Union Pacific Rules

Air Brake and Train Handling Rules

Effective May 2, 2016
Includes Updates as of September 19, 2018
PB-20329

These rules become effective at 0900, Monday, May 2, 2016. At that time, all previous rules and instructions that are inconsistent with these rules become void.

30.0: Train Air Brake Tests/Inspections – Chapter 30

- 30.11.2: Brake Pipe Leakage Test

30.0: Train Air Brake Tests and Inspections

30.0 Train Air Brake Tests and Inspections

Rule Updated Date

February 12, 2013

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30.1: Compliance with FRA Regulations

30.1 *49 CFR 215.13* *232.1*	**Compliance with FRA Regulations** Inspect and test brake equipment in accordance with Federal Railroad Administration (FRA) regulations contained within these rules. This is the responsibility of the employee(s) who perform the work, unless otherwise instructed. The status of the inspection/test must be communicated to the relieving crew verbally or by written notification left on the controlling locomotive.

Rule Updated Date

January 20, 2012

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30.1.1: Qualified Inspectors

30.1.1 *49 CFR 232.203* Reference Glossary	**Qualified Inspectors** Inspections and air brake tests must be performed by either a "Qualified Person", "Qualified Mechanical Inspector" or a "Qualified Maintenance Person" as specified by Federal Regulations.

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January 20, 2012

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30.2: General Requirements

30.2 General Requirements

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30.2.1: Coupling and Securing Air Hoses

30.2.1 *49 CFR 232.107*	**Coupling and Securing Air Hoses** Before coupling air hoses between locomotives and/or cars, employees must: • Shake debris out of the hoses and • Blow all condensation from the locomotive brake pipe or yard air line.

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30.2.2: Operative Brakes

30.2.2
49 CFR 232.103
Reference SSI Item 2-F
	Operative Brakes
	These requirements apply to air brake tests and inspections:
	• All cars must have operative air brakes.
	Exceptions:
	  • Cars with defective air brakes may be moved for repairs when properly tagged on both sides by a Qualified Mechanical Inspector.
	  • Scale test cars are not required to be equipped with air brakes, but if equipped, the brakes must be operable.
	  • Brakes that fail en route.
	• At least 85% of the cars in a train must have operative brakes.

	• To determine the number of operative brakes in a train, refer to Item 2-F in System Special Instructions. • Cars with brakes that fail en route must be tagged on both sides and noted on train documentation. Leave information for the relieving crew, and notify the dispatcher or Mechanical Help Desk. Train documentation that reflects such cars may be transmitted by electronic means to relieving crews.

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30.2.3: Employee in Charge During Air Brake Test

30.2.3 *49 CFR 232.205*	**Employee in Charge During Air Brake Test** The employee performing the air brake test is in charge while the test is being conducted and must ensure that all other employees are safely positioned before beginning the test. The employee in control of the air brakes must not apply or release brakes without permission from the employee performing the air brake test.

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January 20, 2012

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30.2.4: Standard Brake Pipe Pressure

30.2.4 *49 CFR 232.103*	**Standard Brake Pipe Pressure** Regulating valve must be set at 90-psi. (Passenger and Freight Equipment) **Note:** When UP employees are operating foreign line passenger trains, they are governed by the foreign line's instructions.

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30.2.5: Charging Air Brake System

30.2.5 *49 CFR 232.103* Reference Rule 32.1.2 32.2.1	**Charging Air Brake System** When charging the system: • Do not charge a train's air brake system with more than one automatic brake valve cut-in unless utilizing distributed power locomotives. • If main reservoir pressure falls below 100-psi, engine RPM may be increased not to exceed throttle position 2. • If using a remote control locomotive, use the charge feature on the remote control transmitter. In yards where trains are made up, when unattended locomotives are used to charge the brake system, the automatic brake valve may be left in release position.

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May 2, 2016

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30.2.6: Air Brake Tests Using Gauge or End-of-Train Device

30.2.6 *49 CFR 232.205*	**Air Brake Tests Using Gauge or End-of-Train Device** When required to determine brake pipe pressure at rear of train, any of the following devices may be used: • An accurate gauge. • An EOT. • A distributed power locomotive. To determine that the brakes apply and release on the rear car, the requirement is considered fulfilled when either an EOT or power consist attached to the rear of the train indicates the following: • Brakes are applied when brake pipe pressure decreases by at least 5-psi. • Brakes are released when brake pipe pressure increases by at least 5-psi.

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30.2.6.1: Air Brake Tests Using Hand Held Gauges

30.2.6.1	**Air Brake Tests Using Hand Held Gauges** Handheld gauges used for air brake test purposes must be determined to be accurate within the last 92 days. A method of checking accuracy of the hand held gauge is outlined below: **1.** Utilizing a locomotive brake pipe gauge, have engineer release automatic brake valve and charge brake pipe to 90 psi. **2.** Attach handheld gauge to brake pipe of the controlling locomotive. **3.** Compare pressure indicated by the handheld gauge to locomotive brake pipe gauge. **4.** If pressure indicated by handheld gauge is within 3 psi of locomotive brake pipe gauge reading, the handheld gauge may be used to conduct air brake tests. **5.** The date of the most recent pressure comparison must be noted on a sticker applied to the gauge or on a document in the possession of the user. Note: Gauges that are not within 3 psi of the locomotive reading must not be used to conduct air brake tests and must be repaired or replaced.

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30.3: Initial Terminal Air Brake Test (Class I Air Brake Test)

30.3 Initial Terminal Air Brake Test (Class I Air Brake Test)

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30.3.1: Initial Terminal Air Brake Test (Class I) Requirements

30.3.1 *49 CFR 232.205* Reference Rule 1.33 30.3.5 30.10.1 30.11.1	**Initial Terminal Air Brake Test (Class I) Requirements** **A. Test Must be Conducted on Entire Train:** • Where the train is originally assembled. • When a unit or cycle train has traveled 3,000 miles since its last Initial Terminal Air Brake Test (Class I). • When adding more than one solid block. • When removing more than one solid block.

30.11.2
Glossary
	B. Test Must be Conducted on a Portion of the Train When:
	
	• A portion of the train has been off air for more than 4 hours.
	
	Note: On trains designated as Extended Haul, test must be performed by a Qualified Mechanical Inspector.
	
	C. Test Must be Conducted on Cars Added to the Train When:
	
	• Car(s) added are not a solid block.
	• A solid block of cars being added to the train is composed of cars from more than one previous train.
	• Cars added from a previous train have not remained continuously and consecutively coupled with the train line remaining connected unless:
	  • Removing defective equipment from the solid block.
	  • Separated into multiple solid blocks due to space or trackage constraints. Cars must be re-coupled in the same relative order as removed.
	
	D. Test Not Required When:
	
	• Adding or removing only one solid block.
	• Removing defective cars.
	• Repositioning cars to meet hazardous material or restricted car placement requirements.
	• Changing any locomotive consist(s).

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June 1, 2017

System Special Instructions

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30.3.2: Initial Terminal Air Brake Test (Class I) Procedure

30.3.2 *49 CFR 232.205* Reference Rule 30.10.1	**Initial Terminal Air Brake Test (Class I) Procedure** When performing an Initial Terminal Air Brake Test (Class I), comply with the procedures outlined in Rule 30.10.1.

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30.3.3: Initial Terminal Air Brake Test (Class I) Notification

30.3.3 *49 CFR 232.205* Reference Rule 5.10 30.10.1 32.9.4	**Initial Terminal Air Brake Test (Class I) Notification** The engineer and conductor must know they have the required written notification that an Initial Terminal Air Brake Test (Class I) was performed on their entire train. Notification will be left on the controlling unit and will include: • Name of inspector. • Date and time test was completed. • Location where test was performed. • Number of cars inspected. Written notification may be provided to the engineer and conductor by: • Air Brake Test Form at the initial terminal. • Electronic means in the space provided on the train documentation. or • Information may be communicated to the engineer or conductor that the test has been completed and entered on the Air Brake Test Form or on space provided on train documentation. If the test was performed by train crew members, the required information must be entered on an Air Brake Test Form, if available, or in space provided on the train documentation by the conductor or engineer. **Note:** When there is a conflict between train documentation and the Air Brake Test Form, the Air Brake Test Form will govern.

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30.3.4: Cycle Trains

30.3.4 *49 CFR 232.5 232.205 232.207*	**Cycle Trains** Cycle trains must meet the following conditions: • Must not be operated more than 3,000 miles before another Initial Terminal Air Brake Test (Class I) is required.

Reference Rule 30.3.5 Glossary	• 1,000 Mile Inspection (Class IA) must be performed each 1,000 miles. • A bulk commodity train designated as extended haul must be governed by Rule 30.3.5.

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30.3.5: Trains Designated as Extended Haul

30.3.5 *49 CFR 232.213* Reference Rule 30.1.1	**Trains Designated as Extended Haul** Trains designated as Extended Haul must be given an Initial Terminal Air Brake Test (Class I) performed by a Qualified Mechanical Inspector at the initial terminal. These trains must not: • Operate more than 1,500 miles before an additional air brake test is performed when designated as Extended Haul 1,500. • Operate more than 1,680 miles before an additional air brake test is performed when designated as Extended Haul 1,680. • Make more than one pick up and one set out between the initial terminal and the next designated inspection point, excluding set out of defective equipment. • Move any cars with defective equipment, regardless of whether tagged appropriately. Any cars or solid block of cars added en route must be given an Initial Terminal Air Brake Test (Class I) by a Qualified Mechanical Inspector (either at the time of pick up or pretested) at the location the cars are added.

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30.3.6: Attaching Locomotive to Cars Previously Class I Tested Using Yard Air or Other Locomotive

30.3.6 *49 CFR 232.205 232.217*	**Attaching Locomotive to Cars Previously Class I Tested Using Yard Air or Other Locomotive** After locomotive is attached, one of the following procedures must be used: • If cars have been off air 4 hours or less and yard air or locomotive pressure setting was 90 psi, then perform Application and Release Test (Class III).

Reference Rule 30.3 30.7 32.5.1 Glossary	• If train has been off air more than 4 hours, perform an Initial Terminal Air Brake Test (Class I) on the entire train. **Note:** When attaching locomotive to the opposite end of air source, an overcharged condition may occur. To correct condition, comply with Rule 32.5.1 prior to performing air test.

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30.4: 1,000 Mile Inspection Tests (Class IA Brake Test)

30.4 1,000 Mile Inspection Tests (Class IA Brake Test)

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30.4.1: 1,000 Mile Inspection Tests (Class IA Brake Test)

30.4.1 *49 CFR 232.207* Reference Rule 30.10.1	**1,000 Mile Inspection Tests (Class IA Brake Test)** At designated locations, comply with procedures outlined by Rule 30.10.1.

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30.5: Transfer Train Movement Air Test

30.5 Transfer Train Movement Air Test

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30.5.1: Transfer Train Movement Air Test

30.5.1 *49 CFR 232.215* Reference Rule 30.10.1 Glossary	**Transfer Train Movement Air Test** A train making transfer movements between a point of origin and a point of final destination that does not exceed 20 miles is considered a transfer train. Intermediate switching is permitted en route. Comply with the procedures outlined in Rule 30.10.1.

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June 1, 2018

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30.6: Test When Cutting Off and Recoupling

30.6 Test When Cutting Off and Recoupling

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30.6.1: Test When Cutting Off and Recoupling

30.6.1 *49 CFR 232.211* Reference Rule 30.2.6 30.3.1 30.5.1	**Test When Cutting Off and Recoupling** Before proceeding when a train is uncoupled and recoupled in 4 hours or less: • Restore brake pipe pressure as indicated by gauge or device at the rear end of the train. or

	• Verify that the brakes on rear car apply and release from a 20-psi brake pipe reduction. If more than 4 hours, conduct an Initial Terminal Air Brake Test (Class I) or a Transfer Train Movement Air Test - whichever applies to the type of test previously performed on those cars that did not remain charged. Note: On trains designated as Extended Haul, test must be performed by a Qualified Mechanical Inspector.

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30.7: Application and Release Test (Class III Brake Test)

30.7 Application and Release Test (Class III Brake Test)

Rule Updated Date

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30.7.1: Application and Release Test (Class III Brake Test) Requirements

30.7.1 *49 CFR 232.211* Reference Rule 30.3 30.3.6 30.10.1 33.6	**Application and Release Test (Class III Brake Test) Requirements** Test must be conducted when: • Any change is made to a locomotive consist. • A caboose is changed. • Picking up a block of previously tested cars that have not been off air for more than 4 hours. • Helper locomotives are added anywhere in the train or removed from other than the rear end of the train. • One or more consecutive cars are set out of the train. • Defective equipment is set out of train. or • Rearranging previously tested cars in train for hazardous materials, train make-up, or helper placement. Comply with the procedures outlined in Rule 30.10.1

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30.8: Inbound Mechanical Inspection

30.8 Inbound Mechanical Inspection

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30.8.1: Inbound Mechanical Inspection

30.8.1 Reference Rule 32.1.3	**Inbound Mechanical Inspection** At terminals where the Mechanical Department will make immediate air brake inspections and repairs, secure equipment and then perform the following before locomotives are detached. 1. Place the automatic brake valve handle in the HANDLE OFF position, and make a 70 pound brake pipe reduction. 2. Place the handle in the SUPPRESSION position to stop the brake pipe reduction. 3. When the brake pipe reduction is complete and the air has stopped exhausting, close the angle cock on the locomotive or on the cars that will be detached with the locomotive. 4. Leave angle cock open on the portion left standing.

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30.9: Train Information

30.9 Train Information

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30.9.1: Train Information

30.9.1 *49 CFR 232.211*	**Train Information** A train crew taking charge of a train will be provided a train consist containing the following information: • Weight and length of the train. • Weight distribution of train, if necessary, for proper train handling. • Information related to car or locomotive defects. • If train air brake test, i.e., Class I or Class IA, is required prior to next crew change point. If a consist is not available or if the consist does not include all of the required information, it may be provided by other means. A written record of the information shall be maintained in the cab of the controlling locomotive.

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30.10: Air Brake Test and Inspection Charts/49 CFR 232

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30.10.1: Air Brake Test Requirements

Freight Air Brake Tests											
Type of Test	**Perform safety inspection on both sides per Rule 1.33**	**Charge system to at least 75-psi at rear of train as indicated by gauge**	**Leakage test as required per rule 30.11.2**	**20-psi brake pipe reduction**	**Brake application and inspection per rule 30.11.1**			**Release brakes and check release[1]**			**Brake pipe pressure being restored as indicated by gauge**	**Brake test notification required**
					All cars	**Car(s) picked up**	**Rear car[5]**	**All cars**	**Cars(s) picked up**	**Rear car[5]**		

		or device.									**or device at rear of train**	
30.3.1 Class I	**X**	**X**	**X**	**X**	**X**			**X**			**X**	**X**
30.3.5 Extended Haul[2]	**X**	**X**	**X**	**X**	**X**			**X**			**X**	**X**
30.3.1/30.3.5[2] Car added en route	**X**	**X**	**X**	**X**		**X**	**X**		**X**	**X**	**X**	
30.4.1 Class IA		**X**	**X**	**X**	**X**						**X**	
30.5.1 Transfer Train[3]	**X**	**X**		**X**	**X**						**X[3]**	
30.6.1 Recoupling											**X**	
30.7.1 Class III		**X**	**X[4]**	**X**			**X**			**X**	**X**	

[1]Rolling release inspection may be made not exceeding 10 MPH.
[2]Cars must be inspected by a Qualified Mechanical Inspector.
[3]Cars added en route must be tested as required by Rule 30.5.1. When cars are set out en route - determine that brake pipe pressure at the rear car has been restored.
[4]Required when cars were previously tested from a Yard Test Plant.
[5]Class III rear car brake requirements are considered fulfilled when brake pipe pressure is decreased by 5 psi and increased by 5 psi per Rule 30.2.6.

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30.11: Air Brake Tests and Inspection Procedures

30.11 Air Brake Tests and Inspection Procedures

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January 20, 2012

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30.11.1: Brake Inspection Requirements

30.11.1
49 CFR 232.205
Reference Rule 1.33
	Brake Inspection Requirements
	Inspect both sides of cars while performing the air brake test to determine that:
	• Angle cocks are properly positioned.
	• Air hoses are in condition for service and properly coupled.
	• Air brake system leakage is minimal; if necessary, make repairs to reduce leakage.
	• Retaining valves are in exhaust (EX) position.
	• Piston travel meets the following requirements:
	  • Comply with requirements as outlined by stenciling or badge plate.
	  • Truck-mounted brake piston travel must be within the limits of the travel indicator when brakes are applied and provide brake shoe clearance when brakes are released.
	  or
	  • Body-mounted brake requirements:
	  • Class I air test between 6 and 9 inches when brakes are applied.
	  • Class IA and Transfer Train Test, piston travel must be between 6 and 10 1/2 inches when brakes are applied. When piston travel exceeds 10 1/2 inches it is no longer considered an operative brake.
	• Brakes are applied and remain applied until signal is given to release the brakes. If any car's brakes release prior to signal being given to release the brakes, then that car may be retested once. On retest, the brakes must remain applied for at least 3 minutes.
	• Brake rigging does not bind or foul.
	• All parts of the brake equipment are properly secured.

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30.11.2: Brake Pipe Leakage Test

30.11.2	

49 CFR 232.205 Reference Rule 30.10.1 32.9.2 Glossary: AFM	**Brake Pipe Leakage Test** When a leakage test is required per Rule 30.10.1, use one of the following methods: **A. Air Flow Method (AFM)** To qualify a non-DP train's air brake system, use AFM as follows: • The controlling locomotive must be equipped with an AFM indicator with a direct reading of air flow in increments no greater than 10 cubic feet per minute (CFM). • After charging the brake system to at least 75-psi, as indicated by gauge or device at rear of train, air flow must not exceed 60 CFM. If air flow exceeds 60 CFM, then the train must be inspected for leakage. Once the leakage is corrected, the train must be re-tested. **B. Brake Pipe Leakage Method** If unable to use AFM, conduct a brake pipe leakage test as follows: 1. Charge the brake system to at least 75-psi as indicated by gauge or device at rear of train. 2. After the signal is received, reduce brake pipe pressure by 20-psi. 3. After the brake pipe exhaust stops, wait 1 minute. 4. Cut-out the automatic brake valve, and then wait an additional minute for brake pipe pressure to equalize. 5. Time the brake pipe leakage for 1 minute. If the leakage does not exceed 5-psi, then the test is complete. If the leakage exceeds 5-psi, then the train must be inspected; the leakage must be corrected, and the train must be re-tested. 6. After receiving the proper signal, release the brakes. **C. Distributed Power Trains** The Distributed Power system's automated brake pipe leakage function must be used when checking leakage on DP trains.

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31.0: Locomotive Consist Requirements – Chapter 31

- 31.8.4.2: Remote Control Light Engine Running Air Brake Test
- 31.8.4.3: Electronic Alertness Control Device (Alerter) Test
- 31.8.5: Starting Procedure
- 31.8.6: Weak Batteries
- 31.8.7: Locomotive Fuel Conservation and TPA Compliance
- 31.8.7.1: Shutdown Procedure
- 31.8.7.2: Prevent Engine Cooling System from Freezing

31.0: Locomotive Consist Requirements

31.0 Locomotive Consist Requirements

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31.1: Taking Charge of Locomotive Consist

31.1 *49 CFR* *218.55* *218.57* *229.23* *229.140* *232.105* Reference Rule 1.23.1 31.8 35.3.1	**Taking Charge of Locomotive Consist** Engineers are responsible for the following: • Checking that the locomotive daily inspection card is current on the controlling locomotive. • Verify that "Blue Card" is displayed under a transparent cover in the cab of each locomotive. Union Pacific locomotives have an entry at the bottom of the blue card which reads "Do Not Use After mm/dd/yy". Verify that the locomotive has not passed this date. • When locomotive inspection forces are not immediately available, an engineer taking charge of a locomotive must know that the brakes are in operating condition.

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31.1.1: Locomotive Safety Devices

31.1.1	**Locomotive Safety Devices** • Inspect that locomotive safety devices and systems are cut-in and sealed on lead controlling locomotive for the route to be used except: o When a safety device becomes defective en route. or o During drag loading/unloading operations under 5 MPH. If a safety device becomes defective en route, inform the train dispatcher and Mechanical Department as soon as possible. A safety device may only be cut-out or disabled when authorized by rule or when proper authorization is received. When a locomotive is en route, this authorization may come from the train dispatcher, mechanical supervisor, or other manager. **Do not tamper with safety devices.**

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31.1.2: Electronic Alertness Control Device

31.1.2 *49 CFR 229.140* Reference Rule 31.8.4.3	**Electronic Alertness Control Device** Before departure from a train's initial terminal or when the controlling locomotive has been changed en route, the controlling locomotive of the lead consist must be equipped with an Electronic Alertness Control Device (alerter) and tested per Rule 31.8.4.3. If a penalty brake application does not occur, the locomotive must not be used as a controlling locomotive. Note: Does not apply to Commuter Trains and Yard Switching Operations.

Rule Updated Date

June 1, 2017

System Special Instructions

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31.2: Locomotive Inspections

31.2 Locomotive Inspections

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31.2.1: Inspection Requirements

31.2.1	**Inspection Requirements** The engineer is responsible for ensuring that each locomotive in his charge, including locomotive(s) picked up en route, is inspected each day the locomotive is in service. Determine if the locomotive needs to be inspected by checking the locomotive daily inspection card in each locomotive cab. The card will indicate the date and time of the last daily inspection. **Exception:** On a multiple-locomotive consist, the engineer may assume that all trailing locomotives in the consist and any distributed power locomotives in the train were inspected on the same date as the locomotive daily inspection card on the controlling locomotive. **A. Inspected Previous Calendar Day** If the locomotive daily inspection card indicates that the locomotive was inspected the previous calendar day, complete the current daily inspection before the end of the tour of duty. The engineer may be relieved from requirements to perform a daily inspection when instructions provide for mechanical forces to make the inspection.

