International Standard ISO 6897

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Guidelines for the evaluation of the response of occupants of fixed structures, especially buildings and off-shore structures, to low-frequency horizontal motion (0,063 to 1 Hz)

Guide pour l'évaluation de la réponse des occupants de structures fixes, en particulier de bâtiments et de structures en mer, à un mouvement horizontal de basse fréquence (0,063 à 1 Hz)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been authorized has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 6897 was developed by Technical Committee ISO/TC 108, *Mechanical vibration and shock*, and was circulated to the member bodies in April 1982.

It has been approved by the member bodies of the following countries :

Australia	France	Romania
Belgium	Germany, F. R.	South Africa, Rep. of
Czechoslovakia	Hungary	Spain
Denmark	Italy	United Kingdom
Egypt, Arab Rep. of	Netherlands	USA

The member body of the following country expressed disapproval of the document on technical grounds :

Japan

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0 Introduction

Until this century, buildings were seldom more than a few storeys high and the few tall buildings which did exist were usually of a heavy gravity design which did not readily respond to wind or other forces. Also, tall buildings constructed in the late nineteenth century and early this century generally had vertical load-bearing frames with massive granite infills which provided another generation of unresponsive buildings.

This history of unresponsive building structures has led people to expect buildings to provide nearly stationary accommodation, even under storm conditions, and the occupants of buildings are prepared to accept only extremely low levels of motion.

In contrast to these unresponsive structures, more modern buildings have tended, for reasons of economy of space, foundation requirements, material outlay, speed of erection and elegance, to be formed from more slender sections such that these much lighter buildings are more responsive to dynamic forces than their predecessors. This International Standard proposes magnitudes of low-frequency horizontal motion that should produce only minimum adverse comment from people working or living in buildings.

Similarly, off-shore fixed structures were, until recently, generally of a non-habitable form or of an unresponsive design. Modern mineral exploitation and production structures founded on the seabed are of such large proportions and subject to such extreme wind and wave action that the dynamic response of both the overall structures and their component parts has become the focus of much attention from the viewpoint of the motion transmitted to those operating and living on the structures. Also, although outside the scope of this International Standard, the structural integrity, material fatigue and operation of off-shore fixed structures in storm conditions receive much attention. This International Standard therefore proposes magnitudes of low-frequency horizontal motion which should prove satisfactory to those living on and operating off-shore fixed structures. Allowances are made for the fact that wind and waves shall be expected to cause motion of these structures which, in addition, are generally manned by trained personnel who are prepared to accept some degree of motion so long as it does not present a health hazard or interfere with the efficient operation of the installation.

Often the likely motion of a planned structure has to be calculated in order to assess the probable response, to the vibration, of those who will use the structure. The probable motion of a proposed structure can generally be found by structural dynamics using the structure stiffness and mass, the wind or wind and wave spectra, the structure shape, aspect and roughness, and the appropriate topographical parameters. Wind tunnel and wave tank studies using aerodynamic and fluid dynamic models can also be used to determine the likely motion of structures.

In some forms of tall building construction, poor construction joints allow inter-storey drift in the structure and, when assessing the probable response of such structures, an allowance should be made for the effects of inter-storey movements.

Guidance on satisfactory magnitudes of vibration for specific situations is given in the annex.

1 Scope and field of application

1.1 This International Standard relates to typical responses of people to the horizontal motion of structures in the frequency range 0,063 to 1 Hz. The recommendations are categorized in accordance with the use of the structures and, in the case of off-shore fixed structures, with the nature of work being carried out.

Injury of occupants due to structural vibration is outside the scope of this International Standard.

1.2 Whole-body motion caused by structural vibrations induced by infrequent external environmental forces is considered separately from whole-body motion resulting from structural vibrations caused by frequently occurring force actions. Frequently occurring force actions may arise from external sources, machinery or structure services such as elevators, fans, air conditioners, heating units and plumbing. Both perceptible magnitudes of low-frequency horizontal motion of structures and magnitudes likely to raise minimum adverse comment are included.

NOTES

1 Visual perception of building motion, the influence of torsional oscillations of structures and the effects of noise may influence the subjective response to vibrations of structures but no quantitative assessment is made.