



Technical Specification

ISO/TS 14837-34

Mechanical vibration — Ground-borne noise and vibration arising from rail systems —

Part 34: Characterizing irregularity of the running surfaces with respect to vibration excitation

Vibrations mécaniques — Vibrations et bruits initiés au sol dus à des lignes ferroviaires —

Partie 34: Caractérisation des irrégularités de surface de roulement associées à l'excitation vibratoire

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Foreword

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A list of all parts in the ISO 14837 series can be found on the ISO website.

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Introduction

The mechanisms of excitation of ground-borne noise and vibration from railway systems are listed in ISO 14837-1:2005, 4.2.2, which identifies five excitation mechanisms acting at the wheel-rail interface. These mechanisms include

- a) moving loads (quasistatic) excitation,
- b) excitation caused by wheel or rail roughness,
- c) parametric excitation,
- d) wheel or rail defects, and
- e) discontinuities of the track.

This document is concerned with excitation by roughness. The aim of this document is to

- f) define the term roughness used in connection with the source of ground vibration from railways,
- g) provide guidance regarding the procedures that can be used for roughness excitation measurement and analysis, and
- h) provide guidance regarding the equipment that can be used to measure roughness excitation.

The term acoustic roughness is already defined by common use and in EN 15610. The mechanism by which acoustic roughness generates vibration, leading to noise in the range $f = 50$ Hz to $f = 6$ kHz, is essentially the same as that which is a source of ground vibration in the frequency ranges of approximately $f = 1$ Hz to $f = 80$ Hz and approximately $f = 20$ Hz to $f = 250$ Hz, that leads to ground-borne or structure-borne noise. This document therefore draws upon the established definitions, methods of measurement and methods of analysis for acoustic roughness to provide guidance for the measurement and analysis of the roughness pertaining to ground-borne vibration and ground-borne noise.

Mechanical vibration — Ground-borne noise and vibration arising from rail systems —

Part 34:

Characterizing irregularity of the running surfaces with respect to vibration excitation

1 Scope

This document specifies methods for measuring and analysing irregularities of running surfaces for use in the prediction and assessment of ground-borne noise and vibration arising from railway systems. This document

- a) defines the data that can be described as rail or wheel roughness and that can be used to quantify a source term for the generation of the dynamic forces that can lead to ground-borne vibration from railway vehicles,
- b) gives guidance regarding the types of equipment that can be used to measure roughness as a variation of height along the running direction of the rail surface or wheel parameter,
- c) gives guidance regarding the methods that can be used to obtain an estimate of the roughness wavelength spectrum from measurement records taken over a length of rail head or wheel perimeter, and
- d) gives guidance regarding the presentation of a roughness spectrum representing the condition of a length of rail or of a wheel related to its ability to generate vibration.

This document does not

- e) give guidance regarding the characterization of localized geometrical features (e.g. switches, crossings, rail squats, occasional rail joints and localized geometrical defects of the running surface). These features are likely to produce dynamic forces that are not linear with their amplitude because of the change of geometry at the wheel-rail contact. Hence these features are not characterized by methods of analysis defined within this document. [Annex A](#) provides further information regarding the characterization of localized geometrical features,
- f) give guidance regarding the specification or testing of roughness measurement equipment that can be used. [Annex B](#) provides an overview of measuring equipment,
- g) give guidance regarding the measurement or analysis of track quality for any other purpose than the assessment of ground-borne vibration,
- h) present any example of roughness spectra intended to represent typical roughness. Roughness levels vary greatly between track sites and any examples used in this document have not been selected on any other basis than their usefulness for the purpose of demonstrating the principles of analysis,
- i) promote any particular make, model or manufacturer of measurement equipment, and
- j) recommend or promote software for the implementation of the analysis procedure.

2 Normative references

There are no normative references in this document.