



NATIONAL TRANSPORTATION SAFETY BOARD
Investigative Hearing

Norfolk Southern Railway general merchandise freight train 32N
derailment with subsequent hazardous material release and fires,
in East Palestine, Ohio, on February 3, 2023

GROUP	E
EXHIBIT	
15	

Agency / Organization

Norfolk Southern

Title

**Exhibit 15- NS Wayside Basic
Instruction Sheet - Internal
Cheat Sheet**



WAYSIDE HELP DESK
STANDARD OPERATING PROCEDURES



ALERT PATTERN / FAULT

KEY / PASS TRAIN?

NO DEFECTS AT LAST?

FOLLOW UP ACTION

DETECTOR FAILURE MESSAGES

(Operating Rule 149)

Trains receiving 'Too Slow' or 'Not Working' at the first detector out of origin, any yard where consist was changed or 2 consecutive detectors require a roll by inspection. Trains receiving 'Too Slow' or 'Not Working' at the last detector before yard must notify yardmaster to ensure proper inspection can be made upon arrival.

TRAIN TOO SLOW (-8MPH)
(STOPPED ON DETECTOR)

YES → 2 SIDED INSPECTION OF TRAIN MUST BE PERFORMED
NO YES → PROCEED NOT EXCEEDING 30 MPH TO NEXT DETECTOR
NO NO → 2 CONSECUTIVE FAILURES REQUIRES ROLL BY INSPECTION TO BE PERFORMED

DETECTOR NOT WORKING

YES → 2 SIDED INSPECTION OF TRAIN MUST BE PERFORMED
NO YES → PROCEED NOT EXCEEDING 30 MPH TO NEXT DETECTOR
NO NO → 2 CONSECUTIVE FAILURES REQUIRES ROLL BY INSPECTION TO BE PERFORMED

NOT WORKING: WITH DEFECT ALARM

YES → 2 SIDED INSPECTION OF ENTIRE TRAIN MUST BE PERFORMED. FOCUS ON ANNOUNCED AXLE ALARMS.
NO YES → INSPECT ANNOUNCED DEFECTIVE AXLES. IF PREVIOUS SCAN WAS GOOD TRAIN CAN PROCEED NTE 30MPH TO NEXT DETECTOR AFTER ALARM INSPECTION. IF PREVIOUS SCAN WAS 'NOT WORKING', 'TOO SLOW' OR FIRST OUT OF THE YARD TRAIN WILL REQUIRE ROLL BY INSPECTION IN ORDER TO PROCEED.

TOO SLOW: WITH DEFECT ALARM

YES → 2 SIDED INSPECTION OF ENTIRE TRAIN MUST BE PERFORMED. FOCUS ON ANNOUNCED AXLE ALARMS.
NO YES → INSPECT ANNOUNCED DEFECTIVE AXLES. IF PREVIOUS SCAN WAS GOOD TRAIN CAN PROCEED NTE 30MPH TO NEXT DETECTOR AFTER ALARM INSPECTION. IF PREVIOUS SCAN WAS 'NOT WORKING', 'TOO SLOW' OR FIRST OUT OF THE YARD TRAIN WILL REQUIRE ROLL BY INSPECTION IN ORDER TO PROCEED.

NO RESPONSE: NO DATA AVAIL

*ENSURE REBROADCAST WAS ATTEMPTED (001)

YES → 2 SIDED INSPECTION OF TRAIN MUST BE PERFORMED
NO YES → PROCEED NOT EXCEEDING 30 MPH TO NEXT DETECTOR
NO NO → 2 CONSECUTIVE FAILURES REQUIRES ROLL BY INSPECTION TO BE PERFORMED

NO RESPONSE: DATA AVAIL

*ENSURE REBROADCAST WAS ATTEMPTED (001)

*Any train can be relieved of inspection or speed restriction if good WDS or WHMS info is available & no erratic operation felt by crew.

