Memorandum

U.S. Department
of Transportation

**Federal Railroad
Administration**

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Reply to Attn of: S-08-02

Subject: Technical Bulletin S-08-02 – Clarification Regarding the Application of the Requirements Associated with Warning Time Testing of Highway-Rail Grade Crossing Active Warning Systems

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To: Regional Administrators, Deputy Regional Administrators, S&TC Specialists, Chief Inspectors, Rail Safety Oversight Managers, State Program Managers, and all Federal and State S&TC Inspector Personnel

This technical bulletin is provided to address and clarify the Federal Railroad Administration's (FRA) expectations related to the performance of tests for prescribed warning times at highway-rail grade crossing active warning systems, as is required by Title 49 Code of Federal Regulations (CFR) Section 234.259–Warning Time. This technical bulletin is also being provided to address and clarify FRA's expectations related to the level of detail that should be contained in prescribed warning time test records.

Clarification of the Application of Prescribed Warning Time Testing Requirements (49 CFR § 234.259)

Title 49 CFR § 234.259 requires that each highway-rail grade crossing warning system be tested for the **prescribed warning time** at least once every 12 months and when the warning system is modified because of a change in train speeds. This section applies to all train detection equipment (including standby units, if equipped) used in each highway-rail grade crossing warning system.

For purposes of the application of this Technical Bulletin, prescribed warning time can be defined as follows: Prescribed warning time is the designed warning time less any associated "buffer time" and "equipment response time." Buffer time is added by the railroad to compensate for speed variance (e.g., accelerating train) and ballast impedance variances (e.g., for motion detection equipment). Equipment response time is the inherent delay in the equipment between the initial detection of a train and the actual activation of the warning system. In other words, prescribed warning time is the length of time from the moment that properly operating warning devices begin to provide their intended warning (e.g., the flashing lights begin to flash) until an approaching train operating at maximum authorized speed enters the crossing (i.e., reaches the edge of the crossing surface).

A warning system location is not considered fully tested for the prescribed warning time unless and until the crossing activation is proven for the required distance on all available approaches at the crossing (i.e., all routes and in each direction), including while operating on standby units, if so equipped. Examples of the application of this position include:

- At a basic single-track location, the entire approach circuit in each direction (two tests), or if equipped with standby units (four tests);
- At a double-track location, the entire approach circuit in each direction on each track (four tests), or if equipped with standby units (eight tests); and
- At a location where a turnout or crossover is within an approach circuit, the straight route approach and the diverging route approach must both be tested for each track, including on standby units.

As stated in FRA's Grade Crossing Signal System Safety Technical Manual ("Technical Manual"), testing may be accomplished by one of the following three methods: 1) observation of a train movement, if practical; 2) by calculation and track shunt simulation of a train movement; or 3) by use of an electronic device that accurately determines warning time.

1. If the method used is "by observation of a train movement," the actual speed (or at least a close approximate speed) of the movement must be known and it must be at (or very near) the maximum authorized speed for the route approaching and through the crossing. In the great majority of instances, "at or very near the maximum authorized speed" will be within the lesser of 20 percent or 5 mph of the maximum authorized speed (i.e., within 5 mph of any maximum authorized speed of 25 mph or more, or within 2 mph of a maximum authorized speed of 10 mph). If the speed of the movement were less than the maximum authorized speed by a margin beyond those parameters, the full extent of the intended approach circuit would not be proven to be effective by this method.

2. If the method used is "by calculation and track shunt simulation of a train movement," the process would require that the maximum authorized train speed be converted from miles per hour to feet per second. The resulting feet-per-second train speed would then be multiplied by the prescribed warning time (in seconds) for the location, not the minimum of 20 (representing a minimum of 20 seconds warning time) as is indicated in the current Technical Manual. This product would then represent a point, in feet, that is a minimum distance from the edge of the grade crossing, where train detection by the warning system must occur to assure the intended warning time. A shunt must then be placed at that point, or at a location closely beyond that point, to ensure that the system detects the presence of the shunt. If applicable, a train may be used to provide the shunt in this method of testing. Where a crossing warning system train detection is not provided through track shunting but rather the warning system is activated through other means—such as presence-detection loops, transducers, wheel counters, or other acceptable means—a simulation method appropriate to the type of detection may be used.

3. If the method used is "by use of an electronic device that accurately determines warning time," again, the actual (or at least close approximate speed) of the movement must be known and it must be at or very near the maximum authorized speed for the route approaching and through the crossing. In the great majority of instances, "at or very near the maximum authorized speed" will be within the lesser of 20 percent or 5 mph of the maximum authorized speed. If the speed of the movement were less than the maximum authorized speed by a margin beyond those parameters, the full extent of the intended approach circuit would not be proven to be effective by this method. If the data that was recorded during a period when normal train operations were in effect (which would include trains operated at or very near maximum authorized speed as described above) indicates appropriate warning times (i.e., none out of tolerance), the shortest warning time provided must be used as the actual recorded warning time of the testing.

