hand brake(s) must stop locomotive(s) within 25 feet.

**9.** Move OCU speed selector from coast position to stop position (independent brakes apply) when locomotive(s) stop.

This procedure tests the effectiveness of the parking brake(s) per NS Rules, and is in addition to existing procedures for securing locomotive(s). **NOTE: NS-1 Rule L-236** — Securing Locomotives, remains in full force.

## L-237. OPERATING AN ELECTRIC PARKING BRAKE

**(a)** When **applying** an electric parking brake on locomotives so equipped, the following steps will apply:

**1.** Verify that the parking brake circuit breaker is in the ON position.

**2.** Rotate the collar of the parking brake switch clockwise to align the indicator mark with the position marked “Apply” or operate the toggle switch up to the “Apply” position.

**3.** Press and hold the push button until the needle indicator on the parking brake meter moves to the extreme right position of (and remains steady in) the applied zone. (This may take 45 to 50 seconds)

**NOTES:** 1) If the indicator needle does not move after the push button has been pressed for 30 seconds, the parking brake must be operated manually, and 2) do not hold the push button in for more than 15 seconds after the indicator needle reaches and remains steady in the applied zone.

On locomotives equipped with a toggle switch, it is not necessary to hold the toggle switch up. When the toggle switch is operated, the release light will go out. The parking brake is on when the applied indictor light is illuminated.

**(b)** When applying an electric parking brake **manually** on locomotives so equipped, the following steps will apply:

**1.** Place the parking brake circuit breaker in the OFF position.

**2.** Remove the hand crank from the container adjacent to the parking brake unit, which is located on the left side of the front truck.

**3.** Apply the hand crank to the manual drive shaft of the parking brake unit and rotate it clockwise on EMD locomotives (counter-clockwise on GE locomotives) until the brake shoes are firmly against L2 and L3 wheels.

4. Remove and store the hand crank.

**(c)** When **releasing** an Electric Parking Brake on locomotives so equipped, the following steps will apply:

1. Rotate the collar of the parking brake switch counter-clockwise to align the indicator mark with the position marked “Release” or operate the toggle switch down to the release position.
2. Press and hold the push button until the indicator needle on the parking brake meter moves to the extreme left position of (and remains steady) in the release zone. (This may take 45 to 50 seconds.)

**NOTES:** 1) If the indicator needle does not move after the push button has been pressed for 30 seconds, the parking brake must be operated manually, and 2) do not hold the push button in for more than 15 seconds after the needle indicator reaches and remains steady in the release zone.

On locomotives equipped with a toggle switch, it is not necessary to hold the toggle switch down. When the toggle switch is operated, the applied light will go out. The parking brake is off when the released indicator light is illuminated.

**(d)** When releasing an electric parking brake **manually** on locomotives so equipped, the following steps will apply:

1. Place the parking brake circuit breaker in the OFF position.
2. Remove the hand crank from the container adjacent to the parking brake unit, which is located on the left side of the front truck.
3. Rotate the hand crank counter-clockwise on EMD locomotives (clockwise on GE locomotives) until the brake shoes for L2 and L3 wheels are away from the wheels when the parking brake and air brakes are released.
4. Remove and store the hand crank.

**(e)** When applying or releasing electric parking brake, inspect brake shoes at the number 2 and number 3 axle positions on the left side of the locomotive to ensure that brakes are properly applied or released. The Parking Brake Meter may be incorrect if the brake rigging is damaged or obstructed by debris or severe icing.

## L-238. FUEL CONSERVATION PROCEDURES

### (a) General Instructions

The Train Dispatcher or Yardmaster should be contacted as necessary for weather updates concerning the current and expected temperatures. When the temperature is anticipated to remain above 32˚F:

1. Locomotive(s) left at any location that will not be utilized within 30 minutes must be shut down. Locomotives expected to be shut down in excess of 2 hours must have their battery knife switch opened.
2. Except as provided in L-236, at the completion of a tour of duty on line-of-road, locomotives must be shut down, unless the relieving Engineer is present to take control of the locomotives.

### (b) Train Delays

When any train is stopped, the crew will inquire on the length of delay and obtain updates on this information. If there will be a delay of 30 minutes or more, all locomotives except the controlling locomotive must be shut down. Locomotives will be restarted prior to the end of the delay to ensure the train is ready to proceed without additional delay when authorized. 5 minutes per locomotive should be used as a guideline for calculating the time needed to restart the locomotives. During meal periods, yard assignments must shut down all locomotives.

### (c) Train Operations

1. Engineers must be aware of the operational condition of the locomotives in their consist. Locomotives not required to operate, based on horsepower per ton ratings, should be isolated and shut down when temperature permits.
2. When a train or locomotive(s) is stopped, the Engineer must center the reverser handle to activate the low idle feature.
3. Unless shutdown in accordance with L-238(g), when the temperature is 32˚F or below, or anticipated to drop to 32˚F or below, locomotives which are shut down must be restarted. Before attempting to restart any locomotive, the locomotive sight glass must be inspected to ensure the presence of engine coolant.

4. Pusher locomotives must be isolated or shut down if temperature permits, at the first stop after determining power is not needed. Locomotives in a remote consist of designated Distributed Power (DP) train when not required for tonnage will be left running and isolated and will not be shut down.
5. Do not open the battery knife switch when locomotives will be utilized within 2 hours. Locomotives shut down and moving in a consist must have the battery knife switch opened, unless tagged otherwise.
6. When taking locomotives off line, the lead locomotive will remain on line unless mechanical difficulties require otherwise.

**(d) Light Locomotives**

1. On light engine movements, all locomotives not required to safely control the movement will be isolated, or shut down if temperature permits.
2. When leaving locomotive servicing areas, only the controlling locomotive will be on line. Trailing locomotives in the working consist will be isolated. Locomotives in tow will be handled as set up at the servicing area.
3. On inbound trains, all working locomotives except the controlling locomotive will be shut down after yarding the train. Upon arrival at either a locomotive facility or designated area where Mechanical Department personnel are on duty, all locomotives will be shut down when the temperature is above 35°F unless Mechanical Department employees are physically present to mount and take immediate control of the locomotives.

**(e) LEADER/Trip Optimizer**

Engineers must log in to LEADER, Trip Optimizer, and other on-board systems. Prompts for fuel conservation must be followed and any discrepancies should be promptly reported to the Help Desk.

**(f) Horsepower Per Ton (HPT)**

Horsepower per ton tables are provided on the Train Clearance in the Fuel Directive section. The tables provide the maximum tonnage rating in each direction on the district for each train type, according to the number of powered axles on line. Engineers must ensure their train operates with no more than the required

powered axles on line as indicated in the table, based on the train's type, direction, and tonnage. Locomotives not needed for power according to HPT values must be shut down. Train types are as follows:

IP – Premium Intermodal Trains
IM/ML – Non-Premium Intermodal and Multi-level Trains
FREIGHT – General Merchandise Freight Trains
BULK – Solid Bulk Commodity Trains

**(g) Freeze Beater and Trackside Plug-In Charging Stations**

The "Freeze Beater" system provides locomotive battery charging, cab warming, and freeze protection on locomotives when shut down and properly connected to trackside plug-in charging stations. Equipped locomotives can be identified by a blue electrical connection under the walkway by the diesel fuel tank fill.

Where trackside plug-in stations are available and when practicable, properly secured locomotives equipped with "Freeze Beater" that will not be used for 4 hours must be connected to trackside plug-in charging stations regardless of temperature as follows:

To connect the locomotive(s):

1. Ensure that the locomotive(s) is shut down with all circuit breakers placed in the down position and the battery knife switch opened.

2. Open the blue cover on the locomotive's receptacle and remove the blue cap from the end of the crane's plug. Then manually pull the crane down toward the unit.

3. To connect the locomotive to the station plug, align the red dot on the plug with the red dot on the locomotive receptacle and insert the plug while rotating slightly clockwise until the latch on the receptacle engages on the plug. Then lock in place with the latches on the side of the receptacle.

4. The “CONTROL POWER” key switch on the control panel should be in the “ON” position and the white “POWER AVAILABLE” light illuminated. The green “PHASE CORRECT” light should also be illuminated. If the “CONTROL POWER” switch is in the “OFF” position, contact the Yardmaster or Mechanical Supervisor for the key.

5. Turn the upper right black manual switch from “OFF” to “LOOP TEST” position and the orange “LOOP COMPLETE” light should illuminate.

6. Finally, turn the black switch from “LOOP TEST” to “POWER FEED” and the pumps and heaters on the unit will automatically start.

To disconnect the locomotive(s):

1. Turn the black manual switch from “POWER FEED” to “LOOP TEST”.

2. Unlatch the plug from the receptacle and disconnect it. There will be a time delay, but the crane should automatically retract for storage. If the crane does not retract, turn the black knob on top of the cylinder slightly counterclockwise and the cylinder will slowly retract.

3. Hook the Cord and Plug into the storage hook. Close the blue cover on the locomotive receptacle and insert the blue cap back into the plug to keep dirt and water out.

4. If for any reason the “POWER AVAILABLE” or the “LOOP COMPLETE” fail to light up, or during operation the blue “GROUND FAULT” light illuminates, or the main breaker on the control panel on the trackside station trips, disconnect the unit from the station and contact local Mechanical Supervisor. Be sure to note the unit number as well as the station location when reporting these issues.

**5.** The "GROUND RESET" button will reset the ground fault relay. If the "GROUND FAULT" light is on, press the "GROUND RESET" button just one time. If the light remains on, contact the Mechanical Supervisor to troubleshoot the problem. *Revised 12/4/17*

## L-239. YARD SERVICE LOCOMOTIVES

SW1500, SW1001 and MP15DC type locomotives will be handled as follows:

**(a)** MP15DC type locomotives are not equipped with traction motor shunting and must not be operated under power in the eighth notch at speeds above 20 MPH. MP15DC type locomotives may be operated at maximum authorized speed up to 50 MPH in seventh notch or lower.

**(b)** Must be used as lead when operated in road service in multiple due to not being equipped with dynamic brakes.

## L-240. LOCOMOTIVE CALENDAR DAY INSPECTION AND REPORTING

### (a) Calendar Day Inspection

**1.** Each locomotive in use must be inspected once each calendar day. When taking charge of locomotives, Engineers or Remote Control Operators will determine if an inspection is required by examining Form ME-65 located on each locomotive. An inspection record, Form ME-65, must be completed and maintained on each locomotive indicating:

**a.** Date

**b.** Time

**c.** Location

**d.** Signature of inspecting employee

**e.** Compliance

When a Calendar Day Inspection is not in date and Mechanical Department employees are not assigned to inspect, Engineers or Remote Control Operators will inspect each locomotive and at the time the inspection is performed, complete the (above) appropriate lines on Form ME-65.

**NOTE:** Printed names in the signature column on Form ME-65 are not permitted. Signatures must be legible.

**2.** Handling of Defects Identified:

**a.** Where Mechanical Department Employees are On Duty or Assigned:

- Defects found during the Calendar Day Inspection are to be reported to the local Mechanical representative at the location where the defects are discovered. The Mechanical Department employee will determine if the reported defect(s) is non-complying. If the defect(s) is found to be noncomplying the Engineer or Remote Control Operator must not use the locomotive(s) until the noncomplying defect(s) has been corrected or repaired.
- Engineer or Remote Control Operators will be governed by the instructions of the Mechanical Department regarding proper handling of non-complying equipment.

**b.** Where Mechanical Department Employees are NOT ON Duty or Assigned:

- Defects found during the Calendar Day Inspection must be reported to the LCDI Desk before departing the location where the defects are discovered. The LCDI Desk will determine whether the reported defect(s) is non-complying. If the defect(s) is found to be non-complying the Engineer or Remote Control Operator must:

  **(1)** Not use the locomotive(s) until the noncomplying defect(s) has been corrected or repaired. (**NOTE:** The LCDI Desk will enter an "F" into the LCDI System indicating the reported defect(s) is non-complying.)

  **(2)** Complete a "NON-COMPLYING LOCO MOTIVE" (Form ME-615) tag as instructed by the LCDI Desk and place the completed tag on the isolation switch of the locomotive with the non-complying defect(s).

**c.** Defects Discovered En Route:

- Must be reported to the LCDI Desk when discovered. The LCDI Desk will determine if the defects are non-complying. If the defects are reported as noncomplying, the Train Dispatcher must also be notified.

  Locomotive(s) with non-complying defect(s) and properly tagged with "NON-COMPLYING LOCOMOTIVE" (Form ME-615) tag may continue to be used, if it is safe to move the locomotive, until the earlier of:

  **(1)** The next Calendar Day Inspection.

  **(2)** The nearest forward point where repairs can be made.

**(b) Locomotive Calendar Day Inspection and Reporting System (LCDI)**

All Engineers or Remote Control Operators are required to report the status and condition of their locomotive consist(s). Completion of the LCDI Report is mandatory:

**1.** At the completion of tour of duty, the Engineer or Remote Control Operator must review the LCDI System and confirm that all defects reported to the local Mechanical Department or the LCDI Desk have been properly entered into the LCDI System.

**2.** All defects identified by the Engineer or Remote Control Operator are required to be reported in the LCDI System regardless of the defect's state of repair. If the reported defects are not present on the LCDI reporting screen, it is the Engineer or Remote Control Operator's responsibility to enter the defects.

**3.** All defects identified and reported must be identified by their FRA classification of defect. The Defect Category, as determined during required reporting to local Mechanical or LCDI Desk personnel, should be marked with an "F" to indicate a FRA Non-Complying Condition or a "D" to indicate all other reported defects.

**4.** Prior to being released from duty and prior to their Hours of Service Limit (HSL), Engineers or Remote Control Operators will access the electronic LCDI reporting system and:

- Verify data previously entered by local Mechanical representative or LCDI Desk.
- Update with any additional defects.
- Complete the verification and update process with an electronic signature.

**5.** Engineers or Remote Control Operators, who have reached their HSL and are unable to complete the electronic LCDI Report, must verify and complete the LCDI Report at the beginning of their next tour of duty.

**NOTE:** Prior to being relieved under HSL, every effort should be made to notify local Mechanical Department employees or the LCDI Desk of any outstanding defects.

## L-241. CRESTING GRADE

**(a)** As the locomotive consist crests the summit, the throttle must be reduced to maintain a safe level of forces in those couplers at the crest of the grade. Further throttle reductions may be made to keep speed constant and amperage at a safe level.

**(b)** When dynamic brake is available and special instructions do not prohibit its use, after the train is balanced and after the throttle has been reduced to idle, on heavy grades, apply the dynamic brake gradually and increase amperage to a level that will generate enough retarding force to control the train at a constant speed. The speed should not be allowed to increase until two-thirds of the train is over the crest. An increase in speed of 1 MPH indicates the train is balanced and dynamic braking is required to keep the speed constant.

**(c) Descending Steep Grades (1% or More)**

**1.** Prior to descending a grade of 1% or more, determine:

- air brake system is charged within **15 PSI** of the regulating valve setting
- number of **Effective Dynamic Brake Axles (EDBA)** allowed under NS-1, **Rule L-210, Item (b) 2.**

**NOTE:** The EDBA value of Distributed Power locomotives or pusher locomotives (with operable dynamic brakes) may be added to the EDBA of the lead locomotive consist to determine the allowable number of EDBA that may be used to descend the grade.

**2. Trains NOT Meeting the Effective Dynamic Brake Axle Requirement**

**a.** Prior to descending the grade, the train must:

- obtain additional locomotives, including pusher locomotives, to meet the EDBA value, or

**b.** The train may descend the grade but must **NOT**:

- exceed a speed of **15 MPH**
- make an automatic brake pipe reduction greater than **18 PSI** for a distance of **2 miles** or more to avoid brake fading

**NOTE:** If an automatic brake pipe reduction greater than **18 PSI** must be made:

- the train must be stopped and secured with sufficient number of hand brakes
- the air brake system must be charged within **15 PSI** of the regulating valve before proceeding
- hand brakes may remain applied until the train safely descends the grade

**3. Identification of Steep Grades**

Timetables or special instructions will identify the section of track with an average grade of 2% or greater over a distance of 2 continuous miles or 1% or greater over a distance of 3 continuous miles.

**4. Steep Grade Charts**

After determining the track section's average grade, select the Steep Grade chart that corresponds to the percent grade (up to 2.50%), train type and tonnage to calculate the minimum number of **EDBA** required and the maximum speed the train may descend the grade. If the grade exceeds 2.50%, refer to local instructions for maximum operating instructions.

**5. Partial or Complete Loss of Dynamic Brake While Descending Grade**

**a.** If a train experiences a partial or complete loss of its dynamic brakes, which results in fewer **EDBA** than those permitted by the lowest speed for the train type and tonnage indicated in the grade charts, the train must be

stopped immediately with an application of the train's air brakes. If necessary, an emergency application of the train's air brakes must be initiated.

**b.** After the train stops, the procedures outlined in the **NOTE** contained in **Item (c) 2.** must be followed. In addition, the train speed must not exceed **15 MPH** and the automatic brake pipe reduction must not be more than **18 PSI** until the train descends the grade.