YES → 2 SIDED INSPECTION OF TRAIN MUST BE PERFORMED
NO YES → PROCEED UNRESTRICTED ONLY IF RAW DATA SHOWS NO DEFECTS
NO NO → PROCEED UNRESTRICTED ONLY IF RAW DATA SHOWS NO DEFECTS
NO NO → 2 CONSECUTIVE FAILURES REQUIRES ROLL BY INSPECTION TO BE PERFORMED

HOT BOX ALERTS

(Operating Rule 150)

K-Values [-2.5] [2.5 to 3.9] [≥4] 870 - TALKER PLAIN 876 - Dragging Alarm
871 - TALKER BEARING 861 - HBD Sun Alert
872 - TALKER BRAKING 860 - HBD Differential

800/810 BRAKING ALERTS

NA → STRESSES INDICATED ON MULTIPLE BEARING LOCATIONS CAN BE A SIGN OF STICKING BRAKES. REQUEST SET AND RELEASE IN ATTEMPT TO REMEDY POSSIBLE STICKING BRAKES.

851/850 BAD BEARING

NA → 851/850 ALERTS THAT TREND WARMER AND DEVELOP Kvalues OF >3.5 OFTEN BECOME CONDEMNABLE BEARINGS (853) ACCORDING TO AAR S-6001. KEEP AN EYE ON ANY THAT ARE TRENDING WARMER. POSSIBLE INSPECTION MAY BE JUSTIFIED WHERE MINIMAL DELAY INCURRED IF WAYSIDE DEEMS NEEDED.

870/860 DIFFERENTIAL (115+ S-S DIFF)

Inspection should look for bearing Discoloration from overheating, Leaking grease, Physical abnormalities, grinding in motion.

Occasionally alert only populates in the public folder inbox.
*WDS only alarm, does not talk to crew

NA → INSPECTION OF DEFECTIVE AXLES MUST BE MADE AS SOON AS CONSISTENT WITH SAFE TRAIN HANDLING PROCEDURES. DIFFERENTIAL ALARMS ARE SOMETIMES ATTRIBUTED TO WHEEL HEAT, CHECK WTD HISTORY. KNOWN SITES FOR FINDING STICKING BRAKES, RETAINER VALVES, HAND BRAKES AS THE CAUSE: KUNKLE, OH (D87.6). MULTIPLE ALERTS MAY INDICATE STICKING BRAKES AS CAUSE OR DETECTOR ERROR (CHECK RAW DATA FOR FAILURES).

HBD Hotbox Detector Differential - 860 CRITICAL

*Example of false WDS Differential (always axles 1/1 or 1/6) still review data to be certain of no issues. Most often are of no concern.

*WDS only alarm, does not talk to crew

953 - BEARING TEMPERATURE SPIKE

NA → SINGLE JOURNAL SHOWING STRESS AND POSSIBLY TRENDING IS MORE LIKELY TO BE AN INDICATOR OF DEFECT IN THE BEARING. BOTH SIDES OF THE SAME AXLE OR MULTIPLE LOCATIONS OF BEARING STRESS WITHIN THE SAME EQUIPMENT (JUST LIKE 800 SERIES ALERTS) IS MORE LIKELY TO BE SIGN OF STICKING BRAKES WHERE SET AND RELEASE IS MOST APPROPRIATE FIRST STEP. THIS ALERT CAN ALSO SHOW THE INITIAL SPIKE IN TEMPERATURE THAT LEADS TO PATTERN 853 (WMS1).

870 WARM BEARING (170+ DEG)

Inspection should look for bearing Discoloration from overheating, Leaking grease, Physical abnormalities, grinding in motion.

YES → INSPECTION OF DEFECTIVE AXLES MUST BE MADE.
IF KEY TRAIN STOPS ON DETECTOR THEN INSPECTION OF ENTIRE TRAIN MUST BE PERFORMED.
NO YES → INSPECTION OF DEFECTIVE AXLES MUST BE MADE.
NO NO → INSPECTION OF DEFECTIVE AXLES MUST BE MADE AND ROLL BY OF REMAINDER OF TRAIN ONLY IF STOPPED ON DETECTOR WITH INCOMPLETE CURRENT SCAN.
(2 CONSECUTIVE MISSED SCANS REQUIRES ROLL BY)

870 ABSOLUTE BEARING (200+ DEG)

Inspection should look for bearing Discoloration from overheating, Leaking grease, Physical abnormalities, grinding in motion.

