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Measurement methods for building — Setting-out and measurement —

Part 1:

Planning and organization, measuring procedures,
acceptance criteria

*Méthodes de mesure pour la construction — Piquetage et mesure —
Partie 1: Planification et organisation, procédures de mesure
et critères d'acceptation*



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Foreword

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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 4463-1 was prepared by Technical Committee ISO/TC 59, *Building construction*.

This first edition of ISO 4463-1 cancels and replaces ISO 4463 : 1979, of which it constitutes a technical revision.

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.

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Measurement methods for building — Setting-out and measurement —

Part 1 : Planning and organization, measuring procedures, acceptance criteria

0 Introduction

This part of ISO 4463 forms one of a series concerning the accuracy of measurement methods on building sites.

Part 2 will deal with measuring stations and targets and part 3 will deal with setting-out drawings.

1 Scope

This part of ISO 4463 deals with the progressive stages of setting-out work in building construction, i.e. acquisition of information, establishing the primary system, setting-out the secondary system, vertical transfer of points in the secondary system to other levels, and setting-out the position points and the establishment and transfer of levels (bench marks).

In addition it gives values of permitted deviations and guidance on independent check measurements (quality control) using instruments and methods currently in common use at each stage of the setting-out process.

2 Field of application

This part of ISO 4463 applies to common types of building construction. Special operations such as setting-out of precision machinery or the legal location of the building, as specified for example in planning laws or local regulations, are not covered by this part of ISO 4463 since all recommendations are subject to statutory legislation in a particular country.

3 References

ISO 1803-1, *Building construction — Tolerances — Vocabulary — Part 1: General terms*.

ISO 1803-2, *Building construction — Tolerances — Vocabulary — Part 2: Derived terms*.

ISO 7078, *Building construction — Procedures for setting-out, measurement and surveying — Vocabulary and guidance notes*.

ISO 7976-1, *Tolerances for building — Guidelines indicating methods of measurement of buildings and building products — Part 1: Instruments and accuracy*.

ISO 7976-2, *Tolerances for building — Guidelines indicating methods of measurement of buildings and building products — Part 2: Position of measuring points*.

ISO 8322 (all parts), *Building construction — Measuring instruments — Procedures for determining accuracy-in-use*.¹⁾

4 Definitions

For the purposes of this part of ISO 4463, the definitions of ISO 1803 and ISO 7078, together with the following, apply.

4.1 site surveyor: Person entrusted with the carrying-out of one or more of the different measuring operations in the building process.

As practice can differ from country to country, the term site surveyor is intended to refer to a competent operator in this field irrespective of his formal qualifications.

4.2 compliance measurement: Measurement carried out to verify compliance with the specified permitted deviation of a completed stage of the construction process (for example, building components, setting-out and constructed work).

4.3 check measurement: Independent informal measurement to check the correctness and accuracy of a previous measurement.

4.4 secondary line: Any line used for the purpose of setting-out the proposed building and for checking and compliance of the building or building parts.

4.5 acceptance criteria: Conditions to be fulfilled prior to acceptance of a completed task or process.

1) To be published.

Section one : General introduction

5 General introduction

5.1 The process of setting-out on any building site may be described as the determination and establishment of a well-defined system of lines, distances and planes to provide a suitable network for the determination of the accurate position and level of buildings and building elements.

This International Standard is concerned with the complete range of setting-out on building sites and thus adopts a three-stage order of reference systems which are commonly required for large and complex building projects.

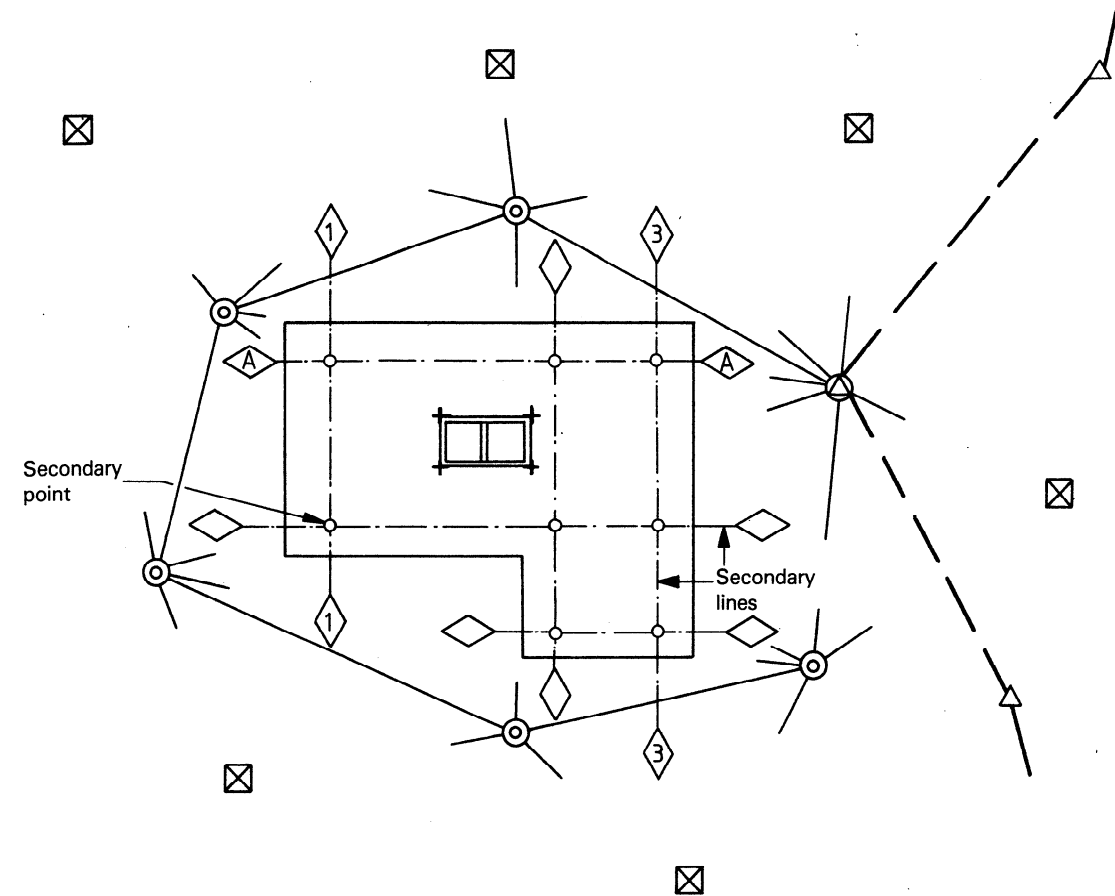
As shown in figure 1, the order of establishment and connection of reference systems is as follows :