# STEEP GRADE CHARTS

| 1.0 % to 1.25% Grade Requirements | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Total Trailing Tonnage (including Locomotives not in Dynamic Brake) | Maximum Speed for Loaded Unit Trains (coal, grain, etc.) | | | | | | | |
| | 15 MPH MINIMUM EDBA | 20 MPH MINIMUM EDBA | 25 MPH MINIMUM EDBA | 30 MPH MINIMUM EDBA | 35 MPH MINIMUM EDBA | 40 MPH MINIMUM EDBA | 45 MPH MINIMUM EDBA | 50 MPH MINIMUM EDBA |
| 2000 or less | 0 | 0 | 0 | 1 | 2 | 3 | 4 | 5 |
| 2001 to 3000 | 0 | 0 | 0 | 1 | 3 | 4 | 6 | 7 |
| 3001 to 4000 | 0 | 0 | 0 | 1 | 3 | 5 | 7 | 9 |
| 4001 to 5000 | 0 | 0 | 0 | 2 | 4 | 7 | 9 | 11 |
| 5001 to 6000 | 0 | 0 | 0 | 2 | 5 | 8 | 11 | 13 |
| 6001 to 7000 | 0 | 0 | 0 | 2 | 5 | 9 | 12 | 15 |
| 7001 to 8000 | 0 | 0 | 0 | 2 | 6 | 10 | 14 | 18 |
| 8001 to 9000 | 0 | 0 | 0 | 2 | 7 | 11 | 16 | 20 |
| 9001 to 10000 | 0 | 0 | 0 | 3 | 8 | 13 | 17 | 22 |
| 10001 to 11000 | 0 | 0 | 0 | 3 | 8 | 14 | 19 | 24 |
| 11001 to 12000 | 0 | 0 | 0 | 3 | 9 | 15 | 21 | 26 |
| 12001 to 13000 | 0 | 0 | 0 | 3 | 10 | 16 | 22 | 28 |
| 13001 to 14000 | 0 | 0 | 0 | 3 | 10 | 17 | 24 | 30 |
| 14001 to 15000 | 0 | 0 | 0 | 4 | 11 | 19 | 26 | 33 |
| 15001 to 16000 | 0 | 0 | 0 | 4 | 12 | 20 | 27 | 35 |
| 16001 to 17000 | 0 | 0 | 0 | 4 | 13 | 21 | 29 | 37 |
| 17001 to 18000 | 0 | 0 | 0 | 4 | 13 | 22 | 31 | 39 |
| 18001 to 19000 | 0 | 0 | 0 | 4 | 14 | 23 | 32 | 41 |
| 19001 to 20000 | 0 | 0 | 0 | 5 | 15 | 25 | 34 | 43 |
| 20001 to 21000 | 0 | 0 | 0 | 5 | 15 | 26 | 36 | 45 |
| 21001 to 22000 | 0 | 0 | 0 | 5 | 16 | 27 | 37 | 47 |
| 22001 to 23000 | 0 | 0 | 0 | 5 | 17 | 28 | 39 | 50 |
| 23001 to 24000 | 0 | 0 | 0 | 5 | 18 | 29 | 41 | 52 |
| 24001 to 25000 | 0 | 0 | 0 | 6 | 18 | 31 | 42 | 54 |
| 25001 to 26000 | 0 | 0 | 0 | 6 | 19 | 32 | 44 | 56 |
| 26001 to 27000 | 0 | 0 | 0 | 6 | 20 | 33 | 46 | 58 |
| 27001 to 28000 | 0 | 0 | 0 | 6 | 20 | 34 | 47 | 60 |
| 28001 to 29000 | 0 | 0 | 0 | 6 | 21 | 35 | 49 | 62 |
| 29001 to 30000 | 0 | 0 | 0 | 7 | 22 | 37 | 51 | 65 |

| 1.26% to 1.5% Grade Requirements | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Total Trailing Tonnage (Including Locomotives not in Dynamic Brake) | Maximum Speed for Loaded Unit Trains (coal, grain, etc.) | | | | | | | |
| | 15 MPH MINIMUM EDBA | 20 MPH MINIMUM EDBA | 25 MPH MINIMUM EDBA | 30 MPH MINIMUM EDBA | 35 MPH MINIMUM EDBA | 40 MPH MINIMUM EDBA | 45 MPH MINIMUM EDBA | 50 MPH MINIMUM EDBA |
| 2000 or less | 0 | 0 | 1 | 3 | 4 | 5 | 6 | 8 |
| 2001 to 3000 | 0 | 0 | 2 | 4 | 6 | 7 | 9 | 11 |
| 3001 to 4000 | 0 | 0 | 2 | 5 | 7 | 10 | 12 | 15 |
| 4001 to 5000 | 0 | 0 | 2 | 6 | 9 | 12 | 15 | 18 |
| 5001 to 6000 | 0 | 0 | 3 | 7 | 11 | 14 | 18 | 22 |
| 6001 to 7000 | 0 | 0 | 3 | 8 | 12 | 17 | 21 | 25 |
| 7001 to 8000 | 0 | 0 | 3 | 9 | 14 | 19 | 24 | 29 |
| 8001 to 9000 | 0 | 0 | 4 | 10 | 16 | 21 | 27 | 32 |
| 9001 to 10000 | 0 | 0 | 4 | 11 | 17 | 24 | 30 | 36 |
| 10001 to 11000 | 0 | 0 | 5 | 12 | 19 | 26 | 33 | 39 |
| 11001 to 12000 | 0 | 0 | 5 | 13 | 21 | 28 | 36 | 43 |
| 12001 to 13000 | 0 | 0 | 5 | 14 | 22 | 31 | 39 | 46 |
| 13001 to 14000 | 0 | 0 | 6 | 15 | 24 | 33 | 41 | 50 |
| 14001 to 15000 | 0 | 0 | 6 | 16 | 26 | 35 | 44 | 53 |
| 15001 to 16000 | 0 | 0 | 6 | 17 | 27 | 38 | 47 | 57 |
| 16001 to 17000 | 0 | 0 | 7 | 18 | 29 | 40 | 50 | 61 |
| 17001 to 18000 | 0 | 0 | 7 | 19 | 31 | 42 | 53 | 64 |
| 18001 to 19000 | 0 | 0 | 8 | 20 | 32 | 45 | 56 | 68 |
| 19001 to 20000 | 0 | 0 | 8 | 21 | 34 | 47 | 59 | 71 |
| 20001 to 21000 | 0 | 0 | 8 | 22 | 36 | 49 | 62 | 75 |
| 21001 to 22000 | 0 | 0 | 9 | 23 | 37 | 51 | 65 | 78 |
| 22001 to 23000 | 0 | 0 | 9 | 24 | 39 | 54 | 68 | 82 |
| 23001 to 24000 | 0 | 0 | 9 | 25 | 41 | 56 | 71 | 85 |
| 24001 to 25000 | 0 | 0 | 10 | 26 | 42 | 58 | 74 | 89 |
| 25001 to 26000 | 0 | 0 | 10 | 27 | 44 | 61 | 77 | 92 |
| 26001 to 27000 | 0 | 0 | 11 | 28 | 46 | 63 | 80 | 96 |
| 27001 to 28000 | 0 | 0 | 11 | 30 | 48 | 65 | 82 | 99 |
| 28001 to 29000 | 0 | 0 | 11 | 31 | 49 | 68 | 85 | 103 |
| 29001 to 30000 | 0 | 0 | 12 | 32 | 51 | 70 | 88 | 106 |

| 1.51% to 1.75% Grade Requirements | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Total Trailing Tonnage (Including Locomotives not in Dynamic Brake) | Maximum Speed for Loaded Unit Trains (coal, grain, etc.) | | | | | | | |
| | 15 MPH MINIMUM EDBA | 20 MPH MINIMUM EDBA | 25 MPH MINIMUM EDBA | 30 MPH MINIMUM EDBA | 35 MPH MINIMUM EDBA | 40 MPH MINIMUM EDBA | 45 MPH MINIMUM EDBA | 50 MPH MINIMUM EDBA |
| 2000 or less | 0 | 1 | 3 | 4 | 6 | 7 | 9 | 10 |
| 2001 to 3000 | 0 | 1 | 4 | 6 | 8 | 11 | 13 | 15 |
| 3001 to 4000 | 0 | 1 | 5 | 8 | 11 | 14 | 17 | 20 |
| 4001 to 5000 | 0 | 2 | 6 | 10 | 14 | 18 | 21 | 25 |
| 5001 to 6000 | 0 | 2 | 7 | 12 | 16 | 21 | 26 | 30 |
| 6001 to 7000 | 0 | 2 | 8 | 14 | 19 | 24 | 30 | 35 |
| 7001 to 8000 | 0 | 2 | 9 | 15 | 22 | 28 | 34 | 40 |
| 8001 to 9000 | 0 | 2 | 10 | 17 | 24 | 31 | 38 | 45 |
| 9001 to 10000 | 0 | 3 | 11 | 19 | 27 | 35 | 42 | 50 |
| 10001 to 11000 | 0 | 3 | 12 | 21 | 30 | 38 | 46 | 55 |
| 11001 to 12000 | 0 | 3 | 14 | 23 | 32 | 42 | 51 | 60 |
| 12001 to 13000 | 0 | 3 | 15 | 25 | 35 | 45 | 55 | 65 |
| 13001 to 14000 | 0 | 4 | 16 | 27 | 38 | 48 | 59 | 69 |
| 14001 to 15000 | 0 | 4 | 17 | 29 | 40 | 52 | 63 | 74 |
| 15001 to 16000 | 0 | 4 | 18 | 30 | 43 | 55 | 67 | 79 |
| 16001 to 17000 | 0 | 4 | 19 | 32 | 45 | 59 | 71 | 84 |
| 17001 to 18000 | 0 | 4 | 20 | 34 | 48 | 62 | 76 | 89 |
| 18001 to 19000 | 0 | 5 | 21 | 36 | 51 | 66 | 80 | 94 |
| 19001 to 20000 | 0 | 5 | 22 | 38 | 53 | 69 | 84 | 99 |
| 20001 to 21000 | 0 | 5 | 23 | 40 | 56 | 72 | 88 | 104 |
| 21001 to 22000 | 0 | 5 | 24 | 42 | 59 | 76 | 92 | 109 |
| 22001 to 23000 | 0 | 6 | 26 | 43 | 61 | 79 | 97 | 114 |
| 23001 to 24000 | 0 | 6 | 27 | 45 | 64 | 83 | 101 | 119 |
| 24001 to 25000 | 0 | 6 | 28 | 47 | 67 | 86 | 105 | 124 |
| 25001 to 26000 | 0 | 6 | 29 | 49 | 69 | 90 | 109 | 129 |
| 26001 to 27000 | 0 | 6 | 30 | 51 | 72 | 93 | 113 | 133 |
| 27001 to 28000 | 0 | 7 | 31 | 53 | 75 | 96 | 117 | 138 |
| 28001 to 29000 | 0 | 7 | 32 | 55 | 77 | 100 | 122 | 143 |
| 29001 to 30000 | 0 | 7 | 33 | 57 | 80 | 103 | 126 | 148 |

| 1.76% to 2.0% Grade Requirements | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Total Trailing Tonnage (Including Locomotives not in Dynamic Brake) | Maximum Speed for Loaded Unit Trains (coal, grain, etc.) | | | | | | | |
| | 15 MPH MINIMUM EDBA | 20 MPH MINIMUM EDBA | 25 MPH MINIMUM EDBA | 30 MPH MINIMUM EDBA | 35 MPH MINIMUM EDBA | 40 MPH MINIMUM EDBA | 45 MPH MINIMUM EDBA | 50 MPH MINIMUM EDBA |
| 2000 or less | 0 | 2 | 4 | 6 | 8 | 10 | 11 | 13 |
| 2001 to 3000 | 0 | 3 | 6 | 9 | 11 | 14 | 17 | 19 |
| 3001 to 4000 | 0 | 4 | 8 | 11 | 15 | 19 | 22 | 26 |
| 4001 to 5000 | 0 | 4 | 10 | 14 | 19 | 23 | 28 | 32 |
| 5001 to 6000 | 0 | 5 | 11 | 17 | 22 | 28 | 33 | 38 |
| 6001 to 7000 | 0 | 6 | 13 | 19 | 26 | 32 | 38 | 45 |
| 7001 to 8000 | 0 | 7 | 15 | 22 | 29 | 37 | 44 | 51 |
| 8001 to 9000 | 0 | 7 | 17 | 25 | 33 | 41 | 49 | 57 |
| 9001 to 10000 | 0 | 8 | 19 | 28 | 37 | 46 | 55 | 64 |
| 10001 to 11000 | 0 | 9 | 20 | 30 | 40 | 50 | 60 | 70 |
| 11001 to 12000 | 0 | 10 | 22 | 33 | 44 | 55 | 66 | 76 |
| 12001 to 13000 | 0 | 10 | 24 | 36 | 47 | 60 | 71 | 83 |
| 13001 to 14000 | 0 | 11 | 26 | 38 | 51 | 64 | 76 | 89 |
| 14001 to 15000 | 0 | 12 | 28 | 41 | 55 | 69 | 82 | 95 |
| 15001 to 16000 | 0 | 13 | 29 | 44 | 58 | 73 | 87 | 102 |
| 16001 to 17000 | 0 | 14 | 31 | 46 | 62 | 78 | 93 | 108 |
| 17001 to 18000 | 0 | 14 | 33 | 49 | 66 | 82 | 98 | 114 |
| 18001 to 19000 | 0 | 15 | 35 | 52 | 69 | 87 | 104 | 121 |
| 19001 to 20000 | 0 | 16 | 37 | 55 | 73 | 91 | 109 | 127 |
| 20001 to 21000 | 0 | 17 | 38 | 57 | 76 | 96 | 114 | 133 |
| 21001 to 22000 | 0 | 17 | 40 | 60 | 80 | 100 | 120 | 140 |
| 22001 to 23000 | 0 | 18 | 42 | 63 | 84 | 105 | 125 | 146 |
| 23001 to 24000 | 0 | 19 | 44 | 65 | 87 | 109 | 131 | 152 |
| 24001 to 25000 | 0 | 20 | 46 | 68 | 91 | 114 | 136 | 159 |
| 25001 to 26000 | 0 | 20 | 47 | 71 | 94 | 119 | 142 | 165 |
| 26001 to 27000 | 0 | 21 | 49 | 73 | 98 | 123 | 147 | 171 |
| 27001 to 28000 | 0 | 22 | 51 | 76 | 102 | 128 | 152 | 177 |
| 28001 to 29000 | 0 | 23 | 53 | 79 | 105 | 132 | 158 | 184 |
| 29001 to 30000 | 0 | 24 | 55 | 82 | 109 | 137 | 163 | 190 |

| 2.01% to 2.25% Grade Requirements | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Total Trailing Tonnage (Including Locomotives not in Dynamic Brake) | Maximum Speed for Loaded Unit Trains (coal, grain, etc.) | | | | | | | |
| | 15 MPH MINIMUM EDBA | 20 MPH MINIMUM EDBA | 25 MPH MINIMUM EDBA | 30 MPH MINIMUM EDBA | 35 MPH MINIMUM EDBA | 40 MPH MINIMUM EDBA | 45 MPH MINIMUM EDBA | 50 MPH MINIMUM EDBA |
| 2000 or less | 1 | 3 | 6 | 8 | 10 | 12 | 14 | 16 |
| 2001 to 3000 | 1 | 4 | 8 | 11 | 14 | 17 | 21 | 24 |
| 3001 to 4000 | 2 | 6 | 11 | 15 | 19 | 23 | 27 | 31 |
| 4001 to 5000 | 2 | 7 | 13 | 18 | 23 | 29 | 34 | 39 |
| 5001 to 6000 | 2 | 8 | 16 | 22 | 28 | 34 | 41 | 47 |
| 6001 to 7000 | 3 | 10 | 18 | 25 | 33 | 40 | 47 | 55 |
| 7001 to 8000 | 3 | 11 | 21 | 29 | 37 | 46 | 54 | 62 |
| 8001 to 9000 | 3 | 12 | 23 | 32 | 42 | 51 | 61 | 70 |
| 9001 to 10000 | 3 | 14 | 26 | 36 | 46 | 57 | 67 | 78 |
| 10001 to 11000 | 4 | 15 | 28 | 39 | 51 | 63 | 74 | 85 |
| 11001 to 12000 | 4 | 16 | 31 | 43 | 55 | 68 | 81 | 93 |
| 12001 to 13000 | 4 | 18 | 33 | 46 | 60 | 74 | 87 | 101 |
| 13001 to 14000 | 5 | 19 | 36 | 50 | 65 | 80 | 94 | 109 |
| 14001 to 15000 | 5 | 20 | 38 | 54 | 69 | 85 | 101 | 116 |
| 15001 to 16000 | 5 | 22 | 41 | 57 | 74 | 91 | 107 | 124 |
| 16001 to 17000 | 6 | 23 | 43 | 61 | 78 | 97 | 114 | 132 |
| 17001 to 18000 | 6 | 24 | 46 | 64 | 83 | 102 | 121 | 139 |
| 18001 to 19000 | 6 | 25 | 48 | 68 | 88 | 108 | 127 | 147 |
| 19001 to 20000 | 6 | 27 | 51 | 71 | 92 | 114 | 134 | 155 |
| 20001 to 21000 | 7 | 28 | 53 | 75 | 97 | 119 | 141 | 163 |
| 21001 to 22000 | 7 | 29 | 56 | 78 | 101 | 125 | 147 | 170 |
| 22001 to 23000 | 7 | 31 | 58 | 82 | 106 | 130 | 154 | 178 |
| 23001 to 24000 | 8 | 32 | 61 | 85 | 110 | 136 | 161 | 186 |
| 24001 to 25000 | 8 | 33 | 63 | 89 | 115 | 142 | 167 | 193 |
| 25001 to 26000 | 8 | 35 | 66 | 92 | 120 | 147 | 174 | 201 |
| 26001 to 27000 | 9 | 36 | 68 | 96 | 124 | 153 | 181 | 209 |
| 27001 to 28000 | 9 | 37 | 71 | 100 | 129 | 159 | 187 | 217 |
| 28001 to 29000 | 9 | 39 | 73 | 103 | 133 | 164 | 194 | 224 |
| 29001 to 30000 | 9 | 40 | 76 | 107 | 138 | 170 | 201 | 232 |

