U.S. Department of Transportation
Federal Transit Administration

Headquarters

1200 New Jersey Avenue, SE
Washington, DC 20590

Subject: SAFETY ADVISORY 14-2
Verification of Rail Vehicle Safe Stopping Distances in Terminal Stations

The Federal Transit Administration (FTA) is issuing *Safety Advisory 14-2* to alert rail transit operators of the need to assess the adequacy of safe stopping distances for rail transit trains in emergency braking in terminal stations. This safety advisory identifies specific actions for rail transit agencies not overseen by the Federal Railroad Administration (FRA). It also requests action from the State Safety Oversight (SSO) agencies designated to implement FTA's SSO program specified by 49 CFR part 659 and 49 U.S.C. 5329(e).

Urgent Action Required

The collision and derailment that occurred on the Chicago Transit Authority's O'Hare Blue Line station on March 24, 2014, injured over 30 passengers and the train operator and caused millions of dollars in property damage. The National Transportation Safety Board (NTSB) investigation is ongoing.

This accident confirms the critical importance of ensuring the appropriate configuration of the systems, technology and procedures designed to guarantee safe stopping for a train in emergency braking at a terminal station. Results of analysis from the accident scene indicate a discrepancy between the original safe braking design for the Chicago-O'Hare International Airport station and its sufficiency during the actual emergency event. This discrepancy resulted in a lack of stopping space available for the passenger train, which entered the station at authorized speed but failed to slow as required.

In light of this finding, FTA urges each rail transit agency to immediately conduct a review of the configuration of terminal stations in order to verify that designed safe braking distances address the actual operating conditions in these stations, including authorized train speeds, train length and length of platform, the position of signals and trip stops, and the bumping post installation.

When conducting this verification activity, rail transit agencies should take into account any system modifications made since the initial calculations were completed, such as the introduction of new vehicles with different braking profiles; changes made to the track, station, or bumping post installations; or changes in authorized speeds for entering the station. Inspection and testing for this advisory should be consistent with the design parameters of the rail transit agency's actual operating system.

Emergency braking can be triggered for many reasons: Operator fatigue, operator distraction or inattention, a medical crisis, equipment failure, or other unforeseen circumstances. Automatic

triggering of a train's emergency braking system provides a critical redundancy that prevents accidents and saves lives.

Should the rail transit agency determine that available stopping distance is inadequate, FTA urges the rail transit agency to immediately initiate its safety hazards management process to evaluate and resolve this safety deficiency. Determining appropriate and effective mitigations is critical to ensuring that identified safety risks have been brought under control by the rail transit agency. Previous NTSB investigations have identified appropriate mitigations for insufficient stopping distances in terminal stations, such as speed restrictions, re-configuring automatic signals and trip stops, modifying the placement and performance of bumping posts and installations, and recalculating safe braking rates.

Further, FTA is directing State Safety Oversight (SSO) agencies to confirm the rail transit agencies' actions to verify rail vehicle safe stopping distances in terminal stations in accordance with this safety advisory, and approve corrective action plans to be implemented by the rail transit agency by 60 days after publication in the Federal Register. Additionally, FTA is directing SSO agencies to provide a summary of actions taken by each rail transit agency in the next Annual SSO Program Report.

Supporting Resources

Verification regarding the block validation of the signal system and the actual integrated performance of the rail transit vehicles and wayside equipment is critical for the safe operation of the rail transit system. Resources available to support this activity include:

- For the railroads under its jurisdiction, the FRA requires inspection and periodic testing of the automatic train stop, train control, and cab signal apparatus to ensure its effective performance. Many rail transit agencies also apply these practices, or portions of them, in their programs. Federal Railroad Administration regulations, 49 CFR Part 236, Subpart E are available at: http://www.gpo.gov/fdsys/pkg/CFR-2009-title49-vol4/pdf/CFR-2009-title49-vol4-part236-subpartE.pdf and http://www.law.cornell.edu/cfr/text/49/part-236/subpart-E.

- The Institute of Electrical and Electronics Engineers (IEEE) has developed *IEEE Standard 1698, Guide for the Calculation of Braking Distances for Rail Transit Vehicles*, approved September 11, 2009. This guide provides methods and assumptions used in calculating the braking distances of rail transit vehicles. The methods encompass automatic train protection and signal system operation, propulsion and brake system operation, environmental conditions, operator interfaces, tolerances, and failure modes. Annex E provides informative sample calculations, and Annex E-5 focuses on trip-stop based signaling applications. This resource can be ordered from IEEE at: http://standards.ieee.org/findstds/standard/1698-2009.html.

- The Transit Cooperative Research Program (TCRP), managed by the Transportation Research Board of the National Academies of Science, issued TCRP Report 13 Rail Transit Capacity, which offers an overview of block signal systems and safe braking considerations in the rail transit industry, and is available at: http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_13-a.pdf

- The American Railway Engineering and Maintenance-of-Way Association (AREMA) provides its comprehensive *Communications & Signals Manual* – an encyclopedic reference regarding the design, operation and maintenance of train control and signal systems. This manual can be ordered from at http://www.arema.org/publications/.

- The American Public Transportation Association (APTA) provides guidance on train control and signal systems under Signals & Communications at http://www.apta.com/resources/standards/Pages/Rail-Standards.aspx.

- Previous NTSB investigations into accidents involving safety braking and the verification of stopping distances include:
    - http://www.ntsb.gov/doclib/safetystudies/SIR0102.pdf
    - http://www.ntsb.gov/doclib/safetystudies/SIR0201.pdf
    - http://www.ntsb.gov/doclib/reports/1996/rar9604.pdf