National Transportation Safety Board

# Operating Issues

Ted Turpin

# Issue Areas

- How the alerter functioned
- Alerter ineffectiveness in addressing crew fatigue

# Alerter Alarm Cycle

- When the engine brakes are released the alerter is activated
- Below 20 mph – 2-minute alerter cycle
- Above 20 mph – alerts more often

| Speed | Approximate Cycle in Seconds | |
|---|---|---|
| | EMD | GE |
| 30 MPH | 120 | 80 |
| 40 MPH | 120 | 60 |
| 50 MPH | 96 | 48 |
| 60 MPH | 80 | 40 |
| 70 MPH | 69 | 34 |

# Alerter Alarm Sequence

- 4 to 6 seconds flashing light only
- 6 to 10 seconds adds an on/off audible horn
- After 10 seconds audible horn is continuous
- After 24–26 seconds train brakes apply

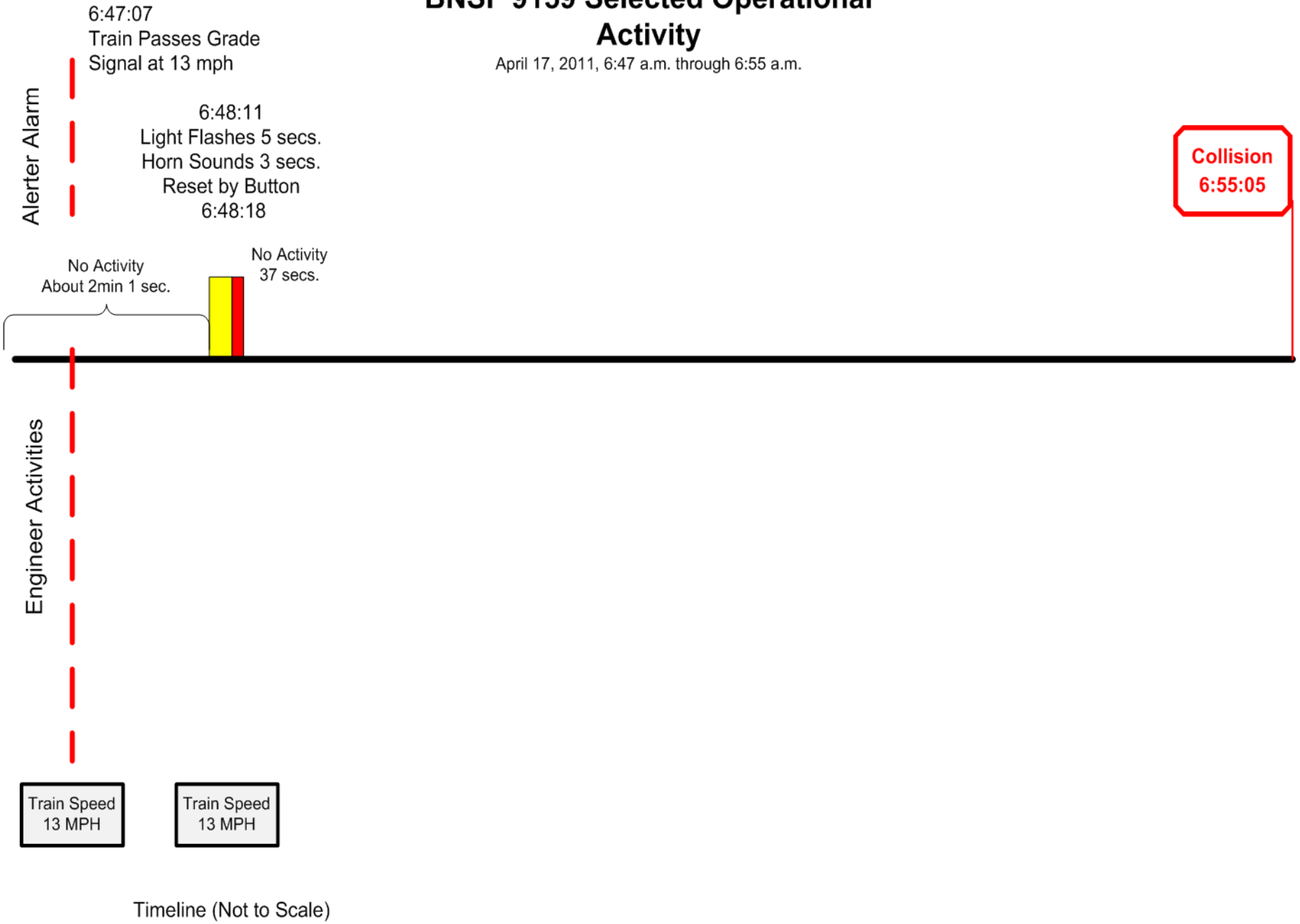
# Resetting Alarm Cycle

- Throttle or Dynamic Brake
- Horn
- Bell
- Reset Button

Alerter Reset Button
ALERTER RESET
ALERTER RESET
ATTENDANT CALL
SAND
113
9388

# BNSF 9159 Selected Operational Activity

April 17, 2011, 6:47 a.m. through 6:55 a.m.