| 2.26% to 2.50% Grade Requirements | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Total Trailing Tonnage (Including Locomotives not in Dynamic Brake) | Maximum Speed for Loaded Unit Trains (coal, grain, etc.) | | | | | | | |
| | 15 MPH MINIMUM EDBA | 20 MPH MINIMUM EDBA | 25 MPH MINIMUM EDBA | 30 MPH MINIMUM EDBA | 35 MPH MINIMUM EDBA | 40 MPH MINIMUM EDBA | 45 MPH MINIMUM EDBA | 50 MPH MINIMUM EDBA |
| 2000 or less | 2 | 4 | 7 | 9 | 12 | 14 | 16 | 19 |
| 2001 to 3000 | 3 | 6 | 10 | 14 | 17 | 21 | 24 | 28 |
| 3001 to 4000 | 4 | 8 | 13 | 18 | 23 | 28 | 32 | 37 |
| 4001 to 5000 | 5 | 10 | 17 | 22 | 28 | 34 | 40 | 46 |
| 5001 to 6000 | 6 | 12 | 20 | 27 | 34 | 41 | 48 | 55 |
| 6001 to 7000 | 7 | 14 | 23 | 31 | 39 | 48 | 56 | 64 |
| 7001 to 8000 | 8 | 15 | 26 | 35 | 45 | 55 | 64 | 73 |
| 8001 to 9000 | 9 | 17 | 30 | 40 | 50 | 61 | 72 | 83 |
| 9001 to 10000 | 9 | 19 | 33 | 44 | 56 | 68 | 80 | 92 |
| 10001 to 11000 | 10 | 21 | 36 | 49 | 62 | 75 | 88 | 101 |
| 11001 to 12000 | 11 | 23 | 39 | 53 | 67 | 82 | 96 | 110 |
| 12001 to 13000 | 12 | 25 | 43 | 57 | 73 | 88 | 104 | 119 |
| 13001 to 14000 | 13 | 27 | 46 | 62 | 78 | 95 | 111 | 128 |
| 14001 to 15000 | 14 | 28 | 49 | 66 | 84 | 102 | 119 | 137 |
| 15001 to 16000 | 15 | 30 | 52 | 70 | 89 | 109 | 127 | 146 |
| 16001 to 17000 | 16 | 32 | 55 | 75 | 95 | 115 | 135 | 155 |
| 17001 to 18000 | 17 | 34 | 59 | 79 | 100 | 122 | 143 | 165 |
| 18001 to 19000 | 18 | 36 | 62 | 84 | 106 | 129 | 151 | 174 |
| 19001 to 20000 | 18 | 38 | 65 | 88 | 111 | 136 | 159 | 183 |
| 20001 to 21000 | 19 | 40 | 68 | 92 | 117 | 142 | 167 | 192 |
| 21001 to 22000 | 20 | 41 | 72 | 97 | 123 | 149 | 175 | 201 |
| 22001 to 23000 | 21 | 43 | 75 | 101 | 128 | 156 | 183 | 210 |
| 23001 to 24000 | 22 | 45 | 78 | 105 | 134 | 163 | 191 | 219 |
| 24001 to 25000 | 23 | 47 | 81 | 110 | 139 | 170 | 199 | 228 |
| 25001 to 26000 | 24 | 49 | 85 | 114 | 145 | 176 | 207 | 237 |
| 26001 to 27000 | 25 | 51 | 88 | 118 | 150 | 183 | 215 | 247 |
| 27001 to 28000 | 26 | 53 | 91 | 123 | 156 | 190 | 222 | 256 |
| 28001 to 29000 | 27 | 54 | 94 | 127 | 161 | 197 | 230 | 265 |
| 29001 to 30000 | 27 | 56 | 97 | 132 | 167 | 203 | 238 | 274 |

| 1.0% to 1.25% Grade Requirements | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Total Trailing Tonnage (Including Locomotives not in Dynamic Brake) | Maximum Speed for Mixed Freight Trains (Including empty unit and intermodal) | | | | | | | |
| | 15 MPH MINIMUM EDBA | 20 MPH MINIMUM EDBA | 25 MPH MINIMUM EDBA | 30 MPH MINIMUM EDBA | 35 MPH MINIMUM EDBA | 40 MPH MINIMUM EDBA | 45 MPH MINIMUM EDBA | 50 MPH MINIMUM EDBA |
| 2000 or less | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 3 |
| 2001 to 3000 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 4 |
| 3001 to 4000 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 5 |
| 4001 to 5000 | 0 | 0 | 0 | 0 | 0 | 2 | 4 | 6 |
| 5001 to 6000 | 0 | 0 | 0 | 0 | 0 | 2 | 5 | 7 |
| 6001 to 7000 | 0 | 0 | 0 | 0 | 0 | 2 | 5 | 8 |
| 7001 to 8000 | 0 | 0 | 0 | 0 | 0 | 2 | 6 | 10 |
| 8001 to 9000 | 0 | 0 | 0 | 0 | 0 | 2 | 7 | 11 |
| 9001 to 10000 | 0 | 0 | 0 | 0 | 0 | 3 | 7 | 12 |
| 10001 to 11000 | 0 | 0 | 0 | 0 | 0 | 3 | 8 | 13 |
| 11001 to 12000 | 0 | 0 | 0 | 0 | 0 | 3 | 9 | 14 |
| 12001 to 13000 | 0 | 0 | 0 | 0 | 0 | 3 | 9 | 15 |
| 13001 to 14000 | 0 | 0 | 0 | 0 | 0 | 3 | 10 | 16 |
| 14001 to 15000 | 0 | 0 | 0 | 0 | 0 | 4 | 11 | 18 |
| 15001 to 16000 | 0 | 0 | 0 | 0 | 0 | 4 | 11 | 19 |
| 16001 to 17000 | 0 | 0 | 0 | 0 | 0 | 4 | 12 | 20 |
| 17001 to 18000 | 0 | 0 | 0 | 0 | 0 | 4 | 13 | 21 |
| 18001 to 19000 | 0 | 0 | 0 | 0 | 0 | 5 | 13 | 22 |
| 19001 to 20000 | 0 | 0 | 0 | 0 | 0 | 5 | 14 | 23 |
| 20001 to 21000 | 0 | 0 | 0 | 0 | 0 | 5 | 15 | 24 |
| 21001 to 22000 | 0 | 0 | 0 | 0 | 0 | 5 | 15 | 25 |
| 22001 to 23000 | 0 | 0 | 0 | 0 | 0 | 5 | 16 | 27 |
| 23001 to 24000 | 0 | 0 | 0 | 0 | 0 | 6 | 17 | 28 |
| 24001 to 25000 | 0 | 0 | 0 | 0 | 0 | 6 | 18 | 29 |
| 25001 to 26000 | 0 | 0 | 0 | 0 | 0 | 6 | 18 | 30 |
| 26001 to 27000 | 0 | 0 | 0 | 0 | 0 | 6 | 19 | 31 |
| 27001 to 28000 | 0 | 0 | 0 | 0 | 0 | 6 | 20 | 32 |
| 28001 to 29000 | 0 | 0 | 0 | 0 | 0 | 7 | 20 | 33 |
| 29001 to 30000 | 0 | 0 | 0 | 0 | 0 | 7 | 21 | 35 |

| 1.26% to 1.5% Grade Requirements | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Total Trailing Tonnage (Including Locomotives not in Dynamic Brake) | Maximum Speed for Mixed Freight Trains (Including empty unit and intermodal) | | | | | | | |
| | 15 MPH MINIMUM EDBA | 20 MPH MINIMUM EDBA | 25 MPH MINIMUM EDBA | 30 MPH MINIMUM EDBA | 35 MPH MINIMUM EDBA | 40 MPH MINIMUM EDBA | 45 MPH MINIMUM EDBA | 50 MPH MINIMUM EDBA |
| 2000 or less | 0 | 0 | 0 | 1 | 2 | 3 | 4 | 6 |
| 2001 to 3000 | 0 | 0 | 0 | 1 | 3 | 4 | 6 | 8 |
| 3001 to 4000 | 0 | 0 | 0 | 1 | 3 | 6 | 8 | 11 |
| 4001 to 5000 | 0 | 0 | 0 | 1 | 4 | 7 | 10 | 13 |
| 5001 to 6000 | 0 | 0 | 0 | 1 | 5 | 8 | 12 | 16 |
| 6001 to 7000 | 0 | 0 | 0 | 1 | 5 | 10 | 14 | 18 |
| 7001 to 8000 | 0 | 0 | 0 | 1 | 6 | 11 | 16 | 21 |
| 8001 to 9000 | 0 | 0 | 0 | 1 | 7 | 12 | 18 | 23 |
| 9001 to 10000 | 0 | 0 | 0 | 1 | 7 | 14 | 20 | 26 |
| 10001 to 11000 | 0 | 0 | 0 | 1 | 8 | 15 | 22 | 28 |
| 11001 to 12000 | 0 | 0 | 0 | 1 | 9 | 16 | 24 | 31 |
| 12001 to 13000 | 0 | 0 | 0 | 1 | 9 | 18 | 26 | 33 |
| 13001 to 14000 | 0 | 0 | 0 | 1 | 10 | 19 | 28 | 36 |
| 14001 to 15000 | 0 | 0 | 0 | 1 | 11 | 20 | 29 | 38 |
| 15001 to 16000 | 0 | 0 | 0 | 1 | 12 | 22 | 31 | 41 |
| 16001 to 17000 | 0 | 0 | 0 | 1 | 12 | 23 | 33 | 44 |
| 17001 to 18000 | 0 | 0 | 0 | 1 | 13 | 24 | 35 | 46 |
| 18001 to 19000 | 0 | 0 | 0 | 1 | 14 | 26 | 37 | 49 |
| 19001 to 20000 | 0 | 0 | 0 | 1 | 14 | 27 | 39 | 51 |
| 20001 to 21000 | 0 | 0 | 0 | 1 | 15 | 28 | 41 | 54 |
| 21001 to 22000 | 0 | 0 | 0 | 1 | 16 | 30 | 43 | 56 |
| 22001 to 23000 | 0 | 0 | 0 | 1 | 16 | 31 | 45 | 59 |
| 23001 to 24000 | 0 | 0 | 0 | 2 | 17 | 32 | 47 | 61 |
| 24001 to 25000 | 0 | 0 | 0 | 2 | 18 | 34 | 49 | 64 |
| 25001 to 26000 | 0 | 0 | 0 | 2 | 18 | 35 | 51 | 66 |
| 26001 to 27000 | 0 | 0 | 0 | 2 | 19 | 36 | 53 | 69 |
| 27001 to 28000 | 0 | 0 | 0 | 2 | 20 | 38 | 55 | 71 |
| 28001 to 29000 | 0 | 0 | 0 | 2 | 20 | 39 | 57 | 74 |
| 29001 to 30000 | 0 | 0 | 0 | 2 | 21 | 40 | 58 | 76 |

| 1.51% to 1.75% Grade Requirements | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Total Trailing Tonnage (Including Locomotives not in Dynamic Brake) | Maximum Speed for Mixed Freight Trains (Including empty unit and intermodal) | | | | | | | |
| | 15 MPH MINIMUM EDBA | 20 MPH MINIMUM EDBA | 25 MPH MINIMUM EDBA | 30 MPH MINIMUM EDBA | 35 MPH MINIMUM EDBA | 40 MPH MINIMUM EDBA | 45 MPH MINIMUM EDBA | 50 MPH MINIMUM EDBA |
| 2000 or less | 0 | 0 | 1 | 2 | 4 | 5 | 7 | 8 |
| 2001 to 3000 | 0 | 0 | 1 | 3 | 5 | 8 | 10 | 12 |
| 3001 to 4000 | 0 | 0 | 1 | 4 | 7 | 10 | 13 | 16 |
| 4001 to 5000 | 0 | 0 | 1 | 5 | 9 | 13 | 16 | 20 |
| 5001 to 6000 | 0 | 0 | 1 | 6 | 10 | 15 | 20 | 24 |
| 6001 to 7000 | 0 | 0 | 1 | 7 | 12 | 18 | 23 | 28 |
| 7001 to 8000 | 0 | 0 | 1 | 8 | 14 | 20 | 26 | 32 |
| 8001 to 9000 | 0 | 0 | 1 | 8 | 15 | 22 | 29 | 36 |
| 9001 to 10000 | 0 | 0 | 1 | 9 | 17 | 25 | 32 | 40 |
| 10001 to 11000 | 0 | 0 | 1 | 10 | 19 | 27 | 35 | 44 |
| 11001 to 12000 | 0 | 0 | 1 | 11 | 20 | 30 | 39 | 48 |
| 12001 to 13000 | 0 | 0 | 1 | 12 | 22 | 32 | 42 | 52 |
| 13001 to 14000 | 0 | 0 | 1 | 13 | 24 | 35 | 45 | 55 |
| 14001 to 15000 | 0 | 0 | 1 | 14 | 25 | 37 | 48 | 59 |
| 15001 to 16000 | 0 | 0 | 2 | 15 | 27 | 39 | 51 | 63 |
| 16001 to 17000 | 0 | 0 | 2 | 15 | 29 | 42 | 55 | 67 |
| 17001 to 18000 | 0 | 0 | 2 | 16 | 30 | 44 | 58 | 71 |
| 18001 to 19000 | 0 | 0 | 2 | 17 | 32 | 47 | 61 | 75 |
| 19001 to 20000 | 0 | 0 | 2 | 18 | 34 | 49 | 64 | 79 |
| 20001 to 21000 | 0 | 0 | 2 | 19 | 35 | 52 | 67 | 83 |
| 21001 to 22000 | 0 | 0 | 2 | 20 | 37 | 54 | 70 | 87 |
| 22001 to 23000 | 0 | 0 | 2 | 21 | 39 | 56 | 74 | 91 |
| 23001 to 24000 | 0 | 0 | 2 | 22 | 40 | 59 | 77 | 95 |
| 24001 to 25000 | 0 | 0 | 2 | 22 | 42 | 61 | 80 | 99 |
| 25001 to 26000 | 0 | 0 | 2 | 23 | 44 | 64 | 83 | 103 |
| 26001 to 27000 | 0 | 0 | 2 | 24 | 45 | 66 | 86 | 107 |
| 27001 to 28000 | 0 | 0 | 2 | 25 | 47 | 69 | 90 | 110 |
| 28001 to 29000 | 0 | 0 | 2 | 26 | 49 | 71 | 93 | 114 |
| 29001 to 30000 | 0 | 0 | 2 | 27 | 50 | 74 | 96 | 118 |

| 1.76% to 2.0% Grade Requirements | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Total Trailing Tonnage (Including Locomotives not in Dynamic Brake) | Maximum Speed for Mixed Freight Trains (Including empty unit and intermodal) | | | | | | | |
| | 15 MPH MINIMUM EDBA | 20 MPH MINIMUM EDBA | 25 MPH MINIMUM EDBA | 30 MPH MINIMUM EDBA | 35 MPH MINIMUM EDBA | 40 MPH MINIMUM EDBA | 45 MPH MINIMUM EDBA | 50 MPH MINIMUM EDBA |
| 2000 or less | 0 | 0 | 2 | 4 | 6 | 8 | 9 | 11 |
| 2001 to 3000 | 0 | 0 | 3 | 6 | 8 | 11 | 14 | 16 |
| 3001 to 4000 | 0 | 0 | 4 | 7 | 11 | 15 | 18 | 22 |
| 4001 to 5000 | 0 | 0 | 4 | 9 | 14 | 18 | 23 | 27 |
| 5001 to 6000 | 0 | 0 | 5 | 11 | 16 | 22 | 27 | 32 |
| 6001 to 7000 | 0 | 0 | 6 | 12 | 19 | 25 | 32 | 38 |
| 7001 to 8000 | 0 | 0 | 7 | 14 | 21 | 29 | 36 | 43 |
| 8001 to 9000 | 0 | 0 | 8 | 16 | 24 | 32 | 40 | 48 |
| 9001 to 10000 | 0 | 0 | 8 | 18 | 27 | 36 | 45 | 54 |
| 10001 to 11000 | 0 | 0 | 9 | 19 | 29 | 39 | 49 | 59 |
| 11001 to 12000 | 0 | 0 | 10 | 21 | 32 | 43 | 54 | 64 |
| 12001 to 13000 | 0 | 0 | 11 | 23 | 35 | 47 | 58 | 70 |
| 13001 to 14000 | 0 | 0 | 11 | 24 | 37 | 50 | 63 | 75 |
| 14001 to 15000 | 0 | 0 | 12 | 26 | 40 | 54 | 67 | 80 |
| 15001 to 16000 | 0 | 0 | 13 | 28 | 42 | 57 | 71 | 86 |
| 16001 to 17000 | 0 | 0 | 14 | 30 | 45 | 61 | 76 | 91 |
| 17001 to 18000 | 0 | 0 | 15 | 31 | 48 | 64 | 80 | 96 |
| 18001 to 19000 | 0 | 0 | 15 | 33 | 50 | 68 | 85 | 102 |
| 19001 to 20000 | 0 | 0 | 16 | 35 | 53 | 71 | 89 | 107 |
| 20001 to 21000 | 0 | 0 | 17 | 36 | 56 | 75 | 94 | 112 |
| 21001 to 22000 | 0 | 0 | 18 | 38 | 58 | 78 | 98 | 118 |
| 22001 to 23000 | 0 | 0 | 18 | 40 | 61 | 82 | 102 | 123 |
| 23001 to 24000 | 0 | 0 | 19 | 42 | 63 | 86 | 107 | 128 |
| 24001 to 25000 | 0 | 0 | 20 | 43 | 66 | 89 | 111 | 134 |
| 25001 to 26000 | 0 | 0 | 21 | 45 | 69 | 93 | 116 | 139 |
| 26001 to 27000 | 0 | 0 | 22 | 47 | 71 | 96 | 120 | 144 |
| 27001 to 28000 | 0 | 0 | 22 | 48 | 74 | 100 | 125 | 150 |
| 28001 to 29000 | 0 | 0 | 23 | 50 | 77 | 103 | 129 | 155 |
| 29001 to 30000 | 0 | 0 | 24 | 52 | 79 | 107 | 133 | 160 |

