Train Handling and Fuel Conservation

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103.0 Train Handling

Locomotive engineers must exercise judgment and plan ahead to operate their train safely and efficiently. The engineer is responsible for properly controlling the slack in the train. Good train handling requires the proper combination of throttle modulation, dynamic braking, and air braking to:

- Protect yourself and others from injury.
- Prevent damage to the track structure and equipment.
- Protect lading.
- Use the most fuel-efficient method consistent with good train handling.
- Controlling and limiting in-train forces is essential for safe train operation. Unless an emergency or other condition requires immediate speed reduction, change throttle positions and dynamic and air brake applications slowly to allow slack to adjust gradually. Many locomotives can produce higher tractive effort than the average train’s draft gear and couplers can withstand.

High retarding force during dynamic braking can cause excessive buff forces. To limit these forces, observe dynamic braking limitations.

103.1 Train Status Information

Train crew member must discuss with the engineer, train status or other conditions affecting train movement. It is the engineer’s responsibility to ensure slack changes are controlled, through the use of the throttle, dynamic, automatic and independent air brakes while moving in forward or reverse direction. This would include some or all of the following:

- Train makeup.
- Train length and tonnage.
- Tons per operative brake.
- Speed.
- Severity of the grade.
- Block signal spacing.
- Type and axle limitations (if any) of the dynamic brake.
- Temperature and weather conditions.
- Throttle response.
- Amount and type of slack in the train.

103.2 Dynamic Braking

Dynamic Brake Ground rules

- Allow for electrical current decay and prevent a surge of dynamic braking, by pausing for 10 seconds 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.
- The locomotive brake should never be relied on to control speed in lieu of an effective dynamic brake.
· Extended range dynamic brakes must be utilized to their fullest extent.

103.2.1 Dynamic Brake Limitations
High buff force generated by dynamic brake retarding force may cause a derailment or damage the track structure. Therefore, limit dynamic brake retarding force as follows:

1. Limit the total operative dynamic brake to 28 equivalent dynamic brake axles unless further restricted by another rule or special instruction.

   Exception: Trains with manned helper locomotive consists entrained or at the rear of the train may have the maximum allowable dynamic brake axles for each locomotive consist placed within the train.

2. Limit the dynamic brake retarding force by cutting out the dynamic brake on the trailing locomotive(s) using the dynamic brake cutout switch or the dynamic brake selector switch on the control panel.

3. The preferred option is to cut out the basic dynamic brake(s) on a trailing locomotive(s).

4. When approaching and operating through turnouts or disturbed track areas with train’s air brakes released, use the dynamic brake handle position to limit retarding force to 50 percent of maximum (dynamic brake handle position number 4). Continue to limit the braking effort until at least half the train has passed the restricted area. At speeds of 10 MPH or less, this limitation applies only if 12 axles or more of extended range dynamic brakes are being utilized.

103.3 Use of Automatic Brake

A. Applying or Reapplying Automatic Brakes
When applying or reapplying automatic brakes, make brake pipe reductions according to these guidelines:

1. Make an initial brake pipe reduction as follows:
   · For a fully charged system, reduce the brake pipe at least 6 psi.
   or
   · For an uncharged system, reduce the brake pipe 5 psi below the previous reduction.

2. Use split reductions for planned slowdowns and stops. Make an initial reduction of 6 to 8 psi followed by additional reductions in 2 to 3 psi increments spaced 30 seconds apart.

3. For balanced braking, limit brake pipe reduction to 15 psi or less to control speed.

4. Make a final reduction when operating conditions permit as train is nearing a stop to prevent a run out of slack. A final reduction is a brake pipe reduction made in such a way as to result in brake pipe pressure exhausting as the train comes to a stop.

B. Delayed Departure
Observe the following when train is stopped and movement is delayed.

1. When train is stopped and operating conditions allow do not release the train brakes until you are ready to depart. If required to release brakes, such as during a train inspection, brakes must be reapplied and released prior to departing.
**Note:** An example of an operating condition that may not allow brakes to remain applied until ready to depart or no increase in brake pipe reduction after stopping would be when near a long, descending heavy or mountain grade and brake system requires full charge before proceeding.

2. When operating conditions allow, increase brake pipe reduction to at least 15 psi.

3. Closely observe equalizing reservoir pressure when brakes are applied and if leakage occurs, report to mechanical department and make a locomotive defect report of this fact at first opportunity.

