

Recommendations for New Rail Inspection and Storage

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Rails are critical components in railway infrastructure, providing load-bearing capacity, directional guidance, and safe train operations. However, during service, rails are subjected to severe contact stresses, thermal effects from friction, and cyclic loading, which can cause plastic deformation, microstructural alterations, wear, rolling contact fatigue, and surface defects such as shelling and galling. Furthermore, decarburization layers formed during manufacturing may accelerate surface degradation. These issues compromise riding comfort, increase vibration and noise, and raise maintenance costs.

This study emphasizes the need for standardized acceptance and inspection procedures for new rails in Thailand. Metallurgical analyses of unused rails revealed that additional inspection requirements are essential to ensure safety and service life. Recommended procedures include microstructural examination of the running surface and cross-section, hardness profiling across the rail head, chemical composition analysis, and assessment of decarburization depth.

Based on these findings, a comprehensive inspection and storage standard has been developed in collaboration with the Department of Rail Transport and the State Railway of Thailand. The proposed standard defines technical guidelines for sampling, testing, corrosion protection, and storage, with reference to internationally recognized practices. Complementary measures include drafting manuals for rail head maintenance, corrosion risk mapping, and material selection for high-risk environments.

The outcomes are expected to enhance acceptance quality, reduce premature rail failures, and improve the efficiency, reliability, and safety of Thailand's railway system.

(a) Micrograph of a new rail showing corrosion attack and a decarburized zone with pro-eutectoid ferrite at the surface; (b) rolling contact fatigue cracking associated with the decarburized layer on the running surface after only 8 months in service. These results underscore the importance of sampling inspections of new steel rails to ensure long-term reliability and operational safety.