| 2.01% to 2.25% Grade Requirements | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Total Trailing Tonnage (Including Locomotives not in Dynamic Brake) | Maximum Speed for Mixed Freight Trains (Including empty unit and intermodal) | | | | | | | |
| | 10 MPH MINIMUM EDBA | 15 MPH MINIMUM EDBA | 20 MPH MINIMUM EDBA | 25 MPH MINIMUM EDBA | 30 MPH MINIMUM EDBA | 35 MPH MINIMUM EDBA | 40 MPH MINIMUM EDBA | 45 MPH MINIMUM EDBA |
| 2000 or less | 0 | 0 | 1 | 3 | 6 | 8 | 10 | 12 |
| 2001 to 3000 | 0 | 0 | 2 | 5 | 8 | 11 | 14 | 18 |
| 3001 to 4000 | 0 | 0 | 2 | 6 | 11 | 15 | 19 | 23 |
| 4001 to 5000 | 0 | 0 | 2 | 8 | 13 | 18 | 24 | 29 |
| 5001 to 6000 | 0 | 0 | 3 | 9 | 16 | 22 | 28 | 35 |
| 6001 to 7000 | 0 | 0 | 3 | 11 | 18 | 26 | 33 | 40 |
| 7001 to 8000 | 0 | 0 | 3 | 12 | 21 | 29 | 38 | 46 |
| 8001 to 9000 | 0 | 0 | 4 | 14 | 23 | 33 | 42 | 52 |
| 9001 to 10000 | 0 | 0 | 4 | 15 | 26 | 36 | 47 | 57 |
| 10001 to 11000 | 0 | 0 | 4 | 17 | 28 | 40 | 52 | 63 |
| 11001 to 12000 | 0 | 0 | 5 | 18 | 31 | 44 | 56 | 69 |
| 12001 to 13000 | 0 | 0 | 5 | 20 | 34 | 47 | 61 | 74 |
| 13001 to 14000 | 0 | 0 | 5 | 21 | 36 | 51 | 66 | 80 |
| 14001 to 15000 | 0 | 0 | 6 | 23 | 39 | 54 | 70 | 86 |
| 15001 to 16000 | 0 | 0 | 6 | 24 | 41 | 58 | 75 | 91 |
| 16001 to 17000 | 0 | 0 | 6 | 26 | 44 | 62 | 80 | 97 |
| 17001 to 18000 | 0 | 0 | 7 | 27 | 46 | 65 | 84 | 103 |
| 18001 to 19000 | 0 | 0 | 7 | 29 | 49 | 69 | 89 | 108 |
| 19001 to 20000 | 0 | 0 | 7 | 30 | 51 | 72 | 94 | 114 |
| 20001 to 21000 | 0 | 0 | 8 | 32 | 54 | 76 | 98 | 120 |
| 21001 to 22000 | 0 | 0 | 8 | 33 | 56 | 80 | 103 | 125 |
| 22001 to 23000 | 0 | 0 | 8 | 35 | 59 | 83 | 108 | 131 |
| 23001 to 24000 | 0 | 0 | 9 | 36 | 62 | 87 | 112 | 137 |
| 24001 to 25000 | 0 | 0 | 9 | 38 | 64 | 90 | 117 | 143 |
| 25001 to 26000 | 0 | 0 | 9 | 39 | 67 | 94 | 122 | 148 |
| 26001 to 27000 | 0 | 0 | 10 | 41 | 69 | 98 | 126 | 154 |
| 27001 to 28000 | 0 | 0 | 10 | 42 | 72 | 101 | 131 | 160 |
| 28001 to 29000 | 0 | 0 | 10 | 44 | 74 | 105 | 136 | 165 |
| 29001 to 30000 | 0 | 0 | 11 | 45 | 77 | 108 | 140 | 171 |

| 2.26% to 2.50% Grade Requirements | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Total Trailing Tonnage (Including Locomotives not in Dynamic Brake) | Maximum Speed for Mixed Freight Trains (including empty unit and intermodal) | | | | | | | |
| | 5 MPH MINIMUM EDBA | 10 MPH MINIMUM EDBA | 15 MPH MINIMUM EDBA | 20 MPH MINIMUM EDBA | 25 MPH MINIMUM EDBA | 30 MPH MINIMUM EDBA | 35 MPH MINIMUM EDBA | 40 MPH MINIMUM EDBA |
| 2000 or less | 0 | 0 | 0 | 2 | 5 | 7 | 10 | 12 |
| 2001 to 3000 | 0 | 0 | 0 | 3 | 7 | 11 | 14 | 18 |
| 3001 to 4000 | 0 | 0 | 0 | 4 | 9 | 14 | 19 | 24 |
| 4001 to 5000 | 0 | 0 | 0 | 5 | 12 | 17 | 23 | 29 |
| 5001 to 6000 | 0 | 0 | 0 | 6 | 14 | 21 | 28 | 35 |
| 6001 to 7000 | 0 | 0 | 0 | 7 | 16 | 24 | 32 | 41 |
| 7001 to 8000 | 0 | 0 | 0 | 8 | 18 | 28 | 37 | 47 |
| 8001 to 9000 | 0 | 0 | 0 | 8 | 20 | 31 | 42 | 52 |
| 9001 to 10000 | 0 | 0 | 0 | 9 | 23 | 34 | 46 | 58 |
| 10001 to 11000 | 0 | 0 | 0 | 10 | 25 | 38 | 51 | 64 |
| 11001 to 12000 | 0 | 0 | 0 | 11 | 27 | 41 | 55 | 70 |
| 12001 to 13000 | 0 | 0 | 0 | 12 | 29 | 44 | 60 | 75 |
| 13001 to 14000 | 0 | 0 | 0 | 13 | 31 | 48 | 64 | 81 |
| 14001 to 15000 | 0 | 0 | 0 | 14 | 34 | 51 | 69 | 87 |
| 15001 to 16000 | 0 | 0 | 0 | 15 | 36 | 55 | 73 | 93 |
| 16001 to 17000 | 0 | 0 | 0 | 15 | 38 | 58 | 78 | 99 |
| 17001 to 18000 | 0 | 0 | 0 | 16 | 40 | 61 | 83 | 104 |
| 18001 to 19000 | 0 | 0 | 0 | 17 | 42 | 65 | 87 | 110 |
| 19001 to 20000 | 0 | 0 | 0 | 18 | 45 | 68 | 92 | 116 |
| 20001 to 21000 | 0 | 0 | 0 | 19 | 47 | 71 | 96 | 122 |
| 21001 to 22000 | 0 | 0 | 0 | 20 | 49 | 75 | 101 | 127 |
| 22001 to 23000 | 0 | 0 | 0 | 21 | 51 | 78 | 105 | 133 |
| 23001 to 24000 | 0 | 0 | 0 | 22 | 54 | 82 | 110 | 139 |
| 24001 to 25000 | 0 | 0 | 0 | 23 | 56 | 85 | 115 | 145 |
| 25001 to 26000 | 0 | 0 | 0 | 23 | 58 | 88 | 119 | 150 |
| 26001 to 27000 | 0 | 0 | 0 | 24 | 60 | 92 | 124 | 156 |
| 27001 to 28000 | 0 | 0 | 0 | 25 | 62 | 95 | 128 | 162 |
| 28001 to 29000 | 0 | 0 | 0 | 26 | 65 | 98 | 133 | 168 |
| 29001 to 30000 | 0 | 0 | 0 | 27 | 67 | 102 | 137 | 174 |

## L-242. BACK UP MOVEMENT

Prior to making a back up movement, consideration must be given to tonnage, train length, position of heavy and light cars, grade conditions, track curvature, turnouts, locomotive type and number in the consist.

**(a)** Train air brakes are to be fully released before applying maximum power.

**(b)** Amperage must be limited to a safe level throughout the movement.

**(c)** No more than the equivalent of 16 powered axles (as referenced in the NS Locomotive series table) may be used to make a back up movement where train and track conditions indicate a high risk for jackknifing, rail turnover or pushing cars off the outside of sharp curves.

**(d)** Back up movements must not be made account inability to start a forward movement.

**(e)** If the back up movement cannot be started after taking slack, other arrangements must be made.

## L-243. USE OF LOCOMOTIVE BRAKE

Except as provided below, the independent brake may be used only in switching, handling a light locomotive, starting a train on descending grade or in an emergency.

Brake cylinder pressure may be allowed to apply to a safe level from an automatic brake application when there are more locomotives than cars or in a very short train when slowing or stopping. Brake cylinder pressure is to be bailed off during automatic brake application on other trains.

**(a) Locomotive Consist Equipped with 6 or More Axles of Extended Range Dynamic Braking:**

When using the dynamic brake to make a planned stop with locomotive consist equipped with 6 or more axles of extended range dynamic braking, the independent brake may be used to complete the stop, providing there are no more than 20-axles in the locomotive consist, including locomotives in tow, under the following conditions:

1. Speed is decreased to 3 MPH or less with dynamic brake fully applied.
2. Slack is bunched throughout the train and terrain will keep slack bunched after stop is completed.
3. Dynamic brake is released and independent brake is applied simultaneously.
4. Stop is not being made with train in a turnout or crossover. (Does not apply to solid loaded bulk commodity trains.)

**(b) Locomotive Consist Equipped with less than 6-axles of Extended Range Dynamic Braking or when Consist is not Equipped with Extended Range Dynamic Braking:**

When using the dynamic brake to make a planned stop with locomotive consist equipped with less than 6-axles of extended range dynamic braking or when consist is not equipped with extended range dynamic braking, the independent brake may be used to complete the stop, provided there are no more than 20-axles in the locomotive consist, including locomotives in tow, under the following conditions:

1. Speed is decreased to 10 MPH or less with dynamic brake fully applied.
2. Slack is bunched throughout the train and terrain will keep slack bunched after stop is completed.
3. Dynamic brake is released and independent brake is applied simultaneously.
4. Stop is not being made with train in a turnout or crossover. (Does not apply to solid loaded bulk commodity trains.)
5. Train is not within the limits of a terminal except on main track. (Does not apply to solid loaded bulk commodity trains.)

## L-244. LOCOMOTIVE BRAKE IN SWITCHING OPERATIONS

When relying entirely on the locomotive brakes to control speed in a switching operation, consideration must be given to rail condition, weight of cars, distance required for stopping and number and type of locomotives. When locomotive brake is not sufficient to control the movement, the crew must couple air and determine that brakes are operative on a sufficient number of cars so that the Engineer may safely control the movement at all times.

Due caution must be exercised when starting a cut of cars to prevent damage to equipment and/or possible injury or derailment. When stopping, the independent brake must not be fully applied, except in an emergency, until slack has adjusted.

During switching moves with a multiple locomotive consist, the independent brake must be applied gradually to a safe level to control slack run in or run out for the prevention of damage to equipment. After slack is bunched or stretched throughout the cars being handled, a heavier application of the independent brake must be made to complete the stop.

When operating a locomotive moving away from a hump with cars at or near the crest of the hump and instructions are received to stop, except in an emergency the independent brake may only be applied to a maximum of 15 PSI until slack is bunched. Locomotive brake cylinder pressure may then be gradually increased to full application until movement stops.

**L-245. USE OF TRAIN AIR BRAKE**

**(a) Dynamic Brake — First Priority**

The dynamic brake is the first priority brake for controlling train speed. The train air brake is to be used when the dynamic brake is not available or in an emergency. The train air brake can also be used with the dynamic brake when additional braking is required.

**(b) Slowing or Stopping a Train — Without Dynamic Brake**

To slow a train when the dynamic brake is not available, or when necessary for proper train handling, the initial brake pipe reduction of 5 to 8 PSI should be made while working power, keeping the locomotive brake released. After the air brakes have taken effect throughout the train, throttle setting should be reduced gradually, keeping the train stretched. Additional brake applications of 2 to 3 PSI may be made to further reduce speed, keeping the locomotive brake released. These reductions should total at least 10 PSI to ensure that the train brakes fully release. After placing the automatic brake valve in release position, gradually reduce throttle to keep in-train forces at safe levels while train brakes are releasing.

*Revised 9/21/15*

**(c) Locomotive Regulating Valve**

The locomotive regulating valve must not be adjusted or used in making train air brake applications or releases.

**(d) Brake Pipe Cut Off Valve**

Brake pipe cut off valve on the controlling locomotive of the consist will be in the “IN” position except while:

**1.** Performing brake pipe leakage test.

**2.** Operating as a helper locomotive and coupled to the train.

In addition, light locomotive consist will operate with the automatic brake valve handle in the “release” or “running” position.

**(e) Multiple Locomotives**

When one or more locomotive(s) are coupled to a train, all automatic brake valves must be cut out except the one from which the train brakes are operated.

**(f) Passenger Position**

The passenger position on the locomotive brake control stand must be used only if:

- trailing equipment is designed for graduated release
- equalizing reservoir leakage occurs and its use is necessary to safely control the movement of the train until it reaches the next forward point where repairs can be made

**(g) Air Brake Use on Heavy Descending Grades When Train Has Stopped and Train Air Brakes Will be Required to Safely Control the Movement**

**1.** When a train:

- is stopped with a brake application of 20 PSI or more
- receives an emergency brake application

and another brake application will be required as grade is descended:

**a.** Apply sufficient hand brakes to secure the train.

**b.** Release air brakes.

**c.** Charge air brake system to within 15 PSI of regulating valve setting as indicated by a gauge at the rear of the train and wait at least 10 minutes before proceeding.

**d.** Hand brakes may remain applied until the train safely descends the grade.

**2.** When a train has stopped to remove pusher locomotive:

**a.** Drape and hold the train with the independent brake if possible.

**b.** Brake system must remain fully charged.

**c.** Remove pusher locomotive from the train at the bottom of the grade if the train is not draped and held or the brake system is not maintained fully charged.

**NOTE:** Do not remove pusher locomotive on a grade unless brake system remains fully charged.

**(h) Re-application of Train Air Brakes**

When a train has been stopped while descending a heavy grade with an automatic brake application and another brake application will be required to further descend the grade, additional applications must be at least 3 PSI GREATER than the previous reductions to ensure the brakes reapply.
**EXCEPTION:** When using 100% retainers.

## L-246. RUNNING RELEASE

**(a)** After the air brake is applied, a running release MAY be made when the last brake pipe application has become effective on the rear car of the train, and a total reduction of 10 PSI but not exceeding 15 PSI has been made, provided:

**1.** Brakes on the entire train have been released before the train speed is reduced to 10 MPH.

**2.** Sufficient dynamic brake can be maintained to prevent slack run-out, or the locomotive tractive effort (power) is maintained or reduced while the brakes are releasing.

**3.** The train length is not over 6,250 feet unless the terrain is such that it will allow the slack condition to remain constant during release.

**EXCEPTION:** 15 PSI or less reduction does not apply when cresting or descending heavy grades, to Distributed Power, to ECP trains or to trains less than 3,700 feet in length.

**(b)** During a running release, before train line is fully charged, subsequent brake pipe reductions must be at least 3 PSI GREATER than that used for the last brake application to ensure that brakes reapply. **EXCEPTION:** When using 100% retainers.

**(c)** Following a penalty application, a complete stop must be made before the train air brake is released.

## L-247. MOVEMENT OF NON-COMPLYING LOCOMOTIVES

A locomotive with one or more conditions not in compliance with the Railroad Locomotive Safety Standards may be moved as a light locomotive or a dead locomotive after the carrier has complied with the following:

**(a)** A qualified person must determine that:

- it is safe to move the locomotive
- the maximum speed and other restrictions necessary for safely conducting the movement

**(b)** The Engineer in charge of the movement of the locomotive must be notified in writing and inform all other crewmembers in the cab of the presence of a non-complying locomotive and the maximum speed and other restrictions determined under **Item (a)** of this rule. This notification must be provided by furnishing the Engineer a copy of Form ME-615, “Non-Complying Locomotive” tag.

**(c)** A Form ME-615, NON-COMPLYING LOCOMOTIVE tag, must be securely attached to the isolation switch or near the engine start switch on the non-complying locomotive.

**(d)** A locomotive that develops a non-complying condition en route may continue to utilize its propelling motors, if it is safe to move the locomotive, until the earlier of:

**1.** The next Calendar Day Inspection.

**2.** The nearest forward point where repairs necessary to bring it into compliance can be made.

## L-248. HELPER/PUSHER SERVICE

The following procedures must be observed when pusher locomotives are used:

**(a)** Couple locomotives to rear of train or cut of cars to be pushed. Place automatic brake valve in “HANDLE OFF” position. This id necessary to provide “POWER CUT-OFF” (PC) feature when a brake pipe initiated emergency occurs. Cut brake pipe cut out cock out on pusher locomotives, allowing train line air to be controlled by the lead locomotive.

**(b)** Couple train line hoses and open both angle cocks.

**(c)** When one or more helper locomotives are placed in a train, a visual inspection must be made of each helper locomotive’s brake system to determine that the brake system operates as intended in response to a 20 PSI reduction initiated from the controlling locomotive of the train.

**(d)** When more than 1 locomotive is pushing, the locomotive coupled to the rear of the train must be unoccupied except when the rear car is loaded and equipped with a bottom shelf coupler or the rear car is loaded with a solid bulk commodity with or without bottom shelf couplers.

**(e)** If a caboose is ahead of the pusher locomotives, the caboose must be unoccupied while pushing.

**(f)** When pusher service is no longer required, the movement must stop before pusher locomotives are uncoupled except where automatic uncoupling device is authorized.

**(g)** Close both angle cocks except where automatic uncoupling device is authorized.

**(h)** Cut in double-heading cock on the pusher locomotives, test independent brake and separate from train or cut of cars being pushed.

**(i)** Except as provided below, no more than the equivalent of 16 conventional powered axles (as referenced in the NS Locomotive series table) may be used in pusher service.

- The equivalent of 18 conventional powered axles may be used to push a loaded bulk commodity train.

*Revised 11/16/15*

- Where authorized by Special Instructions, the equivalent of 24 conventional powered axles may be used to push a loaded bulk commodity train.

*Revised 11/16/15*

A locomotive must not be used as the controlling locomotive in a pusher consist unless it is known to be equipped with a **"power knockdown"** feature that reduces power or engine speed without delay following an emergency application of the air brakes initiated from any source other than the automatic brake valve. The following test will be used to determine that the locomotive is equipped with an operative **"power knockdown"** feature:

- reverser must be centered
- generator field switch must be in OPEN position
- automatic brake valve handle must be in HANDLE OFF position and brake pipe cut out cock must be in OUT position
- throttle must be advanced to No. 3 position
- emergency valve must be opened to determine that 'PC' switch activates and engine speed is reduced to idle

## L-249. DOUBLEHEADING SERVICE

In doubleheading service, the Engineer on the controlling locomotive must operate the brakes. On all other locomotives in the train, the brake pipe cut out cock to the brake valve must be cut out, the maximum main reservoir pressure maintained and brake valve handles kept in HANDLE OFF position. If it becomes necessary for the leading locomotive to give up control of the train short of its destination, a Class III brake test of the air brakes must be made to see that the brakes are operative from the automatic brake valve of the locomotive taking control of the train. When 2 locomotive consists are coupled, they must be set up for M/U operation when possible.

## L-250. EMERGENCY BRAKE APPLICATION AND PENALTY BRAKE APPLICATION — HELPER/PUSHER SERVICE

**(a)** In the event of an emergency brake application on the head end, the Engineer of the leading locomotive will immediately notify by radio the Engineer of the second or pusher locomotive. Upon receipt of such information, the Engineer of the second or pusher

locomotive will immediately place the automatic brake valve handle in emergency position.