4. When a train is ready to depart and grade conditions allow train brakes to be released, it must be known that the brake pipe pressure is being restored to the rear of train after releasing the brakes. If end of train telemetry indicates brake pipe pressure is not being restored:
   - Movement must not exceed 10 MPH and the train’s length unless the reason for the brake pipe blockage indicated by telemetry is determined. (Distance may be extended if public crossings or bridges not equipped with walkways are involved).
   - If end of train telemetry has failed, visual observation of a set and release of brakes at the rear car is sufficient in determining no blockage exists. RTC must be notified of a failed ETD to avoid additional stops and delays, when possible.

Exception: Locals, road switchers and work trains, working under the provisions of Rule 102.14 (without a 2-way ETD) are exempt from this requirement.

5. A brake pipe pressure reduction at the end of the train with no corresponding brake pipe reduction made at the head end of the train, as indicated by end of train telemetry, may also indicate a possible blockage in the brake pipe. Cause of blockage, if any, must be determined as outlined above before proceeding.

**C. Releasing Brakes**

To release the brakes at slow speeds, use judgment and evaluate the following conditions before attempting a running release of the automatic brakes:

- Train speed
- Train makeup
- Temperature
- Physical characteristics of territory

Attempting a running release at very low speeds may damage equipment, lading, or track.

When operating conditions allow releasing the brakes:

1. Increase the brake pipe reduction to 10 psi.

2. Allow the exhaust at the automatic brake valve to stop before releasing the train brakes.

When a train brake application is in effect with pressure maintaining equipment, do not move the automatic brake valve handle toward RELEASE unless a brake release is desired.
103.3.1 Use of Automatic Brakes During Cold Weather Conditions

During extreme cold weather (below zero degrees) when operating conditions and outstanding instructions permit, throttle manipulations and dynamic braking must be used in lieu of train air brakes whenever possible in controlling and stopping freight trains.

103.4 Throttle Handling

To allow the train to absorb in-train forces gradually, follow these throttle handling rules:

1. Make throttle changes one notch at a time.

2. When moving at speeds of 25 MPH or more over a railroad crossing at grade (diamond):
   a. At least 8 seconds before the locomotive reaches the crossing, reduce the throttle to RUN 4 (or lower if the throttle is already positioned in RUN 4 or lower).
   b. Wait until the entire locomotive consist passes over the crossing before advancing the throttle.

3. Use this procedure if the wheel slip light comes on:
   a. If the light is on continuously, reduce the throttle on the locomotive until the light goes out.
   b. If the light does not go out, stop the locomotive immediately and make sure the wheels are rotating freely.
   c. If the wheels rotate freely and the wheel slip light remains on during throttle reduction, isolate the locomotive unit affected.
   d. If the wheels do not rotate freely, notify the dispatcher and set out the locomotive if safe to do so.

   **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. A slipped pinion gear is indicated by traction motor rotation while locomotive is stopped and under load.

4. Do not apply power to hold a train stationary on a grade.

5. Reverser handle must not be moved to any position other than in the direction of travel while locomotive is moving.

6. The generator field switch must never be closed or moved to “ON” position with the throttle open.

103.4.1 Short Time Ratings

A. Short Time Rating

Short time rating limits on DC locomotives apply to high amperage levels in any throttle position. A rating plate is located near the load meter and gives the time limits for operating locomotives at various amperage levels. Always stay within the time limits indicated by the rating plate on the lead, controlling locomotive. (AC locomotives do not require short time rating protection, and newer DC locomotives without short time rating plates are protected from overheating by the computer. Computer-protected locomotives include EMD-type GP/SD60 and above and GE-type C/B40 and above.)
B. More Than One Consecutive Short Time Rating

When operating a locomotive consist at more than one consecutive short time rate:

1. Do not operate the locomotive continuously for more than the maximum time of any one short time rating without stopping to cool traction motors.

   Example: Do not operate a locomotive at the 1/4 hour rating for 1/4 hour, then at the 1/2 hour rating for 1/2 hour, then at the 1 hour rating for 1 hour, etc.

2. If the locomotive exceeds the short time rating indicated on the rating plate, stop train and double the train over the grade or allow traction motors time to cool before continuing, unless otherwise instructed.

3. Sufficient cooling of traction motors is when allowing the locomotive a minimum of 20 minutes without a short time event.

103.4.2 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.

103.5 Independent Brake (Locomotive Brake)

When using the independent brake, do the following:

1. 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.

2. When operating a locomotive consist and it is desired to prevent the locomotive brakes from applying during an automatic brake application, the independent brake valve handle must be depressed in RELEASE position (actuated) a minimum of two seconds per locomotive prior to the automatic brake application and held depressed until exhaust ceases.

