



# Standard Practice for Building Floor Area Measurements for Facility Management<sup>1</sup>

This standard is issued under the fixed designation E1836/E1836M; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

<sup>e1</sup> NOTE—Units information and designation was corrected editorially in April 2009.

## 1. Scope

1.1 This practice provides a definitive procedure for measuring and classifying floor area in buildings for use in facility management, specifying occupant requirements, space planning, and for strategic facility planning.

1.2 This practice specifies the sequence in which to measure floor area.

1.3 This practice is applicable to owned, rented, and leased buildings.

1.4 Use **Annex A1** to measure floor area in office facilities. The measurement practice in **Annex A1** may also be suitable for use in other functional types of building which include offices, such as research, laboratory, or manufacturing buildings and building-related facilities.

1.5 The practice in **Annex A1** is not intended for use in lease negotiations with owners of commercial office buildings or related properties. For that purpose, refer to the American National Standard published by the American National Standards Institute under the designation ANSI/BOMA Z65.1–1996 and commonly known as the ANSI-BOMA standard.

1.6 This practice is not intended for and not suitable for use for regulatory purposes, fire hazard assessment, and fire risk assessment.

1.7 This practice was developed for use within North America and includes some rules comparable to ISO 9836 Performance Standards in Building—Definition and Calculation of Area and Space Indicators.

1.8 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.25 on Whole Buildings and Facilities.

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1.9 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

E631 Terminology of Building Constructions

E2619/E2619M Practice for Measuring and Calculating Building Loss Features That Take Up Floor Area in Buildings

### 2.2 ANSI Standard:<sup>3</sup>

ANSI/BOMA Z65.1–1996 Standard Method for Measuring Floor Area in Office Buildings

### 2.3 ISO Standards:<sup>4</sup>

ISO 9836 Performance Standards in Building—Definition and Calculation of Area and Space Indicators

## 3. Terminology<sup>5</sup>

### 3.1 Definitions:

3.1.1 *floor, n*—in a building, supporting structure (generally horizontal) and constituting the bottom level of each story.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

<sup>4</sup> Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, http://www.iso.ch.

<sup>5</sup> Certain definitions of terms in this practice were agreed in 2007 by a Working Group established jointly by the Building Owners and Managers Association (BOMA) International and the International Facility Management Association (IFMA). Certain terms were derived from referenced ASTM standards or from referenced ANSI standard, or from published IFMA documents. Ownership of copyright to specific terms is indicated by footnotes. Certain terms are quoted from other ASTM standards, in which case the ASTM source is identified at the end of the definition.

<sup>6</sup> Information such as this, inserted at the end of a definition, gives the number of a standard from which this definition was quoted or derived. If a number follows a dash at the end of this information, it indicates the year of approval of the standard.

3.1.2 For standard definitions of additional terms applicable to this practice, see Terminology **E631**.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *amenity area, n*—portion of a building that provides a convenience to an occupant or occupants of a building or group of buildings.<sup>7</sup>

3.2.1.1 *Discussion*—In general, occupancy codes and regulations do not govern these areas, although there may be codes and regulations that relate to their specific uses.

3.2.2 *assignable area, n*—portion of the plannable area on a floor that can be assigned to occupant groups or functions.

3.2.3 *building, n*—contiguous and undivided shelter comprising a partially or totally enclosed space, erected by means of a planned process of forming and combining materials.<sup>7</sup>

3.2.4 *dominant portion, n*—the inside surface of the outside wall, as defined in ANSI/BOMA Z65.1–1996.<sup>8</sup>

3.2.4.1 *Discussion*—ANSI/BOMA Z65.1–1996 specifies when to consider the inside surface of the window glass as the dominant portion to measure to, and when to measure to some other part of the outside wall.

3.2.5 *excluded area, n*—portion of a floor within a building that is not suitable for occupancy by people or equipment.<sup>7</sup>

3.2.5.1 *Discussion*—While excluded areas may meet the criteria of adequate clear headroom there is owner/landlord documentation which indicates that these areas are to be excluded from floor interior gross area calculations. Examples of excluded areas include but are not limited to unfinished attic areas, attic areas with obstructed access, damp or flooded basements, and confined areas requiring permits for entry. Areas temporarily unusable due to flood, fire damage, construction or renovation activity are *not* excluded areas.<sup>7</sup>

3.2.6 *exterior gross area, n*—the area of the floor measured to the outside face of the walls that enclose the floor(s) of the building.