	Ensure that the Electronic Locomotive Inspection Report is completed. Inspection should be performed during daylight hours when possible. **B. Not Inspected Previous Calendar Day** If the locomotive daily inspection card indicates that the locomotive was not inspected during the previous day, or if there is no record on the locomotive, inspect the locomotive before it is placed into service on the current day. **C. Locomotive Picked Up En Route** When picking up a locomotive on line, the engineer must determine which locomotives will require a daily inspection. No locomotive in resulting consist may have a date older than the lead controlling locomotive. **D. Locomotive Set Out on Line** When setting out a locomotive on line that last inspected on the previous calendar day, inspect the locomotive, unless notified that the locomotive will be inspected by the Mechanical Department.

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31.2.2: Complete Required Daily Inspection Forms

31.2.2 *49 CFR 229.21*	**Complete Required Daily Inspection Forms** **Locomotive Inspection Report** Complete an Electronic Locomotive Inspection Report for each locomotive inspected. **Locomotive Daily Inspection Card** The locomotive daily inspection card must include the following information: • Date. • Location. • Time. • Complying or non-complying (check appropriate box). • Union Pacific employee number of the inspector. Legible signatures may be used by other than Union Pacific employees. The locomotive daily inspection card must remain in the holder in the locomotive cab.

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31.2.3: Event Recorder/Track Image Recorder/Cab Image Camera

31.2.3	**Event Recorder/Track Image Recorder/Cab Image Camera** Only authorized personnel may remove the recorder data pack or download recorder data.

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31.2.4: Speed Indicator

31.2.4 *49 CFR 229.117* Reference Rule 31.8.1	**Speed Indicator** **A. Speed Indicator Test** The engineer must test the speed indicator of the controlling locomotive using identified test miles or mile posts as soon as possible after departure. **B. Operative Speed Indicator** A locomotive used as a controlling unit at speeds above 20 MPH must be equipped with an operative speed indicator. Speed indicator requirements: Locomotive speed indicators must be accurate within: ○ ±3 MPH at speeds between 10 and 30 MPH. ○ ±5 MPH at speeds above 30 MPH. **Note:** A speed indicator that exceeds either of the above tolerances must be handled as a non-complying condition found en route. **C. Speed Indicator Fails En Route** If a speed indicator on a controlling locomotive fails en route, the locomotive may continue as a controlling locomotive at normal track speed only to the next facility where repairs can be made or until the

	locomotive is due a daily inspection, whichever occurs first. Movement beyond a facility where repairs can be made or location where daily inspection was conducted must not exceed 20 MPH.

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31.2.5: Locomotive with Non-complying Condition Safe to Move

31.2.5
 	
CFR
229.9
 	
Reference Rule
31.8
	Locomotive with Non-complying Condition Safe to Move
	
	A. During the locomotive daily inspection, if a non-complying condition is discovered, it may be moved only:
	
	• As a single locomotive under power not attached to cars.
	• In a locomotive consist not attached to cars.
	• If isolated or shut down when attached to cars.
	
	Exceptions:
	
	• A controlling locomotive found with defective speed indicator during daily inspection may be operated under power attached to cars not exceeding 20 MPH.
	• Locomotives found with any of the following defects during the daily inspection may be operated under power attached to cars as a trailing locomotive:
	  • Both headlights are inoperative.
	  • Both ditch lights are inoperative.
	  • Inoperative horn or bell.
	  • Defective speed indicator.
	  • Window cracks that obscure view.
	  • Cab seats not properly secured.
	  • Inoperative automatic or independent brake controls.
	  • Inoperative electronic alertness control device.
	
	Prior to moving a non-complying locomotive, perform the following:
	
	1. Complete a non-complying locomotive tag, and attach it to the isolation switch of the non-complying locomotive. The tag must include the following information:
	  • "Non-complying locomotive" written on the tag.
	  • Locomotive initials and number.
	  • Name of the inspecting railroad.

	• Inspection location and date. • Nature of the defect. • Movement restrictions, if any. • Destination. • Signature of the employee making the inspection. 2. Secure a copy of the non-complying tag on the control stand of the controlling locomotive. 3. Make sure the engineer in charge of the locomotive movement receives written notification of the non-complying locomotive (A copy of a non-complying locomotive tag meets this requirement.). The engineer must inform all other crew members of the non-complying unit and of any restrictions. 4. Notify the train dispatcher/Mechanical Help Desk, yardmaster, or other proper authority. However, a locomotive may be moved as a single or dead unit within a yard solely for repairs, not to exceed 10 MPH, without complying with Items 1, 2, and 3 listed above. **B. Non-complying Condition Found En Route** A locomotive that develops a non-complying condition en route may continue operating if the engineer or other qualified employee determines the locomotive is safe to move. The locomotive may be operated at normal speed until the next daily inspection or until it reaches the nearest point where repairs can be made, whichever occurs first. The engineer must: • Apply a non-complying tag to the isolation switch on the non-complying locomotive and the controlling locomotive. • Report non-complying conditions to the train dispatcher/Mechanical Help Desk as soon as possible. • Notify the relieving engineer of any non-complying conditions when possible. • Report any non-complying conditions on the Electronic Locomotive Inspection Report.

Rule Updated Date

May 2, 2016

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31.2.6: Defects Other than Non-complying Conditions

31.2.6	Defects Other than Non-complying Conditions

	Report all defects through the Electronic Locomotive Inspection Report for each locomotive in the consist. A locomotive that is not loading properly must be reported to the Dispatcher/Mechanical Help Desk. Examples of a defect or problem that is not a non-complying condition include: • Weather stripping is defective. • Windshield wipers are not working. • One headlight bulb is burned out. • Ground relay is tripped. • Safety valve on the air compressor or main reservoir is popping off.

Rule Updated Date

January 20, 2012

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31.2.7: Major Internal Defects

31.2.7	**Major Internal Defects** If a locomotive has a major internal defect, shut down the engine and do not restart until inspected by mechanical forces. Report condition to Dispatcher/Mechanical Help Desk, and fill out a "Non-Complying Locomotive" tag. Attach the tag near the engine starting control. If instructed to set out locomotive, leave the locomotive where mechanical personnel can access it, when possible.

Rule Updated Date

January 20, 2012

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31.3: Locomotive Air Brake Tests

31.3 Locomotive Air Brake Tests

Rule Updated Date

January 20, 2012

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31.3.1: Locomotive Air Brake Test Requirements

31.3.1 *CFR* *229.13* Reference Rule 31.8.2 31.8.4 31.8.4.1	**Locomotive Air Brake Test Requirements** Conduct a locomotive air brake test when: • Making up a locomotive consist. • Adding locomotive to a consist. • Other than rear locomotive is removed from consist. • Locomotive consist is rearranged. or • Changing operating ends of a consist.

Rule Updated Date

May 2, 2016

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31.4: Standard Air Pressure

31.4 Standard Air Pressure

Rule Updated Date

January 20, 2012

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31.4.1: Standard Locomotive Air Pressures

31.4.1	**Standard Locomotive Air Pressures** Before initiating movement, ensure that air pressures are as follows: • Main reservoir pressure is 120 to 140-psi. • Locomotive brake cylinder pressure must be adjusted to pressure indicated on badge plate. **Note:** Foreign line locomotives may require different main reservoir and brake cylinder pressures.

Rule Updated Date

January 20, 2012

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31.5: Dynamic Brake/Locomotive Warnings

31.5 Dynamic Brake/Locomotive Warnings

Rule Updated Date

January 20, 2012

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31.5.1: Dynamic Brakes

31.5.1
 	
49 CFR 232.109
 	
Reference Rule 31.8.1
	Dynamic Brakes
	
	A. Controlling Dynamic Brake
	On train movements equipped with operative dynamic brakes, the lead controlling locomotive must have:
	
	• An operative dynamic brake.
	or
	• The ability to control the operative dynamic brakes of trailing locomotives in a consist and an operative accelerometer that displays current change in speed or predicted change in speed in miles per hour per minute.
	
	Note: The above requirement would not apply to low-speed yard, local, and transfer movements on level or light grade.
	
	B. Controlling Dynamic Brake – En Route Failure
	May continue operating as the lead locomotive if:
	
	• The engineer or other qualified employee determines the train is safe to move.
	• The train may then be operated at normal speed until:
	  • The train reaches the nearest repair point.
	  or
	  • The lead locomotive can be replaced.
	
	C. Locomotives with Inoperative Dynamic Brakes
	Inoperative dynamic brake:

	• Must be individually tagged, and an additional defect tag must be left on the controlling locomotive as information to the locomotive engineer. • Information may be shown on train consist. Tag indicating inoperative dynamic brakes should include the following information: • Locomotive number. • Name of discovering railroad. • Location and date condition discovered. • Signature of person discovering the condition. Dynamic brakes cut-out to comply with dynamic brake axle limitations are not considered inoperative brakes.

Rule Updated Date

May 2, 2016

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31.5.2: Dynamic Brake Warning Light

31.5.2 *49 CFR 229.115*	**Dynamic Brake Warning Light** If the Dynamic Brake Warning Light illuminates, reduce the dynamic brake until the light goes out. If condition continues, cut-out the dynamic brake on defective unit.

Rule Updated Date

January 20, 2012

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31.5.3: Wheel Slip Warning Light

31.5.3 *49 CFR 229.115*	**Wheel Slip Warning Light** If the wheel slip light is illuminated, reduce power or dynamic brake until the light goes out. If light does not go out: • Ensure that wheels are rotating freely. • If wheels rotate freely and wheel slip light remains on during throttle reduction, isolate affected locomotive. • If the wheels do not rotate freely, notify the dispatcher and set out the locomotive.

	WARNING: A wheel slip light continuously illuminated for 6–8 seconds or longer at speeds above 15 MPH may indicate a locked wheel or a slipped pinion gear. Should this occur, stop and determine that all wheels rotate freely.

Rule Updated Date

January 20, 2012

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31.6: Moving Locomotives

31.6 Moving Locomotives

Rule Updated Date

January 20, 2012

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31.6.1: Moving Light Locomotive Consists

31.6.1 Reference Rule SSI Item 2-A	**Moving Light Locomotive Consists** Operate a light locomotive consist from the cab nearest the direction of travel when any one of the following conditions exists: • Distance to be traveled exceeds 2 miles. • A member of the same crew does not control movement using hand signals or radio. or • Visibility is impaired. **Exceptions:** This may not be required when it is necessary to maintain a DP link when moving a locomotive to train or when other operating conditions prevent occupying the cab nearest the direction of travel.

Rule Updated Date

May 2, 2016

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31.6.2: Locomotive Consist Limits

31.6.2 Reference Rule 31.8.3	**Locomotive Consist Limits** Freight trains are limited to ten locomotives on the lead consist that are: • Working. • Isolated. • Dead-in-consist. or • Dead-in-train immediately behind the locomotive consist. Limit power transfers to a maximum of 25 locomotives.

Rule Updated Date

December 29, 2017

System Special Instructions

Effective Date: June 1, 2018

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31.6.3: Hostling Locomotives

31.6.3	**Hostling Locomotives** Do not move or switch more than eight coupled locomotives within locomotive servicing facilities unless authorized by mechanical department. This includes movements between service tracks and train yards. Multiple locomotive consists may be moved within a terminal area with only the brake pipe connected, provided the speed does not exceed 10 MPH. Perform the following inspection and test before the initial movement of locomotives coupled together and whenever locomotives are added or the controlling locomotive is changed: 1. Brake pipe is connected and angle cocks are open between each locomotive. 2. Automatic brake valve must be cut-out on all locomotives coupled together except the controlling locomotive. 3. Independent brake valve must be cut-in on the lead unit on each consist and handle in release.

	4. Allow brake pipe to charge. 5. Perform a standing brake test as follows: a. Make a 10-psi service brake application. b. Ensure that sufficient locomotive brakes apply for safe movement. **Note:** Brakes may not apply on locomotives that are shut down unless the dead engine feature is cut-in. c. Release the automatic brake application. d. Ensure brakes release on each locomotive. 6. Release all hand brakes.

Rule Updated Date

May 2, 2016

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31.6.4: Moving Locomotives within Mechanical Department Limits

31.6.4	**Moving Locomotives within Mechanical Department Limits** When moving locomotives within Mechanical Department limits: 1. Charge and properly position brake equipment before moving the controlling locomotive. 2. On controlling locomotive, apply and release locomotive brakes to verify that brake cylinder pistons are operating and brake cylinder lines to trucks are not cut-out. Braking requirements: When moving six or more locomotives, a minimum of two locomotives must have operative independent brakes. No more than eight locomotives can be moved at one time. Local policy can be more restrictive.

Rule Updated Date

September 30, 2016

System Special Instructions

Effective Date: June 1, 2017

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31.6.5: Turntable

31.6.5	**Turntable**

	Do not move on or off a turntable unless correctly lined and locked.

Rule Updated Date

January 20, 2012

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31.7: Locomotive Placement

31.7 Locomotive Placement

Rule Updated Date

January 20, 2012

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31.7.1: Locomotive Alignment Control

31.7.1	**Locomotive Alignment Control**

<table>
<tr><th colspan="3">LOCOMOTIVE PLACEMENT TABLE</th></tr>
<tr><th></th><th>Locomotives Equipped
for MU</th><th>Locomotives Not Equipped for MU.</th></tr>
<tr><td>UPRR and Foreign Line/Waybilled Locomotives with Alignment Control</td><td>When running, they may be placed anywhere in consist. If shutdown or isolated, place behind lead consist and MU.</td><td>Couple directly behind lead consist and set-up by Mechanical Department (Dead Engine Feature).</td></tr>
<tr><td rowspan="3">UPRR Locomotive without Alignment Control</td><td>When consist has locomotives with alignment control, they must be placed second in consist, one per train when handling cars.</td><td rowspan="3">Shut down and place between the tenth and fifth cars from rear of train. If two locomotives are handled in one train, they must be separated by one car. No more than two may be entrained.

Entrained locomotives must be set-up by Mechanical Department (Dead Engine Feature).</td></tr>
<tr><td>When consist has no locomotives with alignment control, up to three non-alignment control locomotives may be placed on head end when handling cars.</td></tr>
<tr><td>On light locomotive consist, up to five locomotives may be handled on rear of consist.</td></tr>
<tr><td>Foreign Line/Waybilled Locomotives without Alignment Control</td><td colspan="2">Special Train Move only (light locomotive consist).</td></tr>
</table>

Rule Updated Date

April 30, 2016

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31.8: Locomotive Inspections and Procedures

31.8 Locomotive Inspections and Procedures

Rule Updated Date

January 20, 2012

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31.8.1: Conducting a Locomotive Daily Inspection

31.8.1 *49 CFR* *229.21* *229.53* *232.105* *236.553*	**Conducting a Locomotive Daily Inspection** Inspect these three general areas of each locomotive: • Control Compartment/Locomotive Cab. • Walkways and Engine Compartments. • Ground Level. **Note:** B-units and other units designated or modified not to be occupied are not required to have or be equipped with all the devices included in the inspection. Remote control locomotives (RCL) must be in manual mode when conducting inspection. The following items are non-complying conditions if they do not function properly during the daily inspection. (Not all defects are non-complying conditions.) **A. Control Compartment/Locomotive Cab** Operate sanders to deposit sand in front of each locomotive's lead wheels using the reverser position to determine the direction. On each locomotive ensure that: • Each air gauge registers within 3-psi of the required pressure.

- Locomotive cab is free of stumbling or slipping hazards.
- No traction motors have been cut-out. However, on GE AC, GE-8 DC, GE-9 DC, and EMD AC locomotives, one or more traction motors/trucks may be cut-out and not considered a non-complying condition.
- Cab seats are properly secured.
- Dynamic brakes are operative on equipped locomotives. A locomotive will be considered as having a non-complying condition if the dynamic brake has been defective for 30 continuous days.

On lead locomotive ensure that:

- At least one headlight bulb is operational on each end of the locomotive consist.
- At the initial terminal, both ditch lights are operational. At least one ditch light must be operational at other than initial terminal.
- Horn and bell operate.
- Gauge lights and engineer's overhead cab light illuminate. If burned out and other available lighting is sufficient to allow visibility from the crew's normal position, report as a defect but not a non-complying condition.
- Speed indicator functions accurately. After a daily inspection, if the speed indicator failure is identified on the lead locomotive as soon as it begins moving, the failure is a non-complying condition discovered during the daily inspection.
- Windows provide a clear view. Small cracks that do not obscure view must be reported as defects but not non-complying conditions.
- The locomotive toilet facility is sanitary and operational.
- Only a telemetry head end unit (HEU) calibrated within the last 368 days may be used.

  Exception: Calibration is not required when an affixed sticker states the unit is:
  - Equipped with a Wabtec synthesized or Ritron FRA-compliant radio.
    or
  - Exempt form FRA mandatory periodic testing requirements.

B. Walkway and Engine Compartment
Inspect both sides of each locomotive to ensure that:

- Walkways and walk-in compartments (car body-type locomotives) are clear of debris, tools, and accumulated oil or grease that present a hazard to the crew.
- Handrails, hand holds, steps, ladders, safety chains, and guards are secured and ready for service. Inspect for broken, bent, damaged, or loose equipment. Make sure safety chains are connected high enough for safe passage. The chain droop must not exceed 8 inches from the grab iron connection to top of chain.
- All electrical and rotating equipment guards are in place.
- The diesel engine has no apparent exhaust, oil, water, or fuel leaks.
- The hand brake is operational.
- Walkway and engine compartment lights are working. If burned out and other available lighting is sufficient to allow visibility, report as a defect but not a non-complying condition.

	C. Ground Level
	Inspect the exposed areas for apparent defects, but do not crawl under or between locomotives to make the visual inspection. Set hand brakes, if necessary, and walk around both sides of the locomotive to ensure that:
	
	• Sand is deposited on the rail in front of the lead wheels of each locomotive in the consist.
	
	Exceptions:
	  • In road service as lead locomotive, if sanders are found to be defective en route, the locomotive may continue in service until it is placed in a repair facility but under no conditions for more than 14 calendar days.
	  • In road service as a trailing locomotive, if sanders are found to be defective en route, the locomotive may continue in service until it is placed in a repair facility.
	  • In switching service, if sanders are found to be defective at a location where repair facilities are not available, the locomotive may remain in service for no more than 7 calendar days.
	• Fuel tank is not leaking.
	• No defects such as cracks and broken or missing parts are on the following:
	  • Locomotive trucks.
	  • Wheels.
	  • Gear cases.
	  • Draft gears.
	• Brake cylinder piston travel is sufficient to provide brake shoe clearance when the brakes are released.
	• Maximum brake cylinder piston travel is 1 1/2 inches less than the travel entered on FRA Form F 6180-49A (blue card) in the locomotive cab.
	• Brake shoes are secured and approximately in line with the tread of the wheel with no obvious lips or overhangs.
	• Foundation brake rigging is secured, and all components other than wheels and sand hoses are at least 2 1/2 inches above the top of the rail.
	• Snowplow, pilot, or endplate is properly secured and is between 3 inches and 6 inches above the top of the rail.
	• No part of the electrical cable is lying on the coupler.
	• Unused electrical cables are stowed, or the disconnected ends are placed into a dummy receptacle or a multiple-unit cable holder.
	• There is no apparent physical damage to the ATC/ACS receiver bars on locomotives equipped with ATC/ACS.
	  • These bars are located above the rail and in front of the wheels. This requirement applies only to lead locomotives on trains operating in ATC/ACS territory. Any apparent damage must be reported, but it does not constitute a non-complying defect.

Rule Updated Date

March 24, 2017

System Special Instructions

Effective Date: June 1, 2017

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31.8.2: Changing Operating Ends Procedure

31.8.2 Reference Rule 31.8.4.1	**Changing Operating Ends Procedure** Change operating ends on a locomotive consist by cutting out the operating controls on the controlling end and proceeding immediately to the opposite end of the locomotive consist and restore controls. **A. Cut-Out Operating Controls as follows:** 1. Fully apply the independent brake. 2. Make a 20-psi brake pipe reduction. 3. Remove the reverser. 4. Apply sufficient hand brakes to hold locomotive consist. Cut-out the independent and automatic brakes. (On electronic brake systems, toggle independent setting from LEAD to TRAIL, and accept and confirm the change. This will also place the automatic brake in the cutout position.) 5. Place the automatic brake valve handle in HANDLE OFF/CONTINUOUS SERVICE. 6. Place independent brake valve handle in release position. 7. Place the generator field switch in the OFF position. 8. Disarm two-way EOT, if equipped. (DP must be unlinked to change ends.) 9. Position headlight switch as necessary. **B. Restore Operating Controls as follows:** 1. Place the independent brake valve handle in FULL APPLICATION. 2. Cut-in the independent brake. (On electronic systems, toggle setting from TRAIL to LEAD.) 3. Place the automatic brake valve handle in RELEASE. 4. Cut-in the automatic brake. (On electronic systems, toggle setting from CUT OUT to CUT IN.) 5. Replace the reverse lever. 6. Place switches and breakers in proper positions. 7. Conduct locomotive air brake test. **Application:** After changing operating ends, perform a Light Engine Running Air Brake Test.

	Note: A Standing Locomotive Air Brake Test may be performed when the Light Engine Running Air Brake Test is not practical .

Rule Updated Date

May 2, 2016

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31.8.3: Light Engine Setup

31.8.3 *49 CFR 232.205*	**Light Engine Setup** When light engine power transfers are operated, set-up as shown below:

Light Engine Power/Dynamic Brake Setup					
Number of Units	Minimum MU'd	Minimum on line for power and dynamic brake	Armed EOT Required	MU Cable Required between units.	Headlight
1–8	All	2 units minimum with 3 or more units	No	All units MU'd *	Lead/ Rear on Dim or Highly Visible Marker
9–12	8	4	Yes	Must not be placed between eighth and ninth units.	EOT on rear
13–15		5			
16–18		6			
19–21		7			
22–25		8			

Light Engine Air Brake Setup					
Number of Units	Train Line Hose	Automatic Brake Cut-in	Independent Brake Cut-in	MU Hoses	Air Test Required
1–8	All	Lead Only	Lead Only	All	31.8.4

9–25			Cut-in and Released	Locomotive must be running or main reservoir must be connected to running locomotive.	Determine that brakes apply and release on each locomotive.

Light engine movements must not be operated in DP mode except when moving power consists from the service track to a yard track. Site-specific instructions may be created to govern movement of light engine moves within the terminal limits.
* MU cable not required between units shut down or isolated at rear of consist.