**(b)** In case of an emergency condition, the Engineer of the second or pusher locomotive will stop the train by applying brakes in emergency. The Engineers must have a complete understanding before proceeding.

**(c)** In the event of a penalty brake application on the head end, the Engineer of the leading locomotive will immediately notify by radio the Engineer of the second or pusher locomotive. Upon receipt, the Engineer of the second or pusher locomotive will promptly place the throttle in IDLE.

## L-251. LOCOMOTIVE SPEED LIMITER (LSL) DEPARTURE TEST

A test of the LSL system on each locomotive operating in LSL designated territory must be made either on departure of the locomotive from its initial terminal or if the apparatus was cut out at the time of departure from initial terminal, prior to the time the locomotive enters LSL designated cab signal territory, including Amtrak's Northeast Corridor. Only 1 departure test is required in any 24-hour period provided that the apparatus has not been cut out since the previous test.

**(a) Departure Tests are Required:**

1. On a single locomotive equipped for operation in the forward direction, the test must be made for operation in the forward direction only.
2. On a consist of two or more locomotives, test must be made on both ends of the consist.

**(b) Set Up — Lead Locomotive:**

1. Automatic Brake Valve cut IN and handle in RELEASE position.
2. Independent Brake Valve in APPLIED position.
3. Reverser in FORWARD position.
4. Generator Field switch in ON position (GE locomotives only).
5. Isolation switch in RUN position.
6. Air cut out cock locked in OPEN position.
7. ATC breaker in ON position.
8. Logic box cut out switch in ON or LSL/CS position and locked.

**(c) Set Up — Trail Locomotive(s):**

**1.** Automatic Brake Valve cut OUT, handle removed.

**2.** Independent Brake Valve cut OUT, handle removed.

**3.** Reverser in NEUTRAL position, handle removed.

**(d) LSL System Self-Test:**

**1.** Perform LSL System self-test by pressing the Mode Switch to advance the indicator to “Self-Test” mode.

**a.** When “do Air” message is displayed, the LSL SYSTEM will wait indefinitely until Engineer recovers the air by moving automatic brake valve handle to RELEASE and independent brake valve to APPLIED position.

**b.** Test mode cannot be exited without running a successful self-test.

**2.** The LSL will run its self-test, which takes about 30 seconds. During this test, the LSL will do the following:

**a.** Display software version number for 5 seconds (Version 2.00 or higher). **Make a note of this number.** Display any faults from prior running for 2 seconds for each fault. DO NOT press the Mode button at this time. This will cause the system to abort the test and go to the “Cab Signal Test” mode.

**b.** Light all LEDs one at a time, check brightness, and then turn them off one at a time. Watch for burned out lights and digit segments.

**c.** Test the LSL alarm.

**d.** Test the Logic Box electronics.

| Test No. | Test | Fault No. Displayed |
|---|---|---|
| 03 | Horn Test<br>Audible Warning Sounds | — |
| 04 | RAM TEST<br>Electronics Self-Test | 08 |
| 05 | System Watchdog<br>( Electronics Self-Test ) | 29 |

**e.** De-energize magnet valve causing a penalty brake application. Engineer must recover from penalty in normal manner. **NOTE:** See **Item (d) 1. a.**

**f.** When the System LSL self-test has been completed and the system is free of faults, the display will read “run,” indicating that the system passed the self-test. The locomotive will automatically exit to the “Non-Cab” mode in 5 seconds.

**g.** If the LSL fails any test during self-test, it will display an associated fault code and an error code “err” upon completion. If a fault appears make a note of the fault in the LCDI System.

**(e) Critical Faults (Display “C”)**

If the fault is a Critical Stop fault, the locomotive will receive a penalty brake application if an attempt is made to move. If the fault is a Critical Limited Fault, the locomotive must be run at restricted Speed (not exceeding 15 MPH) regardless of cab signal indication.

**(f) Record All Fault Numbers in LCDI System**

**(g) Self-Test to Clear Fault**

Repeat the self-test to clear the fault by pushing the mode button once. Fault cannot be cleared without running a self-test. Test mode cannot be exited without running a successful self-test.

Move the automatic brake valve handle to the SUPPRESSION position and the independent brake valve to RELEASE position. Push the mode button to the “Self-Test” mode.

The display should show software version and a “do Air” message will appear. The “do Air” message will continue to be displayed until the automatic brake valve handle is moved to RELEASE and the independent brake valve is APPLIED.

Return the automatic brake valve handle to the RELEASE or RUNNING position and apply the independent brake, LSL will run another self-test. Upon completion, it will exit to “Non-Cab” mode.

## L-252. DEPARTURE TEST OF CAB SIGNALS AND AUTOMATIC TRAIN STOP

**(a) Set Up:**

**1.** Visually inspect the pickup bars for physical damage and to ensure they are not distorted.

**2.** Automatic brake valve cut IN and handle in RELEASE or RUNNING position.

**3.** Independent brake valve cut IN and in FULL APPLICATION position.

**4.** Reverser in direction of travel for test.

**5.** Isolation switch in RUN position.

**6.** Circuit breaker in CUT IN position.

**7.** Air cut out cock locked in OPEN position.

**(b) Departure Test for Locomotives Equipped with Cab Signal Self-Test**

**1. LSL Equipped Locomotives:**

Cab signal test can be performed in either “CS Only” mode or “LSL/CS” mode.

**NOTE:** Cab Signal Test mode cannot be exited without running a successful cab signal self-test.

**a.** To enter the cab signal self-test, the automatic brake valve must be in the RELEASE or RUNNING position, the independent brake must be APPLIED. If the locomotive air is not set up properly, the LSL will display a “do Air” message until air handles are moved to proper position. The Reverser must be in FORWARD and the Generator Field switch must be in ON position (GE locomotives ONLY).

**b.** Press the Mode Button to advance into “Cab Signal Self-Test.” The LSL display will display the following:

**(1)** Software version CR 2.0 or higher.

**(2)** “PS NOR” (press mode button once to advance).

**(3)** “PS LO” (press mode button once to advance).

**(4)** “50 CLR” (“90 CLR” on E8 locomotives only).

**(5)** “30-A” (acknowledge cab signal change).

**(6)** “20 APP” (acknowledge cab signal change).

**(7)** “20 RES” (acknowledge cab signal change).

**(8)** “50 CLR” (“90 CLR” on E8 locomotives only).

**(9)** “50 LO” (“90 LO” on E8 locomotives only) — Do not acknowledge cab signal change.

**(10)** Locomotive goes into penalty braking after the expiration of a time period not exceeding 8 seconds.

**(11)** LSL displays “do Air.”

**NOTE:** The “do Air” message will be displayed indefinitely until Engineer recovers air.

**(12)** Engineer must place automatic brake valve handle in SUPPRESSION or LAP position until PCS is reset and acknowledge Cab Signals.

**(13)** Air is recovered, test continues.

**(14)** “-1-” (receiver bar coil resistance test).

**(15)** “Run.”

**(16)** Automatically exit to Non-Cab Mode.

**c.** If any faults were encountered during this test an error message will be displayed at the end of the cab signal self-test. Make a note of the faults and repeat the cab signal self-test by pushing the mode button once.

**d.** When no faults are found, the display will read “run” on completion of the self-test. System will automatically exit to Non-Cab Mode.

**e.** Prior to considering the test complete and successful, a visual inspection of the receiver bar on the lead engine in the direction of travel must be made. Receiver bars should be mounted 6.5 to 7 inches above the top of the rail and must be inspected for:

- Bent or damaged frames
- Cut, nicked or bare cables
- Dangling or loose cables

- Loose or missing mounting bolts

**f.** Cab Signal Test Form 12061 must be completed, dated and signed indicating that the Cab Signal System was tested and functioned properly.

# OPERATION OF TRIPLE CROWN EQUIPMENT

## T-400. REVERSE MOVEMENTS

Reverse movements with Triple Crown Service Rail Compatible Vehicles (RCV), when in a yard or on line-of-road, must be made only when absolutely necessary and then only under the following conditions:

**(a)** Speed may not exceed 10 MPH.

**(b)** The controlling locomotive will be on line. All other locomotives must be isolated unless terrain and tonnage require additional power.

**(c)** The amperage/tractive effort must be limited to a safe level when starting a reverse movement. If more than one locomotive must be used, the throttle must be slowly advanced and amperage/tractive effort constantly monitored for any abnormal changes.

**(d) Coupling** — A member of the crew must be positioned to watch the rear end of the movement. Prior to coupling to any other standing Triple Crown Service Rail Compatible Vehicle (RCV), a stop must be made within 5 car lengths prior to the coupling. The movement must be stopped again no closer than 10 feet from the equipment to be coupled to.

The relative height between the tongue and pocket must be correct before the movement is allowed to couple.

## T-401. BRAKE PROCEDURES

The **truck mounted spring parking brake** functions very differently from a conventional rail car hand brake. The spring parking brake cylinder contains a heavy coil spring that acts to extend the brake cylinder piston any time brake cylinder pressure to the truck is lost. Spring parking brakes also apply after an emergency brake application to keep the train from rolling away if air brake cylinder pressure bleeds off.

**(a)** Locomotive independent brake and dynamic brake must be used with caution to minimize longitudinal forces on Triple Crown Service Rail Compatible Vehicles (RCVs).

**(b)** Air brakes on Triple Crown Service Rail Compatible Vehicles (RCVs) will be cut out according to **Rule A-27**.

**(c)** The acceptable length for Rail Compatible Vehicle (RCV) trains during cold weather will be determined from the "temperature- to length" chart. (See **Rule A-32**) Rail Compatible Vehicle (RCV) trains are limited to a maximum of 150 vehicles and are not to exceed 5,200 trailing tons behind the head RCV unless otherwise restricted by local instructions.

**(d)** Sticking Brakes:

**1.** Cut out brake valve at the truck.

**2.** Pull the brake release handle to bleed all air from the brake system.

**3.** Check to ensure that brakes have released.

**(e)** Any vehicle bypassed with a run-around hose must be set out at the next Triple Crown terminal.

**(f)** Do not bypass a bogie unless absolutely necessary. If a bogie must be bypassed, the spring brake must be caged or otherwise disabled.

**(g) Manually releasing ("Caging") spring parking brakes —** When moving a Rail Compatible Vehicle (RCV) trailer mounted on a rail bogie without brake pipe pressure to the truck, the spring parking brake must be released manually prior to movement of the equipment. **NOTE:** The "caging" procedure will be performed only by specially qualified personnel.

**(h)** The brake cylinder piston travel for Mark V RoadRailer® equipment, using a standard swing motion truck, will be set as follows:

Initial Terminal 1-1/4 to 3-1/2 inches

A piston travel in excess of 3-5/8 inches will be considered an ineffective brake.

## T-402. DETACHING LOCOMOTIVES OR SEPARATING RAIL COMPATIBLE VEHICLES (RCVS) ON LINE-OF-ROAD

The following procedure must be followed before detaching locomotives or separating Rail Compatible Vehicles (RCVs):

**(a)** Reduce train line pressure to zero (0) with an emergency brake application.

**(b)** Inspect 20% of the equipment (no less than 10 vehicles) to ensure that brakes are applied.

**NOTE:** If equipment is left standing on a grade of 1% or more, 50% of the equipment (no less than 10 vehicles) must be inspected to ensure that the brakes are applied.

**(c)** When making a cut between Rail Compatible Vehicles (RCVs), check the landing gear of the trailer behind the cut to ensure that the nose of the trailer is fully supported.

**(d)** Leave the train line open to the atmosphere.

**NOTE:** This procedure does not apply when detaching locomotives from Rail Compatible Vehicles (RCVs) in yards or at other locations designated by bulletin or special instructions.

## T-403. GENERAL INSTRUCTIONS

**(a) Set Out Trailers Whenever:**

**1.** Highway tires are on the rail and cannot be properly secured.

**2.** Dragging equipment cannot be secured.

**3.** The unit has a hot or damaged journal.

**4.** A rail wheel is detected with either of the following:

**a.** A flat or shelled spot that is 2-1/2 inches or more in length.

**b.** Two adjoining flat or shelled spots each of which is 2 inches or more in length.

**(b) Adjusting Coupler Height** — To adjust coupler height, raise or lower the landing gear on the unit being coupled to.

**(c) Highway Operation** — If a Rail Compatible Vehicle (RCV) unit is set out of a train along line-of-road and is to be picked up by a highway tractor, ensure that the mode valve is in the highway mode before dispatching the trailer over the highway.

## T-404. ASCENDING OR DESCENDING GRADES

When Triple Crown Service Rail Compatible Vehicle (RCV) trains are stopped on an ascending or descending grade due to an emergency brake application of the air brakes, regardless of the cause, the automatic brake valve must not be released to charge the air brake system until the crew has determined that a sufficient number of locomotives axles with operative brakes are on the head end of the train to prevent unintentional movement. If there are not an

equivalent number of locomotive axles with operable brakes to secure the Triple Crown Service Rail Compatible Vehicle (RCV) train on the grade while charging the train line, the crew must immediately notify the Train Dispatcher.

## T-405. DETACHING LOCOMOTIVES IN YARDS

When detaching locomotives from Rail Compatible Vehicles (RCVs) in yards or at other locations designated by Bulletin or Special Instructions, Engineers will reduce the brake pipe pressure to 20 PSI above zero (0) (70 PSI automatic brake reduction) before locomotive is cut off or any angle cock is turned.

## T-406. BRAKE RELEASE TIME

A Triple Crown Service Rail Compatible Vehicle (RCV) train stopped due to an emergency brake application of the air brakes must not proceed, until:

**(a)** Proper train inspection, if required, is performed and brake pipe pressure is being restored on the rear of the train, and

**(b)** Brake pipe flow indicator, if equipped, has stabilized at or below 60 CFM.

# DEFINITIONS

**ACCELEROMETER**
An indicator that displays in MPH per minute the rate of increase/ decrease of speed.

**AC LOCOMOTIVE**
**Alternating Current (AC)** locomotives are equipped with AC traction motors and are not affected by maximum continuous current ratings or short time operating ratings.

**ACTUATING**
Feature of the independent brake valve to charge the actuating pipe from the main reservoir and prevent or release a locomotive brake application from a brake pipe reduction.

**AIR BRAKE**
A system of compressed air devices, controlled manually, electronically or pneumatically, that makes the car or locomotive slow down or stop.

**AIR FLOW INDICATOR (AFI)**
An instrument that indicates the volume of the air in cubic feet per minute (CFM) flowing through the automatic brake valve into the brake pipe.

**ALERTER SAFETY CONTROL**
A safety control system that senses the activity of the Engineer. As the Engineer goes about normal activities, any such changes will reset the control and start a timing circuit. If, during the timing period, no additional activity is detected, an audible and/or visual alarm occurs. If activity still doesn't occur for another period, approximately 6 seconds, a penalty brake application is initiated.

**ALIGNMENT CONTROL COUPLER**
Specially equipped couplers, installed on most locomotives that only allow the coupler in buff to move laterally within certain limits. This equipment minimizes rail turnover, wheel climb and jackknifing.

**BIND**
The intended movement of one or more brake system components is restricted by reduced clearance, by obstruction, or by increased friction.

**BRAKE INDICATOR**
A device that indicates the brake application range and indicates whether the brakes are applied and released.

**BRAKE PIPE**
The system of piping (including branch pipes, angle cocks, cut out cocks, dirt collectors, hoses, and hose couplings) used for connecting locomotives and all railroad cars for the passage of compressed air.

**BRAKE PIPE PRESSURE**
The air pressure contained in the brake pipe.

**NOTE:** When an End-Of-Train Device is being used, the term brake pipe pressure is being:

- reduced – Means a pressure reduction of at least 5 PSI
- restored – Means pressure increase of at least 5 PSI

**CALENDAR DAY INSPECTION**
The Federally required inspection a locomotive must undergo each day it is in service. The results of the locomotive inspection must be recorded in LCDI system.

**CFM**
Cubic Feet per Minute

**CONTROLLING LOCOMOTIVE**
Locomotive from which the Engineer exercises control over the train.

**CYCLE OR UNIT TRAIN**
A train that except for the changing of locomotive power and the removal or replacement of defective equipment remains coupled as a consist and continuously operates from location A to location B and returns to location A.

**DC LOCOMOTIVE**
DC locomotives are equipped with DC traction motors and are affected by maximum continuous current ratings or short time operating ratings.

**DEAD ENGINE FEATURE**
A device near the locomotive control valve that is used when the locomotive is handled dead-in-train. When the dead engine cut out cock is opened, the main reservoirs are charged from the brake pipe to operate the engine brakes.

**DEAD LOCOMOTIVE**
A locomotive that does not have any traction device supplying tractive power.

**DISTRIBUTED POWER**
One or more locomotive consists that are remotely controlled from the lead locomotive.

**DOUBLEHEADING**
The use of more than 1 locomotive on the head end of a train when one of the locomotives is not equipped for M/U operation.

**DYNAMIC BRAKE**
An electrical device that converts some of the energy developed by a moving locomotive into an effective retarding force.

**Extended Range** — Dynamic braking system, which provides maximum retarding force between 6 MPH and 25 MPH. Retarding force **decreases** as speed decreases below 6 MPH or increases above 25 MPH.

**Flat** — Dynamic brake system that provides retardation that is controlled solely by the position of the dynamic brake lever. Maximum retardation occurs at Position 8.

**High Capacity** — Dynamic braking system, which provides approximately 13,500 lbs. of effort per axle instead of 10,000 lbs. per axle as other dynamic brake systems.

**Standard Capacity** — Dynamic braking system, which provides maximum retarding force between 18 MPH and 25 MPH. Retarding force, decreases as speed **decreases** below 18 MPH or increases above 25 MPH.

**Taper Dynamic Brakes** — Dynamic brake system that provides retardation relative to both speed and dynamic brake handle position. The higher the speed, the greater the retarding force developed for a given handle position. At higher speeds, full dynamic brake effort is reached at Position 4.

**DYNAMIC BRAKE HOLDING FEATURE**
A feature of the lead, controlling locomotive that allows dynamic braking effort when a PCS open condition exists.

**DYNAMIC BRAKE INTERLOCK (DBI)**
A device that will automatically keep the locomotive brakes from applying when automatic brakes are applied during dynamic braking.

