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Railroad Safety Advisory Committee
Task Statement: Wayside Detectors

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Task No.: 2023-01

Date initially presented to the RSAC: March 27, 2023

Purpose:

To consider and review issues related to wayside detectors, including analyzing existing regulations and guidance, accident, incident, and performance data, safety complaints, and existing best practices.

This task statement will not only address wayside detectors from the perspective of the technology and devices, but also the processes and procedures to use and train personnel to use wayside detector measurements, data, and alarms to avert accidents and incidents.

The output of this task will include recommendations and/or proposals to update existing regulations and guidance, and/or develop new regulations regarding some or all the following areas relating to wayside detector equipment and operation:

- Definition of wayside device(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 measurements, data and alarms;
- Decision processes and thresholds, including communications and reporting actions to avert accidents and incidents; and
- Enhanced supervisory procedures

The task will be performed by a multi-disciplinary team, including subject matter experts in railroad motive power and equipment, signal and train control, operating practices and dispatching; as well as wayside detectors, both existing and new technology.

Background:

There are two major categories of wayside detectors – those that detect and diagnose developing faults in rolling stock and those that identify conditions requiring immediate attention.

- Existing FRA regulations do not address most of the wayside detectors currently used for detecting and diagnosing developing rolling stock faults.[1]

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[1] Examples: Detecting wheel bearing defects (HBD, ABD); Detecting loose or dragging components under a train (DED), Detecting wheel defects (WILD, WPMS); Detecting brake issues (HWD, WTD); other types of faults to axles and suspension; and other behaviors such as hunting or load imbalance that could cause an accident or incident.

- If a wayside detector is tied into the signaling system, the requirements of 49 CFR Part 236 apply and the signaling system is required to slow or stop a train to avert an incident the wayside detector is designed to monitor.[2]

FRA's preliminary investigation of recent derailments indicates that the **wheelset bearings** may have caused the incidents and wayside detectors (specifically hot bearing detectors (HBDs), alarmed the suspect bearings, but the train had insufficient time to stop prior to the failure. Trending data was reported to the dispatch center with no action taken until it was too late to prevent the derailment.

As a result, on March 3, 2023, FRA issued a Safety Advisory recommending that railroads review their processes and procedures relating to HBDs and review the thresholds at which HBDs are set to alert of an anomaly in a bearing.

On March 8, 2023, the Association of American Railroads announced the rail industry's commitment to further implement wayside detector technology and the establishment of a new industry standard for stopping trains based on wayside detector measurements – the industry committed to stopping trains and inspecting bearings whenever a temperature reading from an HBD exceeds 170º above ambient temperature.

Recognizing the value of wayside detection systems if they are appropriately installed, maintained, monitored and acted upon, FRA commenced on March 1, 2023, a comprehensive review of industry's current use of such detectors, particularly on routes over which high-hazard flammable trains and other trains transporting hazardous materials operate.

In recognition of the level of expertise and experience in the rail industry relating to the design, installation, maintenance, operation and analysis of wayside detectors and wayside detector trending/alarms data, this task is proposed to the Rail Safety Advisory Committee (RSAC). The output of the RSAC task will include recommendations and/or proposals to update exiting regulations and guidance, and/or develop new regulations relating to wayside detectors.

FRA notes the following history regarding FRA-funded research and oversight relating to wayside detector projects:

- In an ongoing research project, began in 2018, FRA partnered with Metro-North Railroad, Long Island Rail Road, and New York Atlantic Railway to pilot new wayside technology systems to detect defects and precursors to safety-critical defects in rolling stock. This research is designed to improve the process for demonstrating and implementing new wayside technology. The research project includes detection threshold analysis to help railroads establish detection thresholds for inspection, alarm, and emergency level actions.

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[2] Examples: Wayside detectors integrated into the signal system protect oversize trains from entering a tunnel, as well as operating through high water or in high wind situations.

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- FRA continues to support industry in the research, development and testing of new technologies used to monitor and identify equipment faults, including visual systems, acoustics, and alternative methods of temperature monitoring.

- In 2019, FRA published a [guidebook for implementation of wayside detectors](#) as a technical resource available to railroad industry stakeholders.

Description:

The following sub-tasks are proposed for this RSAC task:

1. Define and Identify Wayside Detector types and quantities:
   a. Identify all wayside detector technology currently in use
   b. Identify wayside detector technology currently in test or under development
   c. Develop a definition of a "wayside detector"
   d. Identify cost associated with installation and maintenance of wayside detector systems

2. Review and Evaluate Safety Accident and Incident History:
   a. Identify accidents and incidents caused by developing rolling stock faults and review the root-cause
   b. 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
   c. Identify other accidents and incidents that may be monitored by wayside detector technology that is currently in test or under development
   d. Identify safety complaints, if any, involving wayside detection equipment, its use, maintenance, or management

3. Analyze Installation, Calibration, Test, Repair and Maintenance processes and practices:
   a. Typical quantities and locations of use
   b. Methods of calibration, test, and maintenance, including frequency
   c. Method of determining failures and repair requirements
   d. Skills and training required

4. Analyze Communications and Reporting Methods:
   a. How wayside detectors report or alarm, including trend data
   b. Current alarm thresholds
   c. Frequency and method of reporting general status and health
   d. Availability and location of historical data (by detector, location, etc.)
   e. Where and to whom reports and alarms are sent (e.g., mechanical department)
   f. Method of trend analysis performed

5. Analyze Decision Process for Actions to Avert Accidents and Incidents:
   a. Who takes action when a detector alarms (Engineer, Conductor, Dispatch) and what is the action (e.g., suspect defect inspected at the next Class 1 inspection)

     b. Who evaluates trend data and what is the decision process for actions to avert safety incidents and accidents

     c. Who takes action based on any trending concern and how is this communicated to the Engineer & Conductor)

     d. Who is responsible for ensuring proper operation of wayside detectors

     e. Who is responsible for evaluating historical data to evaluate any update required to alarm thresholds, trending algorithms and/or the decision process

     f.

6. Prepare Recommendations:
   a. Identify best practices
   b. Propose any updates to existing regulations and/or guidelines
   c. Propose any recommended new regulations using a risk-based approach

Items 3-6 may initially focus on one wayside detector type, and then be repeated, as appropriate, for existing and new technology.

This list of sub-tasks will be reviewed by the RSAC Wayside Detector Working Group and expanded/amended, as appropriate.

Issues requiring specific report:

The Working Group should consider, and specifically report on and, if appropriate, develop draft regulatory or guidance document language on issues presented in the description above.

Refer to/establish the following working group:

Wayside Detector Working Group

Target Dates:

Report initial recommendations and ongoing work plan to the Committee no later than 120 days from the kick-off meeting date.

Disposition: Accepted   **Date:** April 21, 2023