RSAC

Wayside Detectors Working Group

Status Update

October 9, 2024

Working Group Task Statement

- **Purpose**: To consider and review issues related to wayside detectors, including analyzing existing regulations and guidance, accidents, incidents and performance data, safety complaints, and existing best practice.
- **Output**: Recommendations and/or proposals to update existing regulations and guidance, and/or develop new regulations regarding some or all of the following areas relating to wayside detector equipment and operation:
  - Definition of wayside devices(s)
  - Location, configuration, installation, inspection, test, repair and maintenance of wayside detectors
  - Integration and interface of wayside detectors with other railroad subsystems
  - Communication, reporting and validation of wayside detector measurement, data and alarms
  - Decision processes and thresholds, including communications and reporting action to avert accidents and incidents
  - Enhanced supervisory procedures
- **Timescale**: 180 days for the first initial deliverables

Working Group Sub-Tasks – Task 1 Status

Key: √ - complete
- in process
o – not started

- **Task 1: Define and Identify Wayside Detector types and quantities.**
- **Activities Complete**:
  - ✓ Identify all wayside detector technology currently in use
  - ✓ Identify wayside detector technology current in test or under development
  - ✓ Develop a definition of wayside detector
  - # Identify cost associated with installation and maintenance of wayside detector systems
- **Completed during the February 29th WG Meeting**
  - ✓ A list of 32 known detector types and placed them into 4 type categories (Rolling Stock; Infrastructure; Environmental; and Intrusion)
  - ✓ Concurred with the Wayside Detector definition: *A Wayside Detector is a device or system installed on the right of way to monitor rolling stock, components, track, or environmental conditions to produce actionable and/or performance data to the handling railroad, or directly to the train crew.*
  - ✓ Focus our efforts on hot bearing detectors, hot wheel detectors, and clearance detectors.
- **FRA Lead**: Gabe Neal, Staff Director, Signal, Train Control & Crossings Division

Working Group Sub-Tasks – Task 2 Status

Key: √ - complete
- in process
o – not started

- **Task 2: Review and Evaluate Safety Accident and Incident History**
- **Activities Complete**: Data provided by WG members
  - # Identify accidents and incidents caused by developing rolling stock faults and review the root-cause
  - # Identify accidents and incidents caused by conditions that are monitored by wayside detectors that require immediate action, such as wind, water, seismic, tunnel size, etc., and review the root-cause
  - # Identify other accidents and incidents that may be monitored by wayside detector technology that is currently in test or under development
  - # Identify safety complaints, if any, involving wayside detection equipment, its use, maintenance, or management
- **Next Steps**:
  - # Focus data on hot bearing, hot wheel and clearance detector caused accidents
  - # Perform data analysis
  - o Present data December WG Meeting
- **FRA Lead**: Ricky Huggins, Staff Director, Incident Management, Accident Reporting & Analysis Division

Working Group Sub-Tasks – Task 3 Status

Key: √ - complete
- in process
o – not started

- **Task 3: Analyze Installation, Calibration, Test, Repair and Maintenance processes and practices**
- **Activities Complete**: FRA collected some data as part of HHFT route assessment and have copies of industry guidance
  - ✓ Typical quantities and locations of use
  - ✓ Methods of calibration, test and maintenance, including frequency
  - ✓ Method of determining failures and repair requirements
  - ✓ Skills and training requirements
- **Next Steps**:
  - ✓ Review industry guidance
  - ✓ Prepare best practice question
  - ✓ Review best practice responses
  - # Consolidate best practice final review responses
- **FRA Lead**: Gabe Neal, Staff Director, STC&C Division
  Gary Fairbanks, Staff Director, MPE Division

Working Group Sub-Tasks – Task 4 Status

Key: √ **- complete**
 # - in process
o – not started

- **Task 4: Analyze Communication and Reporting Methods**
- **Activities Complete**: FRA audit of Class I process for actioning wayside detector information nearing completion.
  - ✓ Current Alarm Thresholds
  - ✓ Frequency and method of reporting general status and health
  - ✓ Availability and location of historical data (by detector, location, etc.)
  - ✓ Where and to whom reports and alarms are sent (e.g., mechanical department)
  - ✓ Method of trend analysis performed
- **Next Steps**:
  - ✓ Review industry guidance
  - ✓ Prepare best practice question
  - ✓ Review best practice responses
  - # Consolidate best practice final review responses
- **FRA Lead**: Chris Holt, Staff Director, OP Division

