

INTERNATIONAL STANDARD

ISO
9836

First edition
1992-06-15

Performance standards in building — Definition and calculation of area and space indicators

iTeh STANDARD PREVIEW
*Normes de performance dans le bâtiment — Définitions et calcul des
indicateurs de surface et de volume*
(standards.iteh.ai)

ISO 9836:1992

<https://standards.iteh.ai/catalog/standards/sist/7f908fff-14c0-485a-8d6b-327398aaa7a2/iso-9836-1992>



Reference number
ISO 9836:1992(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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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.

International Standard ISO 9836 was prepared by Technical Committee ISO/TC 59, *Building construction*, Sub-Committee SC 3, *Functional/user requirements and performance in building construction*.

Annex A of this International Standard is for information only.

© ISO 1992

All rights reserved. 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 the publisher.

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

Introduction

The surface area and volume indicators derived from spaces in existing buildings can give their utilization values, such as the spatial proximity of connected functional uses. As approximate values for planning they can be a basis for further developments.

The same is true of those surface area and volume indicators which represent the use of materials. Such indicators enable an increase or reduction in the quantity of materials to be obtained when planning other constructions.

Reference to surface area and volume indicators when assessing buildings which either already exist or which are in the planning stage indirectly indicates the economic characteristics of the buildings. Thus the relationship between the area taken up by the building and the usable area shows whether the building costs and materials have been used to their best advantage.

In the same way the relationship between the area of the building envelope and the usable area shows the extent to which basic savings have been made on the envelope and the running costs of the heating and air-conditioning systems.

As far as the determination of the economic performance of whole buildings is concerned, surface area and volume indicators contain basic data for calculation of capital costs for running and maintenance. They give a basis for the minimization of running costs by limiting the amount of space and the cost of individual materials. For example, if the area of the external walls is small compared to the usable area, this would indicate not only relatively low energy costs but also relatively low cleaning and maintenance costs for façades.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

This page intentionally left blank

[ISO 9836:1992](#)

<https://standards.iteh.ai/catalog/standards/sist/7f908fff-14c0-485a-8d6b-327398aaa7a2/iso-9836-1992>

Performance standards in building — Definition and calculation of area and space indicators

1 Scope

This International Standard deals with the definition and calculation of surface area and volume indicators.

In defining area measurement, this International Standard uses the intra-muros and extra-muros concept. The wall centre method of measurement used in many parts of the world, or for particular types of buildings, is not considered in this International Standard.

The surface area and volume indicators defined in this International Standard are intended for practical use, as a basis for measuring various aspects of the performance of buildings or as a planning aid. In other words, they should enable judgement to be made on functional, technical and economic aspects.

This International Standard is intended to be used when establishing:

- specifications for the geometric performance of a building and its spaces (e.g. in design, purchasing procedures, etc., or in building regulations where appropriate);
- technical documentation relating to the performance of whole buildings prepared by designers, contractors and manufacturers.
- evaluation, comparison or control of the properties of a building which are connected to its geometric performance.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to

agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 6241:1984, *Performance standards in building — Principles for their preparation and factors to be considered*.

ISO 6707-1:1989, *Building and civil engineering — Vocabulary — Part 1: General terms*.

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 6707-1 and the following definitions apply.

3.1 surface area indicators: These measure individual types of area (e.g. usable area) and the relationship between different types of area (e.g. area occupied by structure/usable area).

3.2 volume indicators: These measure individual types of volume (e.g. net volume) and the relationship between different types of volume (e.g. gross volume/net volume).

3.3 mixed surface area and volume indicators: These relate the types of volume to the types of area (e.g. gross volume/usable area) and the types of area to types of volume (e.g. area of building envelope/net volume).

NOTE 1 Clause 5 gives further definitions of the different surface areas, volumes and indicators, together with the appropriate calculation methods.

4 Units

Surface area and volume indicators are obtained by measuring the plan and elevation of the building, and their units of measurement differ according to

the type of calculation (m^2 ; m^3 ; m^2/m^2 ; m^3/m^3 ; m^2/m^3 ; m^3/m^2).