3. The independent brake must not be applied while power or dynamic brake is being used, except when starting or stopping while in the dynamic brake mode and speed is below the effective range of the dynamic brakes being used. Light independent brake may be used to control wheel slips at speeds below 10 MPH only.

4. 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.

5. When controlling the independent brake during an emergency brake application, place the independent brake handle to the desired position in the APPLICATION ZONE that will develop sufficient pressure, without sliding the locomotive wheels, while at the same time depressing the handle in the ACTUATE position. When emergency brake cylinder pressure is desired, release the handle from the depressed position.

6. Helper locomotive engineers must closely observe brake pipe gauge in order to appropriately react to either a service or emergency brake pipe reduction and control locomotive brakes as necessary.

7. The maximum independent brake cylinder pressure designed for each locomotive type must never be exceeded.
Exception: When emergency braking is necessary to protect life or property, parts 1 through 7 above do not apply. Use the maximum braking effort.

103.6 Train Handling Scenarios

Use the train handling methods for starting, stopping, slowing, and controlling trains as well as unplanned stopping. These methods are guidelines. Heavy tonnage, heavy grades, or specific locations may require other combinations of throttle modulation, dynamic braking, or air braking.

103.6.1 Starting Train

Locomotives equipped with automatic engine start/stop systems (Auxiliary Power Units) may have shut down if locomotives have been inactive for a sufficient period of time. Before attempting to start a train, ensure that all locomotives that are on line are running. Start train as follows:

- Use the lowest throttle position possible to start the train moving. It may be necessary to retard starting acceleration by use of the locomotive brake.
- Allow the locomotive load to stabilize before advancing the throttle to the next higher position.
- Once the train is moving, do not increase the throttle until either the amperage or the tractive effort decreases.
- Accelerate the movement by advancing the throttle slowly, one notch at a time.
- In curved territory, use only enough power to start the train. Regulate amperage to reduce the possibility of stringlining in curves because of excessive lateral forces.

A. Starting, Level Grade

When starting the train on a level grade:

1. Release the automatic brake.
2. After the brakes have released on the entire train, move the throttle to RUN 1 and release the independent brake. If the locomotive moves too rapidly in RUN 1, control surge with the independent brake. If the train does not move, slowly advance the throttle.
3. Use the lowest possible throttle position to minimize in-train forces.
   
   Note: If the train does not move in RUN 4, return the throttle to IDLE, apply the independent brake, and determine the cause.
4. After the train starts to move, check to see if the amperage or tractive effort levels are decreasing. If these levels are decreasing, you may advance the throttle to the next higher position.

B. Starting, Ascending Grade

When starting the train on an ascending grade:

1. Advance the throttle to RUN 1.
2. Reduce the independent brake.
3. Release the automatic brake.
4. As the brakes release toward the rear of the train, advance the throttle to RUN 2 or higher to start the train moving.
5. Slowly reduce the independent brake until it is fully released. If the train will not start, consider doubling or getting helpers. Applying power on a standing locomotive longer than necessary will damage DC traction motors.

6. After the train starts to move, check to see if the amperage or tractive effort levels are decreasing. If these levels are decreasing, you may advance the throttle to the next higher position.

7. Observe the load meter and limit the throttle position if necessary to avoid high draft forces.

C. Starting, Descending Grade

When starting the train on a descending grade:

1. Ensure that the independent brake is fully applied.
2. Activate the dynamic brake to full.
3. Release the automatic brake and wait for all brakes to release and slack to adjust.
4. Reduce the independent brake until the train begins to move gradually.
5. Once the entire train is moving, gradually reduce the independent brake to avoid abrupt changes in slack.
6. Slowly release the independent brake when the dynamic brake becomes effective.

103.6.2 Cresting a Grade

A train cresting a grade:

- When speed is less than 20 MPH
  and
- Using 16 or more equivalent axles of head-end power must gradually reduce throttle on lead locomotive consist as the head of train crests the grade to a position that will prevent a speed increase until at least one-half of the train has crested the grade.

  Note: This reduction in throttle outlined above includes trains being operated with remote or manned helpers.

103.6.3 Slowing or Controlling Speed

When slowing or controlling train speed, the following methods should be utilized and are listed in preferred order when operating conditions allow and for best fuel efficiency:

1. Throttle manipulation.
2. Coast braking when conditions allow.
3. Dynamic braking.
4. Dynamic braking supplemented with train air brakes.

When using dynamic and air brakes and the desired speed has been reached, maintain enough dynamic brake to control slack until the train brakes are fully released.
When using the stretch braking method and the desired speed has been reached, reduce the throttle until train brakes are fully released.