Working Group Sub-Tasks – Task 5 Status

Key: √ - complete
- in process
o – not started

- **Task 5: Analyze Decision Process for Actions to Avert Accidents and Incidents**
- **Activities Complete**: FRA audit of Class I process for actioning wayside detector information nearing completion.
  - ✓ Who takes action when a detector alarms (Engineer, Conductor, Dispatch) and what is the action (e.g., suspect defect inspected at the next Class I inspection)
  - ✓ Who evaluates trend data and what is the decision process for actions to avert safety incidents and accidents
  - ✓ Who takes action based on any trending concern and how is this communicated to the Engineer and Conductor
  - ✓ Who is responsible for ensuring proper operation of wayside detectors
  - ✓ Who is responsible for evaluating historical data to evaluate any update required to alarm thresholds, trending algorithms and/or the decision process
- **Next Steps**:
  - ✓ Review industry guidance
  - ✓ Prepare best practice question
  - ✓ Review best practice responses
  - # Consolidate best practice final review responses
- **FRA Lead**: Chris Holt, Staff Director, OP Division

Working Group Sub-Tasks – Task 6 Status

Key: √ - complete
- in process
o – not started

- **Task 6: Prepare Recommendations**
- **Activities Complete**:
  - # Identify best practice (hot bearing, hot wheel and clearance detectors)
  - o Propose any updates to existing regulations and/or guidelines
  - o Propose any recommended new regulations using a risk-based approach
- **Next Steps**:
  - # Complete Tasks 1 - 5
  - # Convene the working group to review best practices and prepare proposals
- **FRA Facilitator**: Carolyn Hayward-Williams

Best Practice Questions, Data Sources, Responses and Current Review

52 Best Practice Questions: HBD, Hot Wheel and Clearance Detectors

- **Placement, Maintenance, Calibration**
  - Number/spacing, placement and calibration levels
  - Maintenance levels, frequency, calibration processes
  - Alarm levels, data communicated, frequency and timing of reports
- **Reporting, Analysis, Trending**
  - Frequency of reporting different types of alarms and alerts
  - Data scrubbing and data analysis/algorithms
  - Trending alarms
- **Actioning Alarms and Alerts**
  - Reporting processes and methods
  - Engagement with train crew
  - Sharing data between railroads at interchange
- **Detector Reliability and Data Verification**
  - Level and extent of detailed analysis of data
  - Variability by car types and other factors
  - Process for taking detectors out of service

Sources of Feedback

- **FRA HHFT Route Assessment**
- **OEM Materials**
- **Industry Standards**
- **FRA SME Observations and Railroad Feedback**
- **Safety Advisories**
- **Research Materials**
- **Initial Feedback to Questions**
- **Meetings and Discussions**

FRA SMEs Consolidation of Best Practices

- **Potential Best Practices Prepared**
- **Discussed at Working Group Meeting**

Final Feedback Requested (by October 23rd)

Best Practice Questions, Data Sources, Responses and Current Review (example 1)

Survey Questions	AAR	IBEW	Lessons Learned in HHFT	Potential Best Practice (v1) - discussed at 9/25 RSAC WG meeting	RSAC Group Response on Best Practices (v1)
What standards do you use/ recommend for the installation of hot bearing detectors?	*not asked*	*I use the manual published by Southern Technologies Corporation. When I received a replacement scanner mount from STC it was bench adjusted perfectly for the proper focus of the optical alignment. This was a reassuring fact of quality from the manufacture that their pursuit of quality standards is reliable.*	Installation practices did not appear standardized. Various carrier departments are involved and may not be on the same page at times. Many locations lacked site plans or could reference a standard plan. When asking the field personnel, they seemed unaware or who to talk to. FRA should have asked the Signal or Mech Engineering departments as it most likely is determined by them.	Follow OEM Standards. Each carrier should have their specific standards built to allow proper installation. This should include site specific plans for the technology in use. Does AAR or Industry have best practices for interchanging between carriers? Is there a certain standard for an initial detector coming out of switching yards?	
Calibration levels?	*FRA's use of "levels" makes the request unclear. AAR would like additional details from the FRA on what is being sought here. In an effort to answer the question, though, the industry can say that it collaborates with internal and external specialists, and detector original equipment manufacturers (OEMs) to determine the calibration. Association of Railway Engineering and Maintenance of Way Association (AREMA) maintains recommendations in this area.*	*The manufacture's Absolute level is 180 over ambient.*	During the HHFT assessment it was noted that not all railroads used the same absolute/critical alarm levels. Most have come to a consensus since then.	Follow OEM standards when installed and then quarterly to align with seasonal changes. Determine a standard absolute alarm threshold for the industry on each system that is in use. Determine a standard for bearing differential alarms.	

