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An American National Standard

Standard Guide for Dimensional Coordination of Rectilinear Building Parts and Systems[1]

This standard is issued under the fixed designation E 577; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

INTRODUCTION

The concept of coordinating the dimensions of buildings and building parts with the dimensions of manufactured components and assemblies by means of a common dimensional factor, or module, was pioneered in the United States in the 1920s and 1930s. The terms "modular coordination" and "dimensional coordination" were adopted for the use of the basic building module and preferred dimensions in building design, production, and construction.

In 1939, the American Standards Association (now ANSI) organized project A62, a cooperative study of dimensional coordination, resulting in the issue of a series of standards concerning the subject between 1945 and 1971. Responsibility for the continuation of the work was transferred to ASTM and under the general supervision of Committee E-6 on Performance of Building Constructions. Subcommittee E06.62, Coordination of Dimensions for Building Materials and Systems, has the specific task to develop standards in this field, including metric versions that use the international building module of 100 mm.

In 1976, ASTM Committee E-6 approved ANSI/ASTM E 577 to set voluntary standards for the dimensional coordination of rectilinear building parts and systems in either metric (SI) or inch-pound units, using a basic incremental dimension (*M*) with the value 100 mm in SI units, or 4 in. in inch-pound units.

Subcommittee E06.62 has now prepared companion standards in acceptable metric and inch-pound units so that designers wishing to apply the principles of dimensional coordination can select preferences in line with the measurement system used in their documentation. Except for the dimensions ascribed to the basic building module and, therefore, its multiples, the companion standards are identical in text.[2]

1. Scope

1.1 This guide covers the application of dimensional coordination in building design and the fabrication of rectilinear building parts and systems. A minimum number of preferred dimensions are recommended to give a range of alternatives that should result in economies in design, detailing, production, and construction. Dimensional coordination should be used where benefits in documentation, fabrication, installation, and maintenance can be established, but is not intended to eliminate uncoordinated custom design.

1.2 Specifically, the guide covers:

1.2.1 Descriptions of terms used in dimensional coordination.

1.2.2 The basis for the dimensional coordination of building parts and systems in the design of buildings.

1.2.3 Preferred horizontal and vertical dimensions for building parts and for the coordination of systems.

1.3 This guide does not state preferred dimensions and sizes for building components, except for general principles.

1.4 Basic guidelines for dimensioning in modular drawing practice are given.

1.5 Where practicable, recommendations in international standards prepared by the International Organization for Standardization (ISO) have been taken into account.

[1] This guide is under the jurisidiction of ASTM Committee E-6 on Performance of Buildings and is the direct responsibility of Subcommittee E06.62 on Coordination of Dimensions for Building Materials and Systems.

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[2] The standards replace ANSI/ASTM E 577-76 and supersedes ANSI A62.1-1957, A62.5-1965, and A62.7-1969.

2. Terminology

2.1 *Definitions of Terms Specific to This Standard:*

2.1.1 *basic building module (basic module)*—a unit dimension used as the standard increment in the dimensional coordination of buildings and building parts.

2.1.1.1 *Discussion*—For dimensional coordination in metric (SI) units, the basic building module has the internationally agreed value of 100 mm; the basic building module is designated by the symbol *M*; for example: 100 mm = 1 *M*; 1200 mm = 12 *M*. For dimensional coordination in inch-pound units, the basic building module has the value of 4 in.; the basic building module is designated by the symbol *M*; for example: 4 in. = *M*; 48 in. or 4 ft 0 in. = 12 *M*.

2.1.2 *building part*—a piece or unit of building material including joints, or an item of building equipment. Rectilinear building parts have sides that are at right angles to each other.

2.1.3 *ceiling height*—the dimension that extends from the coordinating interface of a wall component at the floor to its coordinating interface at the ceiling (see Fig. 1 (*B*)).

2.1.4 *ceiling space dimension*—the dimension measured from the wall-to-ceiling interface to the lowest point of the horizontal structural elements, generally applicable only for suspended ceilings and includes the ceiling construction and the plenum above, if any (see Fig. 1 (*F*)).

