RAIL

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RSAC

Operating Practices (OP) Train Braking Modernization Task Group

OP Task Group Charter

Opportunity Statement:

Identify operating practices that are detrimental to effective and safe train braking followed by mitigating practices that will enhance train braking to approximate a near equivalent level of performance provided by ECP braking.

Description:

The Task Group (TG) will identify detriments to effective train braking and train handling and identify best practices using FRA Safety Data, qualitative analysis and train energy simulations using TEDS & TOES analytic simulator programs.

TG Team Members:

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Objectives: **4 Primary Objectives:**

Identify practices that are detrimental to effective and safe train braking such as improper train makeup and handling	Identify practices that will enhance train braking and handling that can approximate a near equivalent level of performance provided by ECP braking	Identify Best Practices to Quickly Stop Trains	Identify Best Practices for Securing a Stopped Train
➢ Improper train makeup ➢ Improper train handling ➢ Other detrimental causes to effective train braking ➢ Operational Considerations	➢ Mitigations for improper train makeup, practices & factors ➢ Mitigations for improper train handling, practices & factors ➢ Mitigations for other detrimental causes to effective train braking ➢ Mitigations for Operational Considerations	➢ Determine best practices for stopping trains quickly and with minimum in-train forces in the event of a hotbox detector warning or other similar requirement to stop a train quickly.	➢ Determine best practices for securing a train after the train is stopped by normal or emergency braking referencing Wabtec's October 2023 Pneumatic Securement paper and other related papers.

Objective 1A. **Determine improper train makeup causes, practices & factors**

Team Identified the Following:

1. **Topography Considerations that must drive train makeup: River, Undulating & Mountain Grades & Curves**
2. **EOCC Considerations (Placement and Number)**
3. **Loads, Empties, and Light Cars:**
   a) **Big blocks of loads/empties and placement**
   b) **Individual long-light cars (cars not loaded to capacity)**
4. **Long car/Short car tonnage & placement**
5. **DP/Manned Helpers Placement:**
   a) **Spacing (determine tonnage per DP consist does not exceed maximum tonnage rating of locomotives in DP consist)**
   b) **Load/Empties ahead of/behind remote consist(s) with more than one locomotive (empty ahead or behind mid DP Units**
   c) **Long/short placement with respect to DP locations**
   d) **Equipment type (e.g., spine cars and EOCC units)**
   e) **Balancing powered axles based on train type**
   f) **DB requirements/limitations**
6. **Operative Dynamic Brake Axles – Lead Consist:**
   a) **Heavy Grade DB Axle Requirements, (balanced braking)**
7. **Combining trains and related concerns (e.g., exceeding maximum powered axles per DP consist)**
8. **Special/Unusual Cars/Equipment (high/wide, windmill blades, M/W equipment, etc.)**

Objective 1B: **Determine improper train handling causes, practices & factors**

Team Identified the Following: Railroad Operating Rules should provide guidance for the following considerations:

1. **Dynamic Brake (DB) Usage:**
   a) **Too rapid adjustment/application**
   b) **Excessive DB effort (incl. special conditions like turnouts or disturbed track)**
2. **Independent Brake Usage:**
   a) **Too rapid application**
   b) **Excessive effort (number of locomotives in lead consist, speed, prolonged use)**
   c) **Failing to actuate (bail) when appropriate**
3. **Automatic Brake Usage:**
   a) **Excessive application, in conjunction with throttle or DB use**
   b) **Excessive cycle braking**
   c) **Failure to correctly balance the grade (without maintaining adequate brake reserve)Not going deep enough on subsequent brake applications, after release**
4. **Throttle Usage:**
   a) **Too rapid adjustment/application (e.g., starting train on a grade)**
5. **Excessive throttle effort (in conjunction w/brakes)**

Objective 1B. **Determine improper train handling causes, practices & factors**

Team Identified the Following: **Railroad Operating Rules should provide guidance for the following considerations:**