5 Calculation methods and list of indicators for geometric performance

Surface area and volume indicators of existing or projected buildings can be used to advantage only when uniform indicators are used and compared. The method of determination should be identical for all indicators.

5.1 Surface areas

See figure 1.

5.1.1 Calculation principles

5.1.1.1 Horizontal and vertical surface areas are measured by their actual dimensions. Inclined planes are measured by their vertical projection onto an (imaginary) horizontal plane (but for heat loss calculations the true area must always be used).

5.1.1.2 The surface areas are expressed in square metres, to two decimal places.

5.1.2 Covered area

5.1.2.1 The covered area is the area of ground covered by buildings in their finished state.

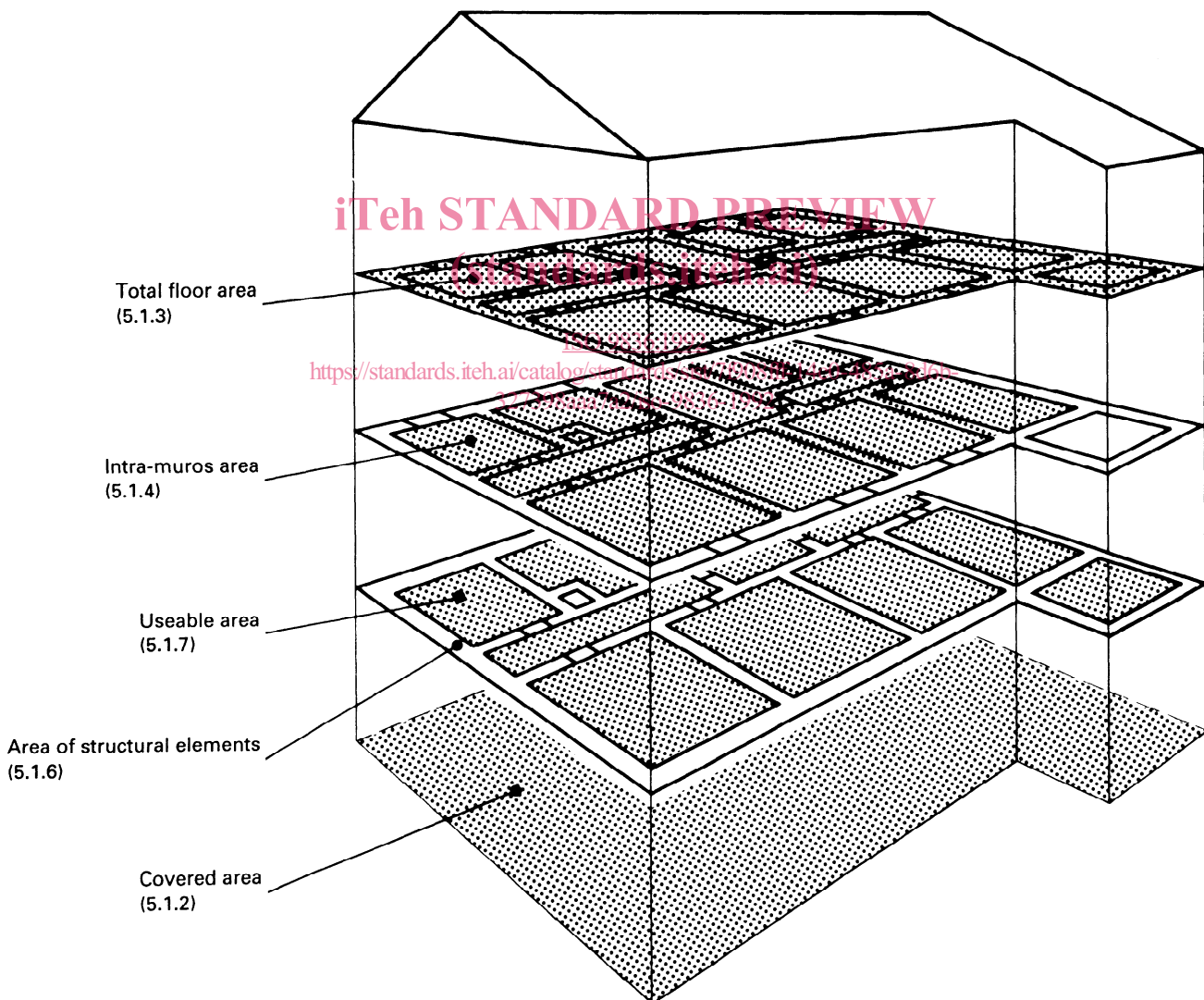


Figure 1 — Presentation of principal areas

5.1.2.2 The covered area is determined by the vertical projection of the external dimensions of the building onto the ground.

The following are not included:

- constructions or parts of constructions not projecting above the surface of the ground;
- secondary components, e.g. external staircases, external ramps, canopies, horizontal sun-shields, roof overhangs, street lighting;
- the areas of outdoor facilities, e.g. greenhouses, outhouses and conservatories.

5.1.3 Total floor area

5.1.3.1 The total floor area of a building is the total area of all floor levels. Floor levels may be storeys which are either completely or partially under the ground, storeys above ground, attics, terraces, roof terraces, service floors or storage floors (see figure 1).

It is necessary to distinguish between

- a) floor areas which are enclosed and covered on all sides;
- b) floor areas which are not enclosed on all sides up to their full height, but which are covered such as recessed balconies;
- c) floor areas which are contained within components (e.g. parapets, fascias, hand-rails), but which are not covered, such as open balconies.

5.1.3.2 The total floor area of each level is obtained from the external dimensions of the enclosing elements, at floor height. These elements include finishes, claddings and parapets.