Best Practice Questions, Data Sources, Responses and Current Review (example 2)

Survey Questions	AAR	IBEW	Lessons Learned in HHFT	Potential Best Practice (v1) - discussed at 9/25 RSAC WG meeting	RSAC Group Response on Best Practices (v1)
What is your standard for determining what alarms are provided directly to the train crew from the detection device?	*Alarms that require immediate action (e.g., train handling reaction and inspections) are provided to the train crew.* *o HBD: When a railroad determines there is sufficient temperature to indicate a failing bearing, the crew is contacted to safely stop the train and perform an inspection. The standards for identification range from AAR standards to more restrictive internal operating procedures.* *o WTD: Internal operating procedures.* *o Clearance: All indications of equipment clearances exceeding route restrictions are reported to the train crew.*	*If the passing train triggers an exception alarm due to an absolute (180), differential bearing temperature level or dragging equipment an immediate alert tone and alarm message is broadcast via the radio. A final alarm proximity alarm broadcast is done post the passing of the train.*		Review current HBD detector trending logic and thresholds considering recent derailments, and all other relevant available data (including data from any close calls or near misses), to determine the adequacy of the railroad's current trend analysis and thresholds levels. Thresholds should be established for single measurement as well as multiple measurements of individual bearings to enable temperature trend analysis. Railroads should maximize the opportunity for journal bearing trending and seek opportunities to integrate wayside detector data types to evaluate railcar health and action critical issues, including risks associated with burnt journal bearings. (SA 2023-01, notice 3) Review current procedures governing actions responding to HBD alerts to ensure required actions are commensurate with the risk of the operation involved. With regard to trains transporting any quantity of hazardous materials, FRA recommends railroads adopt the procedures outlined in AAR's OT–55 for key trains as an initial measure. (SA 2023-01, notice 3) .	
What algorithms do you have written to scrub the detector data?	*This is an exceptionally complex and broad question. The industry employs volumes multi-variable algorithms that consider things such as:* *-Equipment type* *-Matched data recovered from AEI or back office consist identification logic.* *-Normalization of the data*	*The data never leaves the HBD fixed location stored locally unless requested. There is no process of reviewing the recorded train data to process for outliers, patterns, anomalies or to validate data. I do this visually during my monthly inspection looking at the downloaded data to help me determine if is an issue and to confirm everything is normal. Data is not being captured for forward reporting if a trending defect emanate towards destruction.*		Standardization across the industry and real-time information/data exchange	

Best Practice Questions, Data Sources, Responses and Current Review (example 3)

Survey Questions	AAR	IBEW	Lessons Learned in HHFT	Potential Best Practice (v1) - discussed at 9/25 RSAC WG meeting	RSAC Group Response on Best Practices (v1)
What algorithms do you have written to scrub the detector data?	*This is an exceptionally complex and broad question. The industry employs volumes multi-variable algorithms that consider things such as:* *-Equipment type* *-Matched data recovered from AEI or back office consist identification logic.* *-Normalization of the data*	*The data never leaves the HBD fixed location stored locally unless requested. There is no process of reviewing the recorded train data to process for outliers, patterns, anomalies or to validate data. I do this visually during my monthly inspection looking at the downloaded data to help me determine if is an issue and to confirm everything is normal. Data is not being captured for forward reporting if a trending defect emanate towards destruction.*		Standardization across the industry and real-time information/data exchange	
Are these algorithms provided and interpreted by someone monitoring the detector desk and what is the escalation process?	*For the reasons noted above, AAR recommends that FRA avoid the use of "detector desk." The outcomes of the detection algorithms can be monitored by an employee, automatically, or in a hybrid scenario. Regardless of evaluation methods, railroads will ultimately communicate escalated safety critical alarms to key personnel, such as train dispatchers and crew.*	*No & N/A*		Communication chains between the Wayside / Mechanical Help Desks and the Dispatcher should be active and real time communications requiring acknowledgement as well as escalation processes. At shift changes, the status of all wayside detector alerts, alarms and trending should be part of the formal transition, ensuring the status of communications between the Wayside/Mechanical Desk and the Dispatcher is also part of the formal transition. Initial, Refreshment and Recurrency training should be provided for Dispatch and management personnel involved in decision making. Further dispatch territory qualifications should include the location and type of wayside detectors. Increased rules class content focused on detectors and required actions, wayside detection questions in rules tests, and provide and quick reference material to all levels of Network Operations staff.	
On trending alarms or standalone detector reports, does the dispatch center have procedures that are followed or is this determined on a case-by-case basis? o In other words, does the dispatch center or another field officer have the discretion to override these trending or critical reports once they are discovered?	*Train handling procedures and further instructions when detectors have provided a radio alarm or trending information are generally outlined in railroad operating rules or other company documents. Special instructions where a unique scenario may be present with respect to a detector would be well defined and documented. No railroads reported granting discretionary authority to any staff role to override safety-critical reports.*	*Unknown.*			

U.S. Department of Transportation
Federal Railroad Administration

Contact Us

Federal Railroad Administration
1200 New Jersey Avenue, SE
Washington, DC 20590


@USDOTFRA


@USDOTFRA


@USDOT_FRA


@Federal-Railroad-Administration


@Federal Railroad Administration

Carolyn Hayward-Williams
Email: c.hayward-williams@dot.gov

Gabe Neal
Email: gabe.neal@dot.gov

Gary Fairbanks
Email: gary.fairbanks@dot.gov

Chris Holt
Email: chris.holt@dot.gov