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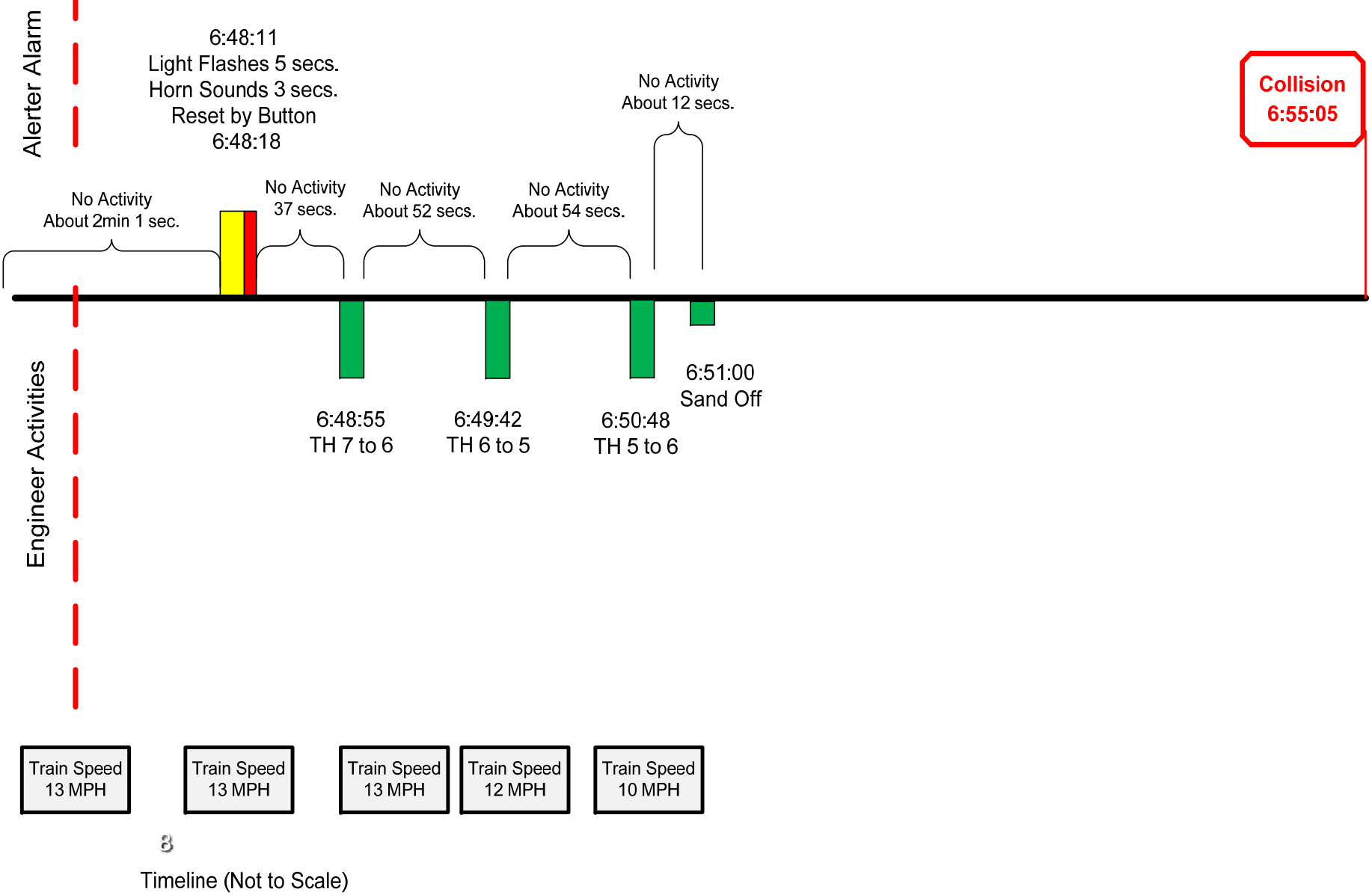

