



U.S. Department of
Transportation
**Federal Railroad
Administration**

Identification of High-Speed Rail Ballast Flight Risk Factors and Risk Mitigation Strategies – Final Report

Office of Research
and Development
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4.3.4 Track Maintenance Standard

Out of all the situations where ballast can be set into motion, the majority of HSR operators believe that ballast flight is most likely to occur at the top of the tie/sleeper. According to guidelines set forth by HSR operators (SNCF and RFI among others) the sleepers must be free of ballast particles on their surface. As a result, track maintenance plays a direct role in the level of hazard for ballast flight.



Figure 4.9: Example of HS track where no ballast particles are present on top of the sleepers.

Most of the time, no sweeping is performed after the stabilization or resurfacing of the track and ballast particles end up lying on the surface of the sleeper. Incidences of ballast flight were reported when the first HST passes on the maintained track (Saussine, 2013). Subsequent passes did not observe ballast flight, since the ballast particles that were present on top of the sleepers had been swept away. **The need to clean ballast particles from sleepers should be carefully considered especially on those lines where speeds are in excess of 160 mph.**

4.3.5 High Wind

The Midwest is a region of the United States where high-wind conditions occur frequently. In the springtime and in those days with temperatures much higher than the norm, extreme atmospheric conditions may occur such as tornadoes or strong wind gusts in excess of 70 mph. On railway lines where speeds are 110 mph and above, the combination of the turbulence effect with the presence of high wind may create the conditions of ballast motion.

4.4 Risk Screening Tool

The University of Illinois has developed a risk screening tool that evaluates the ballast flight risk at any specific section along a rail network. It can be used to compare the relative ballast flight risk at different locations on a current or future planned HSR system. The tool will assist in prioritizing risk mitigation implementations, if needed, along a specific HSR system.

The compact version of the risk screening tool, which is described in detail in this section of the report, considers the five major risk categories identified through the literature review. The complete version considers all the risk factors identified in the literature review, and is summarized in Table 3.1. Figure 4.10 contains a screenshot of the compact version.