Rule Updated Date

May 1, 2016

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31.8.4: Procedure for Conducting a Standing Locomotive Air Brake Test

31.8.4	**Procedure for Conducting a Standing Locomotive Air Brake Test** Ensure locomotive consist is properly secured.

49 CFR *229.46* *229.59* *232.105* *229.140* Reference Rule 31.3.1	From the ground, observe that the locomotive brakes apply and release during this procedure: 1. With the independent and automatic brake valve handles in RELEASE, apply the independent brake. 2. After observing that the brakes apply on each locomotive, release the independent brake. 3. When the brakes are released on all locomotives, apply the automatic brake by making a 10-psi brake pipe reduction. 4. After the brakes apply on all locomotives, actuate and observe that the brakes release. 5. Reduce brake pipe pressure by at least an additional 10-psi to reapply the brakes. 6. Determine that all brakes apply on all locomotives. 7. Move the automatic brake valve handle to RELEASE position. 8. Determine that all brakes release. When adding or removing **non-controlling** locomotive(s) to or from a DP remote consist, it is not necessary to unlink. Add the following to the above procedure: 1. Ensure that the train is properly secured. 2. Utilize the lead (head end) locomotive to apply and release the brakes on the remote consist (Items 1–8 above).

Rule Updated Date

May 2, 2016

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31.8.4.1: Light Engine Running Air Brake Test.

31.8.4.1 *49 CFR* *232.105* Reference Rule 31.3.1 31.8.2	**Light Engine Running Air Brake Test.** An engineer must perform this air test when: ○ Taking charge of engine not coupled to other equipment and originally made up and tested by other than the assigned engineer. or ○ Controlling ends have been changed. When test is required, perform the following tasks: 1. Release the independent brake and open throttle sufficiently to cause locomotive to move. 2. Close throttle. Locomotive should roll freely. If it does not, check for the cause and correct.

	3. Apply and release the independent brake while speed is low. A speed reduction indicates brakes have applied. 4. With the independent brake released, make a light automatic brake pipe pressure reduction. A speed reduction indicates brakes have applied. 5. Actuate and determine that the brakes release. The locomotive should roll freely. When defects or malfunctions are noted, the condition must be corrected. Note: A Standing Locomotive Air Brake Test may be performed when the Light Engine Running Air Brake Test is not practical.

Rule Updated Date

April 30, 2016

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31.8.4.2: Remote Control Light Engine Running Air Brake Test

31.8.4.2 *49 CFR 232.105*	**Remote Control Light Engine Running Air Brake Test** A remote control operator must perform this air test when: • Controlling ends have been changed on a remote control consist. or • Required by Rule 35.4.2. When test is required, perform the following tasks: 1. Select direction on the RCT, press either vigilance button then position Speed Selector to Couple Setting to cause locomotive to move. 2. Move Speed Selector to Coast. Locomotive should roll freely. If it does not, check for the cause and correct. 3. Increase speed by positioning Speed Selector to a speed greater than couple, then move Speed Selector to Coast. 4. Apply a low setting with the Independent Brake Override. A speed reduction indicates brakes have applied. 5. Release Independent Brake Override. With Speed Selector in Coast (increase speed first if locomotive has stopped), apply a minimum automatic brake application. Verify that brakes do not apply. 6. Increase automatic brake application to Light Setting and verify that brakes do not apply. 7. Increase automatic brake application to Medium Setting. A speed reduction indicates brakes have applied. Position Automatic Brake Selector to Release Setting. Locomotive should roll freely.

	When defects or malfunctions are noted, the condition must be corrected. A Standing Locomotive Air Brake Test may be performed when the Remote Control Light Engine Running Air Brake Test is not practical.

Rule Updated Date

September 19, 2016

System Special Instructions

Effective Date: June 1, 2017

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31.8.4.3: Electronic Alertness Control Device (Alerter) Test

31.8.4.3 *49 CFR 229.140*	**Electronic Alertness Control Device (Alerter) Test** Procedure for conducting alerter test: 1. Place the automatic and independent brakes in release. 2. Allow the timing cycle to expire and observe that warning lights and audible alarm function. 3. Allow the alerter to "time out" and observe: • PC or PCS indicator light illuminate. • Reduction in equalizing reservoir pressure. 4. Recover penalty brake application.

Rule Updated Date

May 2, 2016

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31.8.5: Starting Procedure

31.8.5	**Starting Procedure** Follow this procedure to start a locomotive: 1. Check the cooling water level. 2. Check that the governor low oil button, over-speed trip, and low water and crankcase protective devices are in the proper positions, if equipped. 3. Check that switches or breakers for air conditioning, lights, heaters, refrigerator, and other accessories are in the OFF positions. 4. Ensure that the fuel pump circuit breaker is on. 5. Check that the engine run and control switches on the engineer's control console are on. 6. Make sure the Isolation Switch is in the START/STOP/ISOLATE position. 7. Close the main battery switch. 8. Prime the engine as indicated on the badge plate. 9. Crank the engine until the engine starts, but not longer than 20 seconds for EMD locomotives and 45 seconds for GE locomotives. Allow two minutes between cranking attempts. 10. After starting, place switches or breakers for air conditioning, lights, heaters, refrigerator, and other accessories in the ON positions, as appropriate. 11. Check that the air brake system is charged and operative before releasing the hand brake.

Rule Updated Date

May 2, 2016

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31.8.6: Weak Batteries

31.8.6	**Weak Batteries** When a weak battery condition is determined by the Mechanical Department, do the following: • Tag locomotives with weak batteries to prevent shutdown until the condition is corrected. • Report the condition on Electronic Locomotive Inspection report. • Report to the Locomotive Help Desk if discovered en route. Locomotives identified with such tags or other identified mechanical problems that would prevent starting where repair facilities are not available may be left running for no more than seven calendar days.

Rule Updated Date

May 2, 2016

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31.8.7: Locomotive Fuel Conservation and TPA Compliance

31.8.7 Reference Rule SSI Item 5-C Glossary	**Locomotive Fuel Conservation and TPA Compliance** **A. Locomotive Shutdown** Shut down locomotive when: • Left standing unattended for 15 minutes or longer. • The trailing locomotive(s) in the lead consist are isolated. Locomotive should be left running: 1. In a terminal with 24 hour yardmaster or manager support when the temperature is expected to drop below 35 degrees F in the next 4 hours. 2. On the line of road (outside of terminal) when the temperature is expected to drop below 35 degrees F in the next 12 hours. 3. When necessary to maintain the air supply; one locomotive may be left running. 4. When distributed power locomotives are actively linked. Crews are to contact terminal yardmaster or manager on duty for weather information. **B. Tons Per Powered Axle (TPA)** The TPA Limit is the maximum tonnage per equivalent powered axle specified over a given route. Trains may not exceed maximum TPA at origin, unless there is a plan in place to pick up additional power or reduce tonnage (scheduled set-out) prior to reaching the ruling grade. TPA may only be exceeded en route when authorized by proper authority. Train consist TPA numbers will govern any discrepancies. Trains must be operated as required by TPA limits for the current crew district as indicated on the train list (BC), and not to exceed those limits. Non-working status codes (DG, DB, PD, IB) are assigned to locomotive units which are not to be used for power, in order to comply with TPA limits and maximize fuel efficiency. Locomotives with non-working status codes on the BC must always be either isolated or shut down, depending on ambient air temperature, and according to the instructions in Part A of this rule. When train list (BC) recommendations for locomotive

shutdown/isolation are not indicated, or train tonnage is changed significantly en route, crews operating freight trains including local and transfer train movements must:

1. Determine the minimum total EPA needed for route using the following formula:

   Train Tonnage ÷ TPA Limit (as indicated on BC) = Total EPA needed.

2. Determine the minimum number of locomotive(s) which are needed to handle train tonnage without exceeding the train TPA limit.

3. Verify correct EPA is online for route by recalculating TPA:

   Total Train Tonnage (including Isolated/DIC locomotives) ÷ Total EPA = TPA

4. Confirm TPA does not exceed route TPA.

5. Start or shutdown/isolate locomotives and tag as required.

Each head-end locomotive isolated or shut down for fuel conservation purposes must be identified by placing a fuel conservation tag on the isolation switch. The lead unit must also be tagged identifying all of the locomotives in the head-end consist that are isolated or dead.
Any changes made must be noted on the lead unit's tag.

At each crew change point, inbound engineers must communicate the configuration of their head-end locomotive consist to the relieving crew, either in person or by using appropriate tags attached to isolation switches. If unable to ascertain in person from an inbound engineer if the head-end locomotives are set up according to the BC, the outbound engineer must first examine any tags attached to the isolation switch on the lead unit, and then compare that information with the BC train list for their crew district.

Adjustments to the head-end consist configuration must only be made as necessary to ensure compliance with locomotive status codes and crew district TPA limits.

If it is necessary to go through the locomotives in order to release handbrakes, the engineer must verify that the correct units are running and on line at that time.

Locomotive axles / traction motors must not be cut-out to comply with TPA restrictions. Additional locomotive(s) may be on line if the engineer determines that the train may stall due to locomotive defects,
not to exceed system or subdivision maximum powered axle limitations. DG units that are used for power must be reported using

the locomotive inspection reporting process at tie-up.

The controlling unit of each consist, including DP consist(s), must not be manually isolated or shut down to comply with these instructions. This does not prohibit the isolation or shutdown of other units in remote consists.

Note: When calculating TPA/TPDBA, do not round off EPA/EDBA numbers used in making the calculation. After completing the calculation, if the final number is not a whole number, round up the result to the nearest whole number.

Example: A train has 10,469 tons and three locomotives with a total of 36.3 EPA. The detail train consist indicates the following TPA limit:

MAXIMUM TPA BETWEEN SX263 AND NX039 IS 430, CURRENT TPA IS 289. If one unit was isolated weighing 200 tons, the train would then have 24.2 EPA, and TPA will increase to 441. This exceeds the maximum TPA for the territory to be operated over. Therefore, all three locomotives must be left on line.

C. Energy Management Systems (EMS)

When the controlling locomotive on a train is equipped with an EMS, the engineer must initialize the system and utilize it to the fullest extent possible during the entire trip, consistent with safe train operations. The engineer must logout of the EMS at end of trip except for Smart Consist.

Any EMS failure (either initializing or en route) must be reported by the assigned engineer via EMS Feedback Form at tie-up. This requirement does not apply when BC D shows the EMS on the lead unit non-operative.

Superintendent bulletins will designate EMS type, location and class of train allowed to be operated with the system.

D. Fuel Conservation Speed (FCS)

Exceeding throttle position 6 while in power is prohibited at a speed greater 50 MPH. Higher throttle positions may be used, up to and including Run 8, to achieve and maintain 50 MPH. The train dispatcher may cancel fuel conservation speed restrictions.

Passenger trains, Commuter trains, UPS trains, and trains operating with PTC-Integrated EMS are exempt.

Rule Updated Date

September 4, 2018

System Special Instructions

Effective Date: May 31, 2018

General Order

Effective Date: September 4, 2018

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31.8.7.1: Shutdown Procedure

31.8.7.1 Reference Rule 35.5.1	**Shutdown Procedure** Follow this procedure to shut down a locomotive: 1. Make sure hand brake is fully applied if leaving locomotive unattended. 2. Place generator field switch OFF (leave engine run and control & fuel pump switches on). 3. Remove reverser. 4. Move the engine control switch (isolation switch) to the START/STOP/ISOLATE position. 5. Shut down engine (EFCO Switch in Locomotive Cab). 6. Wait 2 minutes. 7. Open all non-covered accessory switches and circuit breakers on the Engineer's Control Panel. Open all covered circuit breakers in accordance with shutdown sticker on locomotive. • If locomotive is GE AC Model (i.e. C44AC, C44ACTE, C45ACCTE, etc.) open BCCB circuit breaker first, wait until the operator screens go blank and green LED extinguishes. Then turn off the remaining breakers prior to opening the main battery switch. 8. Wait 2 minutes. 9. Open main battery switch, except: • Main battery switch may be left closed for up to two hours to maintain cab signal link on locomotives operating in cab signal territory.

	• Main battery switch may be left closed on RCL to maintain link during short-term securement. Note: Locomotives must be stopped before being shut down, except for mechanical failures or an emergency situation.

Rule Updated Date

June 1, 2017

System Special Instructions

Effective Date: June 1, 2017

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31.8.7.2: Prevent Engine Cooling System from Freezing

31.8.7.2	**Prevent Engine Cooling System from Freezing** The engineer is responsible for protecting locomotives from freeze damage. If an engine dies and cannot be restarted, the engine must be drained if the temperature is below 32 degrees F. Notify the train dispatcher. If the failure is in the distributed power, immediately contact the train dispatcher.

Rule Updated Date

January 20, 2012

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32.0: Securement/Train Operations - Chapter 32

32.0: Securement / Train Operations

32.0 Securement / Train Operations

Rule Updated Date

January 20, 2012

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32.1: Securing Equipment

32.1 *49 CFR 232.103* Reference Rule 7.6	**Securing Equipment** Crew members are responsible for securing standing equipment with a sufficient amount of hand brakes to prevent undesired movement. The air brake system must not be depended upon to prevent an undesired movement. On cuts of two or more cars, or on multi-platform cars with two hand brakes, a minimum of two hand brakes must be applied unless otherwise specified.

Rule Updated Date

May 2, 2016

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32.1.1: Securement Procedures

32.1.1	**Securement Procedures**
	
	The number and location of hand brakes to be applied depends on the following:
	
	• Grade:
	  ○ On low end when slack is bunched.
	  ○ On high end when slack is stretched.
	• Number of loaded and empty cars, and type of car.

- High winds.
- Site-specific instructions.

All retaining valves must be in EXHAUST position.

A. Primary Securement Procedure
Verify that the hand brake(s) applied on equipment will prevent movement by releasing all air brakes.

B. Secondary Securement Procedure
Comply with requirements contained in Securement Chart when not practical to comply with Primary Procedure or where site-specific instructions are in effect.

The following table must be used to determine the number of brakes required when using the Secondary Procedure.

C. Site-Specific Instructions
When site-specific instructions do not require an exact number of handbrakes, comply with Part A or Part B as applicable.

	Securement Chart – When Not Practical to Verify Required Hand Brakes by Release of Air Brakes												
	Number of Applied Hand Brakes Required												
	Grade (%)												
Tons	**<0.25**	**0.25-0.49**	**0.50-0.74**	**0.75-0.99**	**1.00-1.24**	**1.25-1.49**	**1.50-1.74**	**1.75-1.99**	**2.00-2.24**	**2.25-2.49**	**2.50-2.74**	**2.75-2.99**	**≥ 3.00**
< 1,000	2	2	2	3	4	4	5	6	6	7	8	8	9
1,000-1,999	2	3	4	6	7	8	10	11	12	14	15	16	18
2,000-2,999	2	4	6	8	10	12	14	16	18	20	22	24	26
3,000-3,999	3	6	8	11	14	16	19	22	24	27	30	32	35
4,000-4,999	4	7	10	14	17	20	24	27	30	34	37	40	44
5,000-5,999	4	8	12	16	20	24	28	32	36	40	44	48	52
6,000-6,999	5	10	14	19	24	28	33	38	42	47	52	56	61
7,000-7,999	6	11	16	22	27	32	38	43	48	54	59	64	70
8,000-8,999	6	12	18	24	30	36	42	48	54	60	66	72	78
9,000-9,999	7	14	20	27	34	40	47	54	60	67	74	80	All
10,000-10,999	8	15	22	30	37	44	52	59	66	74	81	All	All
11,000-11,999	8	16	24	32	40	48	56	64	72	80	All	All	All
12,000-12,999	9	18	26	35	44	52	61	70	78	All	All	All	All
13,000-13,999	10	19	28	38	47	56	66	75	All	All	All	All	All
14,000-14,999	10	20	30	40	50	60	70	80	All	All	All	All	All
15,000-15,999	11	22	32	43	54	64	75	All	All	All	All	All	All
16,000-16,999	12	23	34	46	57	68	80	All	All	All	All	All	All
17,000-17,999	12	24	36	48	60	72	All	All	All	All	All	All	All

18,000-18,999	13	26	38	51	64	76	All	All	All	All	All	All	All
19,000-19,999	14	27	40	54	67	80	All	All	All	All	All	All	All
20,000-20,999	14	28	42	56	70	All	All	All	All	All	All	All	All
21,000-21,999	15	30	44	59	74	All	All	All	All	All	All	All	All
22,000-22,999	16	31	46	62	77	All	All	All	All	All	All	All	All
23,000-23,999	16	32	48	64	80	All	All	All	All	All	All	All	All
24,000-25,000	17	34	50	67	All	All	All	All	All	All	All	All	All

Rule Updated Date

May 2, 2016

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32.1.2: Securing an Unattended Train or Portion of Train with Locomotive Attached

32.1.2 Reference Rule 7.6 32.1.1 32.1.3 32.2.1	**Securing an Unattended Train or Portion of Train with Locomotive Attached** To secure a train or a portion of a train with the lead locomotive consist attached, perform the steps below: 1. Determine the minimum number of hand brakes required to secure a train. 2. Secure equipment against undesired movement as outlined in Rule 32.1.1 (Securement Procedures). 3. Secure the lead locomotive consist and apply the air brakes as outlined in Rule 32.2.1 (Unattended Locomotive(s)), 4. Complete Train and Locomotive Checklist.

Rule Updated Date

May 2, 2016

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32.1.3: Securing an Unattended Train Before Detaching Locomotives

32.1.3 Reference Rule 30.8.1 32.1.1 33.8.3	**Securing an Unattended Train Before Detaching Locomotives** Before detaching locomotives or locomotives and cars: 1. Comply with Rule 32.1.1. 2. Make a 20-psi brake pipe reduction. Exception:

	Comply with Rule 30.8: • At terminals where Mechanical Department will make immediate air brake inspections and repairs after locomotives are detached, comply with Rule 30.8.1. • When separating a train in temperatures below 25 degrees F, follow the steps in Rule 30.8.1 to prevent vent valves from sticking open. **3.** After brake pipe exhaust ceases, close the angle cock on the rear locomotive or last car to be detached from portion left standing. **4.** Except when complying with rule 33.8.3 (Set-out Function), leave the angle cock open on the portion left standing. When removing locomotive(s) from a previously secured train or cut of cars, tie additional hand brakes on cars equal to the number of locomotives removed.

Rule Updated Date

September 19, 2018

General Order

Effective Date: September 19, 2018

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32.1.4: Single Car Securement

32.1.4	**Single Car Securement** A. Do not detach and leave a single car standing when the car can be coupled to and left secured with other equipment. Scale test car(s) must be coupled to other secured equipment when left unattended. After performing a single car securement test as required below, a single car may only be left standing when: • On a customer's industry track or within a customer's facility. • In a track or yard equipped with derail protection. • An articulated car is equipped with two hand brakes and both hand brakes are applied and functioning. • The Car Department has chained the car to the rail. When leaving only two cars, both cars must be equipped with wheel or ratchet type brakes. B. When a single car will be left standing, perform the following steps in the order outlined to prevent uncontrolled movement.

	1. Apply all hand brakes on car to be set-out. 2. Move car a sufficient distance to ensure hand brake(s) are functioning properly (If brake system is charged, release air brake on car before moving.) 3. Slowly bunch or stretch the slack at the coupler where uncoupling is to be made. 4. Observe and verify car does not move for 1 minute. If movement is observed, set out an additional car and retest. 5. If brake system is charged: a. Make a 20-psi brake pipe reduction before cutting away. b. After cutting away, tighten handbrake(s). Maintenance of Way and Car Department Employees moving cars with Brandt Trucks or Car Movers are governed by their own guidelines.

Rule Updated Date

June 1, 2018

System Special Instructions

Effective Date: May 31, 2017

General Order

Effective Date: June 1, 2018

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32.1.5: Securing Specialized Equipment

32.1.5	**Securing Specialized Equipment** **A. Roadrailer Equipment** Roadrailer equipment is equipped with a spring-loaded parking brake (hand brake). The spring-loaded parking brake applies any time the brake cylinder pressure is lost. When this equipment is set out: 1. Place the train in emergency. 2. Inspect 20% of the equipment (not fewer than 10 units) to ensure the brakes are applied. **B. Equipment with Multiple Hand Brakes** When applying brakes on cars with multiple hand brakes, all hand brakes on car must be applied. When determining number of required hand brakes, each brake is considered one car.

Rule Updated Date

January 20, 2012

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32.1.6: Releasing Hand Brakes

32.1.6 Reference Rule 7.7.1 7.12 32.1.4	**Releasing Hand Brakes** To prevent wheel damage, release hand brakes before moving cars or locomotives. **A. Release Hand Brakes Before Movement** Release all hand brakes to prevent wheel damage except when required to: • Control slack. • Control speed while making gravity switch move. • Test hand brake. When releasing hand brakes, check for slack and white paint showing on chain when equipped, and at least three additional hand brakes beyond the last applied hand brake. If a hand brake is difficult to release: • Charge the air brake system. • Make a full service or emergency application. • Release the hand brake. If the hand brake cannot be released using the above method, do not move the car except to set it out. The car must be observed during the entire movement to set out, and limit speed to 5 MPH. Report defect to Mechanical Help Desk/Dispatcher. **B. Controlling Slack** Charge air brake system before releasing hand brakes. On ascending grade, do not release all hand brakes until it is known that slack is stretched.