3.2.6.1 *Discussion*—Areas which are not enclosed, such as patios and balconies, are not part of exterior gross area. Cornices, pilasters, buttresses, and so forth that extend beyond the wall face are disregarded. The exterior gross area of a basement space includes the area measured to the outside face of basement or foundation walls.

3.2.7 *finished surface, n*—inside face of a wall, window, ceiling, or floor that is provided as part of the base building for the general use of occupants, excluding the thickness of any special surfacing materials applied to meet the particular needs of specific occupants.<sup>9</sup>

3.2.8 *floor area, n*—area in the horizontal plane of the bottom level of a story or stories in a building.

3.2.9 *interior encroachment, n*—base building element that is located inside a building, not on an outer wall, and that prevents the use of the floor area for furniture, equipment, circulation, or other occupant function.<sup>9</sup>

3.2.10 *interior gross area, n*—portion of the floor(s) that is totally enclosed within the dominant portion.<sup>9</sup>

3.2.11 *interior parking, n*—totally or partially enclosed area that is within a building and that is normally used to circulate and station vehicles.<sup>10</sup>

3.2.12 *interstitial floor area, n*—area of load-bearing surfaces located above or below occupied building floors that is not available for general occupancy.<sup>7</sup>

3.2.12.1 *Discussion*—Interstitial floor area is often not available for occupancy due to inadequate clear headroom. Typically interstitial floor area contains building mechanical or electrical systems predominantly serving adjacent floors or to provide access to such systems.

3.2.13 *major vertical penetration, n*—opening in a floor that serves a building or system distribution function.<sup>7</sup>

3.2.14 *matrix, n*—a grid-like array of elements.<sup>11</sup>

3.2.15 *occupant, n—of a building*, one who has certain legal rights to or legal control over the premises occupied.<sup>9</sup>

3.2.15.1 *Discussion*—An occupant may be a tenant in a building or the owner of a building.

3.2.16 *occupant void area, n*—opening in a floor created for the specific benefit of an occupant.<sup>10</sup>

3.2.16.1 *Discussion*—Examples of occupant void areas are private elevators, communicating stairs within tenant premises, and the opening in the floor above in tenant rooms that are multi-story in height.

3.2.17 *perimeter encroachment, n*—base building element or restricted area that is located inside the dominant portion of a building on the outer wall and that prevents the use of the floor area for furniture, equipment, circulation, or other occupant function.<sup>9</sup>

3.2.18 *plannable gross area, n*—portion of a floor that is totally enclosed within the interior face of perimeter encroachments at the floor plane and where there are no perimeter encroachments enclosed at the inside finished surface of the exterior walls.<sup>10</sup>

3.2.19 *polygon, n*—closed plane figure made up of several line segments that are joined together.<sup>12</sup>

3.2.20 *primary circulation area, n*—minimum path on a floor for access to egress stairs, elevator lobbies, toilet rooms, refuge areas, building lobbies, and entrances.<sup>9</sup>

3.2.21 *restricted area, n*—portion of floor area that would normally be available for use by an occupant, but the occupant is limited from using the area, either by regulatory authority or from a governing document.<sup>9</sup>

<sup>7</sup> Copyright is shared with BOMA International.

<sup>8</sup> In the 1996 edition, which is copyright by BOMA, the dominant portion is defined as the inside face of the portion of the wall which is window glass where it is more than 50 % of the vertical distance from finished floor to finished ceiling, and elsewhere as the inside face of the outside wall, or of a pilaster or column attached to the outside wall where they occur. Note that the reader is cautioned that the dominant portion is not defined as a part of this ASTM standard. Instead, ANSI/BOMA Z65.1–1996 is developed by and subject to the authority of BOMA International, which may change it from time to time at its sole option.

<sup>9</sup> ASTM copyright is shared with BOMA International.

<sup>10</sup> New term for which copyright is shared by ASTM and BOMA International.

<sup>11</sup> *Oxford English Dictionary*, 2nd ed., Oxford University Press, 1989, s.v. “matrix.”

<sup>12</sup> *Bagatrix Math Glossary*, s.v. “polygon,” [http://www.bagatrix.com/glossary/math\\_glossary\\_p.htm](http://www.bagatrix.com/glossary/math_glossary_p.htm) (accessed April 1, 2009).

3.2.22 *restricted headroom, n*—large portion of a floor that does not have sufficient clear, unobstructed headroom to conform to local building codes or that has headroom less than that required for occupancy.