When operating in curved territory, keep the total braking effort at the lowest practical level.

A. Slowing/Controlling Speed, Level or Descending Grade, with Dynamic Brakes, Slack Bunched

When slowing or controlling speed on level or descending grade with dynamic brakes and slack bunched do the following:

1. If in power, gradually reduce the throttle to IDLE.
2. Wait 10 seconds.
3. Activate the dynamic brake and gradually bunch the slack.
4. Increase braking to the desired level. If the dynamic brake alone will slow or control the speed sufficiently, do not use the train brakes.
5. At a sufficient distance from the speed restriction, make a minimum brake pipe reduction and actuate.
6. Make further split reduction(s) as needed and actuate.
7. 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.

B. Slowing/Controlling Speed, Level or Descending Grade, without Dynamic Brakes, Slack Bunched

When slowing or controlling speed on level or descending grade without dynamic brakes with slack bunched, do the following:

1. If in power, gradually reduce the throttle to IDLE.
2. At a sufficient distance from the restriction, make a minimum brake pipe reduction and actuate.
3. Make further split reduction(s) as needed and actuate.
4. When the speed is controlled, release the automatic brakes.
5. As the train brakes release, keep the locomotive brakes released unless they are needed to avoid severe slack changes.

   **Note:** Before attempting a running release, consider the train makeup and speed. You may need to stop completely or choose an alternate braking method.

C. Slowing/Controlling, Ascending Grade, Slack Stretched, Throttle Reduction

When slowing or controlling speed on ascending grade, do the following:

1. Gradually reduce the throttle one notch at a time.
2. Maintain a slack-stretched condition.
3. Allow the ascending grade to slow the train.
D. Slowing/Controlling While Cresting Grade, Throttle Reduction Method
When slowing or controlling speed approaching a crest:
1. Reduce the throttle before the locomotive crests the grade.
2. Continue to reduce the throttle to keep the speed from increasing until at least half the train has crested the grade.

E. Slowing or Controlling Speed, Undulating Grade or Sag, Throttle Modulation Method
Follow these steps when slowing or controlling speed on undulating grade or sag:
1. As you approach the sag, 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.

F. Stretch Braking
Stretch braking is permitted ONLY where more fuel efficient methods will not provide the necessary control of train speed. When necessary, exceeding throttle position four (4) is prohibited. When it becomes necessary to apply the train brakes while in power, 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 and actuate.
3. Reduce the throttle when amperage or 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. Make additional brake pipe reductions and actuate as necessary.
   **Note:** 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 four (4), reducing throttle as necessary to prevent excessive amperage or tractive effort.

103.6.4 Stopping
A. Stopping, Level or Descending Grade with Dynamic Brakes Available, Slack Bunched
When stopping on level or descending grade with dynamic brakes available with slack bunched:
1. Gradually reduce the throttle to IDLE.
2. Wait 10 seconds.
3. Activate the dynamic brake and gradually bunch the slack.
4. Increase braking to the desired level.
5. At a sufficient distance from the stop, make a minimum brake pipe reduction and actuate.
6. Make further split reduction(s) as needed and actuate.
7. As speed drops below dynamic brake range, supplement with the independent brake.
8. Make a final brake pipe reduction and allow the locomotive brakes to apply.

B. Stopping, Level or Descending Grade, No Dynamic Brakes, Slack Bunched
When stopping on level or descending grade with no dynamic brakes:
1. If in power, gradually reduce the throttle to IDLE.
2. Wait for the slack to adjust.
3. At a sufficient distance from the stop, make a minimum brake pipe reduction and actuate.
4. Make further split reduction(s) as needed and actuate.
5. As the train comes to a stop, make a final brake pipe reduction and allow the locomotive brakes to apply.

C. Stopping, Ascending Grade, Slack Stretched, Throttle Modulation Method
When stopping on an ascending grade using throttle modulation method:
1. Gradually reduce the throttle one notch at a time.
2. Maintain a slack stretched condition and allow the ascending grade to slow the train.
3. When the train stalls, place the independent brake in FULL APPLICATION.
4. After the independent brake is fully applied, reduce the throttle to IDLE.
5. Apply train brakes as the train stops or just before it stops if immediate movement after stopping is not anticipated.

103.6.5 Unplanned Stop
In order to stop in the shortest possible distance without using an emergency brake application, such as when encountering a sudden block signal change or when being signaled to stop by a flagman or other person, the following procedure must be followed:
1. Make a brake pipe reduction immediately before making a throttle change.
2. After the initial brake pipe reduction and train slack has adjusted, throttle must be gradually reduced to IDLE position.
3. The independent brake must not be allowed to apply while still applying power.
103.6.6 Shoving Movements

During shoving movements to avoid jackknifing, wheel climb, or rail turnover use extreme care when applying tractive effort. When exceeding 12 equivalent axles of power during shoving movements (see 102.11.1), use only the minimum amount of tractive effort necessary to begin movement.