Recesses and projections for structural or aesthetic purposes and profiling are not included if they do not alter the net floor area (5.1.5). Covered floor areas which are not enclosed or are partially enclosed and have no enclosing elements [e.g. areas in accordance with 5.1.3.1 b)] are calculated according to the vertical projection of the outer limit of the covering components.

Net floor area is not determined for the following spaces (see 5.1.5.4):

- voids between the ground and the underside of the building, e.g. crawlways;
- space inside ventilated roofs;
- roofs not subjected to foot traffic other than for maintenance purposes.

5.1.3.3 The total floor area is calculated separately for each floor level. Areas with varying storey height within one floor level (e.g. large halls, auditoria) are also calculated separately.

5.1.3.4 If the floor areas are added together, the proportions of the different areas (according to 5.1.3) shall be distinguishable in order to enable the evaluation, comparison and separate calculation of the volumes.

5.1.3.5 The total floor area is made up of the net floor area (5.1.5) and the area taken up by the structure (see 5.1.6).

5.1.4 Intra-muros area

5.1.4.1 The intra-muros area is the total floor area (5.1.3) less the area taken up by the external walls.

5.1.4.2 The intra-muros area is determined separately for each floor level. The calculation principles established for the total floor area (5.1.3) and for the area taken up by the external walls (5.1.6) apply equally. The intra-muros area is obtained by subtracting the area taken up by the external walls from the total floor area.

5.1.4.3 The intra-muros area includes the net floor area (5.1.5) and the area taken up by the internal walls.

5.1.5 Net floor area

5.1.5.1 The net floor area is the area between enclosing elements (see also 5.1.3.2).

5.1.5.2 The net floor area is determined separately for each floor level and is sub-divided according to 5.1.3.1. It is calculated from the clear dimensions of the finished building at floor height, excluding skirtings, thresholds, etc.

Covered floor areas which are not enclosed, or only partially enclosed and have no enclosing elements [areas 5.1.3.1 b)] are determined by the vertical projection of the outer limit of the covering components. Areas with varying storey height within one floor level (e.g. large halls, auditoria) are calculated separately.