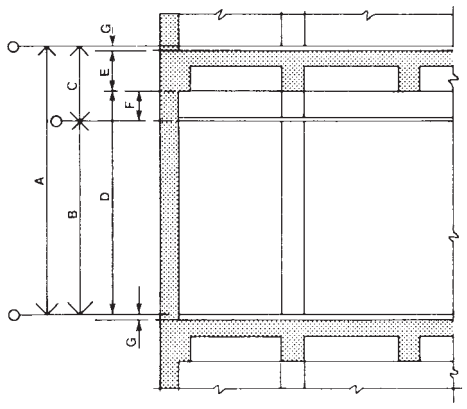
2.1.5 *change in level*—the vertical difference between two adjacent floor or roof planes, or both (see Fig. 2).

2.1.6 *clear structure height*—the clear distance between the highest point of the horizontal structure of one story to the lowest point of the horizontal structure of the story above (see Fig. 1 (*D*)).

2.1.7 *controlling dimension*—a modular coordinating dimension between controlling planes, for example, story height, ceiling height, distance between axes of columns, thickness of controlling zone.

2.1.8 *controlling plane or line*—a plane or line that represents a major building space reference in dimensional coordination.

2.1.9 *controlling zone*—a zone between controlling planes.



A—Story height
C—Floor-ceiling thickness
D—Clear structure height
E—Horizontal structure thickness
F—Ceiling space dimension
G—Thickness of finished floor

FIG. 1 Preferred Vertical Dimensions

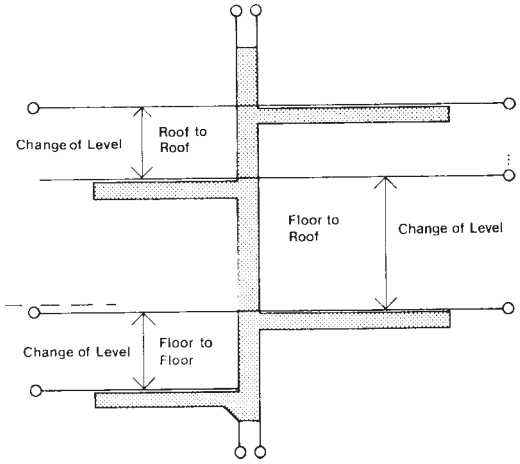


FIG. 2 Changes of Level at Floors or Roofs

2.1.10 *coordinating dimension*—a preferred dimension between coordinating planes or lines that is a whole multiple of the module and used in the coordination of building parts and components, including allowances for joints and tolerances.

2.1.11 *coordinating line or plane*—the theoretical line or plane by reference to which one building part or component is coordinated with another.

2.1.12 *custom dimension*—any dimension that is not a whole multiple of the basic module.

2.1.13 *dimension*—a linear distance, such as length, width, height, depth, or thickness.

2.1.14 *dimensional coordination*—a comprehensive approach to the coordination of the geometry of buildings, building parts, components, and systems, through a set of dimensional preferences derived from the basic module; a relationship between sizes and dimensions of building parts that will permit their assembly and erection without modification or adjustment (see Fig. 3).

2.1.15 *dimensionally coordinated product*—building product, the dimensions of which are established in conformance with this guide, and which include allowances for joint thicknesses and dimensional tolerances (see Fig. 4).

2.1.16 *floor-ceiling thickness*—the dimension from the ceiling plane to the finished floor plane of the story immediately above (see Fig. 1 (*C*)).

2.1.17 *horizontal structure thickness*—the vertical dimension of the structural floor or roof system; in the case of structural floors, the dimension between the structural floor and the lowest point of that structural floor system (see Fig. 1 (*E*)).

2.1.18 *intermediate controlling dimension*—a preferred dimension used for control of openings or other elements; for example, door heads and jambs (see Fig. 5).

2.1.19 *joint*—the space formed by two adjacent building parts or components, when these are put together, fixed, or combined with or without a jointing product (see Fig. 4).

2.1.20 *modular coordination*—dimensional coordination employing the basic building module or multimodules.

2.1.21 *modular grid*—a reference grid with lines or planes at right angles, the spacing of which are either the basic building module or multiples. The spacing of lines or planes in a modular grid need not be the same in difference directions.