3.2.22.1 *Discussion*—Restricted headroom is primarily intended to exclude large areas such as low attics and crawl-spaces from being defined as “floors.” It also establishes, in a sloped ceiling attic or sloped exterior wall, where the effective outer wall is located. Restricted headroom does not apply to reduced or no headroom conditions (that is, walls, columns, stairs, door headers, limited piping, railings, alcoves, and so forth) typically found on a floor, unless they are part of an overall restricted headroom condition.

3.2.23 *secondary circulation area, n*—portion of a floor required for access to some subdivision of a floor, that does not serve all occupants on a floor and that is not defined as primary circulation area.

3.2.24 *service area, n*—portion of a building that provides services that enable occupants to work in a building.

3.2.24.1 *Discussion*—Service areas make it possible to accommodate occupants within a building without violating existing building codes and occupancy controls, or both.<sup>13</sup>

3.2.25 *unassigned area, n*—portion of the plannable area on a floor that is not assigned to occupant groups or functions.<sup>10</sup>

3.2.25.1 *Discussion*—Unassigned area includes all plannable area that cannot be classified as either assignable area, or restricted area, or occupant void, or interior encroachment, or secondary circulation. Examples are: (1) small areas between furniture panels and columns where furniture does not fit; and (2) area set aside to install future workstation or other functions.

3.2.26 *usable area, n*—portions of a building that can be classified as tenant area or amenity area.<sup>14</sup>

3.2.27 *void area, n*—absence of a floor inside the dominant portion where a floor might otherwise be expected or

<sup>13</sup> Terms from BOMA and ASTM standards were used as the starting point to develop this term. The copyright of this term is shared by ASTM and BOMA.

<sup>14</sup> Term in the BOMA standard used as the starting point to develop this term. BOMA shares the copyright with ASTM.

measured, that is typically in the plane of the upper floors of multi-story atria or lobbies, light wells, auditoria or the area adjacent to a partial-floor mezzanine.

#### 4. Significance and Use

4.1 This practice can be used to facilitate comparison of areas that have been measured but it does not specify what measurements must be conducted.

4.2 This practice can be used in space programming and forecasting of space requirements.

4.3 This practice can be used to classify areas for internal cost accounting purposes.

4.4 This practice can be used to compare space use between organizations.

#### 5. Basis of Practice

5.1 The basis for classification of floor area measurements for certain functional types of building is contained in **Annex A1**.

NOTE 1—In the future, additional annexes are expected to be added to this practice to contain the classifications for floor area measurements in other functional types of building and to compare measurements of floor area for different purposes or from different countries.

#### 6. Measurement Procedure and Report

6.1 **Annex A1** provides a procedure for measuring floor area and for reporting such measurements for certain functional types of building for those purposes stated in Section 1.

6.2 When reporting floor area, measured in accordance with the procedure in **Annex A1**, note any exceptions to the prescribed method. Where possible, also assess the extent of variation and state as an estimate.

6.3 If Practice **E2619/E2619M** is also used, findings from that practice may be included in the report of building floor area measurement, but the area of building loss features shall be clearly identified.

#### 7. Keywords

7.1 area; building; building floor area; facility; facility management; floor area; measurement; occupant requirement

## ANNEXES

### (Mandatory Information)

#### A1. PRACTICE FOR MEASUREMENT IN OFFICE FACILITIES AND RELATED FUNCTIONAL TYPES OF BUILDINGS SUCH AS RESEARCH, LABORATORY, AND MANUFACTURING BUILDINGS AND BUILDING-RELATED FACILITIES

## A1.1 Introduction

A1.1.1 The purpose of **Annex A1** is to provide consistent terms, definitions, and measurement procedures for floor area measurements to facilitate comparison of measurements among different organizations and for financial chargeback.

## A1.2 Scope

A1.2.1 Use **Annex A1** to measure floor area in office facilities. This measurement practice may also be suitable for use in other functional types of building which include offices, such as research, laboratory, or manufacturing buildings and building-related facilities.

A1.2.2 **Annex A1** is applicable to the measurement of space whether owned or leased.

A1.2.3 **Annex A1** is intended for use by facility managers and occupants of building and facilities. It is suitable for such purposes as strategic planning, space management, and internal chargeback to occupant organizations.

A1.2.4 **Annex A1** gives rules for measurement for use in facility management, space planning, and chargeback to occupant units.

A1.2.5 **Annex A1** is not intended for use in lease negotiations with owners of commercial office buildings or related properties. For that purpose, refer to the American National Standard published by the American National Standards Institute under the designation ANSI/BOMA Z65.1–1996, and commonly known as the ANSI-BOMA standard.