A. Starting Reverse/Shoving, Level or Ascending Grade

When starting a reverse or shoving movement on a level or ascending grade:

1. Release the automatic brake and wait for all brakes to release and slack to adjust.
2. Reduce the independent brake and use the lowest possible throttle position to start the movement.
3. As speed increases, continue to reduce the independent brake until it is fully released.
4. If you notice a significant increase in the load meter or if train speed slows without a change in throttle position, stop immediately and determine the cause.

B. Starting Reverse/Shoving, Descending Grade, Slack Stretched

When starting a reverse or 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 all brakes to release and slack to adjust.
4. Reduce the independent brake gradually as the train begins to move.
5. Slowly release the independent brake when the dynamic brake becomes effective.

C. Starting Reverse/Shoving, Descending Grade, Slack Bunched or Unknown

When starting a reverse or shoving movement on a descending grade with slack bunched or slack condition unknown:

1. Activate dynamic brake.
2. Reduce the independent brake by 50 percent to allow the locomotive to begin moving as slack adjusts.
3. Release the automatic brake and wait for all brakes to release and slack to adjust.
4. Continue to reduce the independent brake gradually as the train begins to move.
5. Slowly release the independent brake when the dynamic brake becomes effective.
D. Stopping Reverse/Shoving on Ascending Grade, Slack Bunched

When stopping a reverse or shoving movement 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 and actuate.
3. Make further split reduction(s) as needed and actuate.
4. Observe the load meter and reduce the throttle as necessary to avoid high buff forces.
5. As the train stops, place the independent brake in FULL APPLICATION.
6. After the independent brake is applied, reduce the throttle to IDLE.

E. Stopping Reverse/Shoving, Level or Descending Grade, Slack Stretched

When stopping a reverse or shoving movement 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. Wait 10 seconds.
3. Activate the dynamic brake. If the dynamic brake is unavailable or ineffective, use the independent brake to maintain a slack-stretched condition.
4. Gradually increase braking to the desired level.
5. At a sufficient distance from the stop, make a minimum brake pipe reduction and actuate.
6. If needed, make further split reduction(s) and actuate.
7. As speed drops below the dynamic brake range, supplement with the independent brake.
8. Make a final brake pipe reduction and allow the locomotive brakes to apply.

103.7 Grade Operation

103.7.1 Operating on a Grade

Since train speed largely determines the amount of braking distance needed, control train speed in a grade operation as follows:

1. Do not exceed the speed limit.
2. When conditions warrant, use all available braking power. If you are not sure that a service brake application will control the speed of the train, make an emergency brake application without hesitation.
3. Early in the braking process, achieve a balance between the level of dynamic brake and the level of air brake needed to control train speed on a descending grade.
4. At speeds below 10 MPH, use extended range dynamic brakes if available. Extended range dynamic brakes provide more retarding force than locomotive brakes.
103.7.2 Recharging on a Grade
If the independent brakes will not hold the train on a grade, recharge the air brake system as follows:

1. Apply a sufficient number of hand brakes or retainers.
2. 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 or retainers.

Note: Do not apply power to hold a train stationary on a grade.

103.7.3 Cresting a Mountain Grade
Before passing the summit of a mountain grade, observe the following:

1. Ensure that the rear car brake pipe pressure is within 15 pounds of the regulating valve setting.
2. Abnormal brake pipe pressure changes, loss of brake pipe pressure, an abnormal increase in air flow reading, etc.

Note: If minimum brake pipe pressure or unusual conditions are noted, stop and secure the train. Correct the problem before proceeding.

103.7.4 Balance Braking on Grade
When a constant level of braking is required for long distances do the following:

1. Make a minimum brake pipe reduction and make further reductions of 2 psi until the train maintains the desired speed.
2. Limit the effective brake pipe reduction to 15 psi or less. If a greater than 15 psi brake pipe reduction is required to control train speed, stop train and inspect to determine reason before proceeding.

103.7.5 Regulating Valve Braking
Do not use the regulating valve to brake the train.

103.7.6 Retaining Valves
Use retaining valves when required by special instructions or when requested by the engineer.

Setting Retaining Valves
To set retaining valves:

1. Stop the train.
2. Set the retaining valves as specified by special instructions. If no quantity is specified, set all retaining valves.
3. Use High Pressure Position, except use Low Pressure Position on empty cars if equipped. Slow Direct Position must not be used.
4. Notify the engineer of the number of retainers set before proceeding.
Operating With Retainers

After the retaining valves are set, brake cylinder pressure is not retained until a brake pipe reduction and release has been made.