Rule Updated Date

May 2, 2016

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32.2: Securing Locomotives

32.2 Securing Locomotives

Rule Updated Date

January 20, 2012

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32.2.1: Unattended Locomotive(s)

32.2.1 *49 CFR 232.103* Reference Rule 32.1.1 31.8.7 35.5.1	**Unattended Locomotive(s)** When securing engine: 1. Place throttle in idle. 2. Place transition handle (if equipped) in OFF position. 3. Place generator field switch in OFF position. 4. Remove and leave reverser handle. 5. Apply hand brakes on all locomotives. 6. Comply with Rule 32.1 (Securing Equipment) unless locomotive(s) are coupled to previously tested equipment. 7. Fully apply the independent brake. 8. When engine is running, make a 20-psi brake pipe reduction after allowing the brake system to charge. If engine is shut down, place automatic brake handle in full service position. 9. Place headlight switch to OFF position unless required by rule to leave on dim. 10. Place engine control switch to ISOLATE or START on all locomotives. 11. Close doors and windows. 12. Perform the following steps from the DP screen on the lead controlling locomotive when linked DP is not separated from train: • Select ISOLATE and execute for each remote consist in the train. This will cut-out the brake valve on the isolated remote(s) and disable throttle commands to the remote(s). • When train is ready to proceed, remote(s) must be returned to NORMAL status from the DP screen before releasing the automatic brakes. 13. Perform the following steps from the DP screen on the lead controlling locomotive when linked DP consist(s) are separated from train: • Comply with Rule 32.1 (Securing Equipment). • Comply with Rule 33.8.3 (Set-out Function) • After re-coupling, remote(s) must be returned to NORMAL status from the DP screen, and automatic brake must be in release before opening the angle cock on rear portion of the train. 14. When terminating a DP train: • From the SYSTEM screen select END DP and execute prior to detaching lead consist from the train. **Exceptions:**

	1. When on an unattended train, distributed power remote locomotives do not require hand brakes to be applied or engine control switch to be placed in ISOLATE or START when train is otherwise properly secured. 2. Distributed power remote consists may be left standing with all hand brakes applied at any location, even on the main track, for short durations when in the process of making up or disassembling a DP train. At mechanical facilities, when locomotives are protected by outbound derails on designated servicing tracks, apply a sufficient number of hand brakes to prevent undesired movement, with a minimum of one per locomotive consist. Additional securement guidelines for unattended locomotives not coupled to other equipment: • Must not be left unattended on a main track. However, when necessary to switch a locomotive in a consist (reposition, wye, etc.), a properly secured locomotive may be left unattended if crew remains in the area performing the switch move. • Must have all hand brakes applied. Release locomotive brakes to determine hand brakes will prevent movement. Fully apply independent brake and make a 20 psi automatic brake pipe reduction.

Rule Updated Date

September 19, 2018

System Special Instructions

Effective Date: May 31, 2017

General Order

Effective Date: September 19, 2018

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32.2.1.1: Securing Locomotive Cab Doors

32.2.1.1	**Securing Locomotive Cab Doors** **A. Unattended Locomotives** Controlling locomotives equipped with door locks and latches must be locked to prevent cab entry before leaving consist unattended outside of yards or terminals. Trailing locomotives may be left unlocked. To secure controlling locomotive in consist, latch/lock rear cab doors from inside cab, then exit and lock front door using the slide bolt padlock.

	Union Pacific locomotive padlocks require a double cut key, number D575, to operate. All crew members are required to have this key available while on duty. On trains and locomotives that will be delivered to foreign line railroads or interchange locations, crewmembers must leave locomotive cabs unlocked. **B. Attended Locomotives** Ensure cab doors on lead consist are unlocked when locomotives are attended except when necessary to prevent unauthorized entry. **C. Distributed Power** Distributed power locomotives must remain unlocked.

Rule Updated Date

May 2, 2016

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32.2.2: Separating Locomotives

32.2.2	**Separating Locomotives** When separating locomotives, do the following: 1. Apply hand brakes on locomotives to be cut away from. 2. Reposition walkway end platforms and safety chains to create a continuous barrier at ends of locomotives. 3. Disconnect MU cables. 4. Plug the MU cables into a dummy receptacle. 5. Close cutout and angle cocks. 6. Cut-in and fully apply independent and automatic air brakes. 7. Separate locomotives, allowing hose connections to pull apart with movement of locomotive. 8. Attach air hoses to the dummy couplings or place them in the pockets.

test link

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May 2, 2016

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32.3: Train Line

32.3 Train Line

Rule Updated Date

January 20, 2012

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32.3.1: Undesired Emergency Resulting in Train Separation

32.3.1	**Undesired Emergency Resulting in Train Separation** When train separation occurs: 1. Notify train dispatcher and Mechanical Help Desk. 2. Immediately secure detached portion(s) using Secondary Securement Procedure. 3. Close the angle cock on the rear of the cars still attached to the lead locomotive consist. 4. Recharge the air brake system. Additional hand brakes may be required on low end: • Before releasing air brakes when necessary to control slack or prevent movement while recharging. • When necessary to work under or between equipment.

Rule Updated Date

May 2, 2016

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32.3.2: Coupling Brake Pipe Connections

32.3.2 Reference Rule 33.6.2	**Coupling Brake Pipe Connections** Maintain brake pipe connections to enable the air brake system to function properly. Angle cocks must not be left partially closed or partially open. Before coupling air hoses to charge brake pipe: 1. Make a 20-psi brake pipe reduction. On a grade, if necessary to prevent an undesired release of the cars being coupled to, make a 40-psi brake pipe reduction. 2. Notify crew members when the brake valve exhaust has stopped. 3. Couple the air hoses and open angle cocks slowly to prevent an emergency brake application.

	Note: Distributed power trains, in some cases, require a different procedure when coupling to rear portion of train. Refer to Rule 33.6.2. (Adding Manned Helper Mid-train or Rear of Train). 1. When adjusting air hose height: • Couple the air hoses. • Verify the brake pipe hose support is adjusted so that the glad hands are at least 4 inches above the top of the rail.

Rule Updated Date

May 2, 2016

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32.3.3: Coupling to Opposite End of Cars

32.3.3 Reference Rule 32.1	**Coupling to Opposite End of Cars** When a locomotive will immediately run-around or couple to cars at the opposite end, first comply with the following: • Make a 20-psi brake pipe reduction before cutting away from cars. • Allow air brake system to go into emergency. • Wait one minute. • Close angle cock on the standing portion of the train. Do not bottle air or maintain air pressure in the brake pipe when locomotives are detached or yard air is uncoupled.

Rule Updated Date

January 20, 2012

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32.4: Inclement Weather

32.4 Inclement Weather

Rule Updated Date

January 20, 2012

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32.4.1: Required Air Brake Test During Inclement Weather

32.4.1 *49 CFR 232.107*	**Required Air Brake Test During Inclement Weather** During inclement weather conditions that may cause snow or ice build up to occur between brake shoes and wheels, brake applications must be performed periodically to ensure proper braking effort is being provided. To allow any accumulation of ice or snow to melt from brake shoes before braking is necessary, the engineer must make a brake pipe reduction sufficiently in advance of locations where train will be required to: • Reduce speed. • Operate at Restricted Speed. • Stop. or • Crest a grade. If brakes do not provide sufficient braking effort, stop train immediately using an emergency brake application, if necessary. Train must not proceed except as instructed by proper authority.

Rule Updated Date

May 2, 2016

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32.5: Overcharge

32.5 Overcharge

Rule Updated Date

January 20, 2012

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32.5.1: Reducing Pressure in Overcharged Train Brake Systems

32.5.1	**Reducing Pressure in Overcharged Train Brake Systems** To reduce pressure in an overcharged train brake system, do the following: 1. Adjust the regulating valve to the required pressure. 2. Make a full service brake pipe reduction.

	3. Wait at least 30 seconds after the brake pipe exhaust stops. Move the automatic brake handle to release, and charge the system to the required pressure. 4. An emergency application may be made to correct the condition.

Rule Updated Date

January 20, 2012

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32.6: Flat Spots

32.6 Flat Spots

Rule Updated Date

January 20, 2012

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32.6.1: Reporting Flat Spots

32.6.1 *49 CFR 215.103* *229.75*	**Reporting Flat Spots** While inspecting car and locomotive wheels, measure and report flat wheels to proper authority and Mechanical Help Desk when length of flat area exceeds 1 inch. If wheel has a flat spot more than 2-1/2 inches long or wheel has adjoining flat spots that are each at least 2 inches long, the equipment must not be moved faster than 10 MPH and set out at first available point.

Rule Updated Date

January 20, 2012

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32.7: Air Brake Operation

32.7 Air Brake Operation

Rule Updated Date

January 20, 2012

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32.7.1: Air Brakes Not Operating Properly

32.7.1 Reference Rule 30.7.1	**Air Brakes Not Operating Properly** If the train air brake system is not operating properly, stop the train immediately and: **1.** Inspect the air brakes to identify and correct the problem. **2.** Before proceeding, conduct an Application and Release test.

Rule Updated Date

January 20, 2012

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32.7.2: Sticking Brakes

32.7.2 Reference Rule 30.2.2	**Sticking Brakes** Before adding cars that have been charged to the rear of a train, the engineer handling the cars to be added must make a full service brake application before angle cocks are opened to prevent an overcharge and minimize the possibility of sticking brakes. When brakes do not properly release: 1. Stop the train as soon as possible. 2. Determine why the brake(s) did not release and correct if possible. 3. Inspect for: • Hand brakes applied. • Retaining valve not in EXHAUST. • Leak in the air brake system. • Defective control valve. 4. Inspect car(s) before departing for wheel defects, and set out if necessary. If air brake devices are cut-out en route, notify train dispatcher and Mechanical Help Desk.

Rule Updated Date

May 2, 2016

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32.7.3: Procedure to Cut-Out Control Valve and/or Bleeding Off Car

32.7.3	**Procedure to Cut-Out Control Valve and/or Bleeding Off Car** Cut-out control valves on defective cars as follows: 1. Close the branch pipe cutout cock. 2. When cutting out a control valve, drain the air reservoirs completely by operating the brake cylinder release valve. Bleed off cars only when: • Repairing the brake system on a car. • Cutting out the brakes on a defective car. • Switching.

Rule Updated Date

January 20, 2012

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32.7.4: Placement of Cars with Cut-Out Air Brake Equipment

32.7.4 *49 CFR 232.15*	**Placement of Cars with Cut-Out Air Brake Equipment** Follow these requirements when air brake devices must be cut-out: • Make sure no more than two consecutive air brake devices have been cut-out in a train. • If necessary to cut-out a third consecutive air brake device, separate it from the other two cars with cut-out brakes by at least one car with operative brakes. • If one air brake device/control valve is cut-out on a car with multiple control valves, consider the remaining brakes on that car to be operative. **Rear Car Brakes** The rear car of a train must have operative air brakes. If rear car air brakes become defective en route, set car out at first available location or reposition car in train. **Note:** If the brake pipe on the disabled car is broken, the car with a broken brake pipe must be handled to set out location with brake pipe pressure in air hoses between the car ahead and the disabled car.

Rule Updated Date

May 2, 2016

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32.8: Setting Out Cars

32.8 Setting Out Cars

Rule Updated Date

January 20, 2012

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32.8.1: Setting Out Defective Cars

32.8.1 *49 CFR 232.215*	**Setting Out Defective Cars** Set out a defective car whenever it cannot be safely moved to the next repair location. When a defective car must be set out, do the following: 1. Report to the train dispatcher and Mechanical Help Desk. 2. Set out where repair crew can inspect car. 3. If an overheated wheel or journal is involved, inspect the car for signs of fire before departing. The defective car must be properly tagged.

Rule Updated Date

May 2, 2016

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32.9: Telemetry

32.9 Telemetry

Rule Updated Date

January 20, 2012

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32.9.1: Emergency Application Capability from Rear of Train

32.9.1 *49 CFR 232.407* Reference Rule 31.8.3	**Emergency Application Capability from Rear of Train** **A. Requirements** Trains must be operated with the ability to place the train in emergency from the rear. The following trains are exempt from the requirement of this rule:

Glossary Grade	• Passenger and Commuter Trains. • Light engine consist with 8 or fewer units. • Locals, road switchers, and work trains that do not operate on mountain grades. • Trains that do not exceed 30 MPH and do not operate in heavy grade or mountain grade territory. Application: Locals, road switchers, and work trains must: • Not exceed 4,000 trailing tons • Travel over a distance that can normally be operated by a single crew in a single tour of duty. **B. Providing Emergency Application Capability from Rear of Train** Any one of the following methods fulfills the requirement to provide emergency application capability from the rear of the train: • An operable, two-way, end-of-train telemetry system (HEU/EOT), which must be armed and tested at point of installation. • Distributed power placed on rear of train. • Trains with a manned helper, caboose/shoving platform, or passenger equipment at the rear of train equipped with an emergency brake valve and manned by an employee equipped with two-way radio communication with the engineer at head end of train.

Rule Updated Date

May 2, 2016

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32.9.2: Installation

32.9.2 *49 CFR 232.409*	**Installation** End-of-train device must have been calibrated within the last 368 days. Check the affixed stickers prior to installation. **Exception:** Calibration is not required when an affixed sticker states the unit is: • Equipped with a Wabtec synthesized or Ritron FRA-compliant radio. or • Exempt from FRA mandatory periodic testing requirements. After entering the EOT number on the HEU of the locomotive, push the COMM TEST button to establish one-way communication with the EOT.

	After charging the train, the EOT pressure reading displayed in the locomotive HEU must be compared with that on the EOT. The EOT device must not be used if the difference between the two readings exceeds three pounds.

Rule Updated Date

March 24, 2017

System Special Instructions

Effective Date: June 1, 2017

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32.9.3: Arming HEU/EOT

32.9.3 *49 CFR 232.409*	**Arming HEU/EOT** To arm the HEU: 1. Press the TEST button on the EOT, which will display the ARM NOW message on the HEU. 2. Immediately press the COMMUNICATIONS TEST/ARM button on the HEU, which will display the ARMD message and light the EMERG ENABLED status LED at the same time. If NOT ARMD appears on the HEU, the system did not accept the arming sequence. Repeat steps above. Some foreign HEU/EOT systems are self-arming when telemetry is established and may be so indicated by a "*" displayed on the HEU.

Rule Updated Date

January 20, 2012

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32.9.4: Testing HEU/EOT

32.9.4 *49 CFR 232.407* *232.409*	**Testing HEU/EOT** To test the emergency application capability from the rear of the train, do the following: 1. Close the angle cock ahead of the last car. 2. Initiate an EOT emergency from the lead locomotive HEU. The brake pipe pressure on the EOT must reduce to 0-psi. 3. Open the angle cock and determine that brake pipe pressure is restored before proceeding.

	A. Establishing Communications If the End of Train Telemetry System is unable to establish communications at the installation point, train may be moved a maximum of one mile at Restricted Speed in an attempt to establish communications. **B. Engineer Notification** When the test of the emergency application capability from the rear is conducted, the engineer must be notified verbally or in writing that the test was successfully performed. If verbal notification is made, the train crew must record this notification on Air Brake Test form. The written notification must include the following: • Date and Time of test. • Location of test. • Name of employee conducting test. Written notification must be maintained in the cab of the controlling locomotive.

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January 20, 2012

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32.9.5: Emergency Switch

32.9.5 *49 CFR 232.409*	**Emergency Switch** Once a system is properly armed, an emergency brake application can be made at any time. To initiate an emergency brake application at the end of the train: 1. Lift the red cover of the EMERGENCY SWITCH. 2. Push the toggle switch up. 3. Verify that: **a.** The EMERGENCY message briefly appears in the message display window. **b.** The brake pipe pressure reading quickly drops to 0-psi. **c.** The LOW PRES message is displayed while the last car pressure is below 45-psi.

Rule Updated Date

January 20, 2012

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32.9.6: Loss of Emergency Application Capability from Rear of Train

32.9.6
 	
49 CFR 232.407
 	
Reference Rule Glossary
	Loss of Emergency Application Capability from Rear of Train
	Trains required to be equipped with rear-of-train emergency capability are considered to have an en route failure when any one of the following conditions occurs:
	
	• EOT/HEU indicates:
	  • Loss of front to rear communication. Message = FR NOCOM or NOCOM.
	  • Emergency valve not enabled. Message = NOT ARMD and/or "Emergency Enabled" indicator NOT illuminated.
	  • Emergency valve failure or EOT valve failure. Message = VALVFAIL.
	• Loss of communication exceeding 16 minutes 30 seconds as indicated by control console for distributed power locomotive on lead controlling locomotive at head end of train.
	• A loss of voice radio communication between a manned helper, caboose, or passenger equipment at the rear of the train and the lead controlling locomotive.
	
	When an en route failure occurs:
	
	• On other than mountain grades:
	  • Train must not exceed 30 MPH.
	  • Notify dispatcher.
	• On mountain grades, train must not proceed until:
	  • Failure is corrected.
	
	  or
	
	  • Another method of compliance is used.
	
	When communication is lost on mountain grade, a train may:
	
	• Move a train length to attempt to reestablish communication or sufficient distance to clear obstruction.
	• Move train in sections due to en route failure.
	• Continue during a loss of radio communication between the employee at rear of train, provided train does not exceed 5 MPH above maximum authorized speed.
	
	In the event of an emergency, use the emergency toggle switch to initiate emergency application, even if NO COM condition exists.

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May 2, 2016

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32.9.7: Disarming HEU/EOT

32.9.7	**Disarming HEU/EOT** When a two-way EOT armed to a HEU is to be separated or when changing either an EOT or HEU en route, the HEU must be disarmed as outlined below: 1. Set the HEU ID code to 00000, or follow the disarm procedures on the electronic display. 2. Press the COMMUNICATIONS TEST/ARM button. 3. Verify that the HEU displays EMERG DISABLED. GE locomotives with screens displaying "Armed Other" indicate the HEU was not disarmed from the last two-way EOT utilized. This condition can be corrected by either of two methods: • Enter the EOT number of the last EOT, and disarm as prompted by the EOT screen display. or • If last EOT identifying number is not known, HEU may be disarmed by arming the EOT after entering a valid EOT number. Push test button on EOT, then depress "Arm Now" button that will briefly appear in the lower right corner of the EOT screen.

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May 2, 2016

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32.10: Unusual Conditions

32.10 Unusual Conditions

Rule Updated Date

January 20, 2012

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32.10.1: Unusual Air Brake Conditions

32.10.1	**Unusual Air Brake Conditions** Follow this process when unusual air brake conditions exist: • Train must be stopped, secured, and inspected. • Notify the Dispatcher/Mechanical Help Desk. • The Dispatcher must notify the appropriate operating manager for the territory.

	• Manager assisting crew will determine if the train can be moved safely or if it must be held for inspection.

Rule Updated Date

May 2, 2016

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34.0: Train Handling – Chapter 34

34.0: Train Handling

34.0 Train Handling

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January 20, 2012

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34.1: Train Handling Responsibilities

34.1	**Train Handling Responsibilities** Crew members must exercise judgment and plan ahead to operate their train safely and efficiently. The engineer is responsible for properly controlling in-train forces. Proper train handling requires a combination of communication, throttle modulation, dynamic braking, and air braking to: • Prevent injury. • Prevent damage to the track structure, equipment and lading. Controlling and limiting in-train forces are essential to safe train operation. Unless an emergency or other condition requires immediate speed reduction, make: • Throttle position changes one notch at a time. • Dynamic brake changes gradually. • Air brake applications to allow slack to adjust.

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May 2, 2016

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34.2: Train Handling Guidelines

34.2 *49 CFR 232.109*	**Train Handling Guidelines** Train handling guidelines for starting, stopping, slowing, and controlling trains as well as unplanned stops.

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January 20, 2012

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34.2.1: Starting/Accelerating Train

34.2.1	**Starting/Accelerating Train**

A. **On level and ascending grade:**

- Advance the throttle to a position sufficient to hold the train when necessary and verify that DP consist(s) are loading.
- Release the automatic brake.
- Use the lowest throttle position possible to start the train. It may be necessary to limit starting acceleration by use of the independent brake.
- Allow the locomotive load meter to stabilize before advancing the throttle to the next higher position.
- Once the train is moving, do not increase the throttle until the locomotive load meter stabilizes.
- To accelerate, advance the throttle slowly, one notch at a time to avoid excessive draft forces.
- In curved territory, use only enough power to start the train to reduce the possibility of string-lining in curves because of excessive lateral forces.
- Trains operating with cut-in helper and/or rear helper should have the helper throttle setting higher than the head end consist.
- If the train will not start, reapply brakes, reduce throttle to idle, and determine the cause. Applying power on a standing DC locomotive longer than necessary will damage traction motors.

B. **On descending grade:**

1. With the independent brake fully applied, activate the dynamic brake.
2. Release the automatic brake and wait for all brakes to release and slack to adjust. On heavy descending grades the automatic brakes may remain applied.
3. Trains with cut-in helper and/or rear helper should have the throttle setting in idle or low throttle setting if the entire train is on descending grade.
4. Gradually reduce the independent brake until the train begins to move.
5. Release the independent brake as the dynamic brake becomes effective.
6. Adjust dynamic brake on head consist to allow train to accelerate and to accelerate and on cut-in and/or rear helper to control speed and in-train forces.

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May 2, 2016

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34.2.2: Slowing or Controlling Speed

34.2.2	**Slowing or Controlling Speed** When slowing or controlling train speed, the following methods should be utilized (listed in preferred order): 1. Throttle modulation. 2. Dynamic braking. 3. Dynamic braking supplemented with train air brakes. 4. Stretch braking.

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May 2, 2016

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34.2.3: Slowing/Controlling Speed on Level or Descending Grade, with Dynamic Brakes, Slack Bunched

34.2.3	**Slowing/Controlling Speed on Level or Descending Grade, with Dynamic Brakes, Slack Bunched** When slowing or controlling speed on level or descending grade with dynamic brakes, do the following: 1. If in power, gradually reduce the throttle to idle. 2. To avoid excessive buff forces, activate the dynamic brake and gradually bunch the slack. 3. Increase braking to the desired level. 4. If necessary to control speed, make a minimum brake pipe reduction and further split reduction(s) as needed. 5. When the speed is controlled and the automatic brake is released, maintain enough dynamic braking to keep the slack bunched until the brakes release throughout the train.

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May 2, 2016

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34.2.4: Stretch Braking

34.2.4 Reference Rule 33.1.3 34.5.1	**Stretch Braking** Stretch braking is permitted only where more fuel efficient methods will not provide the necessary control of slack and/or train speed. Stretch braking above throttle position 6 is prohibited. When it becomes necessary to apply the train brakes while in power, ensure that locomotive brakes do not apply and observe the following: 1. Make the desired throttle adjustment sufficiently in advance to allow the slack to adjust. 2. After the slack has adjusted, make a minimum brake pipe reduction. 3. Reduce the throttle when tractive effort increases from the effect of the brake pipe reduction. If a portion of the train is on a grade, the drawbar force may increase rapidly, requiring further throttle reduction(s). 4. A distributed power train with cut-in helper and/or rear helper must not have a lower throttle setting than the head end consist. 5. Make additional brake pipe reductions as necessary. If the entire train is on a descending grade and the train brakes must remain applied, it is permissible to use limited power to control train speed. Do not exceed throttle position 4, reducing throttle as necessary to prevent excessive tractive effort. Note: When operating a DP train in a DP Loss of Communication situation, plan ahead to avoid Stretch Braking. Stretch Braking in a Loss of Communication situation will cause a Comm Loss Idle Down on the DP remote consist.