## A1.3 Relationships Between Categories of Floor Area

A1.3.1 This annex includes four categories of floor area: Exterior Gross Area, Interior Gross Area, Plannable Gross Area, and Plannable Area. (Refer to **Fig. A1.1**.)

A1.3.2 These four categories of floor area, and the elements (sub-categories of floor area) within each of these four categories, relate one to the other in the following ways:

A1.3.2.1 Interior Gross Area is equal to Exterior Gross Area less Dominant Portion to Exterior Gross Area, Excluded Areas, Interstitial Areas, Restricted Headroom Areas, and Interior Parking Areas.

A1.3.2.2 Plannable Gross Area is equal to Interior Gross Area less Perimeter Encroachments.

A1.3.2.3 Plannable Area is equal to the sum of the following areas: Restricted Areas, Interior Encroachments, Occupant Void Areas, Unassignable Areas, Assignable Areas, and Secondary Circulation.

## A1.4 Rules for Measurement

A1.4.1 Measurements shall include only floor areas that are totally enclosed within a building. Climate conditions and construction practices will dictate the degree of weather tightness typical for exterior walls in a local area. Basements, enclosed porches, penthouses, mechanical equipment rooms, lobbies, mezzanines, corridors, interior parking, and enclosed loading docks are included. Spaces outside the exterior walls or without a roof covering are not included in the floor area

measurement. A space, such as balcony, which has a roof or ceiling but is not fully enclosed, is not included.

A1.4.2 For space planning and chargeback, measure the *plannable gross area* and the various elements of floor area within the *plannable gross area*. However, there are likely to be instances when additional measurements may be needed. Therefore, elements of floor area shown in **Fig. A1.1** under the *exterior gross area* and the *interior gross area* are described to give context to the cascade of relationships from the gross exterior to the plannable area. However, to ensure correct measurement of elements outside the plannable gross area will require using the procedures contained in ANSI/BOMA Z65.1–1996.

A1.4.3 All measurements shall be made along the plane of the floor to the points where floors and walls intersect.

A1.4.4 In the case of a sloped floor measure the floor area in the horizontal plane as depicted on a floor plan.

A1.4.5 Stair landings shall not count as floor area, but as part of the stair.

A1.4.6 The finished surface of a wall normally consists of gypsum wallboard, glass, plaster, concrete, brick, or masonry units. Special wall materials used to surface a wall are furring strips, paneling or casework, tile, mirrors, and any materials referred to as “wall coverings” or “window coverings” that are applied over base building finished walls or windows.

A1.4.7 The finished surface of an exterior window shall be the glass surface that is in direct contact with the interior environment of the building.

A1.4.8 The finished surface of a floor is the top of a deck, typically concrete or wood, without special surfacing materials that are applied over the base building finished floor, such as carpeting, tile, resilient flooring, or any materials referred to as “floor coverings.”

A1.4.9 The finished surface of a ceiling is typically the underside of acoustical tile, plaster, gypsum, wallboard, or similar surface. In the absence of a continuous ceiling surface, measurement to the finished surface of the ceiling shall be to the bottom of any suspended ceiling grid, or, if no ceiling grid exists, to the lower of (1) the underside of exposed building structure elements or (2) the lowest general level of the bottom of light fixtures (not including up-lighting), air diffusers, sprinkler heads or similar base building fixtures that are suspended below the underside of building structural elements, or (3) the typical ceiling height established by the intended building design; provided that a finished ceiling height as designed does not create a restricted headroom condition.

A1.4.10 Restricted headroom is typically 2.0 to 2.3 m [6.5 to 7.5 ft] or less. This category is primarily intended to exclude large areas such as low attics and crawlspaces from being defined as “floors.” It also establishes, in a sloped ceiling attic or sloped exterior wall, where the effective outer wall is located. The category of restricted headroom does not apply to places with reduced or no headroom conditions (that is, walls, columns, stairs, door headers, limited piping, railings, alcoves, and so forth) typically found on a floor, unless they are part of an overall restricted headroom condition.