6. **Management of in-train forces - Combination of 1, 2, 3, 4:**
   a) **Any combination of the above requires attention to prevent excessive in-train forces. Operating rules should provide further guidance for specific operations such as stopping, starting, unanticipated stops, etc.**
   b) **Reactive braking; excessive automatic, independent, or DB usage as a result of failure to plan for slow orders, signal, etc.**
7. **Distributed Power Usage:**
   a) **Synchronous vs. Asynchronous - should account for the territory that the train is operating over**
   b) **Train state-of-slack and topography should be considered when moving from one mode to the other (such as Energy Management (EM) to Manual, Synchronous to Asynchronous, Fence Moves, etc.)**
   c) **Throttle usage may be considered on remote units during air brake applications (Power braking), consistent with in-train force and slack management**
8. **Energy Management (EM)/PTC Interface Transitions (e.g., EM reverts to manual operation)**
   a) **Train state-of-slack and topography should be considered**
9. **Handling Unplanned Events (e.g., Undesired Releases, Track Fouling Events, UDEs, Locked Axle, Loss of Engine, Panic Braking, etc.)**

Objective 1C: Other detrimental causes to effective train braking

Team Identified the Following:

1. **Brake System Leakage can lead to sub-optimal brake performance such as rollaways, unintended releases, flow and gradient compliance, lower response times, etc.**
2. **Higher air flows (CFM) particularly for longer conventional trains are associated with slower brake system response and reduced performance:**
    a) **Higher air flows may be triggered by low outside temperatures or physical leakage in the brake system**
3. **Not Conditioning brakes:**
    a) **Applying brakes to pre-condition them in response to contamination of the wheel-rail and/or shoe-wheel interface, to establish appropriate adhesion/braking parameters**
4. **Brake Fade:**
    a) **Extended application of pneumatic braking at higher speed can lead to reduced brake shoe friction and therefore, reduced stopping power**
    b) **Generally observed in heavy or mountain grade sections**
5. **False Gradient (Unexpected variations in local/temporary brake pipe pressure that can lead to unanticipated brake system response, such as unintended releases or stuck brakes)**
6. **Anomalies in brake system, such as pipe restrictions, vandalism, retainer valve applied, pinched hose, etc.**
7. **Loss of communication between front and rear of train such as EOT telemetry loss, DPU communication loss**

Objective 1D: **Operational Considerations**

Team Identified the Following: This consideration is necessary to address non-technical concerns that affect train makeup.

1. **Best practices during field operations include consideration of the following:**
    a) **Consistent application of train makeup rules at point of origin**
    b) **Train makeup changes due to enroute setouts and pickups**
    c) **Route changes that impact train makeup criteria**
    d) **Where practicable, verification of train consist departing the point of origin and after switching or combining of trains enroute (e.g., through use of an AEI reader or manual review**
    e) **Procedures to address risk where a train is not built as desired under the train makeup rules**
    f) **Communicating train data/documentation to the train crew (e.g., loads, empties, EOCC cars, etc.)**

Objective 2A: **Identify Performance Enhancement Practices**

Team identified the Mitigations: Improper train makeup, practices & factors

1. **Topography Considerations: Railroads should have and/or develop train makeup rules that address grades and curves that are appropriate for their railroad, considering:**
   a) **Identify train configuration by analysis (simulations, modeling, current configuration)**
   b) **Model train against route/topography**
   c) **Prior incidents**
   d) **Following testing, develop rules for train build. Rules should then be implemented and applied at the train origins and enroute for setouts and pickups**
2. **Peer Review and Benchmarking:**
   a) **Railroads should review best practices and benchmark with other railroads on a regular basis**
3. **EOCC Considerations (Placement and Number)**
   a) **Similar to the process outlined in item 1, railroads should use a combination of analysis, modeling, and/or review of prior incident history to develop rules for the placement, number, weight, length, car type of EOCC cars and operating train speed. These rules should then be implemented and applied as noted in item 1, a-d.**
4. **Loads, Empties, and Light Cars:**
   a) **Big blocks of loads/empties and placement**
   b) **Individual long-light cars (cars not loaded to capacity)**
   c) **Similar to the process outlined in item 1, railroads should use a combination of analysis, modeling, and/or review of prior incident history to develop rules for the placement, number, weight, length, car type of loads, empties, and light cars (as defined by each railroad).**
   d) **These rules should then be implemented and applied as noted in item 1, a-d.**