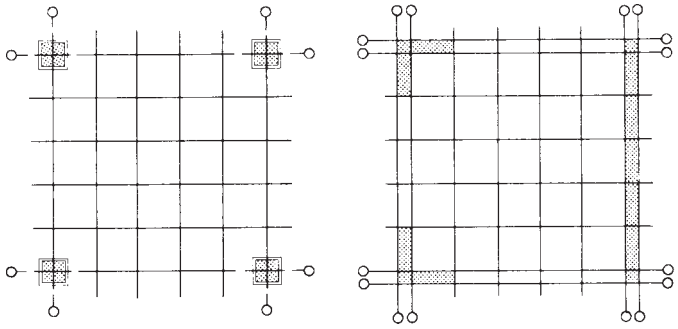


FIG. 3 Preferred Horizontal Dimensions

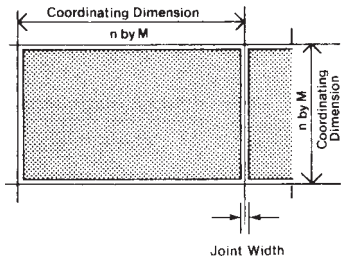


FIG. 4 Dimensionally Coordinated Product

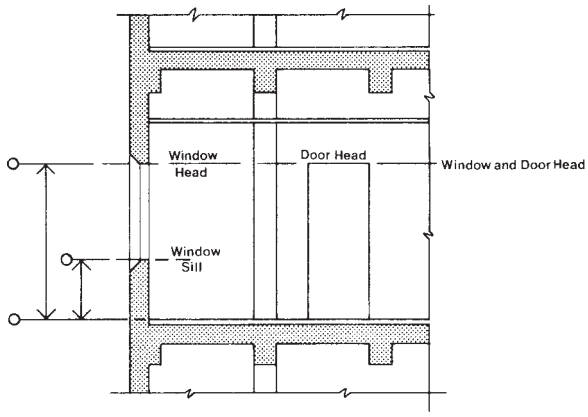


FIG. 5 Intermediate Controlling Dimensions

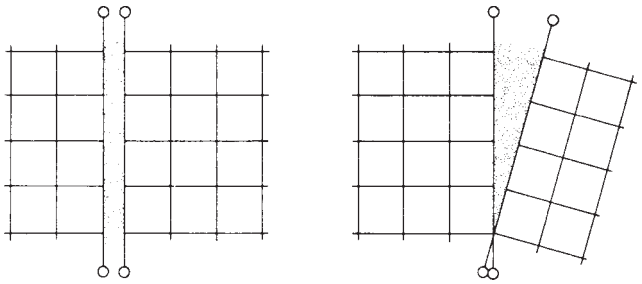


FIG. 6 Neutral Zones

2.1.21.1 *M*—basic modular dimension (see 2.1).

2.1.22 *multimodule*—a preferred multiple of the basic building module used for horizontal or vertical dimensional control in building design.

2.1.23 *neutral zone*—a distance between two adjacent controlling or coordinating planes that is not a preferred dimension (see Fig. 6).

2.1.24 *product dimensional tolerance*—the acceptable departure of the actual from the specified dimensions of a product.

2.1.25 *size*—an area measure that is expressed as a product of two dimensions, or a volume measure that is expressed as a product of three dimensions.

2.1.26 *standard modular grid*—a modular grid in which the space of lines is the basic building module, *M*.

2.1.27 *story height*—the dimension between controlling or coordinating lines at one floor plane and the floor plane or roof plane above (see Fig. 1 (*A*)).

2.1.28 *system*—an integration of building parts that perform one or more specific functions.

3. Basis for Dimensional Coordination of Buildings and Sizing of Building Parts

3.1 Dimensional coordination of buildings and rectilinear building parts is based on the application of three related concepts:

3.1.1 *Modular reference grids of lines or planes* to define reference locations in space;

3.1.2 *Controlling dimensions* in the horizontal and vertical plane as means of controlling the location of major building elements and rectilinear building parts; and,

3.1.3 *Coordinating dimensions* for building components to reduce variety of sizes and to promote a better fit within the controlling reference system, therefore minimizing wasteful cutting or fitting on site.

4. Dimensional Reference System

4.1 The reference system for dimensionally coordinated design may consist of:

4.1.1 A standard modular grid of dimensions;

4.1.2 A multimodular grid of two or three dimensions, which may use different modules in different directions; or,

4.1.3 A selected set of reference planes or lines spaced at modular intervals but without the use of a regular grid.

4.2 The reference system is used in design and detailing decisions to locate building parts that may or may not be shown on working drawings.

5. Controlling Dimensions

5.1 Controlling dimensions locate the planes or grid lines that define the building framework.

5.2 Controlling dimensions occur in two forms:

5.2.1 *Axial controlling dimensions* are from controlling centerline to controlling centerline of building parts.