- a) Primary system, which is connected to the official control system¹⁾ and normally covers the whole site and to which subsequent measurements on that site are related (see clause 14);
- b) Secondary system, which serves as the main reference system or grid for the erection of a particular building or group of buildings and associated works (see clause 15);
- c) Position points, which mark the location of individual elements, for instance columns and walls (see clause 16).

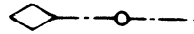
5.2 The choice of the number and type of reference systems required for a particular building project will be dependent on the size, complexity, and configuration of the site, the shape, size and position of each building, the amount of space available, the proposed methods of construction and the erection sequence. In practice, therefore, the previously established reference system from which the secondary setting-out system can be established may be either

- an existing co-ordinate system which covers the particular site, that is an official control system; or
- a network of measuring points specially established for the building project, that is a primary system; or
- corner points or other important points relating to a particular building established for example by the local authority (see figure 7); or
- in the case of an extension of a building or infilling between existing buildings, reference lines established by extending one or more secondary lines, for example lines parallel to the column centre-lines.

1) An official control system can be the national, municipal or other agreed higher order coordinate system.



Key

-   Points in the official control system
-   Stage 1 Points in primary system, marked at ground level
-  Stage 1 Point in primary system, marked with elevated aiming target
-  Stage 2 Point and line of secondary system
-  Stage 3 Position point

NOTE — Some of the primary, secondary and position points are shown. Primary points are marked and measured in. Secondary and position points are set out and marked.

Figure 1 — Example of the three stages of setting-out as adopted in this International Standard

Section two : Planning and organization of setting-out

6 Acquisition of information

Detailed information is required on the size and shape of the site, planning regulations, existing services, adjacent structures above and below ground, and the existing survey network.

Some of this information is often available from the statutory authorities (local authority). A site survey to confirm and update the above information should be carried out. Such information will enable the designer to relate the position of the proposed building and ancillary work to the survey system around the site and also facilitate the contractor's reconnaissance for the setting-out work.

7 Planning the setting-out

7.1 Reconnaissance

A reconnaissance of the site and planning of the setting-out are essential. Based on the site survey drawing relating the building and ancillary work, a suitable reference system should be selected and established.

The system selected will depend on

- the shape and size of the site and the position of any existing buildings or obstructions;
- the position of the proposed building and ancillary work;
- the sequence of excavation and construction.

The chosen reference system should be such that redundant observations are possible and that the measuring points can be referred to during construction.

The positions of the main ground stations should be chosen and protected such that they are at minimum risk to damage or movement and unobstructed lines of sight can be maintained.

Elevated permanent targets on existing buildings could serve this purpose but may be more difficult to use than protected stations on the ground.

Primary and secondary benchmarks should be positioned such that change points are kept to a minimum and sight lengths do not exceed 40 m.

The type of instruments and the method of setting-out should be selected to meet the specified accuracy. This may require calculations. A flow diagram similar to that in ISO 8322 should be used as an aid for such an exercise as well as for the practical accuracy test.

7.2 Grids

Prior to and during the building process, use can be made of the following grids:

- location grids;
- site grids;
- structural grids/system.

7.2.1 Location grids

Location grids (see figure 2) are mostly used for large sites or schemes. Their main function is to assist planning authorities and designers in plotting the location of boundaries, buildings, roads, underground utilities or other features. On plans or drawings, a location grid may be presented either by continuous lines or by the points of intersection of these lines (grid intersections).

7.2.2 Site grids

Site grids (see figure 3) can be considered as the transfer of the location grid from the plan or drawing to the site by setting-out. This can be the grid in its whole or a part of it, with the same spacing or a closer one.

In those cases where the internal accuracy of a previously established site grid falls outside the acceptance criteria for primary or secondary systems (see clauses 14 and 15), further setting-out may be done by using one grid intersection as a reference point and one grid line through it, as a reference direction. Such a procedure is only then allowed if no other acceptance criteria towards other grid intersections are specified or shown to be necessary for the setting-out. Otherwise the site grid — or the particular part of it — has to be resurveyed.

7.2.3 Structural grids (building grids) and secondary grids or systems

Structural grids (see figure 3) are used by designers to define the position of structural elements — usually their centre-lines.

A setting-out grid (see figure 3) is one which will generally be parallel to the structural grid; it is used for the setting-out of position points and for compliance measurements, as the erected elements progressively obscure the structural grid. Such a grid can also be projected up and along the building as the construction proceeds.

Setting-out related to specially laid out grids follows the same procedure as described in this International Standard.