TOP TEN

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Route-Specific Fatigue Damage Assessment of Aerodynamic Loaded Noise Barriers Located Along High-Speed Railway Lines

Preserving noise barriers along high-speed railway lines is crucial for societal well-being, as they play a vital role in reducing train-induced noise pollution. Residents benefit significantly from these barriers, as they mitigate the adverse health effects associated with railway traffic noise, such as sleep disturbances, stress, and cardiovascular illnesses. The primary concern regarding the remaining working life of these barriers typically revolves around fatigue failure in the main supporting steel posts, induced by the aerodynamic loading generated by passing trains at high speeds.

Modern railway operators collect detailed data on train speed and composition at various track sections, enabling a more thorough investigation of the dynamic load history of noise barriers along specific routes. By accurately determining the load history and adjusting it to the actual load cycles, it is possible to extend the remaining working life of these structures. This involves refining the conservative theoretical aerodynamic load model and calibrating the aerodynamic train parameters by comparing calculated fatigue damage with fatigue damage obtained from in-situ measured strains during train passing events.

Past measurements along the Austrian Westbahnstrecke have provided insights into this calibration process. Preliminary results indicate that adjusting dynamic load factors based on real measured loads can effectively prolong the barriers' working life. This calibration process not only offers benefits by reducing material usage and maintenance, but also enhances cost-efficiency, benefiting both railway operators and taxpayers. Considering Austria's extensive railway network with over 900 km of tracks featuring noise barriers, the potential for improvements and cost savings is substantial, especially as expansion plans continue in the future.