Zeitschrift:	IABSE reports = Rapports AIPC = IVBH Berichte
Band:	79 (1998)
Artikel:	Construction work under low-frequency horizontal motions
Autor:	Ohdo, Katsutoshi / Nagata, Hisao
DOI:	https://doi.org/10.5169/seals-59927

Nutzungsbedingungen

Die ETH-Bibliothek ist die Anbieterin der digitalisierten Zeitschriften auf E-Periodica. Sie besitzt keine Urheberrechte an den Zeitschriften und ist nicht verantwortlich für deren Inhalte. Die Rechte liegen in der Regel bei den Herausgebern beziehungsweise den externen Rechteinhabern. Das Veröffentlichen von Bildern in Print- und Online-Publikationen sowie auf Social Media-Kanälen oder Webseiten ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. <u>Mehr erfahren</u>

Conditions d'utilisation

L'ETH Library est le fournisseur des revues numérisées. Elle ne détient aucun droit d'auteur sur les revues et n'est pas responsable de leur contenu. En règle générale, les droits sont détenus par les éditeurs ou les détenteurs de droits externes. La reproduction d'images dans des publications imprimées ou en ligne ainsi que sur des canaux de médias sociaux ou des sites web n'est autorisée qu'avec l'accord préalable des détenteurs des droits. <u>En savoir plus</u>

Terms of use

The ETH Library is the provider of the digitised journals. It does not own any copyrights to the journals and is not responsible for their content. The rights usually lie with the publishers or the external rights holders. Publishing images in print and online publications, as well as on social media channels or websites, is only permitted with the prior consent of the rights holders. <u>Find out more</u>

Download PDF: 01.07.2025

ETH-Bibliothek Zürich, E-Periodica, https://www.e-periodica.ch



Construction Work under Low-Frequency Horizontal Motions

Katsutoshi OHDO Research Official National Inst. of Industrial Safety Tokyo, Japan



Katsutoshi Ohdo, born 1965, received his civil eng. degree from Nagoya Univ. in 1988. He is currently a research official at the National Institute of Industrial Safety.



Hisao Nagata, born 1948, granted PhD from Yokohama National Univ. in 1992. He is currently a senior research official at the National Institute of Industrial Safety.

Summary

Tokyo, Japan

Hisao NAGATA

Senior Research Official

National Inst. of Industrial Safety

According to an investigation of construction sites in Japan, approximately 40% of construction workers on high-rise structures experienced excessive low-frequency horizontal vibration due to wind. In this study, critical limits of continuous tasks such as welding works and straight line drawings were experimentally investigated. From the results obtained, it was found that the critical acceleration for experimental tasks of straight line drawings and simulated tasks of welding works increased in proportion to frequency between 0.5 and 2.0 Hz. However, under the level of 0.5 Hz, inverse proportion was shown. The experimental results differ from the international standards of ISO 6897.

1. Introduction

In the construction of tall structures such as bridge pylons and buildings, weather has a strong influence on work efficiency and safety. The influence of weather on the construction of 14 tall bridge pylons and buildings sites in Japan was investigated by questionnaires to workers. One result from the questionnaires, shown in fig. 1, reveals about 40% of the workers experienced excessive low-frequency horizontal vibration during work, with bridge construction being especially demanding due to wind-induced sways. Bridge pylons under construction are likely to vibrate at wind speeds less than 10 m/s, which is a widely used criterion for suspension of construction work in Japan. In fact, on one construction site, the welding workers felt it difficult to work due to wind-induced sways. Even with these problems, no criteria or standards on limits of construction work under low-frequency horizontal motions have been made.

2. Methods

Critical task limits of construction work under horizontal motions were experimentally investigated by an original device which generates sway, vibration or linear acceleration, and is shown in fig. 2. Low-frequency sine-formed vibrations were given to each subject by the device, and the critical acceleration of straight line drawing tasks, simulated welding tasks or holding limits of human standing posture was investigated. A total of 15 young males, 15 females, and 5 welding workers participated in the series of experiments. Have you experienced excessive vibration to work?



Fig. 1 : Result from questionnaires concerning vibration due to wind



Fig. 2 : Experimental device which generates horizontal motions or vibrations



Fig. 3 : Limits for holding human standing posture for males



Fig. 4 : Limits for holding human standing posture for females

3. Results

3.1 Critical limits for holding human standing posture

Fig. 3 and fig. 4 show experimental results of critical acceleration for holding human standing posture. It was found that the values for male subjects were larger than the values for female subjects. Considering critical values for holding human standing posture, subjects were likely to lose balance under backward forces. The critical acceleration increased in proportion to frequency, which ranged from 0.5 to 2.0 Hz. However, under 0.5 Hz the critical values tended to keep constant.

3.2 Critical limits of welding tasks

Fig. 5 shows the critical acceleration of straight line drawing tasks performed by male subjects. Limits of welding tasks were verified by five welding workers, as shown in fig. 5. It was found that the relation between the values for straight line drawing tasks and for welding tasks showed similar tendencies and these values were at similar levels. Both critical accelerations increased in proportion to frequency between 0.5 and 2.0 Hz. However, they were in inverse proportion to the frequency under 0.5 Hz. These results show different tendencies from the international standards of ISO 6897 of the guidelines to evaluate the response of occupants of off-shore structures to low-frequency horizontal motion, as shown in fig. 5.



Fig. 5 : Limits of straight line drawing or welding tasks