# Vibration Innovation Research

## 15 april 2026

ProRail

Verbindt. Verbetert. Verduurzaamt.

Dear Sir or Madam,

ProRail would like to invite you to the presentation of the most important results from the Railway Vibration Innovation Programme. Commissioned by the Ministry of Infrastructure and Water Management, we have spent the last four years investigating how railway vibrations arise and which measures can effectively contribute to reducing nuisance.

The programme did not produce a comprehensive solution, but it did yield a wealth of new knowledge, practical insights and a considerably better-equipped toolbox for tackling rail vibration issues.

During the meeting, we will share our most important findings and discuss their applicability in an international railway context. It promises to be a compact and valuable session that you will not want to miss.

If you would like to learn more about the topics in advance, you can consult the English version of our Final Document via this link. **prorail-ibs-eindrapport-en.pdf**

Much of the content in this report has been taken from the various research reports. If the reader would like more background information or a better understanding of the methodology used to achieve the results, we recommend consulting the reports. All reports, in Dutch, can be found via: https://www.prorail.nl/programmas/innovatieagenda-bronaanpak-spoortrillingen/resultaten

## Programme Vibration Innovation Research

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| ✓ | 8.30 | Welcome |
| ✓ | 9.00 | Opening Ministry I&W & ProRail |
| ✓ | 9.30 | Session 1: Less vibrations due to rolling stock measures |
| ✓ | 10.45 | Coffee break |
| ✓ | 11.00 | Session 2: Infrastructure maintenance |
| ✓ | 12.15 | Lunch |
| ✓ | 13.15 | Session 3: STEM (Railway Vibrations Emission Model) |
| ✓ | 14.30 | Break |
| ✓ | 14.45 | Session 4: Infrastructure Innovations |
| ✓ | 16.00 | Improvement ideas & recommendations |
| ✓ | 17.00 | Start drinks |
| ✓ | 18:00 | The end |

# Content and speakers

## A) Opening:

***Speakers: Gerrit Jan Dijkgraaf & Chiel Roovers. Irene Kraak (chair)***
Background, setup and scope of the programme

## B) Sessions

### 1. Less vibrations due to rolling stock measures

***Speakers: Jasper Peen***

***Introduction:***
*In this session, we look at the role of rolling stock in the development of rail vibrations and nuisance. We will discuss what the innovation program has taught us about how different parts of various types of trains affect vibration levels and nuisance. This teaches us how design choices in rolling stock can play a role in reducing nuisance and we go deeper into testing with innovative measures. We will zoom in extensively on wheel maintenance, how can extra wheel maintenance reduce vibrations, what are the possibilities and challenges and what costs are involved?*

### 2. Infrastructure maintenance

***Speaker: Pieter Boon***

***Introduction:***
*Within the IBS programme, numerous field trials were carried out on maintenance measures. The aim was to better understand their effect on railway vibrations. This insight allows planning and execution of maintenance work to be optimised to reduce vibrations.*
*The various field trials fall under the overarching research project titled Environment-Oriented Management and Maintenance (abbreviated as OBO). The hypothesis was that such a correlation exists. OBO's main research question was: What is the effect of track maintenance on vibrations in the surrounding environment?*

### 3. STEM (Railway Vibrations Emission Model)

***Speaker: Deltares***

*TU Delft, Deltares and TNO have been working with ProRail on the development of a computational model for railway vibrations –Railway Vibrations Emission Model (Spoor Trillingen Emissie Model, STEM)*

*The aim of the STEM model is to predict what railway vibrations occur under which circumstances and in which situations particular measures are effective. The model makes it*

*possible to identify more precisely the causes of high vibration levels and possible solutions for this.*
*The STEM model is an open-source calculation model based on the finite element method and operated via Kratos Multiphysics. Because it is open-source, anyone can use the model without licence costs. However, using it requires background knowledge of the finite element method and the Python programming language.*

*What makes the STEM model unique are a number of additional and combined features that, as far as is known, are not available in any other model.*

***Information about the STEM calculation model can be found at:***
*https://stemvibrations.readthedocs.io/v1.2/#*

### 4. Infrastructure Innovations

***Speaker: Ronald Damen***

***Introduction***

*Within the innovation program, research was conducted into whether various design modifications to the track structure – already applied in practice for other primary purposes (such as improving track stability) – could also contribute to reducing railway vibrations.*
*In addition, several innovative and never before implemented measures were tested, such as Ballast mats, Low-Vibration Sleeper, Railtube, Adjustable IRJ, Adjustable IRJ and many more.*

## C) Improvement ideas / recommendations / cooperation

*We would like to end todays program with an exchange of ideas and experience between countries to see what we can learn from each other and what other research has been done (or is planned in the near future) in this area of expertise.*