YES → INSPECTION OF DEFECTIVE AXLES MUST BE MADE.
IF KEY TRAIN STOPS ON DETECTOR THEN INSPECTION OF ENTIRE TRAIN MUST BE PERFORMED.
NO YES → INSPECTION OF DEFECTIVE AXLES MUST BE MADE.
NO NO → INSPECTION OF DEFECTIVE AXLES MUST BE MADE AND ROLL BY OF REMAINDER OF TRAIN ONLY IF STOPPED ON DETECTOR WITH INCOMPLETE CURRENT SCAN.
(2 CONSECUTIVE MISSED SCANS REQUIRES ROLL BY)

853 CONDEMNABLE BEARING (WMS1)

Inspection should look for bearing Discoloration from overheating, Leaking grease, Physical abnormalities, grinding in motion. 9853 Intercept (Warm Bearing Trend) is automatically applied once 853 is generated.
*WDS only alarm, does not talk to crew

YES → INSPECTION OF DEFECTIVE AXLE MUST BE MADE TO ENSURE EQUIPMENT SAFE FOR CONTINUED TRAVEL TO DESTINATION.
MAJORITY OF 853 ALERTS ARE SET OFF SHORT OF DESTINATION FOR REPAIR.
(It is better to set it out while the car still rolls then have it fail and block the world for wheelset renewal on the mainline.)
Melts temp stick, Leaking grease (signs of prior leak), physical damage = set out

871 TALKER BEARING (Mandatory set out)

Inspection should look for bearing Discoloration from overheating, Leaking grease, Physical abnormalities, grinding in motion.

871' Indicates the presence of both an AAR overheated bearing (WMS0)(Warm, Absolute or differential alarm) and also a JWDS trending alert (WMS1). The combination of these conditions confirms a defect.

YES → INSPECTION OF DEFECTIVE AXLES MUST BE MADE.
IF KEY TRAIN STOPS ON DETECTOR THEN INSPECTION OF ENTIRE TRAIN MUST BE PERFORMED.
NO YES → INSPECTION OF DEFECTIVE AXLES MUST BE MADE.
NO NO → INSPECTION OF DEFECTIVE AXLES MUST BE MADE.

1) Inspect immediately pursuant to safe train handling procedures. If no defects are found, instruct NOC and crew that equipment is to be set out at next forward mechanical point for wheelset renewal. Follow up email with the same instructions to copy mechanical for awareness. 2) If bearing is found defective and unsafe to continue, set off in the nearest siding. Ensure NOC contacts mechanical with cars location for repairs. 3) If no remaining mechanical locations exist prior to interchange ensure equipment is set off prior for repairs.

HOT WHEEL ALERTS

(Operating Rule 151)

Wheel Temp [<100] [100 < 350] [350 < 500] [500 < 600] [600 < 698] [≥ 698]

610/650/620 HOT WHEELS

500+ Degree Wheels
HWD HOT CAR / WHEEL / TRUCK - MODERATE

NA → TONE UP TRAIN CREW AND REQUEST BRAKE APPLICATION AND RELEASE PER OB-15 (30 AUG 2019). BE COGNIZANT OF APPROACHING EVENTS TO TAKE ADVANTAGE OF PLANNED STOPS, DISPATCHERS DISCRETION ON LOCATION.

610/650/620 HOT WHEELS (LOCO)

Any Clearly Defined Wheel heat

NA → CONSISTENT WITH SAFE TRAIN HANDLING PROCEDURES AT LOCATION THAT WILL MINIMIZE DELAYS.

610/650/620 HOT WHEELS

Multiple 400+ degrees

NA → TONE UP TRAIN CREW AND REQUEST BRAKE APPLICATION AND RELEASE PER OB-15 (30 AUG 2019). BE COGNIZANT OF APPROACHING EVENTS TO TAKE ADVANTAGE OF PLANNED STOPS, DISPATCHERS DISCRETION ON LOCATION.

610/650/620 HOT WHEELS

600+ degrees

NA → LOW VALUE 600 DEG CARS MAY BENEFIT FROM S&R FIRST TO VERIFY INSPECTION WAS TRULY NEEDED. USE BEST JUDGEMENT AFTER REVIEWING TRAIN / CAR ROUTE AND UPCOMING EVENTS. HIGH VALUE 600 DEG CARS SHOULD BE INSPECTED AS SOON AS SAFELY ABLE IN LOCATION THAT WILL NOT CAUSE EXCESSIVE DELAY.

872 TALKER BRAKING

698+ DEGREES

NA → INSPECTION OF DEFECTIVE AXLES MUST BE MADE.
IF KEY TRAIN STOPS ON DETECTOR THEN INSPECTION OF ENTIRE TRAIN MUST BE PERFORMED.