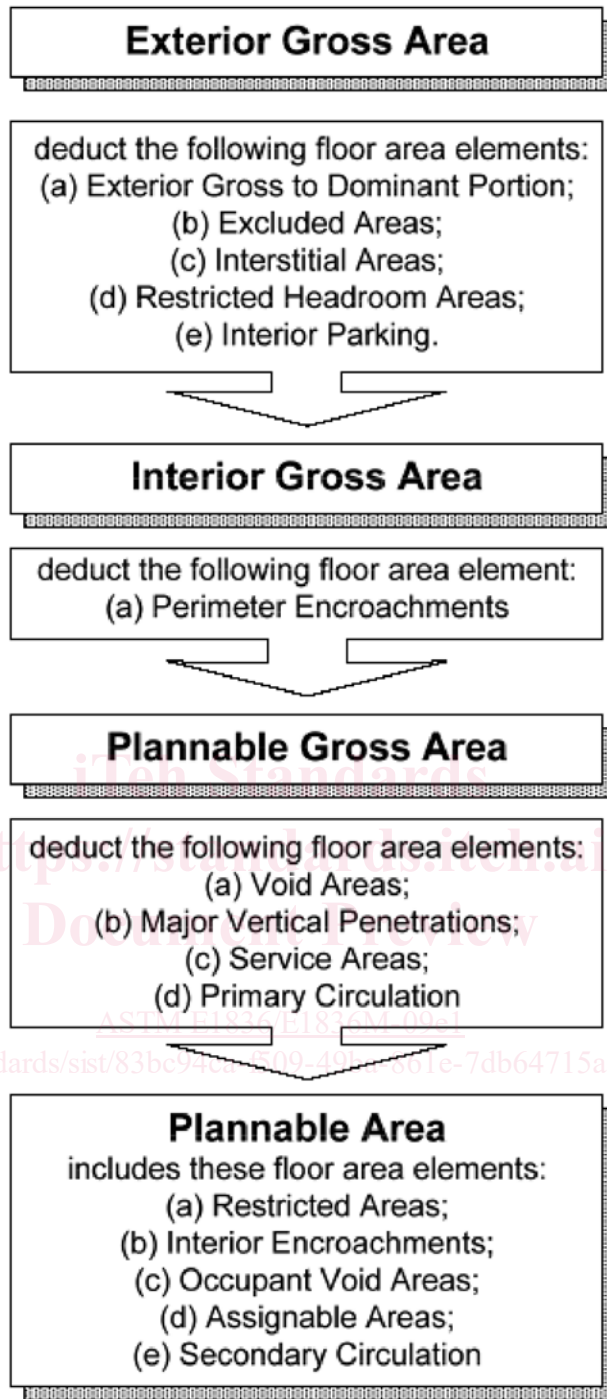


FIG. A1.1 Floor Area Relationships

A1.4.11 *Exterior Gross Area—Measured Elements:*

A1.4.11.1 *Exterior Gross to Dominant Portion*—Building exterior gross area is the sum of the floor areas on all levels of a building that are totally enclosed within the building. When users of this practice also use the ANSI/BOMA standard, measure building exterior gross area to the outside face of exterior walls, disregarding canopies, cornices, pilasters, buttresses, balconies that are not fully enclosed and that extend beyond the wall face, and courtyards that are enclosed by walls

but have no roof. A balcony that is not fully enclosed is not included in the exterior gross area even if it does not extend beyond the line of the outside wall face. The building gross area of basement space includes the area measured to the outside face of basement or foundation walls.

(1) *If Property Line is Within a Building*—If the property line lies within a building wall that is common with an adjoining building, measure the building exterior gross area to the property line. If the property line does not lie within a

building wall but the wall is structurally common with an adjoining building, measure building exterior gross area to the center of the structural portion of the common wall.

A1.4.11.2 *Exterior Bridges and Tunnels*—Exterior tunnels bridges and tunnels which are totally enclosed constructed areas connecting two or more buildings are included in the interior building gross area but are not included in the gross plannable area. Assign exterior bridges and tunnels to one building or apportion between buildings.

A1.4.11.3 *Excluded Areas*—Measure each excluded area. While excluded areas may meet the criteria of adequate clear headroom, if there is owner/landlord documentation that indicates that these areas are to be excluded from the gross interior floor area calculations then measure each excluded area and deduct from the exterior gross area. Examples of excluded areas include, but are not limited to, unfinished attic areas, attic areas with obstructed access, damp or flooded basements, and confined areas requiring permission for entry. Areas temporarily unusable due to flood, fire damage, construction, or renovation activity are *not* excluded areas.

A1.4.11.4 *Interstitial Areas*—Measure the areas of load-bearing surfaces that are located above or below occupied building floors and that are not available for general occupancy.