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May 2, 2016

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34.2.5: Ascending Grade

34.2.5	**Ascending Grade** When slowing or controlling speed on an ascending grade, do the following: • Allow the grade to slow the train. • Reduce the throttle one notch at a time to maintain a slack-stretched condition. • If necessary, make automatic brake pipe reduction(s) to reduce speed.

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34.2.6: Cresting Grade

34.2.6	**Cresting Grade** When approaching and cresting a grade: 1. Reduce the throttle as the lead locomotive crests the grade. 2. On the lead consist, continue to reduce the throttle and/or apply dynamic brake when necessary to keep the speed from increasing or make slack adjustments. 3. When cresting grade with cut-in help and or rear helper(s), reduce helper throttle consistent with good train handling to minimize in train forces, utilizing independent mode as needed. When operating in heavy or mountain grades, refer to System Special Instructions and/or site specific train handling instructions for additional requirements.

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May 2, 2016

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34.2.7: Undulating Grade

34.2.7	**Undulating Grade** On trains without entrained helper(s), when slowing or controlling speed on undulating grade: 1. As the train approaches the undulation, reduce the throttle as necessary to control train speed. 2. Reduce the throttle further as the head end of the train begins descending. 3. Just before the head end of the train reaches the ascending grade, increase the throttle. 4. Continue to increase the throttle as the train ascends the grade. 5. Reduce the throttle as the rear of the train approaches the ascending grade. On trains with cut-in and/or rear helper(s), do not operate DP trains in synchronous mode through undulations. When slowing or controlling speed on undulating grade: 1. In undulating territory, distributed power trains should be operated in independent mode. (Site specific train handling instructions may apply). 2. As the train crests the grade, reduce the throttle on head end consist as necessary to control train speed. 3. Cut-in helper and/or rear helper should have the throttle setting higher than the head end consist. 4. Reduce the throttle on head end consist as the head end of the train begins descending.

	5. On trains with both cut-in helper and rear helper, when the cut-in helper crests the grade, move the fence so the head end consist and cut-in helper are in synchronous mode and rear helper is in independent mode. 6. Reduce the throttle setting on the rear helper, as needed when the rear helper crests the grade. 7. Just before the head end of the train reaches the bottom of the hill, increase the throttle on head end consist. 8. When the rear helper reaches the top of the grade, make sure the head end consist is at a higher throttle setting than the rear consist. 9. Continue to increase the throttle on head end consist as the train ascends the grade. 10. Gradually increase the throttle on rear consist until the throttle setting is greater than the lead consist. Maintain sufficient power on the helper(s) to control slack. Site specific train handling instructions may apply.

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May 2, 2016

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34.2.8: Stopping

34.2.8 Reference Rule 31.5 34.5.1	**Stopping** **A. Level or Descending Grade using Dynamic Brake** When stopping on level or descending grade using dynamic brake: 1. If in power, gradually reduce the throttle to idle. 2. Activate the dynamic brake and gradually bunch the slack. 3. At a sufficient distance from the stop, make a minimum brake pipe reduction. 4. Make further split reduction(s) as needed. 5. As dynamic brake retarding force decreases, apply independent brake to avoid slack run-out. **B. Level or Descending Grade without Dynamic Brake** When stopping on level or descending grade: 1. If in power, gradually reduce the throttle and wait for the slack to adjust. 2. At a sufficient distance from the stop, make a minimum brake pipe reduction. 3. Make further split reduction(s) as needed. 4. As the train comes to a stop, use no more independent brake than necessary to maintain a slack bunched condition. **C. Level or Ascending Grade, Slack Stretched**

	When stopping on level or ascending grade: 1. Gradually reduce the throttle. 2. Maintain sufficient power to keep slack stretched while allowing train to slow. 3. If necessary, make automatic brake pipe reduction(s) to reduce speed. 4. When train is approaching the stopping point, make a brake pipe reduction. 5. As train comes to a stop apply independent brake. 6. After the independent brake is fully applied, reduce the throttle to idle.

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May 2, 2016

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34.2.9: Unplanned Stops

34.2.9	**Unplanned Stops** **A. Non-Emergency** To stop in the shortest possible distance without using an emergency brake application, use the following procedure: 1. Make a minimum brake pipe reduction before making a throttle change. When exhaust stops, make additional brake pipe reduction(s) as necessary. Consider train make-up when determining the amount of additional brake pipe reduction(s) necessary to stop train safely. • If train slack is stretched: 1. While brake pipe is exhausting, gradually reduce throttle. 2. Transition to dynamic brake, if conditions permit. • If train slack is bunched: 1. Gradually increase dynamic braking effort as train brakes become effective. 2. As brake pipe exhaust stops, make additional reduction(s) as necessary. 2. As train comes to a stop, apply independent brake. **B. Train Defect Detectors** When a detector is actuated, train must be stopped as soon as possible consistent with requirements contained in System Special Instructions governing train defect detectors. The type of detector, train makeup, slack condition, location of switches, grade and track curvature must be considered. **WARNING:** Heavy brake applications may cause complete failure of a defective hot journal before train stops.

Rule Updated Date

May 2, 2016

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34.2.10: Emergency Brake Applications

34.2.10 *49 CFR 232.407-f*	**Emergency Brake Applications** When emergency braking is necessary to protect life or property, use the maximum braking effort available consistent with safe train handling techniques. A. **Initiated by Engineer** When conditions warrant, use an emergency brake application and comply with the following: 1. Make an emergency brake application by moving the automatic brake valve handle quickly to EMERGENCY, and leave it there until the train or locomotive stops. 2. Lift the red cover of the EMERGENCY SWITCH, and activate the emergency valve on the end-of-train device (EOT) if equipped. 3. Actuate and hold the independent brake handle in the actuate position, then move the independent brake handle to a position in the application zone that will develop the desired brake cylinder pressure without sliding wheels or developing excessive buff or draft forces. 4. If in power, return throttle to idle. B. **Initiated by Other Than Engineer** Initiate an emergency brake application when: • Life or property is in danger. or • The engineer does not respond to warnings or signals to reduce train speed or stop the train. Crew members must know the location of the emergency brake valves. C. **Undesired Emergency** When an undesired emergency (UDE) brake application occurs, move the automatic brake valve handle to EMERGENCY until the train stops. Actuate and hold the handle in the actuate position, while moving the independent handle to a position in the application zone that will develop the desired brake cylinder pressure without sliding wheels or developing excessive buff or draft forces. Make throttle adjustments to control slack and prevent excessive buff or draft forces. After stopping, if operating conditions permit, place the automatic brake valve handle in RELEASE to release the brakes and help locate the air hose separation or other problems. Promptly notify dispatcher of the occurrence.

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May 2, 2016

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34.2.11: Shoving Equipment

34.2.11	**Shoving Equipment** When shoving equipment, use the lowest throttle position possible to avoid jackknifing, wheel climb, or rail turnover. **A. Starting on Level or Ascending Grade** When starting a shoving movement on a level or ascending grade: 1. Release the automatic brake, and wait for slack to adjust. 2. Reduce the independent brake, and use the lowest possible throttle position to start the movement. 3. As speed increases, reduce the independent brake until it is fully released. 4. If you notice a significant increase in tractive effort or if train speed slows without a change in throttle position, stop immediately and determine the cause. **B. Starting on Descending Grade with Slack Stretched** When starting a shoving movement on a descending grade with slack stretched: 1. Ensure that the independent brake is fully applied. 2. Activate the dynamic brake to full. 3. Release the automatic brake, and wait for slack to adjust. 4. Reduce the independent brake gradually as the train begins to move. 5. Slowly release the independent brake as the dynamic brake becomes effective. **C. Stopping on Ascending Grade, Slack Bunched** When stopping shoving movements on an ascending grade with the slack bunched, do the following: 1. Use the lowest possible throttle position to maintain a slack bunched condition. 2. At a sufficient distance from the stop, make a minimum brake pipe reduction. 3. Make further split reduction(s) as needed. 4. Observe tractive effort and reduce the throttle as necessary to avoid high buff forces. 5. As the train stops, fully apply the independent brake. 6. After the independent brake is applied, reduce the throttle to idle. **D. Stopping on Level or Descending Grade with Slack Stretched**

	When stopping shoving movements on level or descending grade with the slack stretched, do the following: 1. If in power, gradually reduce the throttle to idle and allow the slack to adjust. 2. Activate the dynamic brake. If the dynamic brake is unavailable use the independent brake to maintain a slack-stretched condition. 3. Gradually increase braking to the desired level. 4. At a sufficient distance from the stop, make a minimum brake pipe reduction. 5. If needed, make further split reduction(s). As the train comes to a stop, use independent brake as necessary to maintain a slack stretched condition.

Rule Updated Date

May 2, 2016

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34.2.12: Switching Movements

34.2.12	**Switching Movements** When switching cars, the following must be considered: 1. When starting, slowing, or stopping switching movements, gradually stretch or bunch slack. • When starting RCL movements, including light engine, use the "couple" setting. 2. Care must be taken to limit buff and draft forces and avoid damage to track and equipment when: • Using multiple locomotives in consist. • Switching with air brakes cut-in on one or more cars. 3. Do not use automatic brake to increase locomotive brake cylinder pressure.

Rule Updated Date

January 20, 2012

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34.2.13: Disturbed Track/Temporary Speed Restrictions/Heat Restrictions

34.2.13	**Disturbed Track/Temporary Speed Restrictions/Heat Restrictions**

	When proceeding through the limits of the track bulletin, radio speed restriction, or wherever instructed to comply with Rule 34.2.13, the engineer must use the following train handling techniques to minimize in-train forces when possible: • Use throttle modulation or low dynamic brake amperage. • Avoid making slack adjustments. • Avoid applying or releasing automatic brakes. • Make power and brake adjustments before or after the restriction. When operating with distributed power at the rear of the train: • When in power, operate in synchronous mode or in independent mode with distributed power 1-3 throttle notches below the lead consist. • When in dynamic brake, operate in synchronous mode or in independent mode with distributed power 1-3 throttle positions above the lead consist. Note: When operating with an Energy Management System, allow the system to operate as designed.

Rule Updated Date

September 30, 2016

System Special Instructions

Effective Date: June 1, 2017

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34.2.14: Thermal Misalignment

34.2.14	**Thermal Misalignment** When an obvious thermal misalignment is observed ahead of a moving train, the train must be stopped, if possible, prior to the lead locomotive passing over the misaligned track. If the train cannot be stopped in time with service applications, to minimize additional buff forces imparted on the track, the preferred method for train handling is as follows: • When the train is equipped with a two-way EOT, stop the train using the emergency toggle switch on the HED to place the train into emergency from the rear end and control slack. • When the train is equipped with distributed power, stop the train using a full service brake application.

Rule Updated Date

January 20, 2012

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34.3: Grade Operations

34.3	**Grade Operations** The following must be considered when operating in grade territory: • Tons per operative brake. • Tons per dynamic brake axle. • Percent of grade. • Track curvature. • Rail and weather conditions. • Train speed, ensuring that maximum speed is consistent with grade limitations required by area timetables. • Train Make-Up. • Distributed Power Placement.

Rule Updated Date

May 2, 2016

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34.3.1: Balance Braking

34.3.1	**Balance Braking** When a constant speed on a grade is required for long distances, use a combination of train air brakes and dynamic brake as follows: 1. Make a minimum brake pipe reduction when dynamic brake is not sufficient to maintain speed. 2. Use additional reductions until the desired speed is maintained. 3. If a greater than 18-psi brake pipe reduction is required to control train speed, stop the train using emergency application and inspect to determine reason before proceeding. **Exception:** If an 18-psi reduction is due to Equalizing Reservoir leakage, apply Item 4 below. 4. If equalizing reservoir leakage is discovered and speed is decreasing, stop and secure the train, if necessary. After placing the automatic brake handle in release, place the brake valve cutoff valve in PASSENGER, if equipped. While operating in PASSENGER, movement of the automatic brake valve handle toward RELEASE will release the brakes throughout the train. When practicable, use a combination of train air brakes and dynamic brake to control speed when operating on descending grades exceeding 1.75%.

Rule Updated Date

January 20, 2012

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34.3.2: Recharging on a Grade

34.3.2	**Recharging on a Grade** When necessary to recharge the air brake system while stopped on a grade and the independent brakes may not hold the train: 1. Apply a sufficient number of hand brakes. 2. Leave independent brake fully applied, and release the automatic brake. 3. Recharge the air brake system. 4. After recharging the system, make a sufficient brake pipe reduction to hold the train while releasing the hand brakes. Do not apply power to hold a train stationary on a grade unless: • All locomotive units in the consist are AC locomotives; or • When DC locomotive(s) in consist are isolated, remaining AC locomotives may be used to hold train.

Rule Updated Date

January 20, 2012

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34.4: Delayed Departure

34.4 Reference Rule 33.8.4	**Delayed Departure** When stopped and movement is delayed, apply train brakes with at least a 10-psi brake pipe reduction when operating conditions permit. (Does not apply to lite power consists when all locomotives are MU'd.) Do not release train brakes until ready to proceed except when: • Stopped on a grade where it will be necessary to reapply the brakes or will not require the brakes to be released to start the train.

	• Charging the brake system in heavy or mountain grade territory. • Making air test and train movement is initiated within 10 minutes after releasing the train brakes. When trains equipped with an operable EOT are stopped and movement delayed, before moving, verify brake pipe continuity by releasing the air brakes (unless on descending grade and the train brakes will remain applied), and observe an increase in pressure on the EOT prior to moving the train. Distributed power trains must use the automated train check feature to verify brake pipe continuity. Suspect trainline blockage when a decrease in pressure occurs at the rear of the train that has not been initiated by a brake pipe reduction; cause must be determined before departing: • Inspect train for cause of blockage. • A visual observation of a set and release at the rear car is sufficient to determine that no blockage exists. If excessive tractive effort is needed (based on existing conditions) to start the train, inspect the train to determine the cause.

Rule Updated Date

May 2, 2016

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34.5: Car Air Brakes

34.5 Car Air Brakes

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January 20, 2012

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34.5.1: Applying or Reapplying Automatic Brakes

34.5.1	**Applying or Reapplying Automatic Brakes** When applying or reapplying automatic brakes, make brake pipe reductions according to these guidelines: • Make a minimum reduction followed by additional reductions, as necessary. • Charged condition of brake pipe must be considered before reapplying air brakes.

	• Make a final reduction when operating conditions permit as train is nearing a stop to prevent a run out of slack. To prevent the locomotive brakes from applying during an automatic brake application, the independent brake valve handle must be actuated (bailed) when application is made and held in ACTUATE position until exhaust ceases.

Rule Updated Date

January 20, 2012

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34.5.2: Releasing Brakes

34.5.2	**Releasing Brakes** Before releasing the brakes, consider the following conditions to avoid damage to equipment, lading, or track: • Train speed. • Train makeup. • Weather conditions. • Physical characteristics of territory. • Amount of brake pipe reduction. Running release of the automatic train brakes must not be made when brake application is 18-psi or greater. When operating conditions allow releasing the brakes allow the exhaust at the automatic brake valve to stop before releasing the train brakes.

Rule Updated Date

May 2, 2016

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34.5.3: Unintentional Brake Release

34.5.3 *49 CFR 232.103* Reference Rule 32.7.1	**Unintentional Brake Release** If an unintentional brake release occurs while the brakes are applied, stop the train and determine the cause before proceeding. Promptly notify dispatcher of the occurrence.

Rule Updated Date

January 20, 2012

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34.5.4: Regulating Valve Braking

34.5.4	**Regulating Valve Braking** Use of the regulating valve to control braking is prohibited.

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January 20, 2012

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34.5.5: Retaining Valves

34.5.5	**Retaining Valves** Retainers may only be used after consulting with a DSLE for the location involved. When retaining valves are used: • Retaining valves must be set in the "HP" (High Pressure) position on the entire train. • Do not exceed 15 MPH. • Freight car brake cylinder pressure is not retained until a brake pipe reduction of at least 10-psi has been made and released. Further brake pipe reductions will add to this pressure in the brake cylinder. When retaining valves are not in use, place them in EX (Exhaust).

Rule Updated Date

June 1, 2018

System Special Instructions

Effective Date: June 1, 2018

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34.5.6: Use of Automatic Brakes During Cold Weather Conditions

34.5.6	**Use of Automatic Brakes During Cold Weather Conditions**
49 CFR 232.107	During extreme cold weather, (below 10 degrees F) when operating conditions and site-specific instructions permit, throttle manipulations and dynamic braking must be used in lieu of train air brakes whenever possible in controlling and stopping freight trains.

Rule Updated Date

May 2, 2016

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34.6: Locomotive Operation

34.6 Locomotive Operation

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January 20, 2012

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34.6.1: Independent Brake (Locomotive Brake)

34.6.1	**Independent Brake (Locomotive Brake)** Use of the independent brake valve: • The independent brake valve on the controlling unit must be cut-in at all times, and the handle must not be blocked in actuate position. • The independent brake must not be applied while power or dynamic brake is being used except when starting, stopping, or to control wheel slips at speeds below 15 MPH. • When conditions require the independent brakes to be applied, brake cylinder pressure must be controlled to prevent overheating or sliding of the locomotive wheels, excessive slack action and high in-train forces. The independent brake must not be used when the same results can be obtained with the dynamic brake. • When controlling the independent brake during an emergency brake application, actuate while applying the independent brake to the desired pressure, without sliding the locomotive wheels. When emergency brake cylinder pressure is desired, release the handle from the actuate position. • The maximum independent brake cylinder pressure indicated for locomotive must not be exceeded.

Rule Updated Date

January 20, 2012

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34.6.2: Throttle and Reverser Positions

34.6.2	**Throttle and Reverser Positions** With the throttle open, the generator field switch must never be closed or moved to the "ON" position. When moving, reverser handle must not be in a position other than the direction of travel, except when loading a bulk commodity unit train. Reverser must be centered when locomotive is stopped. However, reverser may be left in forward position when train is stopped in ATC or ACS territory at locations where next signal is not visible.

Rule Updated Date

January 20, 2012

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34.6.3: Dynamic Braking

34.6.3 *49 CFR 232.109*	**Dynamic Braking** When using dynamic brake, comply with the following: • When lead or remote consist includes a DC locomotive, pause for 10 seconds in idle before changing from power to dynamic braking. • Do not supplement the dynamic brake with the locomotive brakes unless in the process of starting or stopping and speed is below the effective range of the dynamic brakes in your locomotive consist. • Comply with Equivalent Dynamic Brake Axle limitations by cutting out trailing locomotives(s) or traction motor(s). • Approaching and operating through turnouts or disturbed track areas with train's air brakes released, limit braking force to 50% of maximum. Continue to limit the braking effort until at least half the train has passed the restricted area.

Rule Updated Date

May 2, 2016

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34.6.4: Short Time Rating/Minimum Continuous Speed

34.6.4	**Short Time Rating/Minimum Continuous Speed** **A. Short Time Rating** Short time rating limits for DC locomotives when necessary, are indicated on rating plate located near or on the load meter; short time rating must not be exceeded. If the locomotive exceeds the short time rating, stop the train and double the train over the grade or allow traction motors time to cool before continuing, unless otherwise instructed. To provide for sufficient cooling of traction motors, allow the locomotive a minimum of 20 minutes without a short time event. **B. Minimum Continuous Speed** Minimum continuous speed is the slowest speed at which a DC locomotive can operate continuously in throttle position 8 before overheating. The minimum continuous speed varies and is indicated by the rating plate on the locomotive.

Rule Updated Date

January 20, 2012

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34.6.5: Penalty Brake Application

34.6.5 *49 CFR* *236.501* *236.503* *236.507* *236.511* *236.564* *238.237*	**Penalty Brake Application** A penalty brake application may be initiated by one of the following safety control devices: • Alertness Device. • Overspeed. • Cab Signal. • Positive Train Control. If a safety control device sounds a warning or when a penalty brake application occurs, comply with the following: 1. Move automatic brake valve handle to SUPPRESSION position. 2. Hold the independent brake handle in the actuate position. Move the independent handle to a position in the application zone that will develop the desired brake cylinder pressure without sliding wheels or developing excessive buff or draft forces. After train stops, reset PCS and release brakes when operating conditions allow.

Rule Updated Date

October 10, 2017

System Special Instructions

Effective Date: June 1, 2018

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38.3: Operative Brakes

38.3	Operative Brakes

Rule Updated Date

January 20, 2012

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38.3.1: Defective Train Brakes

38.3.1 *49 CFR 238.15*	**Defective Train Brakes** Commuter/business equipment that develops inoperative brakes en route may be moved in compliance with **Rule 38.3.4** when a tag or card is placed on both sides of the defective passenger equipment. The information on the tag or card must include: • Equipment number. • Railroad. • Location. • Date. • Nature of defect. • Destination for repair. • Legible signature and title of person reporting the defect.

Rule Updated Date

May 2, 2016

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38.3.2: Operative Brake Conditions

38.3.2 *49 CFR 238.15*	**Operative Brake Conditions** The following brake conditions do not render car air brakes inoperative for the purpose of calculating operative brakes: • Failure or cutting out of dynamic or blended brake systems. • Inoperative or otherwise defective hand brakes or parking brakes.

	• Piston travel in excess of the Class I brake test limits. • Power brakes overdue for inspection, testing, maintenance, or stenciling.