"When operating in single track territory, a train receiving a Hot Wheel defect alarm may proceed at a speed not to exceed 30 MPH to the next siding, multiple track or yard location where the train must be inspected. (NA for Key trains or Crews that have felt any erratic operation.)

After stopping the train, a roll-by-inspection may be performed. Prior to making the roll-by-inspection, the Engineer must make a full service application of the air brakes, allowing sufficient time for a complete set and equalization of the brake system before initiating a release."

DRAGGING EQUIPMENT

(Operating Rule 147)

870 - TALKER PLAIN
871 - TALKER BEARING
872 - TALKER BRAKING
876 - Dragging Alarm
861 - HBD Sun Alert
860 - HBD Differential

876 DRAGGING EQUIPMENT

YES

INSPECTION OF DEFECTIVE AXLES MUST BE MADE.
IF KEY TRAIN STOPS ON DETECTOR THEN INSPECTION OF ENTIRE TRAIN MUST BE PERFORMED.

TALK TO CREW
EMAIL NOC

HBD Talker Plain - 870

Dragger Alarm - 876

876 (Dragging Equipment) always accompanied by 870 (Talker Plain)

"A defect warning message stating "CRITICAL ALARM" will indicate that an excessively hot journal or dragging equipment defect has been detected. The train must be immediately stopped for inspection, consistent with safe train handling procedures..."
By nature most trains will end up stopping on the detector and their Key train status and last scan come in to play.

NO

YES
INSPECTION OF DEFECTIVE AXLES MUST BE MADE. AFTER INSPECTION, TRAIN WILL BE 30 MPH TO NEXT DETECTOR UNLESS TRAIN CLEARED DETECTOR PRIOR TO STOPPING AND WILL NOT RECEIVE 'TOO SLOW' MESSAGE UPON DEPARTING.

NO

NO
INSPECTION OF DEFECTIVE AXLES MUST BE MADE AND ROLL BY OF REMAINDER OF TRAIN ONLY IF STOPPED ON DETECTOR & PRIOR SCAN WASN'T GOOD.
(2 CONSECUTIVE MISSED / INCOMPLETE / NOT WORKING SCANS REQUIRES ROLL BY)

PUBLIC FOLDER INBOX

Public Folders -
All Public Folders
Favorites
HBD 1130366

DED ALARMS TYPICALLY ARRIVE LATE DUE TO TRAIN ON TOP OF THE SITE. USE THE PUBLIC FOLDER TO ASSIST CREW. LINE 2, AXLE 8 IDENTIFIED AS THE ALERTED CAR. USE THIS AND TYES / WDS (PREVIOUS TRAIN SCANS) TO FIND CAR NUMBER, IF NOT THEY WILL COUNT AXLES.

WDS@exchange.nscorp.com
HBD - 870 - HBD Talker Plain and Severity is CRITICAL - Annville-2, PA - NS 4482
An alert was generated for 870 - HBD Talker Plain

WDS@exchange.nscorp.com
DED 02:04:26 2021-07-12 Annville-2, PA
DED 002:005 Right Absolute alarm @27 <end>