5.2.2 *Boundary controlling dimensions* are from the controlling line at the face of a building part to the controlling face of another building part.

5.3 Controlling dimensions are used both in the horizontal plane and the vertical plane.

5.3.1 *Horizontal controlling dimensions* can be either axial or boundary dimensions (see Fig. 3). Axial horizontal controlling dimensions are useful in large open structures, especially where axial centerlines are used in the layout of structural elements, such as columns. Boundary horizontal controlling dimensions are useful in smaller buildings with extensive internal subdivision.

5.3.2 *Vertical controlling dimensions* are normally boundary dimensions (see Fig. 1).

6. Preferred Horizontal Dimensions

6.1 Preferred horizontal dimensions for building parts larger than *M*, and the basis for dimensional coordination of building parts in the horizontal plane up to 60 *M* shall be multiples of the following multimodules, as shown in Table 1:

6.1.1 *First Preference—n* × 3 *M*.

6.1.2 *Second Preference—n* × 4 *M*.

6.1.3 *Third Preference—n* × 10 *M*.

6.2 The multimodule of 60 *M* incorporates all three preferences.

6.3 For large dimensions, exceeding 60 *M*, the dimensional coordination of building parts in the horizontal plane shall be based on multiples of the following multimodules:

6.3.1 *First Preference—n* × 60 *M*.

6.3.2 *Second Preference—n* × 30 *M*.

6.3.3 *Third Preference—n* × 12 *M*.

TABLE 1 Preferred Horizontal Dimensions

NOTE 1—First preference dimensions in italic also occur in the second or third preference columns.

NOTE 2—M = 4 in. (100 mm).

First Preference	Second Preference	Third Preference
3M	4M	
6M	8M	
9M		
12M	*12M*	10M
15M	16M	
18M	20M	
21M		20M
24M	*24M*	
27M	28M	
30M		
	32M	*30M*
36M	*36M*	
39M	40M	
42M	44M	40M
45M		
48M	*48M*	
51M	52M	50M
54M	56M	
57M		
60M	*60M*	
		60M

6.3.4 *Fourth Preference*—Multiples of preferences shown in 6.1.

6.4 Where economic or technical reasons dictate the use of horizontal dimensions other than the preferences listed, such dimensions shall be multiples of the basic building module, *M*.

7. Preferred Vertical Dimensions

7.1 Fig. 1, Fig. 2, and Fig. 3 represent sections through a building and illustrate all elements to be considered in the application of preferred vertical dimensions to a building or building parts.

7.2 Preferred vertical dimensions are as follows:

7.2.1 *Story Height* (Fig. 1(*A*)):

7.2.1.1 *Dimensions up to 30 M—n* × *M*.

7.2.1.2 *Dimensions from 30 M to 48 M*:

(a) (*a*) *First Preference—n* × 3 *M*.

(b) (*b*) *Second Preference—n* × 2 *M*.

7.2.1.3 *Dimensions over 48 M*:

(a) (*a*) *First Preference—n* × 6 *M*.

(b) (*b*) *Second Preference—n* × 3*M*.

7.2.2 *Ceiling Height* (Fig. 1 (*B*)):

7.2.2.1 *Dimensions up to 28 M—n* × *M*.

7.2.2.2 *Dimensions from 28 M to 36 M*:

(a) (*a*) *First Preference—n* × 3 *M*.

(b) (*b*) *Second Preference—n* × 2 *M*.

7.2.2.3 *Dimensions over 36 M*:

(a) (*a*) *First Preference—n* × 6 *M*.

(b) (*b*) *Second Preference—n* × 3 *M*.

7.2.3 *Floor-Ceiling Thickness* (Fig. 1(*C*)):

7.2.3.1 *Dimensions up to 6 M—n* × *M*.

7.2.3.2 *Dimensions from 6 M to 18 M*:

(a) (*a*) *First Preference—n* × 3 *M*.

(b) (*b*) *Second Preference—n* × 2 *M*.

7.2.3.3 *Dimensions over 18 M—n* × 6 *M*.

NOTE 1—The floor-ceiling thickness may also be a non-modular dimension or "neutral zone."