5.1.5.3 Also included in the net floor area are demountable components such as partitions, pipes and ducts.

5.1.5.4 The floor areas of structural elements, door and window recesses, and niches to recesses in the elements enclosing the spaces are not included in the net floor area.

5.1.5.5 The net floor area is divided into

- usable area (5.1.7),
- services area (5.1.8), and
- circulation area (5.1.9).

5.1.6 Area of structural elements

5.1.6.1 The area of structural elements is the area within the total floor area (on a horizontal section at floor level) of the enclosing elements (e.g. external and internal load-bearing walls) and the area of columns, pillars, piers, chimneys, partitions, etc. which cannot be entered (see figure 1).

5.1.6.2 The area of structural elements is determined separately for each floor level and, where necessary, is sub-divided according to 5.1.3.1. It is calculated from the dimensions of the finished building at floor height excluding skirtings, thresholds, plinths, etc.

5.1.6.3 Also included in the area of structural elements are the floor areas of door recesses, and recesses and niches in the enclosing elements (see 5.1.5.4). This is in accordance with 5.1.3.2.

5.1.6.4 The area of structural elements may also be calculated as the difference between the total floor area (5.1.3) and the net floor area (5.1.5).

5.1.7 Usable area

5.1.7.1 The usable area is that part of the net floor area which corresponds to the purpose and use of the building (see figure 1).

5.1.7.2 The usable area is determined separately for each floor level and is sub-divided according to 5.1.3.1.

5.1.7.3 Usable areas are classified according to the purpose of the building and the use to which they are put; they are usually divided into main usable areas and subsidiary usable areas.

The classification into main usable area and subsidiary usable area is dependent on the purpose of the building. See tables 1 and 2 of ISO 6241:1984.

5.1.8 Services area

5.1.8.1 The services area is the net floor area which accommodates technical installations, such as:

- a) installations and pipes for the disposal of waste water;

- b) water supply;

- c) heating and hot water systems;

- d) gas installations (other than for heating purposes) and installations for liquids;

- e) electricity supply, generators;

- f) ventilation, air-conditioning and cooling systems;

- g) telephone switchboard apparatus;

- h) lifts, escalators and conveyors (see 5.1.9.3);

- i) any other central service installation.

5.1.8.2 The services area is determined separately for each floor level and, where necessary, is sub-divided according to 5.1.3.1.

5.1.8.3 Floor areas of spaces for principal service installations, man-sized supply shafts and ducts, and service floors are also included in the services area.

5.1.9 Circulation area

5.1.9.1 The circulation area is the net area for circulation within the building (e.g. the area of stair wells, corridors, internal ramps, waiting areas, escape balconies).

5.1.9.2 The circulation area is determined separately for each floor level and is sub-divided according to 5.1.3.1. Areas with varying storey height within one floor level are calculated separately.

5.1.9.3 The net floor areas of lift shafts and the floor areas of built-in conveying installations for general circulation (e.g. escalators) on each floor level (see 5.1.8.1) are also included in the category of circulation area.

5.1.10 Building envelope area

5.1.10.1 The building envelope area is obtained from buildings or parts of buildings which are enclosed on all sides and covered, including those parts of the structure which are above the top level of the ground and those below it.

Distinction is to be made between the following, in the order shown:

- a) area of the foundations;

- b) external wall area below ground level;

- c) external wall area above ground level;

- d) roof area.

Glazed areas are specified separately as parts of external wall areas or roof surfaces.

The following are not included in the area considered:

- components of the building which are below the lowest floor level (e.g. parts of the foundation);
- recesses and projections for aesthetic purposes, pavement lights, external staircases, external ramps, canopies, horizontal sun-shields, roof overhangs, skylights, chimney stacks, etc.

5.1.10.2 The foundation area of a building is the total base area of the lowest floor level.

5.2 Volumes

See figure 2.