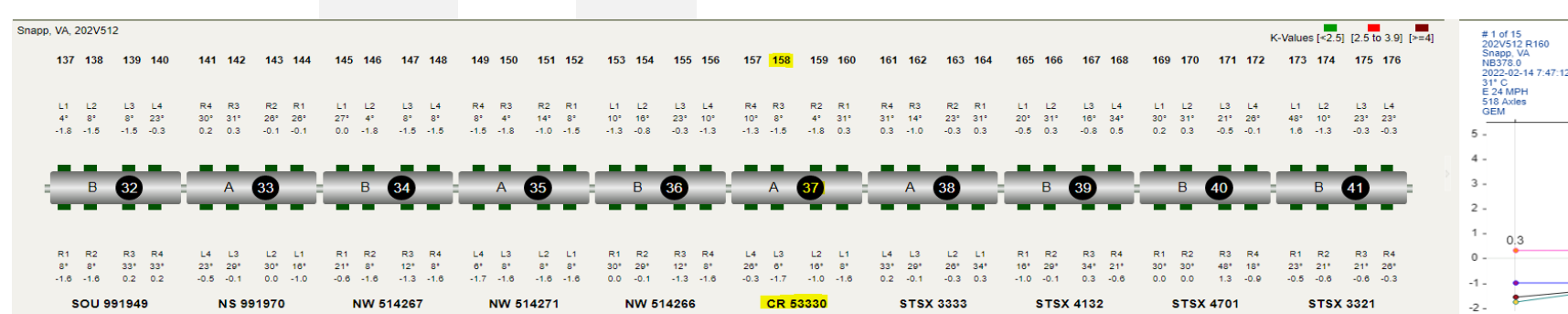
Passing Id: 44201533 - 20210712 0204.GEM.HBD.05020.txt
DEM 00502 HAD5020 20210712 020426 20210712 020534 050 Y 120 0166 ? ? W 0 E 034 027 031 A N F N 02658 0 00 00 046 000 0192 0905 02 027 034 T
HBI PRMICR0HBD ACSSCANNER 0192 0192 200 170 115 000 255 160 F 700 300 100 150 130 253 253 000 000 000 130 1 010 1960 1690 130 F 0000 00 00 012 0010 0000 05162021 05162021 01012001 01012001 01012001 W 2200
ECR +0880 F XXXXX X XXXXX XXXXX X XXX XXX XXX XXXX XXXXX X XXXXX X XXXXX X XXXXX X
RRE 001 ? ? ? ? ? 0000000000 U ? G N ? 00 00 034 006 000
HBD 001 0001 1 N N F 0100 0000 E 000590
HBD 001 0002 1 N N F 0000 0000 E 000590
HBD 001 0003 1 N N F 0000 0000 E 000590
HBD 001 0004 1 N N F 0000 0000 E 000590
HBD 001 0005 1 N N F 0000 0000 E 000590
HBD 001 0006 1 N N F 0000 0000 E 000590
RRE 002 ? ? ? ? ? 0000000000 U ? G N ? 00 00 034 006 000
HBD 002 0007 1 N N F 0000 0000 E 001240
HBD 002 0008 1 N N F 0020 0020 E 000590
DED 002 01 1 0000
HBD 002 0009 1 N N F 0060 0000 E 000590
HBD 002 0010 1 N N F 0020 0000 E 003020
HBD 002 0011 1 N N F 0000 0000 E 000590
HBD 002 0012 1 N N F 0020 0000 E 000590

Alarm Count

Dragging Equipment LINE 2 AXLE 8

WHMS

Find a Detector
Site ID: []
Site Name: []
Detector: []
Search from List of Detectors



Quick View Summary Axles Alarms Statistics Export Save

Alarm : 1 reported

Dragger Car:37, Axle:158, Rail:0, Heat:5, 8, 0, 0

Often the alert for Dragging Equipment does not show up immediately in WDS, especially if the train stopped on the scanner due to critical alarm. WHMS and the Public Folder are the best resources to locate the car number associated with the alerted Axle. then you can use WDS for reference to the prior detector to help the train with a car ID to inspect.

WHEEL IMPACT LOAD DETECTOR ALERTS (WILD)

(Operating Rule 153) (NS-1 / C-115 - Flat Spots)

130 WHEEL IMPACT (CAR)
430 WHEEL IMPACT (LOCO)
201 IMBALANCED LOAD

NA

NA

TALK TO CREW
EMAIL NOC

NON-CRITICAL IMPACT	125 – 139.9 KIPS	MAY CONTINUE NOT EXCEEDING 30MPH TO NEXT FORWARD DESIGNATED LOCATION FOR SET OUT AND WHEEL SET RENEWAL.
CRITICAL IMPACT	140+ KIPS	MUST STOP AND INSPECT TO ENSURE SAFE FOR MOVEMENT. IF NO OBVIOUS DEFECTS FOUND, 30MPH TO NEXT DESIGNATED SET OUT LOCATION. IF DEFECTS (FLAT SPOTS) FOUND REFERENCE NS-1 / C-115 FOR GUIDANCE.
NON-CRITICAL HHF IMPACT	110 – 119.9 KIPS	MAY CONTINUE NOT EXCEEDING 30MPH TO NEXT FORWARD DESIGNATED LOCATION FOR SET OUT AND WHEEL SET RENEWAL.
CRITICAL HHF IMPACT	120+ KIPS	MUST STOP AND INSPECT TO ENSURE SAFE FOR MOVEMENT. IF NO OBVIOUS DEFECTS FOUND, 30MPH TO NEXT DESIGNATED SET OUT LOCATION. IF DEFECTS (FLAT SPOTS) FOUND REFERENCE NS-1 / C-115 FOR GUIDANCE.
NON-CRITICAL IMBALANCE	15-19.9 S-S KIPS	MAY CONTINUE NOT EXCEEDING 30MPH TO NEXT FORWARD DESIGNATED LOCATION FOR SET OUT AND LOAD ADJUSTMENT.
CRITICAL IMBALANCE	20+ S-S KIPS	MUST STOP AND INSPECT TO ENSURE SAFE FOR MOVEMENT. IF NO OBVIOUS DEFECTS FOUND, 30MPH TO NEXT DESIGNATED SET OUT LOCATION.