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May 2, 2016

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38.3.3: Operable Brakes

38.3.3
 	
49 CFR 238.215
 	
Reference Rule 38.3.4
	Operative Brakes
	
	When necessary to cut-out air brakes en route on Commuter/Business trains, the crew must comply with the following restrictions when braking percentage drops below 100%:
	
	• 85 to 99%
	  • Operate at normal speed.
	  • Continue normal operation to either next repair point or end of trip, whichever occurs first.
	• 75 to 84%
	  • Do not exceed 40 MPH.
	  • Discharge passengers at the next station where it is safe to do so.
	  • Proceed to nearest repair point.
	• 50 to 74%
	  • Do not exceed 20 MPH.
	  • Discharge passengers at next forward station.
	  • Proceed to nearest repair point.
	• Less than 50%
	  • Train must not be moved with passengers on board.
	  • Do not exceed 20 MPH to nearest repair point.
	
	To calculate operative brake percentage:
	
	1. Determine total number of trucks in the train.
	2. Subtract the number of cutout trucks from the total number of trucks in the train.
	  • Count each cut-out locomotive truck as 2 cut-out trucks.
	3. Divide the number of operative trucks by the total number of trucks in the train then multiply it by 100.
	
	Example: Train Information – 1 Locomotive / 2 trucks and 5 Cars / 10 trucks
	
	The crew is required to cut-out one truck on a car. Use the following formula to calculate the new braking percentage:

	Locomotive trucks + car trucks 2 + 10 = 12 Total trucks
	
	Subtract BO truck(s) = 1 from total trucks
	
	12 – 1 = 11 Total operative trucks
	
	Divide number of operative trucks by the total number of trucks in the train, then multiply by 100.
	
	Operative trucks 11/ total trucks 12 = .916 X 100 = 91.6%
	
	When Front or Rear Unit is Inoperative
	
	If power brakes on the front or rear unit are inoperative, the following shall applies:
	
	• If the hand brake is located inside the interior of the equipment:
	  • A Qualified Person must be stationed at the hand brake on the unit.
	  • The car must be locked out and empty, except for the railroad employee manning the hand brake.
	  • Comply with applicable speed restriction.
	• If the hand brake is located outside the interior of the equipment or is inaccessible to a Qualified Person:
	  • The car must be locked out and empty.
	  • The train may be moved at Restricted Speed to the first location where car must be removed or repositioned in the train.
	• Notify the Mechanical Department of the failure.

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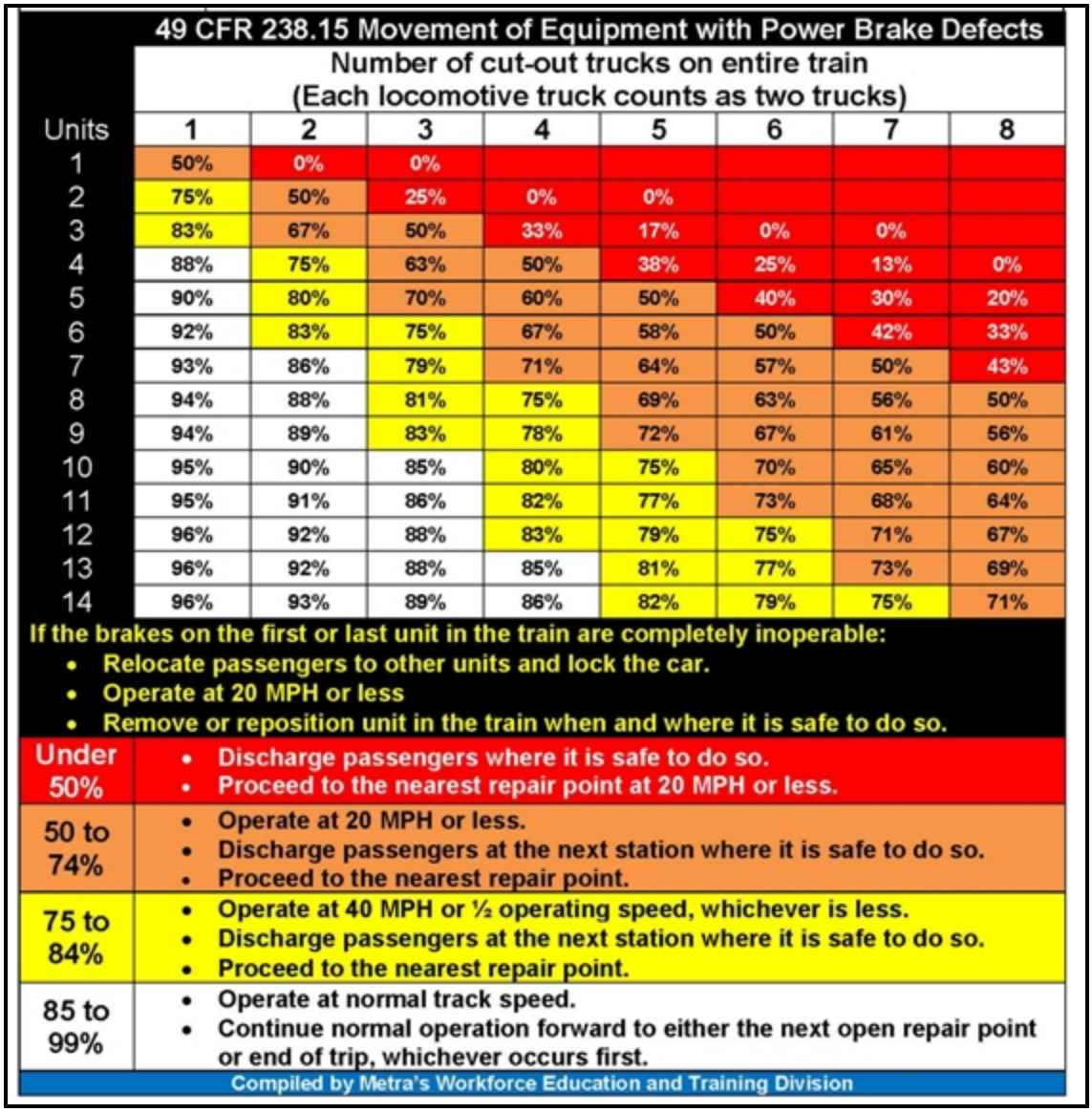
38.3.4: Defective Brake Chart

38.3.4	**Defective Brake Chart**



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Units	Number of cut-out trucks on entire train (Each locomotive truck counts as two trucks)							
	1	2	3	4	5	6	7	8
1	50%	0%	0%					
2	75%	50%	25%	0%	0%			
3	83%	67%	50%	33%	17%	0%	0%	
4	88%	75%	63%	50%	38%	25%	13%	0%
5	90%	80%	70%	60%	50%	40%	30%	20%
6	92%	83%	75%	67%	58%	50%	42%	33%
7	93%	86%	79%	71%	64%	57%	50%	43%
8	94%	88%	81%	75%	69%	63%	56%	50%
9	94%	89%	83%	78%	72%	67%	61%	56%
10	95%	90%	85%	80%	75%	70%	65%	60%
11	95%	91%	86%	82%	77%	73%	68%	64%
12	96%	92%	88%	83%	79%	75%	71%	67%
13	96%	92%	88%	85%	81%	77%	73%	69%
14	96%	93%	89%	86%	82%	79%	75%	71%

If the brakes on the first or last unit in the train are completely inoperable:

- Relocate passengers to other units and lock the car.
- Operate at 20 MPH or less
- Remove or reposition unit in the train when and where it is safe to do so.

Under 50%	• Discharge passengers where it is safe to do so. • Proceed to the nearest repair point at 20 MPH or less.
50 to 74%	• Operate at 20 MPH or less. • Discharge passengers at the next station where it is safe to do so. • Proceed to the nearest repair point.
75 to 84%	• Operate at 40 MPH or ½ operating speed, whichever is less. • Discharge passengers at the next station where it is safe to do so. • Proceed to the nearest repair point.
85 to 99%	• Operate at normal track speed. • Continue normal operation forward to either the next open repair point or end of trip, whichever occurs first.

Compiled by Metra's Workforce Education and Training Division

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39.0: Equipment Charts/Diagrams - Brakes - Chapter 39

39.0: Freight Car and Locomotive Components

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39.1: Freight Car Components

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39.1.1: Freight Car End and Platform Identification

39.1.1	**Freight Car End and Platform Identification** Identify car ends as follows: • On cars with one hand brake, the "B" end of the car is the end with the hand brake. The other end is the "A" end. • On cars with more than one hand brake, the letters "A" and "B" are stenciled on the appropriate ends of the car. • On cars with more than one platform, each section is stenciled. Example: A five-platform articulated spine car is designated with an "A" platform on one end and the adjacent platform is designated as "E" then "D", then "C" and then "B" on the opposite end.

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39.1.2: Wheel and Journal Identification on Cars

39.1.2	**Wheel and Journal Identification on Cars** To determine the correct wheel numbers on cars: 1. Face the "B" end of the car. 2. From the "B" end of the car, identify the designation of wheels, journals, and axles as follows: • Axles are designated from the "B" end of the car with "1" for the axle closest to the "B" end. • Wheels and journals are designated left or right as viewed from the "B" end.

	• Specific wheels are identified using the axle and wheel designation.

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39.1.3: High Strength Couplers

39.1.3	**High Strength Couplers** Each car is to be considered equipped with a standard type coupler unless it is known the car is equipped with high strength couplers. Coal cars, covered hopper cars and cars designed to carry TOFC vans and/or containers are equipped with high strength couplers. If it is not known that a car is equipped with high strength couplers, it can be determined by looking at the coupler casting identification located on top of the coupler. A high strength coupler will have the letter "E", "EA", or "EX" as the last character(s) of identification. Examples of high strength coupler identifications are E60HTE, SBE60CE, E60DE, EF512WEX.

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39.1.4: Freight Car A-1 Reduction Relay Valve

39.1.4	**Freight Car A-1 Reduction Relay Valve** Some long cars have an A-1 reduction relay valve that helps transmit a service or emergency brake pipe reduction by compensating for the added brake pipe length of the car. The relay valve functions as follows: • Service brake reductions are assisted through the B-1 quick service portion. • Emergency brake pipe reductions are transmitted by the No. 8 vent valve portion. If the No. 8 vent valve fails to reset after an emergency brake application, causing a continuous blow at the exhaust port, plug the valve by removing the vent protector and screwing in the threaded plug. The following freight cars are equipped with the relay valve: • Cars with AB or ABD control valves and more than 75 feet of brake pipe between hose couplings. • Cars with ABDW control valves and more than 100 feet of brake pipe between hose couplings.

	Note: Cars with ABDW control valves having between 75 and 100 feet of brake pipe have a No. 8 vent valve added.

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39.1.5: Freight Car Automatic Vent Valve

39.1.5	**Freight Car Automatic Vent Valve** Some multi-platform cars are equipped with what is known as an automatic vent valve (AVV), which is an emergency portion of a control valve. This valve is used only to propagate an emergency brake application through the brake pipe. Should an AVV become defective, the cutout cock is used to cut it out.

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39.1.6: Retaining Valves

39.1.6	**Retaining Valves** The retaining valve on each car controls the brake cylinder pressure exhaust. All freight cars have retaining valves located at the "B" end of the car or at the side near the control valve. The retaining valve can be positioned to function as follows during a brake release: • Allow the exhaust of brake cylinder pressure to atmosphere. • Retain brake cylinder pressure while the system is recharged. **A. Three-Position Retaining Valve** The three-position retaining valve includes these positions. • DIRECT EXHAUST (EX)-Exhausts all brake cylinder pressure. Handle is turned down. • HIGH PRESSURE (HP)-Exhausts brake cylinder pressure to 20 psi. Handle is 45 degrees below horizontal. • SLOW DIRECT EXHAUST (SD)-Exhausts brake cylinder pressure for a blow down time of approximately 86 seconds and continues to exhaust until all pressure is vented. Handle is 45 degrees above horizontal.

	B. Four-Position Retaining Valve The four-position retaining valve includes the positions listed above and one additional position: • LOW PRESSURE (LP)-Exhausts brake cylinder pressure to 10 psi. Handle is horizontal.

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39.1.7: Charging Time Chart

39.1.7

Charging Time Chart

When the brake system is uncharged and not equipped with an air flow meter, use the following chart to determine the minimum and maximum charging times:

Minimum and Maximum Charging Times When Brake System is Empty

Brake Pipe Length (in feet)	**Minimum Charging Time** (Minutes)	**Maximum Charging Time** (Minutes)
2500 or less	8	25
3000	10	30
4000	15	35
5000	20	40
6000	26	55
7000	35	65
8000	45	75
9000	57	100
10,000	71	125
11,000	80	160

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39.2: Locomotive Components

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39.2.1: Automatic Brake Valves

39.2.1	**Automatic Brake Valves** **A. 24RL-MC Automatic Brake Valve** The 24RL-MC automatic brake valve is a maintaining, non-self-lapping automatic brake valve. This brake valve maintains in LAP. Therefore, cut-out the maintaining feature during brake pipe leakage tests. Handle positions include: • FULL RELEASE - Releases the train and locomotive brakes and charges the brake pipe through the regulating valve, preventing overcharge. When the handle is in this position, air is heard exhausting at the brake valve. • RELEASE - Releases the train and locomotive brakes and charges the brake pipe through the regulating valve. • FIRST SERVICE - Reduces the equalizing reservoir 6 to 10 psi at a service rate, then continues to reduce brake pipe pressure at a slow rate. • LAP - Maintains brake pipe pressure at the same level as equalizing reservoir pressure. • SERVICE - Reduces equalizing reservoir and brake pipe pressures at a service rate. • EMERGENCY - Vents brake pipe pressure directly to the atmosphere, causing brakes to apply at an emergency rate. **B. 24RL-MC1 Automatic Brake Valve** The 24RL-MC1 automatic brake valve is a maintaining, non self-lapping automatic brake valve. This brake valve maintains in MAINTAINING. Use LAP during brake pipe leakage tests. Handle positions include: • FULL RELEASE - Releases the train and locomotive brakes and charges the brake pipe through the regulating valve, preventing overcharge. When the handle is in this position, air is heard exhausting at the brake valve. • RELEASE - Releases the train and locomotive brakes and charges the brake pipe through the regulating valve. • MAINTAINING - Maintains brake pipe pressure at the same level as equalizing reservoir pressure. After making a brake pipe reduction, maintain brake pipe pressure by returning the

automatic brake handle to MAINTAINING without pausing in LAP.

Note: Pausing in LAP may allow leakage to reduce brake pipe pressure below equalizing reservoir pressure. The brakes will release when you return the handle to MAINTAINING if equalizing reservoir pressure is above brake pipe pressure.

- LAP - Prevents air from leaving or entering the brake pipe at the automatic brake valve. All ports in the brake valve are closed. Brake pipe leakage will continue to reduce brake pipe pressure at the same rate as the leakage. This position is also used for conducting brake pipe leakage tests and recovering from a penalty application.
- SERVICE - Reduces the equalizing reservoir and brake pipe pressures at a service rate.
- EMERGENCY - Vents brake pipe pressure directly to the atmosphere, causing brakes to apply at an emergency rate.

C. 26C, 30CDW, Knorr CCB and WABCO EPIC Automatic Brake Valves

These maintaining, self-lapping brake valves regulate brake pipe pressure, controlling both locomotive and train brakes.

Brake Valve Features
These automatic brake valves have these features:

- The maintaining feature maintains constant brake pipe pressure unless the cutout valve is in OUT.
- The regulating valve controls the supply of air pressure to the equalizing reservoir, which regulates brake pipe pressure.

Handle Positions:

- RELEASE - Charges the brake pipe to the regulating valve setting and releases the locomotive and train brakes.
- MINIMUM REDUCTION - Reduces equalizing reservoir and brake pipe pressures 6 to 8 psi.
- SERVICE ZONE - Gradually reduces equalizing reservoir and brake pipe pressures in increasing amounts as the brake handle is moved to the right.
- Moving the brake handle to the left with the brake valve cutout valve in PASS will increase equalizing reservoir and brake pipe pressures. Use extreme care when operating freight trains with the automatic brake valve cutout valve in PASS.
- FULL SERVICE POSITION - Reduces equalizing reservoir and brake pipe pressures to near equalization.
- SUPPRESSION - Restores control of the locomotive after a penalty brake application. To recover, leave the brake handle in this position for 60 seconds.
- HANDLE OFF/CONTINUOUS SERVICE - Reduces equalizing reservoir and brake pipe pressures at a service rate. Use this handle position for:
    - Trailing locomotives
    - Helper locomotives that do not control the air brake system
    - Locomotives hauled dead-in-train

	• EMERGENCY - Vents brake pipe pressure directly to the atmosphere, causing brakes to apply at an emergency rate.

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39.2.2: Automatic Brake Valve Cutout Valve

39.2.2	**Automatic Brake Valve Cutout Valve**
	
	The automatic brake valve cutout valve determines how and when the automatic brake controls brake pipe pressure.
	
	There are two-position and three-position cutout valves. These cutout valves are spring-loaded and must be pushed in or pulled out before changing positions.
	
	Note: EMERGENCY is always available regardless of the position of the automatic brake valve cutout valve.
	
	A. Two-Position Cutout Valve
	
	The two-position cutout valve has these positions:
	
	• IN - Provides control of brake pipe pressure from the automatic brake valve. Equalizing reservoir and brake pipe pressures will increase when the automatic brake valve is in RELEASE.
	• OUT - Disconnects control of brake pipe pressure from the automatic brake valve. Use this position when:
	  ○ Not using the automatic brake valve to control brake pipe pressure (trailing locomotives or locomotives hauled dead-in-train).
	  ○ Conducting brake pipe leakage tests.
	
	B. Three-Position Cutout Valve
	
	The three-position cutout valve has these positions:
	
	• FRT - Same as IN position described in two-position cutout valve above.
	• OUT - Same as OUT position described in two-position cutout valve above.
	• PASS - Provides control of brake pipe pressure from the automatic brake valve. Equalizing reservoir pressure and brake pipe pressure will increase from any movement of the brake handle toward RELEASE. Use this position when operating passenger or commuter trains to utilize the graduated release feature.
	
	Note: In freight service, if the equalizing reservoir is leaking, PASS may be used only if it is necessary to maintain constant brake pipe pressure during an automatic brake application. Because of the

	possibility of an undesired release, placing the three-position cutout valve in PASS position must only be done with the automatic brake valve handle in RELEASE position.

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39.2.3: Independent Brake Valves

39.2.3	**Independent Brake Valves** The following describes the positions and functions of the independent brake valve: • RELEASE - Normal position for full release of the locomotive brakes. • ACTUATE - To release the locomotive brakes during an automatic brake application, depress the handle. • APPLICATION ZONE - All handle movements between RELEASE and FULL APPLICATION increase or decrease locomotive brake cylinder pressure as follows: 1. Increase by moving the brake handle to the right (or forward). 2. Decrease by moving the brake handle to the left (or back towards operator). • FULL APPLICATION. Position for creating maximum locomotive brake cylinder pressure from the independent brake system.

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39.2.4: MU-2A/Double-Ported Cutout Cock

39.2.4	**MU-2A/Double-Ported Cutout Cock** The handle for the MU-2A cutout cock is spring-loaded; push it in before changing positions. The MU-2A valve has three positions: LEAD - Engages control of the independent brakes. Use when a locomotive is a single or controlling unit. Dead - Used when locomotive is being hauled dead-in-train.

	TRAIL - Disconnects control of the independent brakes from the independent brake valve. Use when a locomotive is a trailing unit in a multiple-unit consist. The double-ported cutout cock has two positions: IN - Engages control of the independent brakes on a single locomotive or on the controlling locomotive of a multiple-unit consist. Use IN also when a locomotive is hauled dead-in-train. OUT - Disconnects control of the independent brakes from the independent brake valve. Use OUT when a locomotive is trailing in a multiple-unit consist.

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39.2.5: Electro Pneumatic Automatic and Independent Brake Valves

39.2.5	**Electro Pneumatic Automatic and Independent Brake Valves** Electro pneumatic automatic and independent brake valves (Knorr CCB or WABCO EPIC) are cut-in or cut-out through electronic display screens. The air brake setup screens options are: • Independent Brake: 1. Lead. Or 2. Trail. • Automatic Brake Valve: 1. Pass (passenger-to be used only in passenger service). 2. Freight. Or 3. Cut Out. **Note:** To avoid an undesired emergency brake application when cutting in the automatic brake on these systems, cut-in the independent brake first by selecting "Lead" and saving changes before changing automatic brake valve setup to "Freight" (or "Pass"). Most units now have graceful cut-in eliminating this problem.

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39.2.6: Locomotive Electronic Air Brake Computer Resets Resetting CCB Faults

39.2.6	**Locomotive Electronic Air Brake Computer Resets Resetting CCB Faults** Knorr CCB systems may sometimes detect a system fault en route or when setting up that may be cleared as follows: 1. Secure locomotive. 2. Close end cocks on affected unit, including main reservoir line. 3. Verify that air brake computer (CCB) circuit breaker is closed and remove reverser handle. 4. Set unit air brake setup to TRAIL. Note: If unit will not go to TRAIL, select LEAD, save and confirm. Try Step 4 again. 5. Place automatic brake valve handle in EMERGENCY position. 6. Place independent brake valve handle in RELEASE position. 7. After 60 seconds, place automatic brake valve handle in RELEASE position. 8. Change air brake setup to LEAD-CUT IN, and charge brake pipe to 90 psi. 9. Place automatic brake valve handle in SUPPRESSION position for 10 seconds. 10. Return automatic brake valve handle to RELEASE position. Allow equalizing reservoir and brake pipe to FULLY charge and allow brake cylinder pressure to go to 0 psi. 11. Place independent brake valve handle in FULL APPLICATION position. 12. Place independent brake valve handle in RELEASE position. 13. ACTUATE (BAIL) for 10 seconds. 14. Place automatic brake valve handle in EMERGENCY position. 15. After 60 seconds, place automatic brake valve handle in RELEASE position. 16. Place independent brake valve handle in FULL APPLICATION position. 17. Faults should be cleared. If faults do not clear, follow message instructions on operator's display.

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39.2.7: Air Flow Meter

39.2.7	**Air Flow Meter** The air flow meter measures the rate in cubic feet per minute (CFM) that air flows into the brake pipe. The Air Flow Method uses this meter to determine brake pipe leakage.