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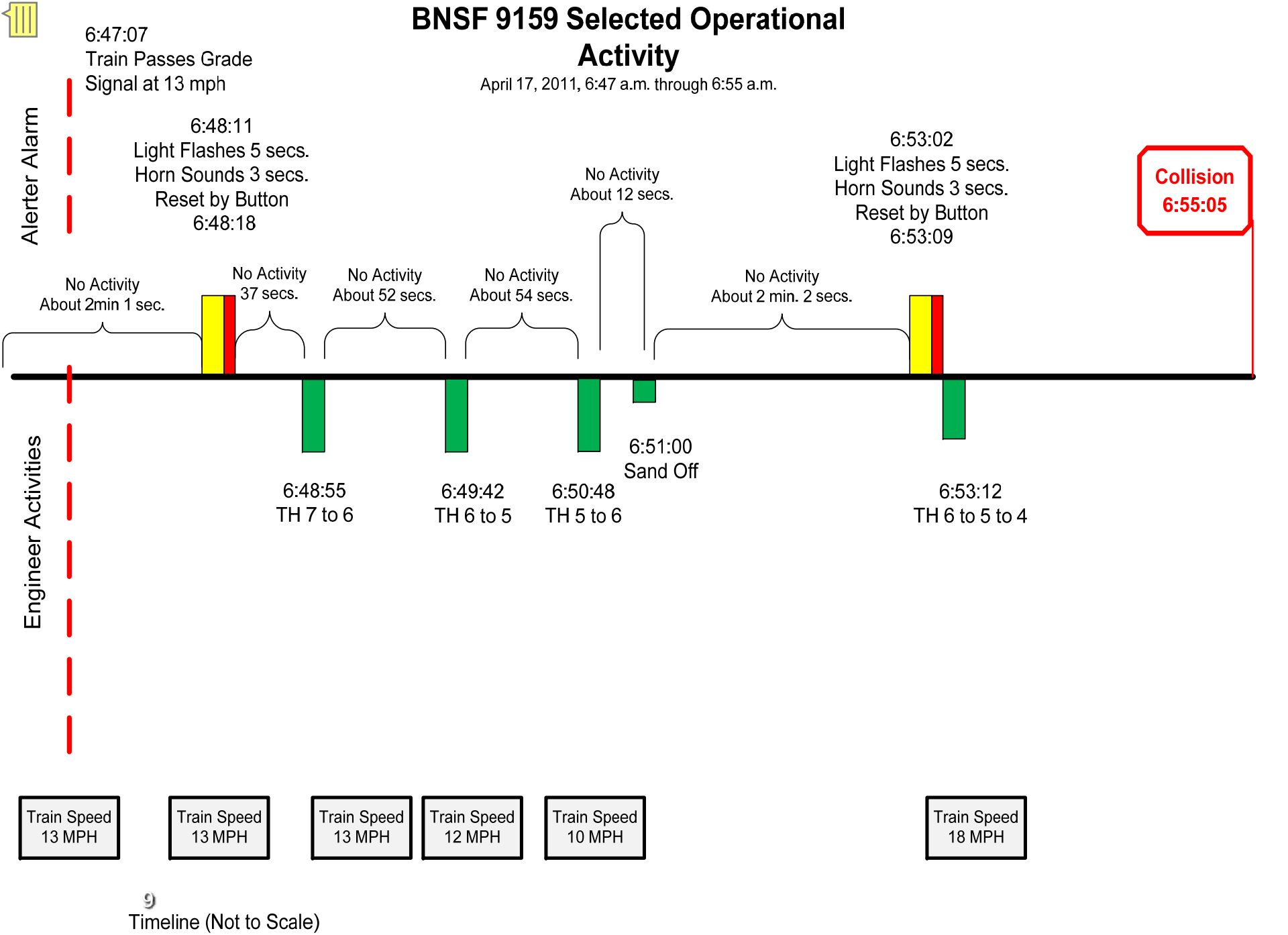