A1.4.11.5 *Restricted Headroom Areas*—Measure each restricted headroom area. These are large portions of a floor that do not have sufficient clear, unobstructed headroom to conform to local building codes or that has headroom less than that required for occupancy, typically 2.0 to 2.3 m [6.5 to 7.5 ft].

A1.4.11.6 *Interior Parking*—Interior parking that is totally enclosed within the building is included in exterior gross area but is not included in the gross plannable area.

A1.4.12 *Interior Gross Area—Measured Elements:*

A1.4.12.1 This practice can be used to determine the Interior Gross Area, which will be consistent with the measurement methodology within the ANSI/BOMA Z65.1–1996 Standard. To facilitate use of both standards, measure and calculate the

total floor area taken up with perimeter encroachments while determining the interior gross area.

A1.4.12.2 *Perimeter Encroachments*—Measure the base building elements or restricted areas that are located inside the dominant portion of a building on the outer wall and that prevent the use of the floor area for furniture, equipment, circulation or other occupant function. (Dominant Portion is defined in ANSI/BOMA Z65.1–1996.<sup>15</sup>) Perimeter encroachments include but are not limited to: (1) window sills; (2) building projections such as convactor, baseboard heating unit, radiator, or other building element that is located in the interior of a building and adjacent to a perimeter building wall that prevents the use of that space for furniture, equipment, circulation, or other functions; (3) horizontal floor area between adjacent encroachments where such area is 300 mm [12 in.] or less (such as the distance between a perimeter column and adjacent curtain wall HVAC distribution device); (4) structural columns located on the perimeter of the building or within 300 mm [12 in.] or less of the inside finished surface of the perimeter wall.

A1.4.12.3 **Figs. A1.2-A1.5** each demonstrates how to measure perimeter encroachments. Each figure shows a different combination of building features at a perimeter wall.

A1.4.12.4 The first example in **Fig. A1.2** illustrates a perimeter encroachment at a windowsill. Measure the area of the encroachment from the inside face of the dominant portion to the inside face of the exterior building wall.

A1.4.12.5 In **Fig. A1.3**, a building structure component such as a radiator protrudes into the floor area. Measure the area of

<sup>15</sup> In the 1996 edition, which is copyright by BOMA, the dominant portion is defined as the inside face of the portion of the wall which is window glass where it is more than 50 % of the vertical distance from finished floor to finished ceiling, and elsewhere is the inside face of the outside wall, or of a pilaster or column attached to the outside wall where they occur. Note that the reader is cautioned that ANSI/BOMA Z65.1–1996 is developed by and subject to the authority of BOMA International, which may change it from time to time at its sole option. It is not defined as a part of this ASTM standard.

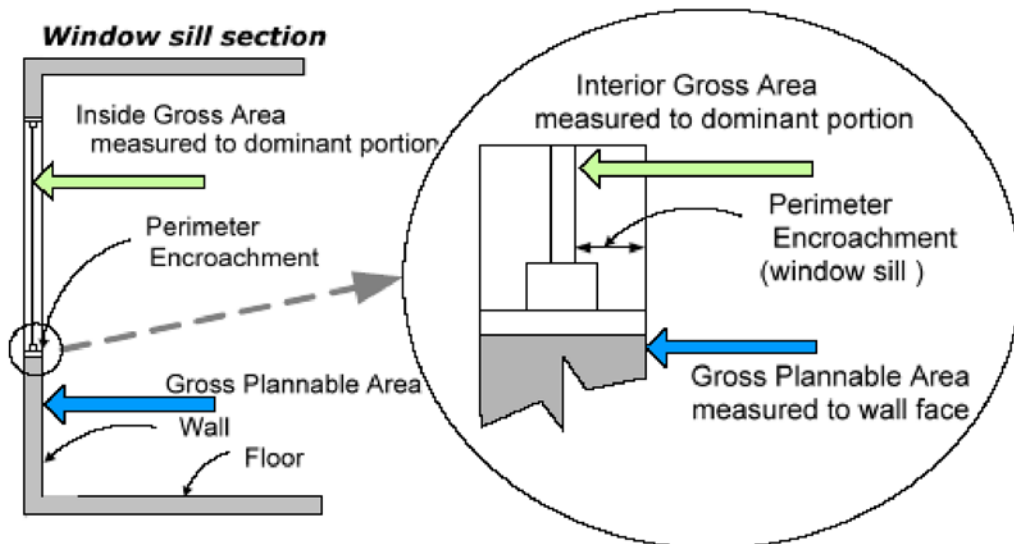


FIG. A1.2 Perimeter Encroachment at a Window Sill