	A. Air Flow Meter Readings The air flow meter provides the following brake pipe flow information: • As the brake system begins charging, a high flow into the brake pipe is indicated by: **a.** Higher numbers (more than 60 CFM). or **b.** The pointer moving to the right. • As the brake system becomes charged, a lesser air flow into the brake pipe is indicated by: a. Lower numbers (less than 60 CFM). or b. The pointer moving to the left. • If the air flow meter shows a reading (less than 60 CFM or left of the calibration mark) that is stabilized, the brake system is charged. **B. Air flow information** The air flow meter also provides the following information about the train's brake system: • After a brake application and release, the air flow meter will indicate high flow. As the brake system recharges, the brake pipe flow rate will decrease until the air flow pointer reaches the reference value, indicating that the brake system is recharged. • Air flow less than the reference value may indicate a closed angle cock. • Air flow greater than the reference value may indicate increased leakage to the brake system. • With a brake application in effect, a decrease in air flow may indicate that an unintentional brake release is occurring. Once the air flow meter shows a constant reading, the engineer should: 1. Note the rate of flow and use this number as a reference to determine when the brake system is charged. 2. If the air flow meter is equipped, adjust the reference pointer to agree with the flow pointer. **Note:** This reading is a reference value to use to monitor fluctuations in air flow to the brake pipe.

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39.2.8: Overspeed Control

39.2.8	**Overspeed Control**
	
	The overspeed control prevents the train from running at speeds higher than the safe mechanical limits of the traction motors. It functions as follows:
	
	• If train speed increases to an unsafe level, the safety control device sounds a warning.
	• If the train does not slow within 6 to 12 seconds of the first warning sound, the overspeed control device applies the train brakes and trips the PC switch.
	
	Exception: Some BNSF locomotives allow an Overspeed Penalty Application to be prevented by placing automatic brake valve to MINIMUM position. When warning whistle is heard, move automatic brake valve to MINIMUM position. If speed reduces sufficiently, train brakes may be released, when desired. If Penalty Brake Application occurs as indicated by PCS open and service brake application, move automatic brake valve handle to SUPPRESSION to recover.
	
	A. Slowing Train due to Overspeed Application
	
	To slow the train when the safety control device sounds a warning, comply with the following:
	
	1. On locomotives with 26L, 30CDW, and CCB brake equipment, move the automatic brake handle to SUPPRESSION within the 6 to 12 second warning period.
	2. On locomotives with other brake equipment, reduce the brake pipe pressure 6 to 8 psi, or more if necessary.
	
	B. Recover Overspeed
	
	To recover when the overspeed control applies the train brakes:
	
	1. On locomotives with 26L, 30CDW, and CCB brake equipment, move the automatic brake handle to SUPPRESSION.
	2. On locomotives with other brake equipment, move the automatic brake handle to LAP.
	3. Move the throttle to IDLE and wait 60 seconds.
	4. After the train stops, move the automatic brake handle to RELEASE and note that:
	  • Brake pipe pressure is restored.
	  • PC light goes out.
	  • Brakes release.
	
	Note: Some locomotive equipment has been modified to slow the train during the warning period with the automatic brake valve in MINIMUM REDUCTION. Unless the engineer knows that the locomotive being operated includes this modification, the SUPPRESSION position should be used.

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39.3: Charts and Diagrams

39.3 Charts and Diagrams

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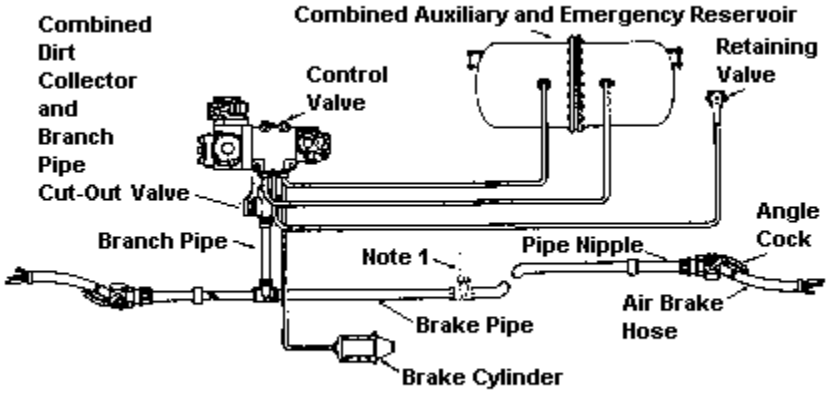
39.3.1: Car Chart Components

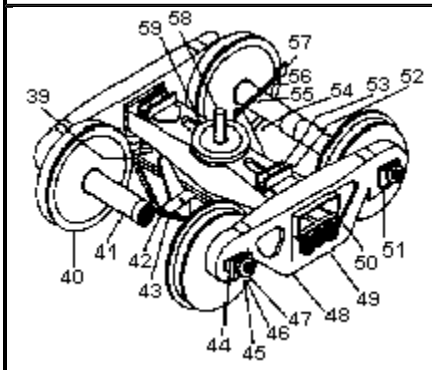
39.3.1	**Car Chart Components** (To be used when notifying the Dispatcher's Office or others of location of defects, etc.) To determine axle number, journal number, and wheel number on a car, stand facing the hand brake end of the car (the B end) and count the closest axle as number one and the wheels and journals on right and left sides as R1, R2, etc., and L1, L2, etc., respectively, as shown in the diagram. **Note:** For all multi-unit articulated cars, the journal-wheel number will be stenciled on the side frame directly above the journal. 1. Horizontal end hand hold 2. Hand brake housing 3. End ladder tread 4. Hand brake wheel 5. Telescoping uncoupling rod 6. Uncoupling lever guide 7. Hand brake chain 8. End platform (combined crossover and brake step) 9. Bell crank 10. Vertical hand brake rod 11. Front draft gear stop 12. Striker	39. Brake shoe 40. Wheel 41. Axle 42. Truck live lever 43. Brake beam 44. Roller bearing adapter 45. Roller bearing end cap 46. End cap retaining bolt 47. End cap locking plate 48. Truck side frame 49. Truck spring 50. Truck bolster 51. Roller bearing assembly 52. Truck side bearing roller 53. Truck side bearing housing 54. Truck dead lever 55. Clevis at dead lever 56. Clevis at dead lever fulcrum 57. Dead lever anchor ¾ underframe mounted 58. Center pin

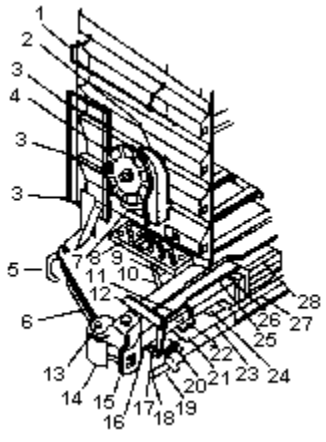
	13. Coupler knuckle pin 14. Coupler knuckle 15. Type E coupler head 16. Coupler carrier 17. Coupler wear plate 18. Striker flange 19. Angle cock 20. Draft key washer 21. Draft key 22. Draft key retainer 23. Brake pipe, 1-1/4" (Train line) 24. Follower block 25. Coupler yoke 26. Draft gear 27. Rear draft gear stop 28. Rear draft gear stop reinforcement 29. Hydraulic piston 30. Center sill 31. Back stop plate 32. Rear lug casting 33. Striker casting 34. Coupler key 35. Cushioning unit 36. Restoring mechanism 37. Inspection plate 38. Rear cross key	59. Truck center plate cast integral with truck bolster 60. Air hose 61. Hand brake chain at bell crank 62. Hand brake rod guide 63. Hand brake rod 64. Hand brake chain at cylinder 65. Cylinder push rod 66. Air brake cylinder 67. Cylinder pipe, 3/4" 68. Floating lever guide 69. Floating lever 70. Pipe clamp, 3/4" 71. Top rod "A" end 72. Branch pipe tee 73. Branch pipe tee support 74. Combined dirt collector and cutout cock 75. Connection hose 76. Pipe clamp, 1-1/4" 77. Retainer pipe 78. Retainer valve 79. ABD control valve 80. Release rod 81. Auxiliary reservoir pipe, 3/4" 82. Emergency reservoir pipe, 3/4" 83. Reservoir support 84. Combined auxiliary and emergency reservoir 85. Cylinder lever guide 86. Brake lever fulcrum

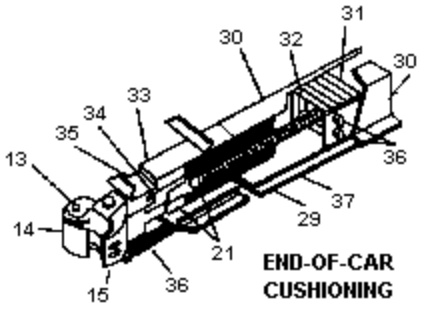
		87. Brake slack adjuster 88. Cylinder lever 89. Top rod "B" end



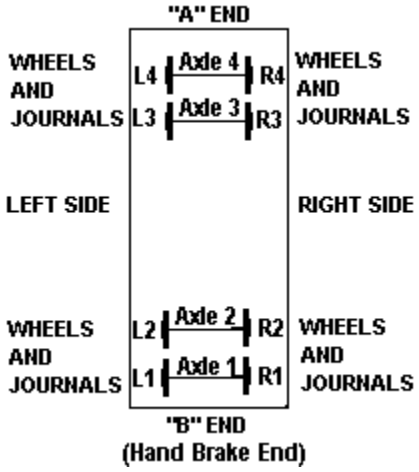
Note 1: Reduction Relay Valve or Vent Valve, when Required

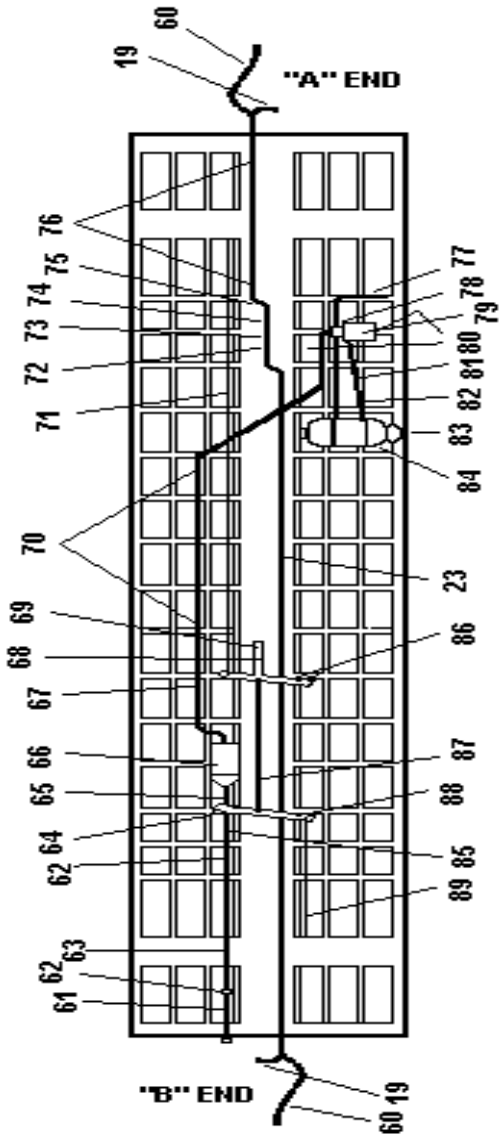






END-OF-CAR CUSHIONING





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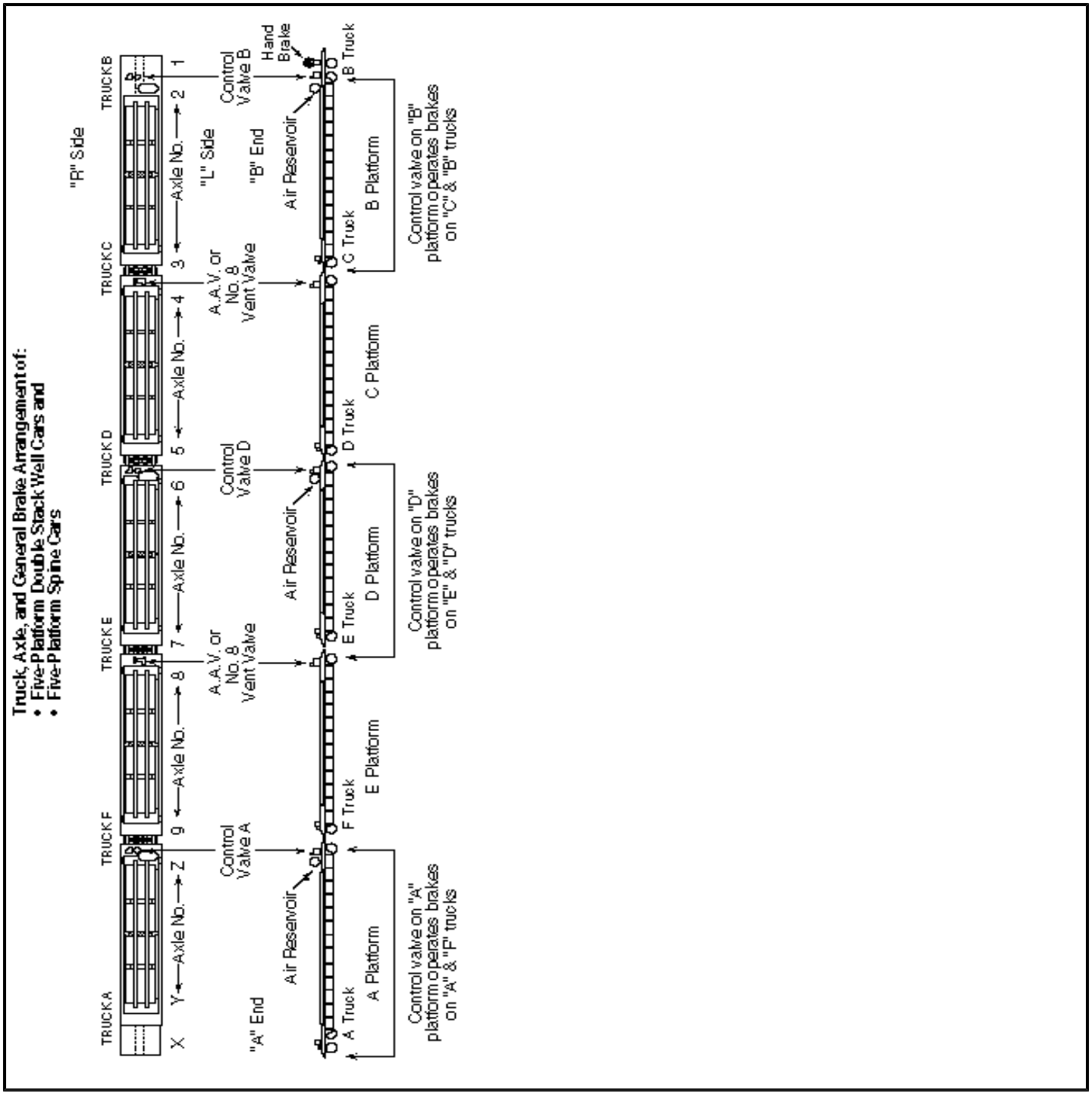
39.3.2: Terminology for Articulated Car Identification Diagram

39.3.2	**Terminology for Articulated Car Identification Diagram** **Control Valve** – Operates truck-mounted brakes. It consists of two valve portions bolted to a pipe bracket and has a cutout cock. It is located by the air reservoir. Each control valve operates the brakes on two trucks: • The control valve on the A platform operates the brakes on A and F trucks. • The control valve on the D platform operates the brakes on E and D trucks. • The control valve on the B platform operates the brakes on C and B trucks. **A.A.V. (Accelerated Application Valve)** – Does not operate brakes, but does propagate the signal to operate brakes. It consists of one valve portion bolted to a pipe bracket and has a cutout cock. However, do not cut-out the A.A.V. unless there is a continuous blow of air through the valve. **No. 8 Vent Valve** – Does not operate brakes but does propagate the signal to operate brakes. It consists of a single vent valve and does not have a cutout cock. It does have a plug that can be installed if there is a continuous blow of air through the valve. **Hand Brakes** – Five platform cars have a hand brake on the B platform. Also, there may be a hand brake on the A platform. When there are hand brakes on both the A and B platforms, they are painted orange. If the car is set out and the use of hand brakes is necessary, apply both hand brakes.



Rule Updated Date

January 20, 2012

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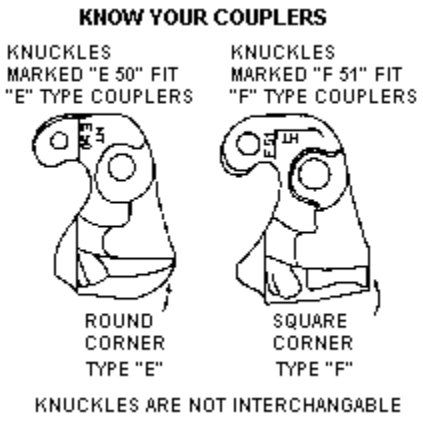
39.3.3: Coupler Diagram

39.3.3	**Coupler Diagram**



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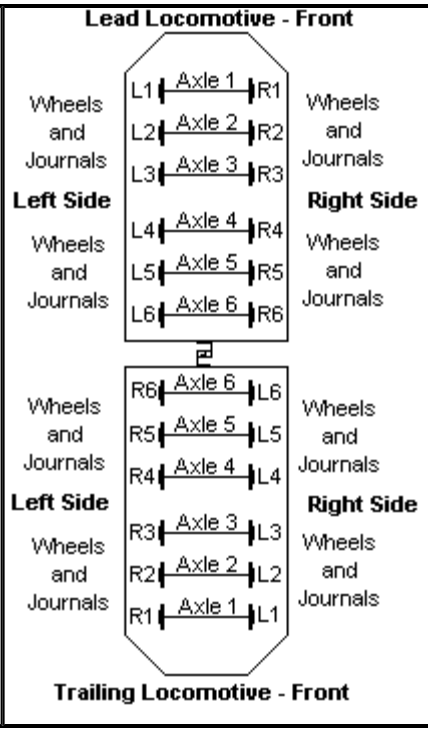
39.3.4: Locomotive Axle, Journal, and Wheel Identification Diagram

39.3.4	**Locomotive Axle, Journal, and Wheel Identification Diagram** (To be used when notifying the Dispatcher's Office or others of location of defects, etc.) To determine axle number, journal number, and wheel number on a locomotive, stand facing the same direction as the specific locomotive is headed and count axles from the front of that locomotive as axle one, two, etc., and wheels and journals on the right and left sides as R1, R2, etc., and L1, L2, etc., respectively, as shown in the diagram.

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39.3.5: Locomotive Air Brake Equipment

Place air brake valves in the proper position on freight and helper locomotives. To MU locomotives, position brake valves and cutout cocks as indicated in the following tables:

26 and 30CDW Brake Equipment Positions			
	Lead	**Trail**	**Helper**
Automatic Brake Valve	Release	Handle Off/Continuous Service	Handle Off/Continuous Service
Independent Brake Valve	Applied Full	Release	Release
	LEAD OR DEAD	**TRAIL**	**LEAD OR DEAD**
MU-2A Valve or Double-Ported Cutout Cock	In	Out	In

CCB Brake Equipment Positions			
	Lead	**Trail**	**Helper**
Automatic Brake Valve	Release	Handle Off/Continuous Service	Handle Off/Continuous Service
Independent Brake Valve	Applied Full	Release	Release
Air Brake Setup	Lead/Cut-in	Trail	Lead/Cut-out

24RL Brake Equipment Positions			
	Lead	**Trail**	**Helper**
Automatic Brake Valve	Release	Release	Lap
Independent Brake Valve	Applied Full	Release	Release
Automatic Brake Valve Cutout Valve	Open	Closed	Closed
Rotair Valve	Pass Frt	Frt Lap	Pass or Frt
MU-2A Valve	Lead or Dead	Trail	Lead or Dead

Note: On SD70ACe and C45 locomotives, when the locomotive is other than the controlling locomotive, the automatic brake valve pin, if available, must be inserted to insure the brake valve handle remains in the proper position. The engineer's seat must be left secured/locked. This also applies when these locomotives are set out.

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May 2, 2016

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GLOSSARY: Glossary

GLOSSARY: GLOSSARY

GLOSSARY

Accelerometer
An indicator that displays the predicted increase or decrease in speed in MPH per minute.

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
Using a feature of the independent brake valve to charge the actuating pipe from the main reservoir and prevent or release a locomotive brake application initiated from a brake pipe reduction.

Air Brake
A system of compressed air devices controlled manually, electronically, or pneumatically that make the car or locomotive slow down or stop.

Air Brake Equipment
The equipment that supplies and exhausts air to and from the brake cylinders but does not include foundation brake gear and hand brakes.

Air Brake Hose
The flexible hose at each end of a car or locomotive that includes a coupling (glad hand) that fits into an identical coupling on the adjoining car or locomotive. The complete arrangement connects air between the brake pipes of the cars and the locomotives throughout the train.

Air Brake System
All of the devices for operating air brakes to control the speed of and stop a locomotive or train. The system includes the operating devices, pipes, hoses, fittings, and foundation brake gear.

Air Compressor
A locomotive device, powered by the diesel engine or an electric motor, that compresses air for operating the air brakes and all other air-operated devices on locomotives and cars.

Air Compressor Control Switch
A device that controls the loading and unloading of the compressor at the proper main reservoir pressures.

Air Flow Indicator (AFI)
A gauge installed in some locomotives that indicates the pressure differential of air flowing into the brake pipe through the

automatic brake valve. It is not adjustable and cannot be used for air flow method leakage testing of trains or cars. This gauge is labeled on the face "AIR FLOW INDICATOR" and graduated from 0 to 14 in even numbers (0, 2, 4, 6, etc. to 14).

AFM Indicator or Air Flow Measurement (AFM)
A gauge installed in some locomotives that indicates the volume of air in cubic feet per minute (CFM) flowing into the brake pipe through the automatic brake valve. This gauge is calibrated every 92 days and can be used in the Air Flow Method of leakage testing on trains and cars. It is labeled on the face as "AFM INDICATOR" and is graduated in 10 CFM increments. The gauge is marked at 20, 40, 60, and 80, and lines mark the 10 CFM steps between those numerals.