When retainers are set in HP (High Pressure) a 20 psi brake cylinder pressure will be retained or in LP (Low Pressure) a 10 psi brake cylinder pressure will be retained only after a brake pipe reduction of at least 10 psi has been made and released. Further brake pipe reductions will add to the pressure in the brake cylinder.

Do not exceed 15 MPH when operating with retaining valves set.

When retaining valves are not in use, place them in EX (Exhaust). Ensure that cars picked up en route have retaining valves in EX (Exhaust).

103.7.7 Inclement Weather Running Air Braking Test on Grade

A running air brake test (Rule 100.13) is required when snow has accumulated above the top of the rail or when snow is blowing within 10 miles of descending mountain grades.

If the ascending grade prior to crest of grade and/or train tonnage does not permit running air brake test, brakes must be applied as train begins to crest grade, utilizing the stretch braking method, in order to determine the effectiveness of the brakes prior to entire train descending the heavy/mountain grade.

103.8 Emergency Brake Applications

When conditions warrant, use an emergency brake application without hesitation if any condition occurs in which there is doubt that service applications can control train speed. 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. In addition, lift the red cover of the EMERGENCY SWITCH and activate the emergency valve on the end-of-train device (ETD) utilizing the head-of-train (HTD) telemetry device, if equipped.

Use the following procedure when stopping from an emergency application:

1. 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 force, then actuate and hold the handle in the actuate position. Extra care must be used to prevent sliding wheels if in dynamic brake mode at the time of emergency application.

2. Adjust brake cylinder pressure by moving the handle in the application zone while actuating.

3. If in power, return throttle to idle.

4. When maximum locomotive brake cylinder pressure is desired, release the handle from the actuate position.

5. After stopping and once freight car vent valves have closed (approximately 60 seconds), if operating conditions permit, place automatic brake valve in RELEASE position to release brakes.
103.8.1 Lead Unit Not Equipped with Dynamic Brake Holding Feature

This D.B. Holding feature may not be available on all locomotives. When operating without this feature, to assure full dynamic braking effort during emergency applications on descending, heavy/mountain grades as described above, observe the following procedures:

1. Place automatic brake valve handle in EMERGENCY position.
2. Control independent brake cylinder pressure to maximum without sliding wheels.
3. Return dynamic brake lever to OFF position. (Required on GE controlling locomotives only)
4. After waiting approx. 30 to 50 seconds, move automatic brake valve handle to CONTINUOUS SERVICE (or HANDLE OFF) position to reset PCS.
5. Return dynamic brake lever to FULL position.
6. Dynamic braking will be restored if independent brake is actuated and locomotive brake cylinder pressure is kept below 15 psi.

103.8.2 Emergency Brake Application by Crew Member

A crew member must initiate an emergency brake application, without hesitation, when:

- Life or property is in danger.
- The engineer cannot be informed to reduce train speed or stop the train.
- The engineer does not respond to warnings or signals to reduce train speed or stop the train.

The trainman must know the location of the emergency air brake valves, and when making the emergency brake application must:

1. Notify other employees that an emergency brake application is in effect.
2. Determine if the emergency brake application is in effect on the entire train.

103.8.3 Undesired Emergency Brake Application

When an undesired emergency (UDE) brake application occurs, move the automatic brake valve handle to EMERGENCY and wait until the train stops. 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 problem.

103.8.4 Emergency Brake Application—Report to RTC

When a train is stopped by an emergency brake application, whether it is induced by the engineer or other employee controlling the move, or by an undesired emergency brake application, a crew member will communicate the following information to the RTC.

1. The milepost location where the emergency brake application occurred.
2. Brief report of who/what caused emergency application and factors involved.
103.8.5 Emergency Brake Application—1% Grade or Greater
1. Notify the RTC of the emergency brake application including MP location and grade and request RTC to notify a supervisor of the event.
2. Crew must inspect train immediately.
3. If separation is found then the following will apply:
   i. Immediately secure the detached portion of the train
   ii. Secure the attached portion of the train
4. Continue ground inspection of train until entire train is inspected.
5. When train is inspected and known to be secured, reset air brakes to charge train line and begin repairs if needed.

103.9 Unintentional Brake Release
If an unintentional brake release occurs while the brakes are applied, increase the brake pipe reduction at least 5 psi below the last effective brake pipe reduction.