WILD Vertical Impact - 130 CRITICAL 112.55 Kips 38GC114 FGLX 87020 184 / 1

WDS will automatically alert for ANY hazardous / loaded equipment with Max Peak Kips of 110 or more (Potential Non-Critical HHF impact). However, this threshold only applies to Crude and Ethanol commodities. Go to TYES / Equipment Lookup / right click equipment / Waybill / > (verify commodity)

Equipment Locate
Equipment ID: []
Controlling Station: 323 LINWOOD
Hazardous Equipment
Equipment List Table with columns: Equipment, ID, Unit, ClassCd, HandCd, Atte, NatlIn, Comd, Aznd, Inland, Car, Cost, Customer

IRC BUTANE
1 TNK 150497 LBS
UN1075
BUTANE
2.1
(NON-ODORIZED BUTANE)
EMERGENCY CONTACT:
CHEMTRAC CCN 8179
1-800-424-9300
HAZMAT STCC=4905424
RELEASE:
210709 : 0926 :

This equipment is a loaded tank of Butane. It does not fall under the HHF impact rules.

EXAMPLES OF CRUDE OIL AND ETHANOL WAYBILL NOMENCLATURE

IRC HAZMAT
1 TNK 192942 LBS
UN1267
ETHANOL CRUDE OIL
3//PG I
ERP 2-1933-026
(8002650212)

IRC 1 TANK CAR
1 TNK 196482 LBS
UN1987
ALCOHOLS, N.O.S.
3//PG II
(ETHANOL, GASOLINE)

IF FLAT SPOTS ARE FOUND FROM INSPECTION OF CRITICAL IMPACT USE NS-1, C-115 FOR AUTHORITY ON MOVEMENT

**NS-1, January 1, 2019
C-115 'FLAT SPOTS'**

IF A FLAT SPOT ON A WHEEL OF A CAR (OR ENGINE) DEVELOPS EN ROUTE, A MEMBER OF THE CREW MUST INSPECT IT. UPON COMPLETION OF INSPECTION, THE TRAIN WILL BE GOVERNED AS FOLLOWS:

- (A) PROCEED AT AUTHORIZED SPEED: THE TRAIN MAY CONTINUE AT AUTHORIZED SPEED IF NO OTHER DEFECTS AFFECTING MOVEMENT ARE OBSERVED, AND IF:
 - a. THE FLAT SPOT IS LESS THAN 2-1/2 INCHES IN LENGTH.
 - b. IF THERE ARE 2 ADJOINING SPOTS, EACH IS LESS THAN 2 INCHES IN LENGTH.
- (B) PROCEED AT 10 MPH: IF A FLAT SPOT IS FOUND IN EXCESS OF EITHER OF THE ABOVE DIMENSIONS, BUT LESS THAN 4 INCHES, AND NO OTHER DEFECT IS OBSERVED, 2 ACTIONS MUST BE TAKEN:
 - a. SPEED MUST NOT EXCEED 10 MPH.
 - b. A REPORT MUST BE MADE PROMPTLY TO THE TRAIN DISPATCHER.
- (C) REMAIN STOPPED: IF A FLAT SPOT OF 4 INCHES OR GREATER IS FOUND, THE TRAIN MUST REMAIN STOPPED UNTIL A REPORT IS MADE TO THE TRAIN DISPATCHER. WHEN DETERMINED SAFE FOR MOVEMENT, THE CAR (OR ENGINE) MUST BE SET OUT