Air Flow Method (AFM)
Shortened name, or slang, for Air Flow Method of leakage testing. The method of train/car leakage testing to determine the amount of air in cubic feet per minute (CFM) flowing into the brake pipe through the automatic brake valve to maintain desired pressure against leakage.

Air Gauge
An instrument that indicates air pressure in pounds per square inch (psi).

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. Coupler swing limiting devices do not make the coupler an alignment control coupler.

Ampere (Amperage, Amps)
The standard unit for measuring electric current.

Angle Cock
A manually operated device located at each end of the brake pipe on locomotives and cars to permit or prevent air flow.

Articulated Multi-platform Car
A car with multiple units (segments) that have articulated couplings and in which the units share a common truck.

Automatic Brake Valve
A manually operated electronic controller or pneumatic valve on the locomotive that controls the train and engine brakes.

Auxiliary Reservoir
A storage volume, charged from the brake pipe, to receive and store air to apply brakes on a car or locomotive. In freight car equipment, the auxiliary reservoir and emergency reservoir are combined in one structure.

"B" End (of car)
The end where the hand brake is located unless otherwise identified.

B-unit
A locomotive which does not have an operating cab or crew compartment that may be occupied, and must be controlled from another coupled cab equipped locomotive unit.

Back-up Valve or Hose
A device, either portable or permanently connected to the brake pipe, which controls brakes from the car that it is attached to. The device can apply the brakes with a service or emergency application.

Balanced Braking
The combined use of train air brakes and dynamic brake to stabilize, increase, or decrease train speed on a descending grade.

Bleed (Bleed-off)
Venting air pressure to the atmosphere, such as venting air pressure from the brake cylinder of individual cars, by using the release valve.

Blended Braking
The combination of air and dynamic braking by making an automatic service brake application with the throttle in idle.

Box Car Mode
A DP software feature that automatically functions to allow a DP remote consist to recover brake pipe pressure from a Penalty/Emergency condition during a sustained radio comm loss. This feature enables the DP locomotive brakes (BC pressure) to respond to normal changes in Brake Pipe (BP) pressure similar to a box car.

Brake Application
A brake pipe pressure reduction (no matter how made) that causes the control valve to move to the service or emergency position.

Brake Cylinder
A cylinder containing a piston. Compressed air forces the piston outward to apply the brakes. When the air pressure is released, the piston returns to its normal position by a release spring coiled around the piston rod inside the cylinder.

Brake Pipe
The section of air brake piping of a car or locomotive that supplies the reservoirs. It also connects the piping to allow the locomotive engineer to control the car brakes. The pipe is 1-1/4" in diameter and extends from one end of the car to the other. At the ends, flexible hoses connect the cars. When a train is made up and all brake pipes on the cars are joined together, the entire pipe line is called the brake pipe.

Brake Pipe Gradient
The difference in brake pipe pressure between the locomotive (or source of supply) and the rear car of the train. Brake pipe gradients may be:

- **Normal:** The gradient that exists when the system is fully charged.
- **False:** The temporary gradient that exists when the system is less than fully charged (For example, the exaggerated difference between the head end and rear end after a release).
- **Inverse:** The temporary condition when the brake pipe pressure is higher at the rear of the train than at the head end of the train (For example, during a service brake application).

Brake Pipe Pressure
The amount of pressure in pounds per square inch (psi) in the brake pipe (commonly expressed in pounds).

Brake Valve Cutoff Valve
A device on locomotives that can cut-out the charging and service functions of the automatic brake valve. This valve also properly positions the brake valve for passenger or freight operation.

Branch Pipe Cutout Cock
A device on locomotives and cars that isolates the control valve from the brake pipe.

Buff Forces
A term used to describe compressive coupler forces in a train. Buff forces bunch the slack in a train.

Cab Car
Railroad rolling equipment intended to provide transportation for members of the general public that is without propelling motors but equipped with one or more control stands. Locomotive rules apply to cab car operation.

Calendar day
A time period running from one midnight (0001) to the next midnight on a given date.

Compensated Grade
A grade, the curved portion of which has been reduced by an amount sufficient to compensate for the resistance due to the curvature.

Consist
The term "consist" usually refers to a set of locomotives coupled together to pull a train. The term may also be used to refer to an entire train—its locomotives and all its cars.

Control Valve
A device on locomotives or cars that charges the reservoirs and applies or releases brake cylinder pressure when brake pipe pressure reduces or increases.

Controlled Tractive Effort (CTE)
CTE mode is a method of limiting maximum tractive effort to 110,000 lbs. at speeds below 14 MPH. CTE mode will affect all linked remote consists if the controlling locomotive on the remote is so equipped. The effect of CTE mode is shown in System Special Instructions under Locomotive Information.

Conventional Car
A car such as a gondola, hopper, intermodal flat car, box car, bulkhead flat car or single well car. Does not include multi-platform spine cars or multi-well cars (articulated cars).

Coupler Limit
The location in the train where maximum trailing tonnage allowed for standard or high strength couplers occurs. Helper locomotive(s) may be used to reduce the amount of tonnage handled by a consist.

Cycle Train
A train that, except for the changing of locomotive power or for the removal or replacement of defective equipment, remains coupled as a consist and operates in a continuous loop.

DC Locomotive
Direct Current (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 used when a unit is handled dead-in-train. When the dead engine cutout cock is opened, the main reservoirs are charged from the brake pipe to operate the engine brakes.

Distributed Power (DP)
One or more locomotive consists that are remotely controlled from the lead locomotive.

Disturbed Track
A section of passable track that has a temporary speed restriction imposed because various defects or track maintenance have affected the integrity of the track.

Draft Forces
A term used to describe tension coupler forces in a train. Draft forces stretch out the slack in a train.

Draft Gear
The connection between the coupler rigging and the center sill. This connection receives and cushions the shocks associated with in-train forces or coupling.

Drawbar Forces (In-train Forces)
Forces at the couplers between cars and/or locomotives that may be either draft (stretched) or buff (compressed), depending on train operation.

Dynamic Brake
An electrical device that converts some of the energy developed by a moving locomotive into an effective retarding force:

- **High Capacity Dynamic Brakes** – Provide approximately 13,500 lbs. of effort per axle instead of 10,000 lbs. per axle as other dynamic brake systems.
- **Flat (Grid Control) Dynamic Brake System** – A dynamic brake system that provides retardation that is controlled solely by the position of the dynamic brake lever. Maximum retardation occurs at Position 8.
- **Taper (Speed Control) Dynamic Brakes** – A 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.

Energy Management Systems
Energy Management Systems (EMS) are placed on locomotives to assist engineers operating trains in the most fuel efficient manner possible. EMS uses global positioning technology to synchronize train location with track characteristics such as grades, curvature, and permanent speed limits. The onboard system calculates a trip plan that maximizes fuel efficiency while minimizing in train forces.

Equalization
A term used to describe the condition that exists when brake cylinder pressure and auxiliary reservoir pressure become equal.

Electronic Alertness Control
A safety control system that senses the activity of the engineer. If activity or manual resetting of the device does not occur within a predetermined time frame, a penalty brake application is initiated.

Electronic Controlled Brakes
An air brake system that can be controlled electronically is referred to as electronically controlled pneumatic brakes or ECP. The ECP systems that are being utilized are overlay brake systems. Overlay means the freight car brake system can be operated in either ECP or conventional pneumatic mode. All cars in the train must be equipped with ECP to operate in the electric mode.

Emergency Application
A rapid reduction of brake pipe pressure that causes the control valves to move to the emergency position and the vent valves to open. This equalizes auxiliary reservoir, emergency reservoir, and brake cylinder pressures.

Emergency Brake Valve
A manually operated device on equipment that initiates an emergency brake application.

Emergency ReservoirA storage volume, charged from the brake pipe, to receive and store air used during emergency brake applications and certain recharge features.

Engine/Locomotive
A self-propelled unit of equipment designed for moving other railroad rolling equipment in revenue service including a self-propelled unit designed to carry freight or passenger traffic, or both, and may consist of one or more units operated from a single control.

End-of-Train Telemetry System Telemetry Components
End-of-train telemetry device is a radio end-of-train telemetry system that consists of:

- End-of-train device (EOT) mounted on the trailing coupler of the last car or linked DP consist located on the rear of the train.
- Head-of-train device (HEU) in the locomotive.

A two-way EOT that has been armed (emergency enabled) provides the capability to initiate an emergency brake application at the rear of the train. An Emergency toggle switch associated with the HEU cab display is used to activate the EOT emergency valve. For this to happen, both the head-end and the rear-end units must be equipped for two-way communication and armed (emergency-enabled).

Equalizing Reservoir
A small reservoir used in automatic air brake operations. It is only cut-in on the controlling unit. When a brake pipe reduction occurs, air is drawn from the equalizing reservoir. The reservoir then automatically draws the proper amount of air from the brake pipe. For this reason, the brake pipe pressure and the equalizing reservoir pressure are always the same, except when they are equalizing after a brake pipe reduction or when the brake pipe is charging/recharging.

Foundation Brake Gear
The levers, rods, brake beams, etc. that connect the brake cylinder piston rod to the brake shoes so that when air pressure forces the piston out, the brake shoes are forced against the wheels.

Full Service Application
A brake pipe reduction made only to the point at which the auxiliary reservoir and brake cylinder pressures equalize. From a 90-psi fully charged air brake system, service equalization will occur following a 26-psi brake pipe reduction, at 64-psi. Any further reduction in the brake pipe pressure, except an emergency application, will not affect the amount of pressure in the brake cylinder. Additional reductions greater than 26-psi may result in the loss of the ability to obtain an emergency brake application.

Full Tractive Effort (FTE)
Allows locomotive to operate at full tractive effort at speeds below 14 MPH.

Grade (of Track)
Grade is other than level track and is usually expressed as a percentage. The percentage is the number of feet the track rises or falls in a distance of 100 feet. For example, a 1% ascending grade means that the track rises 1 foot in elevation for every 100 feet the equipment travels on the track. Unsecured rail equipment may roll on a grade.

- Grade designations include the following:
  - Light Grade: Less than 1.0%.
  - Heavy Grade: At least 1.0% for a distance of 3 miles or more.
  - Mountain Grade: 2.0% or greater for a distance of 2 miles or more.

Hand Brake
A mechanical arrangement of levers, chains, rods, gears, and fulcrum. When applied, the hand brake forces the brake shoes against the braking surfaces (wheel tread or disc) to control car or locomotive movement.

Head of Train Device (HEU)
A radio device located in the locomotive cab that communicates with an End of Train Device (EOT) or distributed power (DP) consist. The HEU displays:

- Last car brake pipe pressure.
- Last car motion status (moving or stopped).
- Marker light status (on or off).
- EOT battery status.
- Communication Status with EOT.
- Two-way Armed Status.
- Distance measurement referenced to locomotive movement.

And it provides:

- Audible alarms pertaining to status changes.
- Arming capability to a selected two-way EOT.
- Interface for Manual and Automatic initiated EOT emergencies.

Helper
Distributed power or manned helper added to a train to assist movement.

Head End Power (Passenger)
Power generated on board the locomotive of a passenger train used for purposes other than propelling the train, such as heating, illumination, ventilation, and air conditioning.

Horsepower Per Trailing Ton (HPT)
The total horsepower of all working locomotives divided by the total trailing weight of the train in tons. For example, a train powered by 15,000 horsepower and having a trailing weight of 4,285 tons has a 3.5 horsepower per trailing ton ratio (15,000 HP divided by 4,285 tons).

Independent Brake Valve
A brake valve that controls the locomotive brakes independent of the automatic brake valve handle position.

Independent Pressure Switch (IPS)
A device on a locomotive that cancels the extended range portion of dynamic braking or all dynamic braking when a sufficient independent brake application occurs. This switch prevents the locomotive wheels from sliding because of excessive braking.

Initial Terminal
Means a location where a train is originally assembled.

Interchange
A location where railroads exchange cars and/or locomotives.

Intercom System
A two-way voice communication system through which voice communication is transmitted and received.

Intermodal Equipment
Equipment designed to carry trailers, containers, or automobiles. Intermodal trains are trains made up entirely of intermodal equipment.

Isolation Switch
A switch on diesel electric locomotives that has two or three positions. In the RUN position, the unit is "on the line," responds to control, and develops power. In the ISOLATION (or Stop-Start) position, the unit is isolated from the consist and does not develop power or respond to control.

Linking
The process of electronically connecting DP or RCL equipment:

- The controlling lead unit to the controlling distributed power unit on a distributed power train.
- The controlling locomotive unit to the remote control transmitter(s).

Light Locomotive
One or more units, with or without a caboose, not coupled to cars.

Jackknife
Excessive lateral forces caused by heavy buff forces resulting in wheels lifting over the high rail or rail rolling over.

Journal
The part of a rail car axle on which the journal bearing rests or is mounted. Found at each end of each axle of a rail car.

Main Reservoir
An air reservoir on the locomotive for storing and cooling compressed air.

Minimum Continuous Speed
Minimum continuous speed is the slowest speed at which a DC locomotive can operate continuously in Throttle 8. Locomotive traction motors operating under these conditions develop the highest amperage possible before overheating. The minimum continuous speed varies and is indicated by the rating plate on the locomotive.

Minimum Reduction
The first position of the automatic brake valve that initiates a service application of 6 to 8-psi.

Man Down Feature
Safety feature on a remote control transmitter that transmits an emergency message over the radio when RCL transmitter is tilted beyond prescribed limits.

Manned Helper
A helper controlled by an engineer in the controlling unit of the locomotive helper consist.

Multiple Unit (MU)
Lead locomotive followed by one or more locomotives. Cables and hose connections between the locomotives allow control of the trailing units from the lead locomotive.

Note: Locomotive(s) handled DIC/Isolated at rear of consist will be considered MU'd when all air hose connections have been made and Rule 31.8.4 Standing Locomotive Air Brake Test performed.

MU Cutout Cock (MU-2-A, Dual-Ported Cutout Cock)
A device for cutting in or out the independent brake valve.

Non-articulated Multi-platform Cars
A car with multiple units (segments) that are connected with solid drawbars. Each unit is a stand-alone unit and does not share a common truck with another unit.

Off Air
Off air is when the brake system has not been connected to a continuous source of compressed air of at least 60 pounds per square inch (psi) for a period of 4 hours or more. The "source" of compressed air is brake pipe pressure being supplied at the locomotive(s) or yard air connection to the brake system. Brake pipe pressure at the opposite end of a brake system may be below 60 psi as long as 60 psi or more is being maintained at the charging end of the brake system and the brake pipe has continuity.

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.

PA System (public address system)
A one-way voice communication system.

Parking Brake
A Cab Car brake valve that controls the brakes on the lead truck of the Cab Car only and does not have the capability to actuate any brakes applied from the automatic brake valve handle.

Penalty Brake Application
An automatic full service brake application caused by various safety devices.

Pitch and Catch
Transferring controls of the locomotive to another linked RCT.

Plug Door
A type of side door used on insulated and refrigerator cars that fits flush with the side of the car when closed.

Positive Stop Protection (PSP)
Positive Stop Protection is designed to stop movements before reaching the end of a remote control zone if the RCO fails to control the movement.

Power Cut-off 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.

Power Holding Feature
A feature of the lead, controlling locomotive that allows tractive effort to continue for approximately 20 seconds when a PCS open condition exists. This feature will not function when an emergency application is initiated by either the conductor's or the engineer's brake valve.

Pressure Maintaining Braking
Controlling train speed by making enough of a brake pipe reduction to stabilize speed on a grade, then allowing the automatic brake valve pressure maintaining feature to hold the brake application constant regardless of brake pipe leakage.

Pressure Maintaining Feature
A system designed to overcome brake pipe leakage both in the RELEASE and SERVICE positions of the automatic brake valve.

Primary Remote Control Operator (Primary Operator)
The employee operating the transmitter while controlling a remote control movement.

Qualified Person (Freight)
A train service employee given fundamental training on freight car inspections and air brake tests.

Qualified Person (Passenger)
A train service employee given fundamental training on passenger car inspections and air brake tests.

Qualified Mechanical Inspector (Carman)
A person, such as a carman, who has been given more extensive training that encompasses more detailed inspection and repairs.

Qualified Maintenance Person (Passenger Car Inspector)
A person, such as a carman, who has been given more extensive training that encompasses more detailed inspection and repairs and is qualified to conduct a Passenger Class I Brake Test.

Remote Control Locomotive
A locomotive equipped with radio control, operated by a remote control operator.

Remote Control Operator (RCO)
Employee trained in remote control operations who uses an RCT to operate a remote control locomotive and possesses a Class 6 or 7 operator's license.

Remote Control Transmitter (RCT)
A portable unit attached to an RCO vest. The RCT sends commands to the RC receiver on the locomotive.

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.

Reduction Relay Valve
A device on long cars that helps reduce brake pipe pressure during service and emergency brake applications. The valve compensates for the added length of brake pipe on long cars.

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.

Restricted Car Limits
A defined number of cars immediately behind the lead locomotive consist, immediately ahead of and behind an entrained helper, or immediately ahead of a rear helper. The number of cars within a restricted car limit can change based on the train tonnage, territory type, and number of powered axles for each power consist.

Restricted Car Placement
When rules restrict the placement of cars, each platform or well is to be considered one car.

Service Application
When brake pipe pressure exhausts at a service rate to apply the train brakes.

Slack Action
Movement of part of a coupled train at a different speed than another part of the same train.

Slug
A unit with traction motors but no diesel engine and incapable of propelling itself. The unit 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)
One or more cars coupled together that:

- Are charged or have not been off air for more than 4 hours.
- Have been tested as outlined in Rule 30.10.1 (Procedure for Inspection and Test).
- Have been inspected as outlined in Rule 1.33 (Inspection of Freight Cars).
- Have been inspected as outlined in Section III (Inspection) of Instructions for Handling Hazardous Materials.
- Have remained continuously and consecutively coupled with the train line remaining connected unless:
    - Removing defective equipment from the solid block.
    - Separated into multiple solid blocks due to space or trackage constraints. Cars must be re-coupled in the same relative order as removed.

Split Service Reduction
A term describing a method of making an air brake application in two or more steps to produce a more uniform application.

String-Lining
Cars pulled off the inside of curves, trying to approach a straight line when the train is in a draft condition.

Standard and High Strength Couplers
Each car is to be considered equipped with a standard type coupler unless it is known the car is equipped with high strength couplers. Coal cars, covered hopper cars, auto rack cars, and cars designed to carry TOFC/COFC are equipped with high strength couplers. If it is not known that a car is equipped with high strength couplers, it can be determined by looking at the coupler casting identification located on top of the coupler. A high strength coupler will have the letter "E", "EX", or "EA" as the last character of identification. Examples of high strength coupler identifications are E60HTE, SBE60CE, E60DE, and EF512WEX.

Territory Code

Code "L" is used to identify territories or corridors with relatively light grades and low to moderate track curvature in the coupler limit tables.
Code "H" is used to identify territories or corridors with heavier grades and severe track curvature in the coupler limit tables.

Thermal Cracks (in wheels)
Cracks in a railroad wheel, normally caused by heat generated on the tread and flange of the wheel from excessive braking.

Throttle Modulation
The action of adjusting the throttle one notch at a time between idle and position 8 to control train speed without the application of air brakes.

Tons per Dynamic Brake Axle (TPDBA)
The total gross trailing tonnage of the train divided by the total number of dynamic brake axles, including helper locomotives, operating in dynamic brake.

When making this calculation, include in the gross trailing tonnage the weight of any locomotive, including a helper locomotive, not operating in dynamic brake or with dynamic brake cut-out.

Tons per Operative Brake (TPOB)
The gross trailing tonnage of the train divided by the total number of cars having operative brakes in the train. There is 1 brake per conventional car (See SSI Item 2-F, Table C for other car types).

Tons per Equivalent Powered Axle (TPA):

- **TPA** is calculated by dividing the total trailing tonnage by the total equivalent powered axles (includes lead and helper power). The weight of dead or isolated locomotives must be added to the total trailing tonnage before making this calculation.
- **TPA Limit** – The maximum tonnage per equivalent powered axle specified over a given route. Trains may not exceed maximum TPA at origin, unless there is a plan in place to pick up additional power or reduce tonnage (scheduled set-out) prior to reaching the ruling grade. TPA may only be exceeded en route when authorized by proper authority. Train consist TPA numbers will govern any discrepancies.

Track-Train Dynamics
A general term used to describe the interaction of a locomotive and cars with the track structure during the movement of a train. Track-Train Dynamics are affected by variables such as weather, speed, train make-up, train handling, condition of track and equipment, grade, curvature, and operating policies.

Transfer Train Movement
An engine with one or more cars that travels between a point of origin and a point of final destination not exceeding 20 miles. Such trains may pick up or set out while en route to destination.

Tread Build-up
Tread build-up is the formation of metal on the running surface of a wheel. Tread build-up on a car can occur due to:

- Failure to remove a hand brake.
- Air brake system defect on the car.
- Retainer left in the retaining position.

Unattended
Equipment is unattended when an employee is not in a position to immediately control the brake system (hand or air brakes).

Attended cars must be properly secured with hand brakes when:

- Air brakes are not applied in emergency.
- There are less than 5 cars.
- Standing on grade exceeding 1%.

Undesired Emergency (UDE)
An unintentional emergency application of train air brakes.

Unit Train
A train made up entirely of cars used to transport coal, grain, ore, potash, molten sulfur, soda ash, phosphate rock, oil, taconite, or other bulk commodities.

- Empty Bulk Commodity Unit Train is made up entirely of empty cars.
- Loaded Bulk Commodity Unit Train is made up entirely of loaded cars.

Unplanned Stop
The shortest stop possible without using an emergency application.

Vent Valve
A valve attached to the brake system of a car or locomotive. The valve responds to an emergency brake pipe pressure rate of reduction by venting the brake pipe at each vehicle to the atmosphere. As a result, the emergency application spreads throughout the train.

Vestibule
The area of a passenger car that normally does not contain seating and is used for passing from the seating area to side exit doors.

Wheel Sliding
When the wheel rotates slower than lengthwise movement dictates.

Wheel Slipping
When the wheel rotates faster than lengthwise movement dictates.

Yard Test Plant
A system of piping and fittings that supplies air at convenient locations to charge and to test cars without a locomotive. Charging pressure must be adjusted to 90-psi.

Rule Updated Date

May 2, 2016

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