7.2.4 *Clear Structure Height* (Fig. 1 (*D*)), *Horizontal Structure Thickness* (Fig. 1(*E*)) *and Ceiling Space Dimension* (Fig. 1 (*F*)) may be modular or multi-modular dimensions, singly or in combination.

7.2.5 *Thickness of Finished Floor* (Fig. 1 (*G*)) is usually determined by economic or technical factors and does not need to be a modular dimension, except in combination with Fig. 2 (*E*) and (*F*).

7.2.6 *Changes in Level at Floors or Roofs* (Fig. 2):

7.2.6.1 *Dimensions up to 24 M*:

(a) (*a*) *First Preference—n* × 3 *M*.

(b) (*b*) *Second Preference—n* × 2 *M*.

7.2.6.2 *Dimensions over 24 M—n* × 6 *M*.

7.2.7 *Intermediate Controlling Dimensions* (Fig. 5)—Intermediate controlling dimensions shall be selected multiples of the basic building module.

7.2.7.1 Preferred dimensions in order are *n* × 3 *M*, *n* × 2 *M*, and *n* × *M*.

7.3 *Order of Preference for Dimensions*—Since structural and economic factors may prevent adherence to the preferred dimensions for certain elements shown in 7.2, or even adherence to the basic building module, the designer must designate

which of these elements should adhere to the preferred dimensions, and handle the remaining elements as an uncoordinated neutral zone. For example, in single-story buildings that do not have a suspended ceiling, it may not be economically justified for the horizontal structure thickness of the roof structure to be a coordinated dimension. In such a case, the designer must determine whether the story height (Fig. 1 (*A*)), or the ceiling height (Fig. 1 (*B*)) shall adhere to one of the preferred dimensions.

8. Neutral Zone

8.1 A neutral zone interrupts a modular grid or where no grid is used, represents a non-modular distance between two consecutive horizontal or vertical controlling or coordinating planes.

8.2 Neutral zones accommodate intermediate building elements, such as walls or floors where reference planes are parallel, or parts of a building placed at an angle, where reference planes are oblique (Fig. 6).

9. Preferred Dimensions for Building Components and Assemblies

9.1 This guide does not cover preferred dimensions or sizes for building components or assemblies of components, except for general principles.

9.2 For the concept of preferred dimensions for buildings and building parts, it is desirable for components and assemblies to be sized in such a way that the coordinating dimensions are themselves derived from the basic building module, and whole multiples or select submultiples thereof.

9.3 The coordinating dimensions define the theoretical space occupied by a component or assembly, including all necessary allowances for tolerances and joints, and, normally, represent the distances between the centerlines of joints (see Fig. 4).

9.4 For overlapping components, the coordinating dimensions represent the dimensions of the effective cover.

10. Drawing Practice for Dimensional Coordination

10.1 Dimensional coordination is accompanied by a set of drawing conventions for the representation of dimensionally coordinated building projects in drawings and other construction documents.

10.2 Distinctions are made between controlling lines, coordinating dimensions, and custom (non-modular) dimensions (Fig. 7).

10.2.1 *Controlling Lines*—Shown with a small circle at the end of the projecting line, and as broken lines for axial controlling lines or solid lines for boundary controlling lines.

10.2.2 *Coordinating Dimensions*—Shown with a 45° open arrow.

10.2.3 *Custom Dimensions (non-modular dimensions)*—Shown with a closed arrow or slash lines.

11. Keywords

11.1 basic building module; building neutral zone; building parts sizing; building systems; buildings modules; dimensional coordination; dimensional reference system; modular coordination; modules; rectilinear building parts; sizing building parts

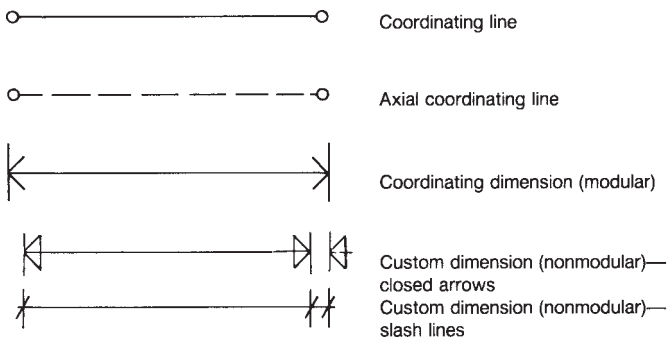


FIG. 7 Drawing Conventions with Dimensional Coordination