Crossing Warning Time (49 CFR § 234.225)

The standard for warning time is contained in 49 CFR § 234.225. This section requires that each highway-rail grade crossing warning system be maintained to activate in accordance with the design of the warning system, but in no event shall it provide less than 20 seconds warning time for the normal operation of through-train movements before the crossing is occupied by rail traffic. For example, a crossing warning system might be designed to activate 30 seconds before a train being operated at the maximum authorized speed arrives at the crossing. At another crossing, the crossing warning system might be designed to activate 35 seconds or more before a train being operated at the maximum authorized speed arrives at the crossing. The designed warning time typically utilizes railroad industry design standards but is, on occasion (as determined by an engineering study that involves the applicable highway agency and railroad representatives), calculated based on criteria such as equipment used, particular crossing intricacies, vehicular traffic patterns, and roadway configurations.

Title 49 CFR § 234.225 contains a defect classification (234.225.02) that may be applied when the crossing warning time is found to not be in accordance with the design of the warning system. This defect applies in instances where the system warning time differs significantly from the prescribed warning time, not the "designed warning time" as is indicated in the current Technical Manual. A "significant difference" is one that is meaningful or important to the safety and/or credibility of the warning system and a situation in which an expected corrective action must be taken. This criteria is based on the fact that train detection systems, such as motion detectors, constant warning time devices, and other authorized systems, are designed to function for trains operating at varying authorized speeds by providing warning times within an acceptable range of the prescribed warning time (e.g., plus or minus 5 seconds or more). This fact is considered when the applicable parties determine what the prescribed warning time should be at each crossing. Thus, prudent judgment must be exercised when reviewing the results of warning time testing to determine whether the actual warning time provided during testing was compliant with the standard.

Clarification of the Application of Recordkeeping Requirements for Warning Time Testing (49 CFR § 234.273)

Title 49 CFR § 234.273, *Results of Inspections and Tests*, requires railroads to record the results of the warning time tests required by 49 CFR § 234.259. It is a normal and acceptable practice for railroads to find and record warning times where the actual warning time found will differ insignificantly from the prescribed warning time (e.g., prescribed time–30 seconds; actual time–26 seconds, or even 33 seconds). A primary purpose for the detail of information required by FRA is to provide positive indication that the persons performing the testing understand all the equipment or functions necessary to be tested, and they successfully accomplish the testing to the full extent required. In Technical Bulletin S-99-06, dated January 17, 2001, FRA highlighted the major elements that must be included in records of tests and inspections required under 49 CFR Part 234. However, FRA has found that some railroads are not maintaining records of warning time testing that contain all of the following required elements:

- Name of the railroad;
- DOT Inventory Number;
- Place and date of testing;
- The equipment tested on each available approach at the crossing;
- Results of tests, both on normal and standby operation, if so equipped ("results of tests" shall be indicated by identifying the method of testing used, the prescribed warning times, and the actual warning times found upon completion of the test.);
- Any repairs, replacements, or adjustments made to individually identified warning devices found to have an actual warning time that differs significantly from the prescribed warning time; and,
- Condition in which the apparatus was left. (Satisfactory condition would indicate the test is complete and the actual warning times are found to be as prescribed or not significantly different.)

The FRA cannot envision any other interpretation of the recordkeeping requirements contained in 49 CFR § 234.273. Nonetheless, some railroads have been proceeding under a very narrow interpretation of these recordkeeping requirements. Even though most railroads have been maintaining warning time test records that contain all of the required elements listed above, FRA understands that certain railroads may need additional time to adjust to this clarification. With respect to those railroads, FRA encourages inspectors to request that action plans be submitted with the railroad's timeframe for full compliance. While that process of adjustment is underway, and to the extent it is clear that the railroad is making an appropriate response, railroads must record, at a minimum, the total number of approaches tested at a crossing location and the shortest actual warning time found on any route. Further, any or all warning times found to be less than the federally required minimum of 20 seconds, and any deemed to be significantly different from that prescribed (i.e., noncompliant), must be individually identified and the corrective action taken must be recorded.

Please keep in mind that where approach circuits are intended, a crossing warning system must be designed or maintained to provide at least 20 seconds warning time before the crossing is occupied by the normal operation of through-train movements on any available route, and the warning time provided must not differ significantly from the prescribed warning time, per 49 CFR § 234.225.