

INTERNATIONAL SOCIETY FOR SOIL MECHANICS AND GEOTECHNICAL ENGINEERING



This paper was downloaded from the Online Library of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE). The library is available here:

<https://www.issmge.org/publications/online-library>

This is an open-access database that archives thousands of papers published under the Auspices of the ISSMGE and maintained by the Innovation and Development Committee of ISSMGE.

The paper was published in the proceedings of XVI Pan-American Conference on Soil Mechanics and Geotechnical Engineering (XVI PCSMGE) and was edited by Dr. Norma Patricia López Acosta, Eduardo Martínez Hernández and Alejandra L. Espinosa Santiago. The conference was held in Cancun, Mexico, on November 17-20, 2019.

Measurement of Ballasted Track Stiffness by FWD for Railway

Yoshitsugu MOMOYA^{a,1}, Takahisa NAKAMURA^a, Kazuki ITO^a and Shuhei KIKKAWA^a

^a*Railway Technical Research Institute Japan*

Abstract. To measure the track stiffness, RFWD (Falling weight deflectometer for Railway) was developed. Heretofore, there has been no general technique to measure the track spring coefficient on operating railway line easily. By using the newly developed RFWD, it became easy to obtain the track spring coefficient. In this paper, measured result of track stiffness on the ballasted tracks in operating line is discussed.

Keywords. Track stiffness, FWD, Ballasted track.

1. Introduction

To measure the track stiffness easily and promptly on the operating railway line, RFWD (Falling weight deflectometer for Railway) was developed [1], [2]. Heretofore, there has been no general technique to measure the track spring coefficient on operating railway line. By using RFWD, the track spring coefficient of operating ballasted track became easily measured. In this article, measurement result of track stiffness on the ballasted tracks in operating line is discussed.

2. Outline of RFWD

2.1. Configuration of RFWD

Figure 1 shows the composition of RFWD. RFWD is specially developed apparatus to measure the track stiffness of railway ballasted track. It is equipped with two loading units with 30kg weight each, and applies maximum 20kN loads on both rails. Loading units, heavy weights, trolley and data recording system are decomposed to be carried by human power at the site. RFWD is easily reassembled on operating line railway line. Two weights are automatically controlled mortars and by falling both weights simultaneously, impact loads are applied on both rails. Loads and displacements are automatically acquired by data recording system.

¹ Yoshitsugu Momoya, Track Structures & Geotechnology Laboratory, Track Technology Division, Railway Technical Research Institute, Japan; E-mail: momoya.yoshitsugu.29@rtri.or.jp

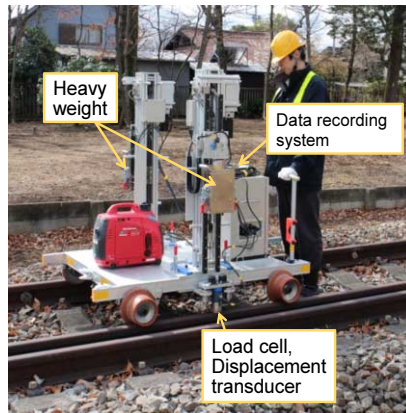


Figure 1. RFWD.

2.2. Measurement result of RFWD

Figure 2 shows measurement data obtained by RFWD. On the hanging (floating) sleeper, difference of peak time for load and displacement became larger, while the time difference was very small on the sleeper properly supported by ballast track bed.

Figure 3 shows the relationship between static – dynamic difference of track irregularity (5m versine) and time delay obtained by RFWD. Static – dynamic difference of track irregularity well corresponded to the degree of sleeper floating.

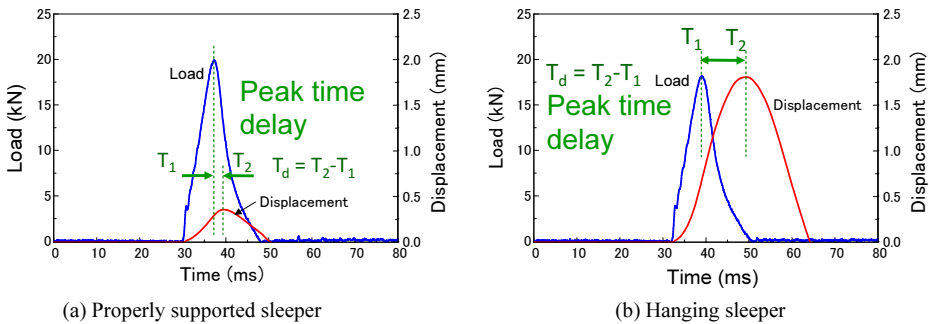


Figure 2. Measured load and displacement by RFWD

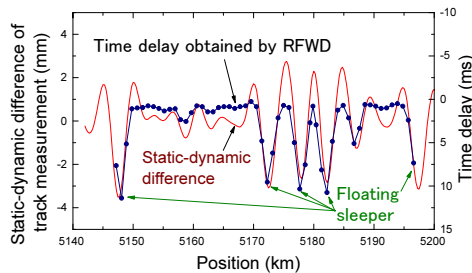


Figure 3. Evaluation of floating sleeper.

3. Summary

To measure the track stiffness easily and promptly on the operating railway line, RFWD was newly developed. From the data measured by RFWD, degree of sleeper floating in ballasted track was estimated.

References

- [1] H. Tanigawa, T. Nakamura and Y.Momoya, *Study on the evaluation of track support stiffness of the ballasted track using the FWD*, BCRRA2017, CRC Press, 2017
- [2] Y. Momoya, T. Nakamura, H. Tanigawa and K. Ito, Development of FWD system to measure the stiffness of railway track, Railways2018 (4th International Conference on Railway Technology), 2018