Objective 2A: **Identify Performance Enhancement Practices**

Team identified the Mitigations: Improper train makeup, practices & factors

5. **Long car/Short car tonnage & placement**
    a) **Similar to the process outlined in item 1, railroads should use a combination of analysis, modeling, and/or review of prior incident history to develop rules for the placement and trailing tonnage for long car-short car combinations ('Long' and 'Short' cars will be defined by the railroad).**
    b) **These rules should then be implemented and applied as noted in item 1, a-d.**
6. **DP/Manned Helpers Placement:** Similar to the process outlined in item 1, railroads should use a combination of analysis, modeling, and/or review of prior incident history to develop rules for the placement of DP units and manned helpers. These rules should consider:
    a) **Spacing (consider tonnage per DP consist not to exceed maximum tonnage rating of locomotives in DP consist, DP radio communication, CLID, and air flow)**
    b) **Load/Empties ahead of/behind remote consist(s) with more than one locomotive (empty ahead or behind mid DP units)**
    c) **Long/short placement with respect to DP locations**
    d) **Equipment type (e.g., spine cars and EOCC units)**
    e) **Balancing powered axles based on train type**
    f) **DB requirements/limitations**
    g) **Cold weather operations (potential high airflow concerns)**
    h) **These rules should then be implemented and applied as noted in item 1, a-d.**

Objective 2A: **Identify Performance Enhancement Practices**

Team identified the Mitigations: Improper train makeup, practices & factors

7. **Operative Dynamic Brake Axles - Locomotive Consists:**
    a) **Heavy Grade DB Axle Requirements, (balanced braking)**
    b) **Similar to the process outlined in item 1, railroads should use a combination of analysis, modeling, and/or review of prior incident history to develop rules for the operative number of dynamic brake axles. The rules should differentiate between AC and DC traction motors, power rating of the locomotives, etc. These rules should then be implemented and applied as noted in item 1, a-d.**
8. **Combining trains and related concerns (e.g., exceeding maximum powered axles per DP consist, light cars or EOCC units ahead of mid-DP consist, length/tonnage limitations overall and per consist)**
    a) **Similar to the process outlined in item 1, railroads should use a combination of analysis, modeling, and/or review of prior incident history to develop rules for combining trains. Two individual trains that are made per the makeup rules, may not meet the rules when combined. For example, the lead train might have light/empty cars at the end of the train; it may not be ideal for these cars to be ahead of the mid-DP consist on the combined train. These rules should then be implemented and applied as noted in item 1, a-d.**
9. **Special/Unusual Cars/Equipment (high/wide, windmill blades, M/W equipment, etc.)**
    a) **Special equipment can be quite varied and needs to be treated on a case-by-case basis. Specific considerations should be given to handle such equipment that would have its own, special, train makeup and handling requirements.**

Objective 2A: **Identify Performance Enhancement Practices**

Team identified the Mitigations: Improper train makeup, practices & factors

10. DP Usage:

- **a) The effective use of properly positioned DP has the potential to mitigate several issues identified earlier, such as topography, EOCC number and placement, Weather and airflow concerns, etc. DP, therefore, offers a methodology to approach ECP-like safety performance, through effective distribution of both throttle and braking input.**
- **b) Therefore, railroads should encourage the use of DP trains to improve both safety and efficiency of operations, especially as the train lengths/weights or makeup/handling complexities increase.**

11. Training and Access to Documentation:

Operating employees, including Yardmasters and Managers, should be adequately trained on train makeup rules. This could include:

- **a) New employee training**
- **b) Refresher training for current employees**
- **c) Bulletins/job-aids/flyers that are discussed at regular or job briefings**
- **d) Employees should also have quick access to applicable operating rules and relevant documentation, as well as a mechanism to request and receive clarifications to questions.**

Note: Train makeup practices identified in Objective 1a & 2a being codified into Federal Regulation was discussed, but the task group could not reach consensus.

Objective 2B: Mitigations for improper train handling, practices & factors

Team Identified the Following:

1. **Railroads should implement training programs that address items identified in 1b, such as excessive brake or throttle use through:**
   a) **Sufficient training (initial/continuous) of engineers on the principles, rules, and best practices of train handling**
   b) **Evaluations of engineers and remedial training**
   c) **Onboard/remote monitoring of train handling input Continued**
   d) **Training simulators, including unusual conditions (e.g., restricted speed compliance, yard operations, equipment malfunction, stops on grade, etc.)**
   e) **Special consideration for reoccurring issues, such as shoving incidents, restricted speeds, range of vision, etc.**
2. **Initial training programs should consider:**
   a) **Sufficient training time (throttle time)**
   b) **Sufficient variability in operations (e.g., topography, weather conditions, equipment, train type)**
   c) **Operating technologies (e.g. PTC, EM, Traffic Control Systems, DP)**
3. **Regular review of operating rules and incidents/near-misses/etc. to ensure that the rules and training are up-to-date**

