NS-1

RULES FOR EQUIPMENT OPERATION AND HANDLING

EFFECTIVE APRIL 15, 2023

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NORFOLK SOUTHERN CORPORATION

Further instructions may be issued by proper authority.

PAUL DUNCAN
Executive Vice President and Chief Operating Officer

EFFECTIVE: APRIL 15, 2023

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-20. RUNNING BRAKE TEST – INCLEMENT WEATHER

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 or during inclement weather conditions which may cause snow or ice build up to occur between brake shoes and wheels, and trains are approaching heavy descending grades, meeting or waiting points, or have 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-23. EMERGENCY BRAKE APPLICATION

(a) 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.

(b) 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.

(c) 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, must be activated to initiate an emergency brake application from the rear.

(d) After experiencing a train line initiated emergency brake application, if the EOTD pressure has not reduced to zero, an emergency application of the EOTD must immediately be initiated.

(e) 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.

A-24. CONDUCTOR/BACK-UP VALVES & HOSES

At points where conductor valves, backup valves, or backup hoses are used, brakes must be tested by placing the train in emergency using the valve or hose.

Conductor valves, backup valves or backup hoses may be used only in an emergency to stop a train or cut of cars from the end opposite the locomotive by promptly moving the valve to a fully open position.

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

The brake on the rear car must be cut in and operative.

A brake must not be cut out unless necessary, and when cut out, the proper authority must be notified.

The brake must not be cut out on more than 2 consecutive cars. Multi-unit articulated 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 consecutive control valves must not be cut out. If 2

screens.

a. AESS reset must not be blocked or otherwise tampered with to cause continuous reset.

b. AESS operation or locomotive shutdown must not be prevented by use of any locomotive controls, features, or functions to include the reverser, throttle, or braking systems. When stopped, the throttle must be in idle, automatic brake applied, and independent brake fully applied.

c. Pusher locomotives must be isolated or shut down if temperature permits, at the first stop after determining power is not needed.

4. Locomotives in a DP remote consist will be left running and isolated and will not be shut down, when not required for tonnage.

(c) 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 32°F unless Mechanical Department employees are physically present to mount and take immediate control of the locomotives.

(d) Energy Management (EM) systems

Norfolk Southern operates two different energy management systems, **Wabtec Trip Optimizer and New**

York Air Brake Leader. These systems operate in two different modes:

- Stand Alone mode (applicable to Trip Optimizer only) - used on trains operating on non-PTC track, locations where we do not have end to end PTC-mapped track, and specific foreign line locomotives. There is not a stand-alone version of Leader.

- PTC Interface (integrated) - used on PTC active track, Leader EM is integrated with PTC, runs on the PTC CDU screen, and is reliant on PTC for operation.

Trip Optimizer runs on the locomotive smart display in two operating modes. The Stand Alone mode is completely independent of signal systems. The TO/PTC IM or PTC Interface mode (Integrated) receives all operating information from the PTC system and is reliant on PTC being initialized. Unlike Leader, all Trip Optimizer information and keys will be on the locomotive smart display.

1. Energy Management (EM) systems must be initialized by crew members on the lead locomotive (including foreign locomotives, if equipped) prior to departing the terminal or immediately upon taking charge of a train on line of road.

2. During EM initialization, crew members must verify that the train and locomotive consist are setup properly and the maximum train speed is set to reflect any equipment speed restrictions for the train.

3. Auto control mode must be used when operating conditions permit.

4. Report any EM initialization problems to the ATC Operations Center.

5. Crew members must verify the train consist is correct and update the EM system when the consist changes or if the consist is not accurately reflected. All train consist changes must be made in the MTR app. If operating EM in standalone mode, not

integrated with PTC, the trains consist must be changed in both the MTR app and in the standalone EM screen.

6. Crew members must verify the locomotive consist and operating status in both power and dynamic brake are correct. Locomotive Consist operating status changes such as lead locomotive orientation (FRONT or BACK), locomotive HPT status (RUN or ISOLATE), and Equipment Speed Restriction must be made in the PTC and/or stand-alone EM screen, if so equipped.

7. Crew members must not prevent EM auto control mode operation on Trip Optimizer locomotives by operating the train with the Power Mode screen open longer than necessary to make any changes required.

8. The EM system is operating as intended when the actual speed is within 5 mph of the planned speed, as indicated by the green or white line on the Trip Optimizer screen.

9. When necessary to disengage the EM system, match the current throttle position or DB notch and press the “disengage” or “manual” soft key.

10. Some EM equipped locomotives have technology that will automatically idle trail locomotives when they are not needed for tonnage or terrain. This can be seen in the consist window of the locomotive screen. When disengaging from EM, to ensure Smart Consist / Smart HPT has not left any locomotives idled and all locomotives are available for power and dynamic brake in manual operation, a crew member must:

a. Press “restore consist” soft key, or

b. Increase the throttle by at least one notch for at least 5 seconds, or

c. Place the throttle handle in idle.

11. In Energy Management systems, the conditional speed function and/or the action of setting maximum

train speed below track speed is intended to allow for continued operation in auto control mode when conditions exist that would otherwise require manual operation at a speed that is below EM planned speed. It must never be used to prevent auto control mode operation or to operate at speeds below maximum authorized speed unless specific conditions exist requiring its use to remain in auto control mode.

a. Do not set a conditional speed below 20 mph,

b. Conditional speeds must be removed or maximum speed set back to maximum authorized speed (based on territory, train type or equipment restriction) after conditions that warranted the change no longer exist.

12. While in auto control mode, manual control of the train must be resumed when:

a. EM directs manual control,

b. Operating conditions change which will require the train to operate at speed below the EM (TO) trip plan and the Conditional Speed setting cannot be used,

c. Operating on signals that require the train to approach the next signal prepared to stop, or

d. The EM System functions in a manner inconsistent with safe train handling practices. Instances of this nature must immediately be reported to the RFE desk.

13. Crew members must log out of the Energy Management system at the completion of their trip.

14. HPT locomotive instructions contained in the Wheel Report provide the EM status of each locomotive in the consist, concerning its Energy Management system type, health, and required action in accordance with rules and practices, as follows:

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) 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 railroad 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 by a copy of Form ME-615 “Non-Complying Locomotive” and must 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.

(c) A Form ME-615, 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

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. AC traction motors are considered 1.5x standard for both power and dynamic brake.

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 GRADIENT (psi)

The difference in brake pipe pressure between the controlling locomotive air supply and the rear car of the train when the brake system is fully charged under existing leakage and temperature conditions.

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.

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. High capacity dynamic braking axles count as 1.33 standard axles.

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 function in 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.

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

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 UNIT TRAIN

A train made up entirely of loads of coal, grain, ore, potash, molten sulfur, soda ash, phosphate rock, oil, taconite or other bulk commodities.

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.

PUSHER

One or more locomotives added to a train to assist movement.

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.