**END-OF-TRAIN DEVICE**
A device that (a) provides an emergency brake application command to an emergency air valve at the rear of a train and sends an acknowledging message to the Head-Of-Train Device and (b) determines the rear car brake pipe pressure and transmits that information to a device located in the cab of the locomotive controlling the train. The emergency brake application command is initiated from a manually operated switch in the controlling locomotive on the front of the train. A two-way End-Of-Train Device is composed of 2 devices: a Head-Of-Train Device (HOTD) and an End-Of-Train Device (EOTD).

**END-OF-TRAIN DEVICE (EOTD) ENROUTE FAILURE**
A loss of communication between the HOTD and EOTD will be considered an enroute failure only if the loss of communication is for a period greater than 16 minutes and 30 seconds. **NOTE:** The display to an Engineer of a message that there is a communication failure indicates that communication has been lost for 16 minutes and 30 seconds or more.

**END-OF-TRAIN DEVICE (EOTD) FAILURE**
A two-way device will be classified as “failed” if the HOTD on the controlling locomotive is unable to initiate an emergency brake application from the rear of the train due to certain losses of communication or due to other reasons. An EOTD has failed when any of the following messages are displayed:

- DEAD BAT — Battery Voltage is too low to consistently transmit
- REPL BAT — Battery Voltage is too low to consistently transmit
- VALVFAIL — Emergency Valve functioning improperly
- DISARMD — EOTD/HOTD not ARMED to each other

• FR NOCOM — HOTD has not been able to communicate with the EOTD in 16 minutes and 30 seconds

**NOTE:** Message RF NOCOM does not indicate a failure of the device.

Any of these messages indicate that the device is unable to initiate an emergency application at the rear of the train from the controlling locomotive. *Added 9/29/17*

**EXTENDED OFF-AIR FACILITY**
A designated location controlled by a sole shipper or consignee which restricts access to the train and provides sufficient security to deter vandalism.

**FOUL**
Any condition, which restricts the intended movement of one or more brake system components because the component is snagged, entangled, or twisted.

**FULL SERVICE APPLICATION**
A brake pipe reduction made only to the point at which the auxiliary reservoir and brake cylinder pressures equalize. Any further reduction in the brake pipe pressure, except an emergency application, will not affect the amount of pressure in the brake cylinder. Therefore, air is being wasted from the brake pipe (over reduction).

When rules require a full service reduction, a service brake pipe reduction must be made as indicated below:

| Regulating Valve Setting | Brake Pipe Reduction |
|---|---|
| 75 PSI | 22 PSI |
| 80 PSI | 23 PSI |
| 90 PSI | 26 PSI |
| 100 PSI | 29 PSI |
| 110 PSI | 32 PSI |

**HELPER/PUSHER**
One or more locomotives added to the rear of a train to assist movement. *Revised 9/8/17*

**INOPERATIVE DYNAMIC BRAKE**
A dynamic brake that, for any reason, no longer provides its designed retarding force on the train.

**LIGHT LOCOMOTIVE**
A locomotive or a consist of locomotives not attached to any piece of equipment or attached only to a caboose.

**LOADED BULK COMMODITY TRAIN**
A train made up entirely of bulk commodities, such as coal, grain, ore, potash, molten sulfur, soda ash, phosphate rock, oil, ethanol, or taconite, plus any required buffer cars.

*Revised 11/6/15*

**LOCOMOTIVE CALENDAR DAY INSPECTION AND REPORTING SYSTEM (LCDI)**
A computer based electronic reporting system designed to record Calendar Day Inspections and track locomotive serviceability. LCDI computer generated forms or reporting screens are completed by employees prior to the end of their tour of duty.

**MU CUT OUT (MU-2-A)**
A device for cutting in or out the independent brake valve.

**OFF AIR**
Not connected to a continuous source of compressed air.

**OVERCHARGE**
Brake equipment charged to a higher pressure than the regulating valve is adjusted for or can maintain. In such a condition, brakes on a portion of the train may not release.

**PARKING BRAKE**
A brake that can be applied by:

- hand
- spring
- hydraulic or air pressure when the brake pipe air is depleted
- electrical motor

**PENALTY BRAKE APPLICATION**
An automatic full service brake application caused by various safety devices.

**PERCENT OF OPERATIVE POWER BRAKES**
The percentage must be determined by dividing the number of control valves that are cut in by the total number of control valves in the train. A control valve will not be considered cut in if the brakes controlled by the valve are inoperative. Both cars and locomotives will be considered when making the calculation.

**PNEUMATIC CONTROL SWITCH (PCS)**
An air-operated switch, activated by an emergency or penalty brake application, that drops the engine speed to idle on EMD locomotives or throttle notch 1 on GE locomotives.

**PRESSURE MAINTAINING FEATURE**
A system designed to overcome brake pipe leakage both in the RELEASE and SERVICE positions of the automatic brake valve. This allows a constant brake application to be held as long as needed.

**PREVIOUSLY TESTED**
Equipment that has received a Class I brake test pursuant to **Rule A-6** and has not been off air for more than 4 hours.

**PSI**
Pounds per Square Inch

**QUALIFIED MECHANICAL INSPECTOR (QMI)**
A person who has received training in one or more of the following functions: troubleshooting, inspection, testing, maintenance or repair of the specific train brake components and systems for which the person is assigned responsibility. This person shall also possess a current understanding of what is required to properly repair and maintain the safety-critical brake components for which the person is assigned responsibility. Further, the qualified mechanical inspector shall be a person whose primary responsibility includes work generally consistent with the functions listed in this definition.

**QUALIFIED PERSON (QP)**
A person who has received required training and has been determined to have the knowledge and skills necessary to perform the required function for which the person is assigned responsibility.

**REDUCTION (of the brake pipe)**
A decrease in brake pipe pressure at a rate and of an amount sufficient to cause a train brake application to be initiated or increased.

**REGULATING VALVE**
The valve that reduces air pressure from the locomotive's main reservoir to the desired pressure in the brake pipe. The regulating valve will automatically maintain that pressure when the automatic brake valve is in the RELEASE position.

**RETAINING VALVE**
A manually operated valve used on cars to exhaust brake cylinder pressure completely or to maintain a predetermined pressure.

**ROLL-BY INSPECTION**
An inspection performed while equipment is moving at a speed not exceeding 10 MPH.

**SERVICE APPLICATION**
When brake pipe pressure exhausts at a service rate to apply the train brakes.

**SERVICE REDUCTION**
A decrease in brake pipe pressure, usually from 5 PSI to 25 PSI, at a rate which will move the operating valve to the service position but not at a rate which will move the operating valve to the emergency position.

**SLACK ACTION**
Movement of part of a coupled train at a different speed than another part of the same train.

**SLUG**
A locomotive with traction motors but no diesel engine and incapable of propelling itself. The locomotive receives electrical power through a power cable from an adjacent, specially equipped locomotive. Slugs are used where low speeds and high tractive effort are needed.

**SOLID BLOCK (of cars)**
Two or more cars coupled together that:

- are added to or removed from a train as a single unit
- are charged or have not been off air for more than 4 hours
- have been tested as outlined in **Rule A-6** ( Class I Brake Test )

**TRACTIVE EFFORT**
The force exerted by a locomotive on the track to move a train. Tractive effort is measured in pounds and decreases as speed increases.

**TRANSFER TRAIN MOVEMENT**
A movement of an engine and one or more cars between a point of origin and a point of final destination not exceeding 20 miles. Such trains may pickup or set out while en route to destination.

**UNATTENDED EQUIPMENT**
Means equipment left standing and unmanned in such a manner that the brake system of the cars and/or locomotives cannot be readily controlled.

**YARD AIR**
A source of compressed air other than from a locomotive.

**YARD AIR SUPPLY**
A system of piping and fittings that supplies air at convenient locations to charge and to test cars without a locomotive.

## TABLE FOR DETERMINING MAXIMUM TONNAGE THAT CAN BE HELD ON VARYING GRADES PER LOCOMOTIVE AXLE

| Grade (%) | Number of Locomotive Axles with Operable Brake | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
| <0.45 | 867 | 3,468 | 5,202 | — | — | — | — | — | — | — | — | — |
| 0.50 | 693 | 2,772 | 4,158 | 5,544 | — | — | — | — | — | — | — | — |
| 0.60 | 495 | 1,980 | 2,970 | 3,960 | 4,950 | 5,940 | — | — | — | — | — | — |
| 0.70 | 385 | 1,540 | 2,310 | 3,080 | 3,850 | 4,620 | 5,390 | — | — | — | — | — |
| 0.80 | 315 | 1,260 | 1,890 | 2,520 | 3,150 | 3,780 | 4,410 | 5,040 | 5,670 | — | — | — |
| 0.90 | 267 | 1,068 | 1,602 | 2,136 | 2,670 | 3,204 | 3,738 | 4,272 | 4,806 | 5,340 | — | — |
| 1.00 | 231 | 924 | 1,386 | 1,848 | 2,310 | 2,772 | 3,234 | 3,696 | 4,158 | 4,620 | 5,082 | 5,544 |
| 1.10 | 204 | 816 | 1,224 | 1,632 | 2,040 | 2,448 | 2,856 | 3,264 | 3,672 | 4,080 | 4,488 | 4,896 |
| 1.20 | 182 | 728 | 1,092 | 1,456 | 1,820 | 2,184 | 2,548 | 2,912 | 3,276 | 3,640 | 4,004 | 4,368 |
| 1.30 | 165 | 660 | 990 | 1,320 | 1,650 | 1,980 | 2,310 | 2,640 | 2,970 | 3,300 | 3,630 | 3,960 |
| 1.40 | 151 | 604 | 906 | 1,208 | 1,510 | 1,812 | 2,114 | 2,416 | 2,718 | 3,020 | 3,322 | 3,624 |
| 1.50 | 139 | 556 | 834 | 1,112 | 1,390 | 1,668 | 1,946 | 2,224 | 2,502 | 2,780 | 3,058 | 3,336 |
| 1.60 | 128 | 512 | 768 | 1,024 | 1,280 | 1,536 | 1,792 | 2,048 | 2,304 | 2,560 | 2,816 | 3,072 |
| 1.70 | 120 | 480 | 720 | 960 | 1,200 | 1,440 | 1,680 | 1,920 | 2,160 | 2,400 | 2,640 | 2,880 |
| 1.80 | 112 | 448 | 672 | 896 | 1,120 | 1,344 | 1,568 | 1,792 | 2,016 | 2,240 | 2,464 | 2,688 |
| 1.90 | 105 | 420 | 630 | 840 | 1,050 | 1,260 | 1,470 | 1,680 | 1,890 | 2,100 | 2,310 | 2,520 |
| 2.00 | 99 | 396 | 594 | 792 | 990 | 1,188 | 1,386 | 1,584 | 1,782 | 1,980 | 2,178 | 2,376 |
| 2.20 | 89 | 356 | 534 | 712 | 890 | 1,068 | 1,246 | 1,424 | 1,602 | 1,780 | 1,958 | 2,136 |
| 2.40 | 81 | 324 | 486 | 648 | 810 | 972 | 1,134 | 1,296 | 1,458 | 1,620 | 1,782 | 1,944 |
| 2.50 | 77 | 308 | 462 | 616 | 770 | 924 | 1,078 | 1,232 | 1,386 | 1,540 | 1,694 | 1,848 |
| 2.60 | 74 | 296 | 444 | 592 | 740 | 888 | 1,036 | 1,184 | 1,332 | 1,480 | 1,628 | 1,776 |
| 2.80 | 68 | 272 | 408 | 544 | 680 | 816 | 952 | 1,088 | 1,224 | 1,360 | 1,496 | 1,632 |
| 3.00 | 63 | 252 | 378 | 504 | 630 | 756 | 882 | 1,008 | 1,134 | 1,260 | 1,386 | 1,512 |

For grades that fall between those listed, the maximum tonnage for the next steepest grade will govern.

NS-1 **Rule L-207** governing the locomotive axle limits under power and **Rule L-210** dynamic brake requirements remain in effect.

# NORFOLK SOUTHERN
# SYSTEM LOCOMOTIVE SERIES TABLE

| ROAD NO'S | MODEL | DYNAMIC BRAKE TYPE/EQ | POWERED AXLES IN DB | NO/EQ | HP | POWER GROUP CODE |
|---|---|---|---|---|---|---|
| 98, 99 | RCP4 | None | -- | 0 = 0 | 0 | Y |
| 100, 101 | RP20BD | STD | 4 | 4 = 4 | 2100 | Y,1 |
| 102, 103 | RP20BD | None | -- | 4 = 4 | 2100 | Y,1 |
| 300, 301 | 3GS-21B | None | -- | 4 = 4 | 2100 | Y,1 |
| 600, 601 | GPTEB | ER | 4 | 4 = 4 | 0 | Y,1 |
| 650-684 | RP-M4C | ER/HC | 5 | 4 = 5 | 0 | Y,2 |
| 700-760 | RP-E4C | ER | 4 | 4 = 4 | 0 | Y,1 |
| 850-887 | RPU6 | None | -- | 6 = 6 | 0 | Y,3 |
| 912, 913 | RP-E4 | None | -- | 4 = 4 | 0 | Y,1 |
| 914-941 | RP-E4D | ER | 4 | 4 = 4 | 0 | Y,1 |
| 952-965 | RP-E4U | None | -- | 6 = 6 | 0 | Y |
| 999 | BP4 | ER | 4 | 4 = 4 | 1350 | Y |
| 1000-1074 | SD70ACe | ER/HC | 9 | 6 = 9 | 4300 | 6 |
| 1625-1652 | SD40-2 | STD | 6 | 6 = 6 | 3000 | Y,3 |
| 1700-1705 | SD45-2 | STD | 6 | 6 = 6 | 3000 | Y,3 |
| 2100-2107 | SW1001 | None | -- | 4 = 4 | 1000 | Y |
| 2120, 2121 | RP14BDB | None | -- | 4 = 4 | 1400 | Y |
| 2220-2346 | SW1500 | None | -- | 4 = 4 | 1500 | Y |
| 2349-2435 | MP15DC | None | -- | 4 = 4 | 1500 | Y |
| 2501-2580 | SD70 | ER/HC | 8 | 6 = 8 | 4000 | 5 |
| 2581-2648 | SD70M | ER/HC | 8 | 6 = 8 | 4000 | 5 |
| 2649-2778 | SD70M-2 | ER/HC | 8 | 6 = 8 | 4000 | 5 |
| 2835-2873 | GP38AC | ER | 4 | 4 = 4 | 2000 | Y,1 |
| 3000-3070 | GP40-2 | STD or ER | 4 | 4 = 4 | 2000 | Y,1 |
| 3071-3102 | GP40-2 | ER | 4 | 4 = 4 | 2000 | Y,1 |
| 3201-3328 | SD40-2 | ER | 6 | 6 = 6 | 3000 | Y,3 |
| 3329-3376 | SD40-2 | STD | 6 | 6 = 6 | 3000 | Y,3 |
| 3377-3447 | SD40-2 | ER | 6 | 6 = 6 | 3000 | Y,3 |
| 3348-3467 | SD40-2 | STD | 6 | 6 = 6 | 3000 | Y,3 |
| 3522-3566 | D8-32B | ER/HC | 5 | 4 = 5 | 3200 | Y,2 |
| 3800-3820 | SD38 | None | -- | 6 = 6 | 2000 | Y,3 |
| 3821 | SD38-2 | STD | 6 | 6 = 6 | 2000 | Y,3 |
| 3830 | RP20CD | ER | 6 | 6 = 6 | 2100 | Y,3 |
| 3850 | 3GS21CDB | ER | 6 | 6 = 6 | 2100 | Y,3 |
| 4000-4011 | PR43C | ER/HC | 8 | 6 = 8 | 4300 | 5 |
| 4123-4154 | GP38AC | STD | 4 | 4 = 4 | 2000 | Y,1 |
| 4270, 4271 | F9A | None | -- | 4 = 4 | 1750 | 1 |
| 4275, 4276 | F7B | None | -- | 4 = 4 | 1750 | 1 |

## NORFOLK SOUTHERN
## SYSTEM LOCOMOTIVE SERIES TABLE *(continued)*

| ROAD NO'S | MODEL | DYNAMIC BRAKE TYPE/EQ | POWERED AXLES IN DB | NO/EQ | HP | POWER GROUP CODE |
|---|---|---|---|---|---|---|
| 4606-4641 | GP59 | ER/HC | 5 | 4 = 5 | 3000 | Y,2 |
| 4650-4684 | GP59E | ER/HC | 5 | 4 = 5 | 3000 | Y,2 |
| 5000-5256 | GP38-2 | ER | 4 | 4 = 4 | 2000 | Y,1 |
| 5257-5361 | GP38-2 | STD | 4 | 4 = 4 | 2000 | Y,1 |
| 5400-5445 | SD50 | ER | 6 | 6 = 8 | 3500 | Y,5 |
| 5501-5580 | GP38-2 | ER | 4 | 4 = 4 | 2000 | Y,1 |
| 5601-5680 | GP38-2 | ER | 4 | 4 = 4 | 2000 | Y,1 |
| 5801-5835 | GP38-3 | ER/HC | 5 | 4 = 4 | 2000 | Y,1 |
| 5900-5901 | GP22ECOM | ER | 4 | 4 = 4 | 2000 | Y,1 |
| 6073-6205 | SD40-2 | STD | 6 | 6 = 6 | 3000 | Y,3 |
| 6300-6359 | SD40E | ER/HC | 6 | 6 = 6 | 3000 | Y,3 |
| 6530-6716 | SD60 | ER/HC | 8 | 6 = 8 | 3800 | 5 |
| 6717-6762 | SD60I | ER/HC | 8 | 6 = 8 | 3800 | 5 |
| 6763-6806 | SD60M | ER/HC | 8 | 6 = 8 | 3800 | 5 |
| 6900-6919 | SD60E | ER/HC | 8 | 6 = 8 | 4000 | 5 |
| 7003-7091 | GP50 | ER/HC | 5 | 4 = 5 | 3500 | Y,2 |
| 7100-7150 | GP60 | ER/HC | 5 | 4 = 5 | 3800 | 2 |
| 7200-7216 | SD80MAC | ER/HC | 9 | 6 = 9 | 5000 | 6 |
| 7500-7719 | ES40DC | ER/HC | 8 | 6 = 9 | 4000 | 5 |
| 8000-8115 | ES44AC | ER/HC | 9 | 6 = 9 | 4400 | 6 |
| 8300-8313 | D8-40C | ER/HC | 8 | 6 = 8 | 4000 | 5 |
| 8314-8467 | D8-40CW | ER/HC | 8 | 6 = 8 | 4000 | 5 |
| 8689-8763 | D8-40C | ER/HC | 8 | 6 = 8 | 4000 | 5 |
| 8764-8888 | D9-40C | ER/HC | 8 | 6 = 8 | 4000 | 5 |
| 8889-9978 | D9-40CW | ER/HC | 8 | 6 = 8 | 4000 | 5 |

EQ = Equivalent
STD = Standard
ER = Extended Range
HC = High Capacity

**POWER GROUP CODE**

Y = Locomotive for Yard and Local Service
1 = Conventional 4-Axle Locomotive
2 = High Adhesion 4-Axle Locomotive
3 = Conventional 6-Axle Locomotive
5 = High Adhesion 6-Axle Locomotive
6 = 6-Axle AC Locomotive, Matched Sets Only

## TRACTIVE EFFORT CONVERTER

## BRAKING EFFORT TO AMPS CONVERTER

| Braking Effort — lbs. | MPH | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 26 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 |
| 5,000 | 243 | 261 | 282 | 302 | 320 | 337 | 354 | 369 | 384 | 399 |
| 10,000 | 344 | 369 | 399 | 426 | 452 | 477 | 500 | 522 | 544 | 564 |
| 15,000 | 421 | 452 | 489 | 522 | 554 | 584 | 612 | 640 | 666 | 691 |
| 20,000 | 486 | 522 | 564 | 603 | 640 | 674 | 707 | 739 | 769 | 798 |
| 25,000 | 544 | 584 | 631 | 674 | 715 | 754 | 791 | 826 | 860 | 892 |
| 30,000 | 596 | 640 | 691 | 739 | 783 | 826 | 866 | 905 | 920 | 920 |
| 35,000 | 643 | 691 | 746 | 798 | 846 | 892 | 920 | 920 | | |
| 40,000 | 688 | 739 | 798 | 853 | 905 | 920 | | | | |
| 45,000 | 729 | 783 | 846 | 905 | 920 | | | | | |
| 50,000 | 769 | 826 | 892 | 920 | | | | | | |
| 55,000 | 806 | 866 | 920 | | | | | | | |
| 60,000 | 842 | 905 | | | | | | | | |
| 65,000 | 877 | 920 | | | | | | | | |
| 70,000 | 910 | | | | | | | | | |

Value indicated at the intersection of speed and braking effort is Amps.