Objective 2C: Mitigations for other detrimental causes to effective train braking

Team Identified the Following:

1. **Brake System Leakage from an Operating Practices (OP) perspective:**
   a) **Railroads should have operating rules/practices to address brake system leakage and other high airflow conditions, both at the terminal and enroute.**
2. **Conditioning Brakes:**
   a) **Railroads should have operating rules/practices to address brake conditioning, as may be needed on topography, wheel-rail, and weather conditions.**
3. **Brake Fade:**
   a) **Railroads should have operating rules/practices to address brake fade, insufficient/non-responsive/unexpected brake system performance**
4. **False Gradient**
   a) **Railroads should have operating rules/practices to identify false gradient conditions and address such conditions (e.g. making deeper brake applications)**
5. **Anomalies in brake system, such as pipe restrictions, vandalism, pinched hose, etc.**
   a) **Railroads should have operating rules/practices to confirm brake pipe continuity**
6. **Loss of communication between front and rear of train such as EOT telemetry loss, DPU communication loss**
   a. **Railroads should have operating rules regarding communications loss (e.g., an active communications check prior to cresting a hill or a long descending grade)**
   b. **FRA review the 16:30 minute communication loss notification requirement (232.407g)**
7. **Railroads' operating practices on initial terminal and enroute inspections will help mitigate several brake related issues, including set handbrakes, retainer valves, leakage, etc.**

Objective 2D: Mitigations for Operational Considerations

Team Identified the Following: Best practices during field operations include consideration of the following:

1. **Consistent application of train makeup rules at point of origin**
   a. **Railroads should pursue procedures/systems to apply the makeup rules consistently**
2. **Train makeup changes due to enroute setouts and pickups**
   a. **Railroads should pursue procedures/systems to ensure that the train remains compliant after pickups/setouts**
3. **Route changes that impact train makeup criteria**
   a. **Railroads should have mechanisms to confirm that rerouted trains meet the train makeup rules for the revised route**
4. **Where practicable, railroads should verify train consist departing the point of origin and after switching or combining of trains enroute (e.g., through use of an AEI reader or manual review)**
5. **Procedures to address risk where a train is not built as desired under the train makeup rules**
   a. **Railroads should have mitigation mechanisms to address these issues, such as reduced operating speeds, limitations on dynamic brake axles, etc.**
6. **Communicating train data/documentation to the train crew (e.g., loads, empties, EOCC cars, etc.)**
   a. **Railroads should pursue procedures/systems to ensure that an accurate train consist is conveyed to the crews, including the locations of loads, empties, EOCC cars, DP units, hazmat cars, etc.; the procedures should ensure that the data remains accurate after setouts/pickups.**

Objective 3: Identify Best Practices to Quickly Stop Trains

Team Identified the Following:

When stopping a train due to a detector alert, proper train handling techniques that minimize speed and in-train forces must always be adhered to including the use of airbrakes, if/when appropriate. Relevant train handling items are identified in Item 1(b) of this document, with mitigating features being outlined in Item 2(b).

Objective 4: Identify Best Practices for Securing a Stopped Train

Team Identified the Following:

When the independent brake may not hold the train on a grade following an emergency brake application and subsequent recharge of the train's brake system, immediately secure the train with a sufficient number of handbrakes following 49 CFR Section 232.103 {n} {1}.

If an unintentional brake release occurs while the service brakes are applied, an additional brake pipe reduction of at least 5 PSI in addition to the last effective brake pipe reduction must be made. If subsequent brake pipe reductions are not effective, immediately place the train's brakes in emergency.

Working Group Meeting Notes:

Note 1: Group agreed to potential codification of Objective 3.

Note 2: At the conclusion of the August 13 & 14 in-person meeting the question of should the working group's train makeup practices identified in Objective 1a & 2a being codified into Federal Regulation. The group could not reach consensus; however, the group did agree that AAR would investigate and possibly add the train makeup conclusions into an AAR updated train makeup manual.

Any Questions or Discussions