103.10 Penalty Brake Application
A penalty brake application is initiated by one of the following safety control devices:
· Alertness Device
· Overspeed

When a penalty brake application occurs, observe the following procedures:
1. Move automatic brake valve handle to SUPPRESSION position.
2. Control the amount of independent brake cylinder pressure desired, if any, by moving handle into the application zone and actuating. (If in power, return throttle to IDLE position.
3. Reset PCS after train stops.
4. After PCS closes, release brakes if operating conditions allow.

103.11 Switching Movements
When switching cars, follow these switching movement requirements:
1. When starting or stopping switching movements, gradually stretch or bunch slack.
2. When using multiple locomotives, limit buff and draft forces.
3. Under normal conditions, make switching movements without using the automatic air brake system.
4. If necessary, cut in sufficient freight car air brakes to control switching movements.
5. Reverser handle must not be moved to any position other than in the direction of travel while locomotive is moving.
6. The generator field switch must never be closed or moved to “ON” position with the throttle open.
103.12 Temporary Speed Restrictions

When moving through an area with a temporary speed restriction, do the following:

1. If possible, release train air brakes and dynamic brakes before entering the restricted area.
2. Use the lowest possible throttle position for running or starting.
3. Avoid or minimize changes in train speed or slack condition.
4. Limit independent brake cylinder pressure as much as possible.
5. Do not exceed the 50 percent limit for dynamic brakes as outlined in Rule 103.2.1 (Dynamic Brake Limitations).
106.0 Fuel Conservation

To accomplish maximum fuel efficiency, use the most efficient method consistent with good train handling. Unless other local isolate/shut down instructions apply, locomotives of the following type must be the first locomotives isolated or shut down when meeting maximum horsepower guidelines: B-23, SD-40, GP-20.

Managers may issue instructions to shut down or isolate units based on local operating plans. Crews will comply with the instructions regardless of current or forecasted temperatures.

106.1 Regulating Horsepower

Train and engine crews are required to isolate or shut down units in a consist that are in excess of the horsepower needed to maintain track speed.

106.2 Isolating or Shutting Down Locomotives En Route

When isolating or shutting down a locomotive en route for fuel conservation purposes, the following will apply:

1. Temperature 36 degrees F or above - locomotive must be shut down; do not drain. (This includes locomotives equipped with automatic start/stop systems)
2. Temperature below 36 degrees F - locomotive must be isolated; do not shut down.

Exceptions:

· Locomotives not equipped with freeze protection equipment - must not be isolated if temperature is below 32 degrees F.
· GP-20 locomotives are equipped with antifreeze coolant and may be shut down when temperature is above 0 degrees F.

106.3 Shut Down Requirement for Locomotives Not Being Utilized

At ALL points when locomotive(s) will not be utilized for fifteen minutes or more, or when unattended, all locomotives except locomotive maintaining a train’s air brake pipe system must be shut down when current and expected ambient temperature is 36 degrees F or above. When in doubt as to the temperature or the length of time locomotive(s) will not be used, contact the RTC or local supervisor.

Exception: Automatic Engine Start/Stop Systems - Locomotives equipped with automatic engine start/stop systems are identified by labels and instructions affixed inside the locomotive cab and at the engine start/stop station. The AESS system, on a single locomotive, within a locomotive consist, may be utilized to maintain a train’s air brake system as outlined above since they are designed to automatically shut down and restart as conditions require. These conditions include maintaining necessary main reservoir and brake pipe pressures. All locomotives not equipped with AESS within the consist must be shut down manually.

A green “Enabled” light is positioned on the engineers control stand on some automatic start/stop systems referred to as “Smart Start”. Small warning horns or bells sound inside the cab and outside the locomotive before an automatic shut down or restart occurs. Auto start/stop equipped locomotives will automatically shut down when conditions permit.
106.3.1 Shut Down Requirements for Locomotives Equipped with Auxiliary Power Units (APUs)

1. APUs must remain in stand by or enabled modes at all times and in all weather conditions. APUs are enabled when the red APU emergency stop button is pulled out.

2. When a locomotive is to be shut down follow posted instructions for APU operation. Do not use the engine stop button/emergency fuel cut-off switch.

