INTERNATIONAL STANDARD

ISO 9194

First edition
1987-12-15

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

Bases for design of structures — Actions due to the self-weight of structures, non-structural elements and stored materials — Density

Bases de calculs des constructions — Actions dues au poids propre des structures, des éléments non structuraux et des matériaux entreposés — Masses volumiques

Reference number
ISO 9194 : 1987 (E)

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.

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. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 9194 was prepared by Technical Committee ISO/TC 98, *Bases for design of structures.*

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

Printed in Switzerland

Bases for design of structures — Actions due to the self-weight of structures, non-structural elements and stored materials — Density

0 Introduction

General principles on reliability of structures are given in ISO 2394.

Since at the moment, only insufficient statistical data of densities are available, the values given in this International Standard are deterministic ones. In general they may be interpreted as mean values of densities.

Even these mean values are in some cases different for the same material from one country to another. This is the reason for giving a range of two values for one material in this International Standard.

Each country in its relevant standards should use its traditional values which are in the indicated range.

1 Scope and field of application

This International Standard defines the actions due to the self-weight of structures, non-structural elements and stored materials. It gives the numerical values of their densities.

These actions are to be determined by multiplying the densities by the gravitational acceleration and by the actual volume. The actions caused by the weight of the earth placed on the structures are similarly calculated.

2 Reference

ISO 2394, *General principles on reliability of structures*.

3 General

3.1 The most important value in determining actions due to the self-weight of structures, non-structural elements and/or that of stored materials is the density.

3.2 For materials having all three dimensions of the same order of magnitude, the densities are expressed in kilograms per cubic metre (kg/m^3). For roofings (sheeting materials) having one dimension of smaller order of magnitude than the other two dimensions, the similar quantity will be surface density, expressed in kilograms per square metre (kg/m^2) (mass related to surface area).

3.3 In some countries roofings are considered to be external load, causing pressure on the structure (by analogy with, for example, snow load) — consequently these are expressed in newtons per square metre (N/m^2) or in pascals [1].

For this reason, roofings (see annex A) are given as surface pressures, together with the values of surface density.

3.4 Densities of stored materials substantially depend on how they are placed. Usually two methods of stocking are distinguished:

a) disorderly storage of materials;

b) orderly storage of materials.

Disorderly or bulky stored materials are stored without bales, forming a natural heap. Orderly stored materials are stored in stocks or piles with or without bales.

4 Density values

4.1 The representative value of the density of materials and/or components of structures, non-structural elements and stored materials is in general determined by the mean value.

The representative value is generally represented by a unique value. In actual design situations, densities may alter due to the difference in quality of workmanship, moisture content, etc. The representative value of the density of earth is represented in the same manner, bearing compactness in mind.

4.2 The representative values of densities of structures and non-structural elements are given in a table in annex A; the representative values of densities of stored materials and densities of earth placed on structures are similarly given in annex B.

4.3 Where the tables give only one density value for one material (or soil), this means that the corresponding nominal values do not normally differ significantly (up to ±5 %) in dif-

1) 1 Pa = 1 N/m^2