5.2.1 Calculation principles

5.2.1.1 The gross volume of a building is obtained from the outer limiting faces. Distinction is to be made between the following, in the order shown:

- a) gross volume of buildings or parts of buildings which are enclosed and covered on all sides [in accordance with 5.1.3.1 a)] (see 5.2.2);
- b) gross volume of parts of buildings which are not enclosed up to their full height on all sides, but which are covered [in accordance with 5.1.3.1 b)] (see 5.2.3);
- c) gross volume of buildings and parts of buildings which are enclosed by components (e.g. parapets, fascias, hand-rails), but which are not covered [in accordance with 5.1.3.1 c)] (see 5.2.4).

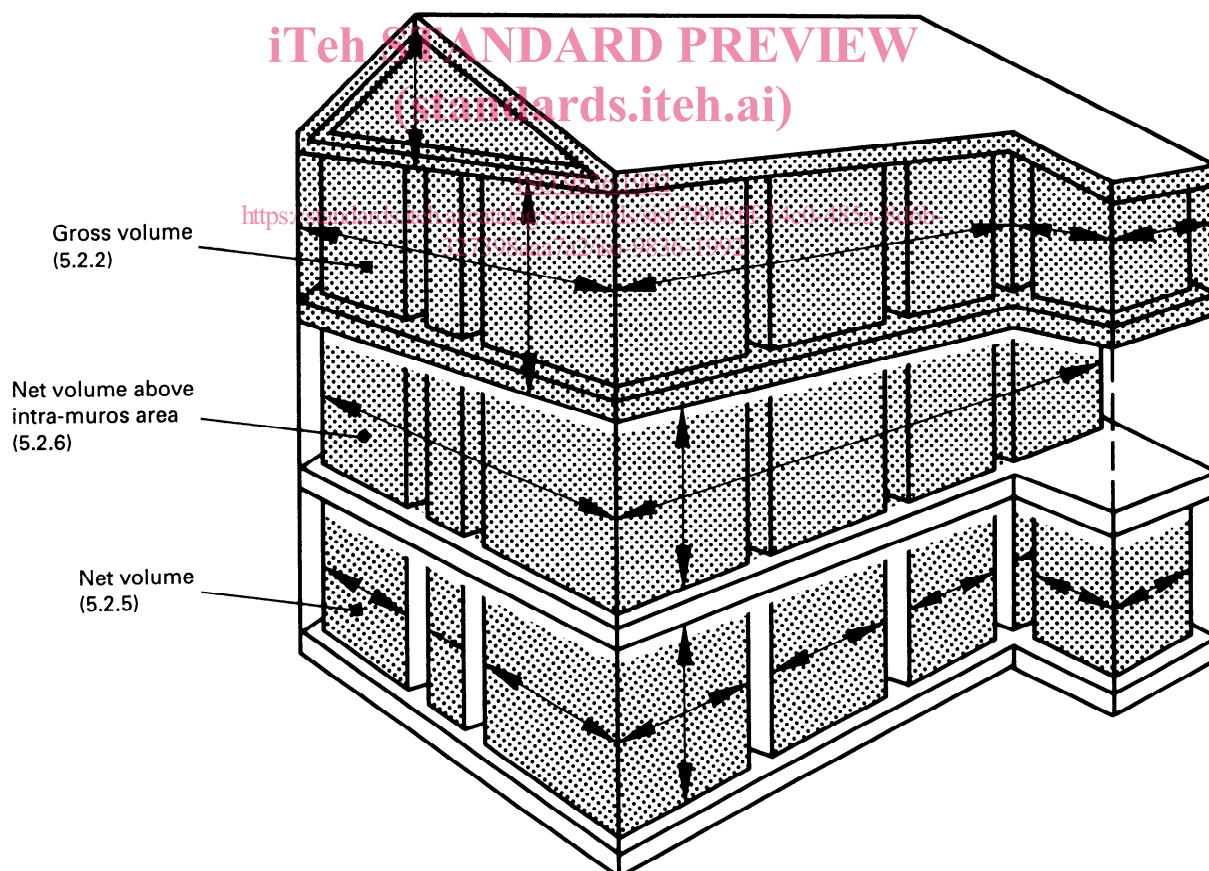


Figure 2 — Presentation of principal volumes