3. Shut down APU locomotives regardless of ambient temperature.

4. Do not open the main battery switch following main engine shutdown.

5. Report defective APUs to the mechanical department.

106.4 Shut Down Procedures

Shut down locomotives left standing as follows:

1. Isolate the engine.

2. Depress the engine stop button.

3. Turn off all switches and circuit breakers on the control stand and engine control panel to conserve battery life.

   Exception: The following switches must be left on or closed:

   a. Auto water drain on all engines equipped.
   b. Auxiliary turbo lube oil pump circuit breaker on EMD turbocharged engines.
   c. Computer-control circuit breaker if equipped.
   d. Open battery knife switch on the following locomotives:
      - All GE locomotives
      - EMD-GP50, GP60, SD60, SD70, and SD75

When locomotives are shut down in consist, such as light engines and excess power in a train, the following switches and circuits must be on or closed, in addition to those above:

1. Battery knife switch

2. Control circuit breaker

3. Local control circuit breaker

106.5 Locomotive Starting

The following are basic instructions for all locomotives:

1. Close battery knife switch.

2. Turn on Engine Run, Control and Fuel Pump Switches on control stand.

3. Turn on all necessary switches and circuit breakers on engine control panel.

   Note: On EMD locomotives, all circuit breakers in black area must be on for engine to start.
a. To avoid burning locomotive radio fuses in the locomotives, ensure that the radio fuse breaker is “OFF” prior to powering up the locomotive. Once the locomotive is powered up and stabilized, allow for 15 seconds prior to switching the breaker “ON”.

4. On locomotives that have been shut down 4 hours or more, open flash (test) cocks and rotate engine at least three revolutions. If water is detected in any cylinder, contact mechanical department and do not make any further attempts to start the locomotive.

5. Close test cocks and start locomotive. If locomotive(s) fail to start, contact the Mechanical Department for assistance.

   **Note:** Computer-equipped GE locomotives experience a 5-10-second delay after the start switch has been placed to start before the diesel engine begins to turn over.

6. Train and engine crews must not attempt to jump start locomotives, unless under the direction of the Mechanical Department.

### 106.6 Cold Weather Protection for Locomotives Not Equipped with AESS or APUs

When temperature is below or expected to drop below 0 degrees F, the following precautions must be followed to prevent locomotive freezing.

**A. Locomotives Set Out for Service and/or Left Unattended**

1. Secure locomotive.

2. Place engine control switch in Run 3-No Load. (Turn generator field circuit breaker off or pull generator field fuse.)

3. Notify RTC, advising location set out, fuel readings and method used to prevent freeze damage.

**B. Locomotives Set Out Due to Defects**

1. Secure locomotive per existing instructions.

2. Place engine control switch in Run 3-No Load, if not equipped with winter isolate. (Turn generator field circuit breaker off or pull generator field fuse.)

3. Notify RTC, advising location set out, fuel readings and method used to prevent freeze damage.

4. If locomotive cannot be placed in Run 3-No Load or defect requires for locomotive to be shut down, drain the cooling water system.

5. In all cases, when defect occurs, contact the Mechanical Department.

   **Note:** Do not set out locomotive(s) for defect(s) unless a safety issue exists or under direction of the Mechanical Department.
C. Locomotives Developing En route Failures

Drain locomotive cooling system when any of the following conditions exist:

1. Locomotive has shut down and cannot be restarted.
2. Locomotive has defect(s) that prevent loading or throttle speeds from developing.
3. If locomotive cannot be placed in Wi Run 3-No Load.

   Note: Care should be taken to spot the locomotive so that if the cooling water system must be drained it will not go into a waterway or public roadway. In addition, contact Mechanical Department and advise of action taken and if the cooling water system has been drained or if it drained automatically, advise if a waterway was impacted.

D. Locomotive Fuel Level Reporting

During cold weather, when trains are left between terminals, crew must contact RTC, advising fuel readings of all locomotives in consist.

   Note: Fuel gauges on both sides of locomotives must be compared.

106.7 Speed Reduction for Fuel Conservation

The RTC may issue instructions for train speed to be reduced to less than maximum authorized timetable speed for fuel conservation. To take advantage of descending grade situations, this restriction only applies when your train is in power (for these instructions, power is defined as throttle positions 3 through 8).

When operating at locations where power is not required, train may be operated at maximum authorized timetable speed for that location.

106.8 Movement of Light Engines and Caboose Only Moves

To conserve fuel, isolate excess units in a consist to handle movement as follows:

1. Only one axle of power per each 120 tons of consist may be on line.
2. When operating on sustained grades exceeding 2.0 percent, only one axle of power per each 90 tons of consist may be on line.
3. Do not isolate excess units if doing so will drop the locomotive consist below any minimum dynamic brake requirements listed in railroad special instructions.

   Note: This rule is intended to limit excess tractive effort only. Employees are encouraged to use the “Dynamic Brake Only” feature on locomotives so equipped when complying with this rule.