**NOTE:** Data provided for GE locomotives with 42 inch wheels. Reprinted with permission.

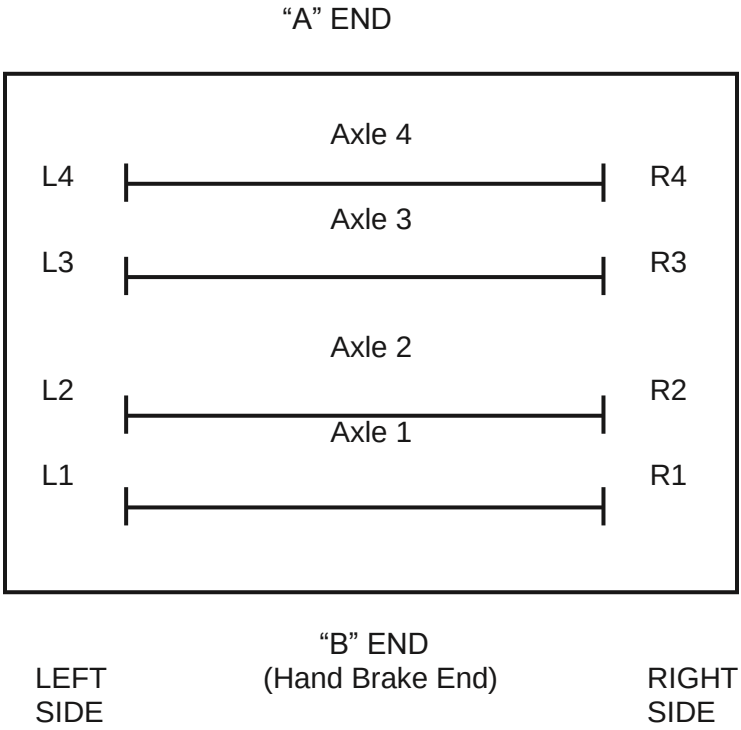
## TRACTIVE EFFORT TO AMPS CONVERTER

| Tractive Effort (lbs.) | Amps (A) | Tractive Effort (lbs.) | Amps (A) | Tractive Effort (lbs.) | Amps (A) |
|---|---|---|---|---|---|
| 5,000 | 177 | 55,000 | 816 | 105,000 | 1,370 |
| 10,000 | 257 | 60,000 | 878 | 110,000 | 1,424 |
| 15,000 | 326 | 65,000 | 937 | 115,000 | 1,485 |
| 20,000 | 392 | 70,000 | 993 | 120,000 | 1,545 |
| 25,000 | 456 | 75,000 | 1,051 | 125,000 | 1,604 |
| 30,000 | 515 | 80,000 | 1,107 | 130,000 | 1,662 |
| 35,000 | 577 | 85,000 | 1,162 | 135,000 | 1,720 |
| 40,000 | 639 | 90,000 | 1,215 | 140,000 | 1,776 |
| 45,000 | 700 | 95,000 | 1,269 | | |
| 50,000 | 759 | 100,000 | 1,320 | | |

**NOTE:** Data provided for GE locomotives with 42 inch wheels. Reprinted with permission.

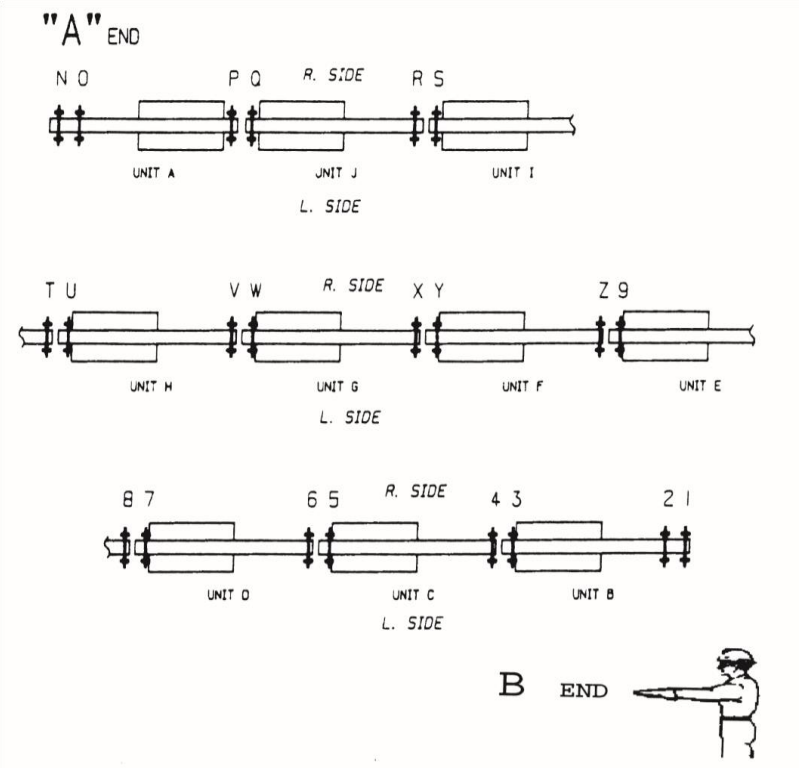
# FREIGHT CAR AXLE, JOURNAL AND WHEEL MECHANICAL IDENTIFICATION DIAGRAM

To determine axle number, journal number and wheel number on a car, stand facing the hand brake end of the car (the B end) and count the closest axle as number one and the wheels and journals on right and left sides as R1, R2, ... etc. and L1, L2, ... etc. respectively as shown in diagram. If the car is equipped with 2 hand brakes, then the piston extends towards the “B” end.



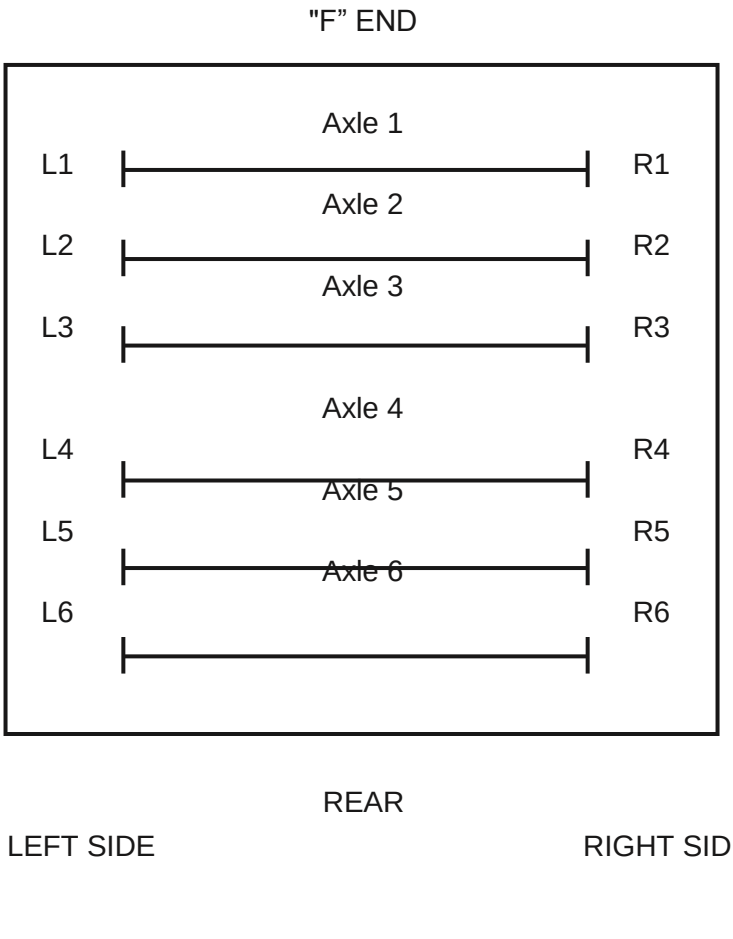
# FREIGHT CAR AXLE, JOURNAL AND WHEEL MECHANICAL IDENTIFICATION DIAGRAM — ARTICULATED AND MULTI-UNIT CARS

To determine platform identification, stand facing the “B” end (a hand brake will be located on this end and the unit will be stenciled “B”). The furthest platform is the “A” unit and should be stenciled “A”. Intermediate platforms are designated as “C”, “D”, “E”, etc. until the “A” platform is reached. Use the following procedure to determine axle number, journal number, and wheel number on articulated or multi-unit cars. Stand facing the “B” end as shown in diagram below. Count the closest axles as numbers 1–9, then use letters in reverse order starting with “Z” for axles over 9. Count the wheels and journals on right and left sides as R1, R2, ... R9 and L1, L2, ... L9 respectively. For cars having more than 9-axles, continue the count as RZ, RY, RX, ...etc. and LZ, LY, LX, ... etc. respectively as shown in the diagram.

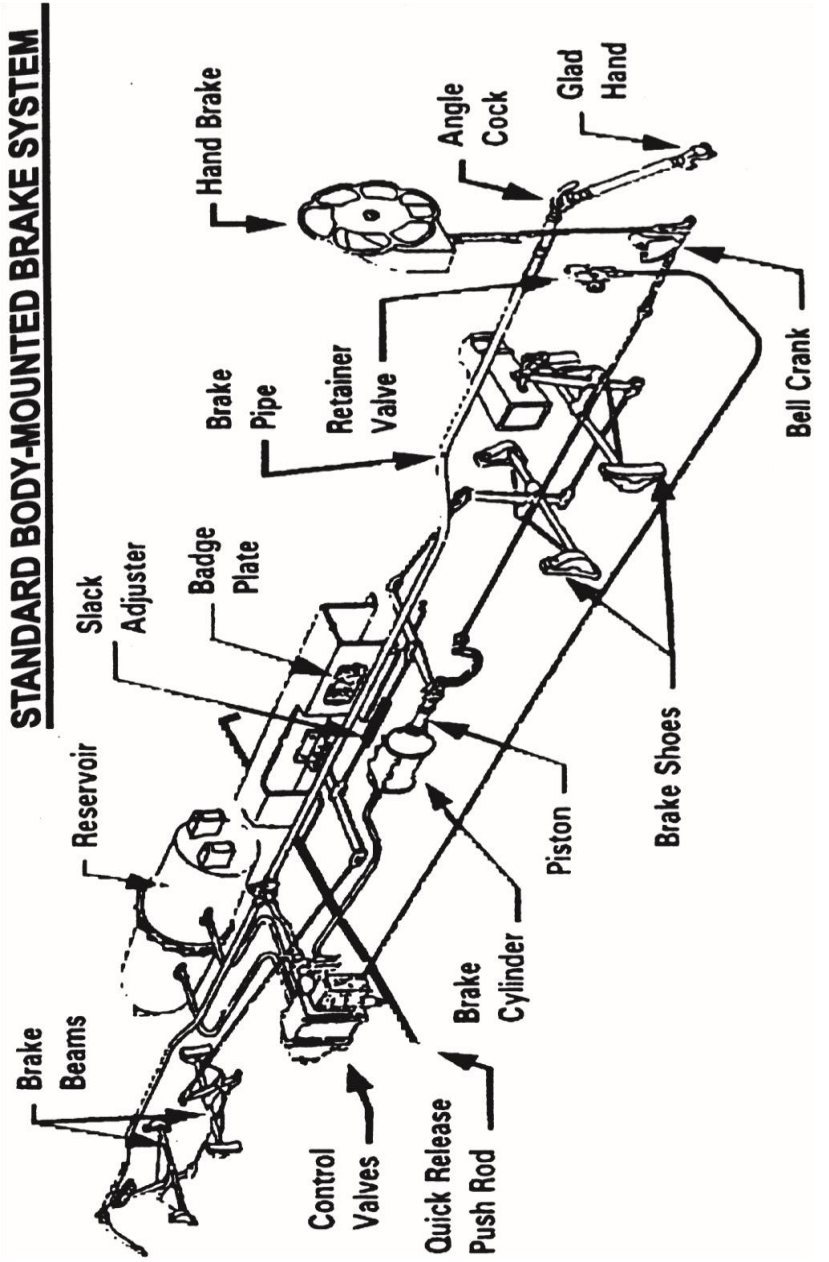


# LOCOMOTIVE AXLE, JOURNAL AND WHEEL MECHANICAL IDENTIFICATION DIAGRAM

To determine axle number, journal number and wheel number on a locomotive, stand on the locomotive facing the end labeled “F” and count the closest axle on the “F” end as one and the wheels and journals on right and left sides as R1, R2, ... etc. and L1, L2, ... etc. respectively as shown in diagram.



# STANDARD BODY-MOUNTED BRAKE SYSTEM



# FORMS

# FORM ME-65 — SIDE 1

**Norfolk Southern Railway Inspection Record**

MONTH _____ UNIT NO. _____

| Date | Time | Location | Inspected By Signature | Complying Yes/No |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |
| 10 | | | | |
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| 23 | | | | |
| 24 | | | | |
| 25 | | | | |
| 26 | | | | |
| 27 | | | | |
| 28 | | | | |
| 29 | | | | |
| 30 | | | | |
| 31 | | | | |

FORM ME-65 (rev. 4/00)
(Item No. 055005)

Norfolk Southern Railway

**INSPECTION RECORD**

THIS FORM IS TO BE KEPT WITH THE LOCOMOTIVE AND WILL BE CHANGED ONLY AT THE 92-DAY INSPECTION. EACH LOCOMOTIVE SHALL BE INSPECTED AT LEAST ONCE EACH CALENDAR DAY.

**LOCOMOTIVE NUMBER**

# FORM ME-65 — SIDE 2

MONTH _____ UNIT NO. _____ MONTH _____ UNIT NO. _____ MONTH _____ UNIT NO. _____

| Date | Time | Location | Inspected By Signature | Complying Yes/No | Date | Time | Location | Inspected By Signature | Complying Yes/No | Date | Time | Location | Inspected By Signature | Complying Yes/No |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 1 | | | | | 1 | | | | |
| 2 | | | | | 2 | | | | | 2 | | | | |
| 3 | | | | | 3 | | | | | 3 | | | | |
| 4 | | | | | 4 | | | | | 4 | | | | |
| 5 | | | | | 5 | | | | | 5 | | | | |
| 6 | | | | | 6 | | | | | 6 | | | | |
| 7 | | | | | 7 | | | | | 7 | | | | |
| 8 | | | | | 8 | | | | | 8 | | | | |
| 9 | | | | | 9 | | | | | 9 | | | | |
| 10 | | | | | 10 | | | | | 10 | | | | |
| 11 | | | | | 11 | | | | | 11 | | | | |
| 12 | | | | | 12 | | | | | 12 | | | | |
| 13 | | | | | 13 | | | | | 13 | | | | |
| 14 | | | | | 14 | | | | | 14 | | | | |
| 15 | | | | | 15 | | | | | 15 | | | | |
| 16 | | | | | 16 | | | | | 16 | | | | |
| 17 | | | | | 17 | | | | | 17 | | | | |
| 18 | | | | | 18 | | | | | 18 | | | | |
| 19 | | | | | 19 | | | | | 19 | | | | |
| 20 | | | | | 20 | | | | | 20 | | | | |
| 21 | | | | | 21 | | | | | 21 | | | | |
| 22 | | | | | 22 | | | | | 22 | | | | |
| 23 | | | | | 23 | | | | | 23 | | | | |
| 24 | | | | | 24 | | | | | 24 | | | | |
| 25 | | | | | 25 | | | | | 25 | | | | |
| 26 | | | | | 26 | | | | | 26 | | | | |
| 27 | | | | | 27 | | | | | 27 | | | | |
| 28 | | | | | 28 | | | | | 28 | | | | |
| 29 | | | | | 29 | | | | | 29 | | | | |
| 30 | | | | | 30 | | | | | 30 | | | | |
| 31 | | | | | 31 | | | | | 31 | | | | |

## FORM ME-109

FORM ME109
ITEM # 533205

REV. 3-03

TIE TO LOCOMOTIVE
ISOLATION SWITCH

# NOTICE

## Inoperative Dynamic Brake

**Unit** _____

**Carrier** Norfolk Southern

**Location** _____

**Date** _____

**Tagged By** _____

**Signed** _____

Note: All Information Must Be Provided. This tag must be applied in accordance with 49 CFR 232.109(c) and locomotive may be used for up to 30 days with this condition.

