INTERNATIONAL
STANDARD

ISO
3010

Second edition
2001-12-01

Basis for design of structures — Seismic actions on structures

Bases du calcul des constructions — Actions sismiques sur les structures

Reference number
ISO 3010:2001(E)

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

This document is a preview generated by EVS

© ISO 2001

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
Web www.iso.ch

Printed in Switzerland

Contents

Page

1 Scope **1**
2 Normative reference **1**
3 Terms and definitions **1**
4 Symbols and abbreviated terms **3**
5 Bases of seismic design **3**
6 Principles of seismic design **4**
7 Principles of evaluating seismic actions **5**
8 Evaluation of seismic actions by equivalent static analysis **7**
9 Evaluation of seismic actions by dynamic analysis **9**
10 Estimation of paraseismic influences **11**

Annexes

A Load factors as related to the reliability of the structure, seismic hazard zoning factor and representative values of earthquake ground motion intensity **12**
B Structural factor **15**
C Normalized design response spectrum **17**
D Seismic force distribution factor and seismic shear distribution factor **19**
E Components of seismic action **22**
F Torsional moments **24**
G Dynamic response **26**
H Damping ratio **30**
I Response control systems **31**
J Paraseismic influences **35**
Bibliography **36**

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 3010 was prepared by Technical Committee ISO/TC 98, *Bases for design of structures*, Subcommittee SC 3, *Loads, forces and other actions*.

This second edition cancels and replaces the first edition (ISO 3010:1988), which has been technically revised.

Annexes A, B, C, D, E, F, G, H, I and J of this International Standard are for information only.

Introduction

This International Standard presents basic principles for the evaluation of seismic actions on structures. The seismic actions described are fundamentally compatible with ISO 2394.

It also includes principles of seismic design, since the evaluation of seismic actions on structures and the design of the structures are closely related.

Basis for design of structures — Seismic actions on structures

1 Scope

This International Standard specifies principles of evaluating seismic actions for the seismic design of buildings, towers, chimneys and similar structures. Some of the principles can be referred to for the seismic design of structures such as bridges, dams, harbour installations, tunnels, fuel storage tanks, chemical plants and conventional power plants.

The principles specified in this International Standard do not cover nuclear power plants, since these are dealt with separately in other International Standards.

In regions where the seismic hazard is low, methods of design for structural integrity may be used in lieu of methods based on a consideration of seismic actions.

This International Standard is not a legally binding and enforceable code. It can be viewed as a source document that is utilized in the development of codes of practice by the competent authority responsible for issuing structural design regulations.

NOTE 1 This International Standard has been prepared mainly for engineered structures. The principles are, however, applicable to non-engineered structures.

NOTE 2 The qualification of the level of seismic hazard that would be considered low depends on not only the seismicity of the region but other factors, including types of construction, traditional practices, etc. Methods of design for structural integrity include regional design horizontal forces which provide a measure of protection against seismic actions.

2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 2394, *General principles on reliability for structures*

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

3.1
complete quadratic combination method

method to evaluate the maximum response of a structure by the quadratic combination of modal response values

3.2
ductility

ability to deform beyond the elastic limit under cyclic loadings without serious reduction in strength or energy absorption capacity