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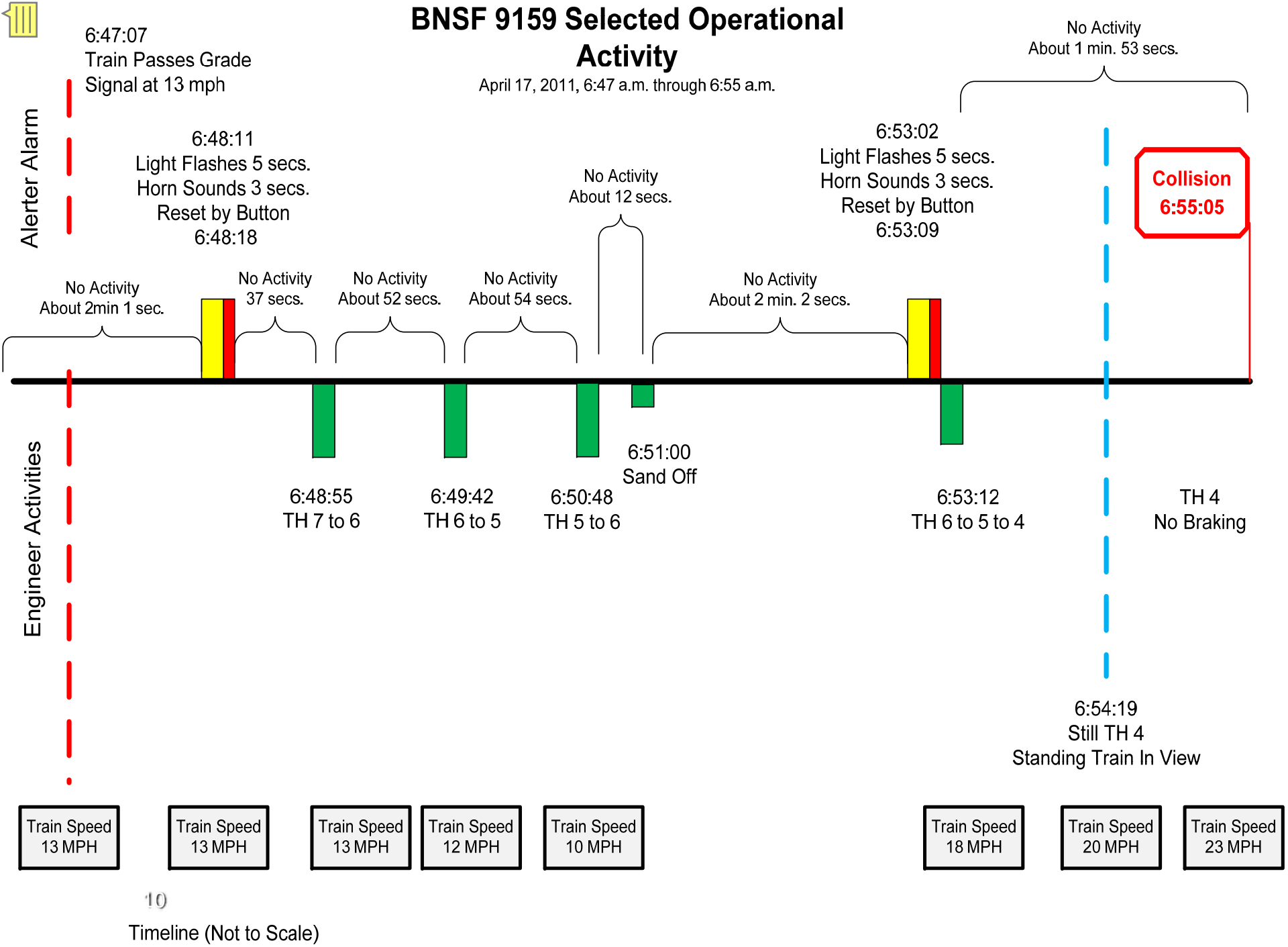


Timeline (Not to Scale)

# Alerter in Red Oak Accident

- Last throttle change was 1 minute 53 seconds before impact
- The train traveled 3,344 feet
- Standing train was visible for 1,364 feet
- No recorded activity by the engineer
- Train accelerated 20 to 23 mph
- Alerter neither interceded nor was designed to intercede during this critical time
- Alerter did not ensure restricted speed

# Safety Issue

Alerter ineffectiveness in addressing crew fatigue

# Alerters and Fatigue

MIT In-Cab Alerter Technology Assessment in 2007

- Estimated for a 12-month period
- Several dozen incidents
- Alerters stopped the trains
- "… clearly conventional alerters are not preventing all fatigue and alertness related accidents."

# Alerters and Fatigue

- The NTSB has concluded engineers reset alerter alarms by a reflex action as if they were a “snooze alarm.”
- The alerter does not address the actual fatigue status of an engineer
- Engineer may be aroused by the alerter but remains fatigued
- Only restful sleep mitigates fatigue

# Monitoring Fatigue

- In-cab video with imaging analysis
- Develop fatigue markers from alerter reset patterns
- Develop fatigue markers from real-time event recorded engineer activities
- Research yet unidentified methods to determine crew fatigue
- Recognize restful sleep addresses fatigue

# Alerters and Fatigue

- Alerters are one element of risk mitigation
- Need to explore other methods to detect and address crew fatigue

# Staff Conclusion

Locomotive alerters only detect engineer inactivity and are not a substitute for an effective fatigue mitigation strategy

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