# FORM ME-112

FORM ME-112 ( 6-03)
ITEM # 420-558525

## Operational Status of Dynamic Brakes

| Initial | Number | Status | | | | |
|---|---|---|---|---|---|---|
| | | OK | ☐ | Inoperative | ☐ | Cut-Out ☐ |
| | | OK | ☐ | Inoperative | ☐ | Cut-Out ☐ |
| | | OK | ☐ | Inoperative | ☐ | Cut-Out ☐ |
| | | OK | ☐ | Inoperative | ☐ | Cut-Out ☐ |
| | | OK | ☐ | Inoperative | ☐ | Cut-Out ☐ |
| | | OK | ☐ | Inoperative | ☐ | Cut-Out ☐ |
| | | OK | ☐ | Inoperative | ☐ | Cut-Out ☐ |
| | | OK | ☐ | Inoperative | ☐ | Cut-Out ☐ |

Date: _____ Number of units in consist: _____

Time: _____ Name: _____

Signature: _____

In accordance with 49 CFR 232.109(a), this form must be completed by the engineer going off duty and left on the lead locomotive in the consist. The completed form must indicate the status of the dynamic brake of each locomotive in the consist. All previously completed forms must be removed from the consist and discarded. Any locomotive checked "Inoperative" must also be tagged in accordance with CFR 232.109(c).

# ME114 – Consist Inspection

ME114 – valid until next calendar day inspection or consist change per L-203.

TRAIN SYMBOL _____ LOCATION _____ DATE ___/___/___
LOCO CONSIST _____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____

The following have been checked on this consist per applicable NS-1 rules:

- LOCOMOTIVE AIR BRAKE TESTS COMPLETE PER NS-1
- LOCOMOTIVES SET UP PROPERLY PER L-213
- LOADING PROPERLY BOTH DIRECTIONS
- DYNAMIC BRAKE – ME112 COMPLETED
- RADIO, SAND, BELL, HORN, HEADLIGHTS, ALERTER,TOILETS - GOOD
- HOTD TESTED
- LOCOMOTIVES PROPERLY EQUIPPED WITH TOOLS, SUPPLIES, ICE & WATER
- COMPLETE CAB SIGNAL DEPARTURE TEST (WHERE REQUIRED)
- CALENDAR DAY INSPECTIONS COMPLETE

NAME OF PERSON(S) REPORTING _____

**FORM ME-114**

## FORM ME-569 — SIDE 1

FORM ME 569
ITEM # 420-567309-0
REV. 4/04

ATTACH TO LOCO ISOLATION OR STARTING SWITCH ALSO TIE TO ALL FUEL CAP CABLES AT THE CAP IF FUEL TANK IS LEAKING (HOT JOURNAL REPORT ON BACK)

NS NORFOLK SOUTHERN

**WARNING**

**LOCOMOTIVE ISOLATION, SHUTDOWN OR DEFECT REPORT**
**(HOT JOURNAL REPORT ON BACK)**

UNIT _____ DATE _____
TRAIN _____ LOCATION _____
TAGGED BY _____
OCCUPATION _____
REASON ISOLATED OR SHUTDOWN
_____
_____

☐ FUEL TANK LEAKING DO NOT FUEL
☐ HOT ENGINE
☐ LUBE OIL DRAINED
☐ COOLING SYSTEM DRAINED
☐ GROUND RELAY
☐ OTHER _____

DIESEL ENGINE MUST NOT BE STARTED UNTIL PROPER REPAIRS ARE MADE

☐ HOT JOURNAL (ALSO MARK BACK)

(OVER)

## FORM ME-569 — SIDE 2

**HOT JOURNAL TAG**

DATE:_____ TRAIN NO._____ CAR/LOCOMOTIVE INIT./NO:_____

LOCATION OF HOT JOURNAL: R_____ L_____

HOW DETECTED? DETECTOR _____ CREW _____ OTHER _____

**ATTACH THIS TAG TO THE DEFECTIVE BEARING OR AS CLOSE AS POSSIBLE.**

**DEFECTIVE AIR BRAKE EQUIPMENT TAG**

INITIAL_____ NUMBER_____ INSPECTING RAILROAD: NS

LOCATION CAR FOUND DEFECTIVE:_____ DATE:_____

REPAIR DESTINATION:_____

DEFECT DESCRIPTION:_____

MOVEMENT RESTRICTION:_____ SPEED NOT TO EXCEED _____ MPH

NAME_____ OCCUPATION _____

SIGNATURE_____

A TAG MUST BE ATTACHED TO THE BLEED ROD ON BOTH SIDES OF THE DEFECTIVE CAR. THIS CARD MUST BE RETAINED 90 DAYS AFTER REMOVAL. (FRA 49 CFR 232.15 (b) (3))

# FORM ME-611

US Department of Transportation
Federal Railroad

ME-611(REV. 11/88)
(578934)
LOCOMOTIVE INSPECTION AND REPAIR RECORD

In accordance with the Locomotive Inspection Act, 36 State, 913, as amended and the regulations issued pursuant to that Act, the parts and appurtenances of the locomotive unit have been inspected and all defects disclosed by the inspection have been properly repaired.

Reporting year 19 | Check if new loco. ☐ | If loco. renumbered give previous no.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. OPERATED BY RR CODE | | | 2. OWNED BY (Railroad) RR CODE | | | |
| 3. MODEL NO. | 4. LOCO. NO. | 5. YR. BUILT | 6. PROPELLED BY D-E | 7. HORSEPOWER | 8. TYPE OF SERVICE: PASSENGER ☐ ROAD ☐ YARD ☐ OTHER ☐ | |
| 9. STEAM GEN. | GEN. #1. N/A Working Pressure | | | GEN. #2. N/A Working Pressure | | |
| 10. MAXIMUM PISTON TRAVEL inches | | TYPE OF AIR BRAKE | | 11. OUT OF USE CREDIT | | |
| 12. LAST PERIODIC INSPECTION DATE | | | | PLACE | | |

PERIODIC INSPECTIONS

| 13. DATE MO DAY YR | 14. PLACE | 15.* ITEMS | 16. PERSON CONDUCTING | 15.* ITEMS | 16. PERSON CONDUCTING | 17. CERTIFIED BY |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

15.* ITEM CODE: [1] BRAKES [2] RUNNING GEAR [3] CAB EQUIP. [4] MECH. EQUIP. [5] ELECT. EQUIP. [6] STEAM GEN. [7] SAFETY APPL.

| TESTS | 18. H & H TEST PRESSURE DRILLED | 19. WAIVER PART – 229 | 20. WAIVER – OTHER |
|---|---|---|---|

| TYPE | INTERVAL NOT MORE THAN | 21. PERSON CONDUCTING | 22. TEST DATE AND PLACE | 23. CERTIFIED BY | 24. PREVIOUS TEST DATE AND PLACE |
|---|---|---|---|---|---|
| METER | 368 calendar days | | | | |
| HAMMER AND HYDRO | 736 calendar days | | | | |
| AIRBRAKE 229.27 | 368 calendar days | | | | |
| AIRBRAKE 229.29 | NUMBER OF CALENDAR DAYS _____ | | | | |

Certification of true copy.
I certify that this is a true copy of the inspection and repair record of locomotive no. _____

_____ DATE
(Officer-in-charge)

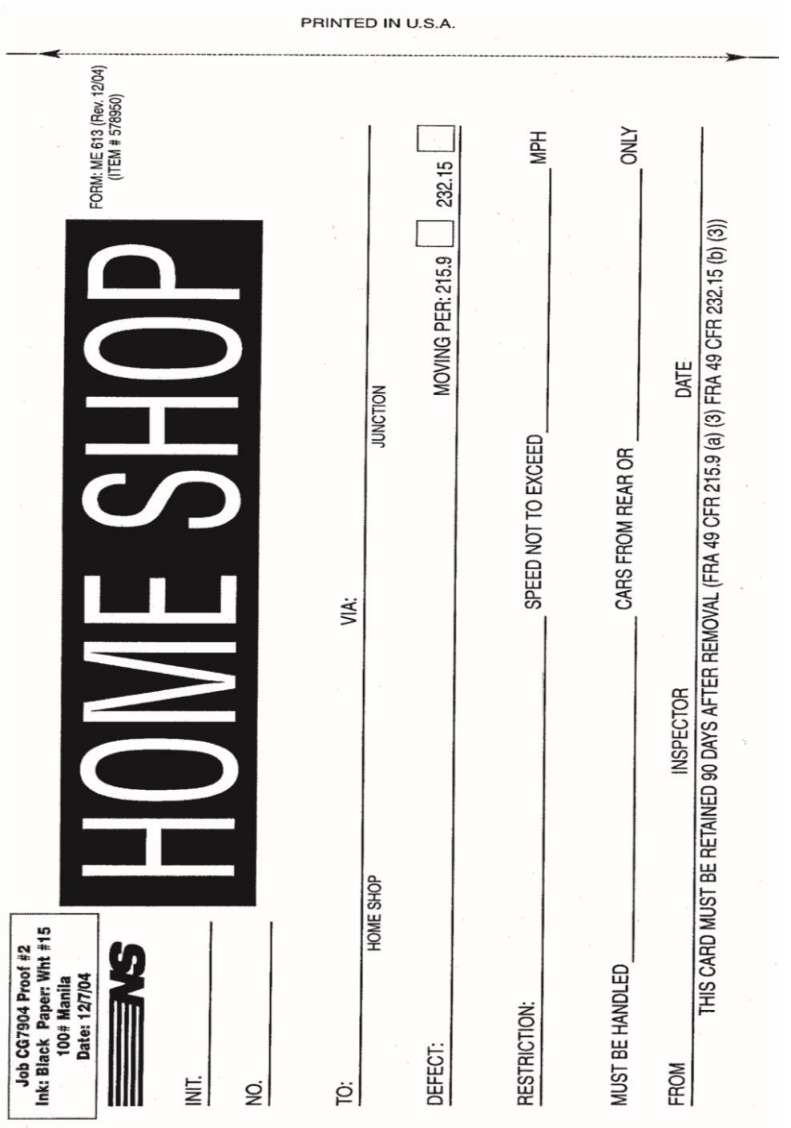
ATTENTION: *A false entry on this form is punishable by fine or imprisonment (U.S. Code, Title 18, Sec. 1001).*

FORM FRA F6180-49 A (3-85)

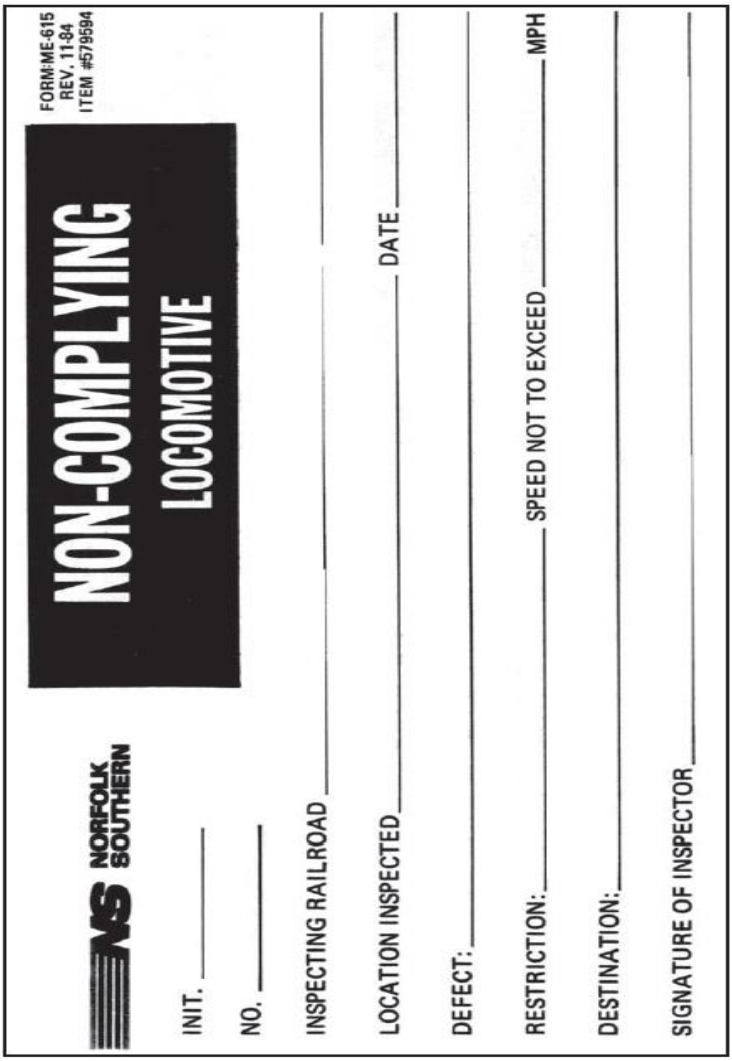
OMB Approval No. 2130-0004

GOVERNMENT PROPERTY DO NOT REMOVE

## FORM ME-613


PRINTED IN U.S.A.
Job CG7904 Proof #2
Ink: Black Paper: Wht #15
100# Manila
Date: 12/7/04
NS
HOME SHOP
FORM: ME 613 (Rev. 12/04)
(ITEM # 578950)
INIT.
NO.
TO:
HOME SHOP
VIA:
JUNCTION
DEFECT:
MOVING PER: 215.9
232.15
RESTRICTION:
SPEED NOT TO EXCEED
MPH
MUST BE HANDLED
CARS FROM REAR OR
ONLY
FROM
INSPECTOR
DATE
THIS CARD MUST BE RETAINED 90 DAYS AFTER REMOVAL (FRA 49 CFR 215.9 (a) (3) FRA 49 CFR 232.15 (b) (3))

## FORM ME-615



NORFOLK SOUTHERN

FORM:ME-615
REV. 11-84
ITEM #579594

# NON-COMPLYING
## LOCOMOTIVE

INIT. _____

NO. _____

INSPECTING RAILROAD _____

LOCATION INSPECTED _____ DATE _____

DEFECT: _____

RESTRICTION: _____ SPEED NOT TO EXCEED _____ MPH

DESTINATION: _____

SIGNATURE OF INSPECTOR _____

# FORM 12061

FORM 12061 (Rev. 2/11) (420-384959)

NORFOLK SOUTHERN

UNIT NUMBER TESTED

**Cab Signal Test** Delay Time _____

Signature _____

Location _____ Date _____ Time _____

**LSL Test** **Penalty Brake—Yes** ☐ **No** ☐

Signature _____ **Inspected Receiver Bars** ☐

Original to stay with Locomotive. Copy to be filed at test location.

## FORM 1043-BT — SIDE 1

NORFOLK SOUTHERN

FORM 1043-BT (Rev. 3/04)
Item # (164056)

REPORT OF SATISFACTORY CLASS 1 BRAKE TEST (A6) PERFORMED
REPORT OF SATISFACTORY EOTD TEST PERFORMED

**BRAKE TEST:**

TRAIN _____ NO. CARS _____ DATE _____ TIME _____

LOCATION _____ LEAKAGE _____ EOTD NO. _____

ABOVE TRAIN WAS INSPECTED AND FOUND TO BE IN COMPLIANCE WITH CFR 49 PART 232 (CLASS 1 BRAKE TESTS-INITIAL TERMINAL INSPECTION) OF THE DEPARTMENT OF TRANSPORTATION'S POWER BRAKE REQUIREMENTS.

NAME OF PERSON REPORTING _____

**EOTD TEST:** EOTD NO. _____ (If not same as noted above, show number)

DATE _____ TIME _____ LOCATION _____

ABOVE EOTD WAS TESTED AND FOUND TO BE IN COMPLIANCE WITH CFR 49 PART 232 (INSPECTION AND TESTING OF END-OF-TRAIN DEVICES) OF THE DEPARTMENT OF TRANSPORTATION'S POWER BRAKE REQUIREMENTS.

NAME OF PERSON REPORTING _____

# FORM 1043-BT — SIDE 2

FORM 1043-BT Reverse (Rev. 3/04)
Item # (164056)

## RECORD OF CLASS I BRAKE TEST(S) and INSPECTION(S) EN ROUTE

| | DATE | TIME | NO. OF CARS INSPECTED | HEAD CAR | REAR CAR | LOCATION | NAME |
|---|---|---|---|---|---|---|---|
| 1. | | | | | | | |
| 2. | | | | | | | |
| 3. | | | | | | | |

### CARS WITH CUT-OUT OR INOPERATIVE BRAKES

| | NUMBER | LOCATION OF CAR(S) | INITIAL (S) NUMBER(S) | NEXT REPAIR POINT |
|---|---|---|---|---|
| 1. | | | | |
| 2. | | | | |

### BRAKE SYSTEM and/or TWO-WAY END OF TRAIN DEVICE PROBLEMS/OTHER

### ROLL-BY INSPECTIONS

RESULTS _____ LOCATION _____ RESULTS _____ LOCATION _____

NORFOLK SOUTHERN

FORM 11239 (12/85)
(112394)

## CONDUCTOR'S REPORT OF MATERIAL APPLIED TO CARS IN TRANSIT

TO: Master Mechanic

_____
(Location)

TRAIN _____ DATE _____

| LOCATION (NEAREST STATION) | INITIAL | NUMBER | KIND OF CAR | LOCATION ON CAR | QTY | NEW OR S.H. | MATERIAL USED | CAUSE FOR REMOVAL |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

REMARKS _____

_____

DIVISION _____ CONDUCTOR _____

CONDUCTORS APPLYING MATERIAL TO CAR IN TRANSIT WILL FILL OUT THIS FORM AND TURN IT IN TO THE FOREMAN IN CHARGE OF CAR REPAIRS AT THE END OF THE TRIP. CREWS DESTINED TO OFF LINE POINTS SHOULD TURN FORM IN AT HOME POINT ON RETURN TRIP.

FORM 11239

# INDEX