

Chapter 3. Building Area Measurement

This chapter provides the technical definitions, measurement procedures, and coding structures for building area data elements. The interrelationships between the components of building area are illustrated by the conceptual framework in figure 3-1. Definitions of what constitutes a *building* are found in chapter 2. The technical definitions and codes for the space use categories are found in chapter 4. An understanding of the FICM system begins with an overview of measurement terms.

3.1 Overview of Building Measurement Terms

In a building inventory, it is important to be able to determine the amount of space that can be assigned to people or programs. However, buildings necessarily contain other types of space as well. Technical definitions and examples of types of space are provided in chapter 4.

The amount of space that can be used for people or programs is known as the *Net Assignable Area*.² The area of an Assignable space is the area measured within its interior walls. The Net Assignable Area of a building (or all buildings in an inventory) is the sum of the space allocated to the 10 major assignable space use categories: classrooms, laboratories, offices, study areas, special use space, general use areas, support rooms, health care, residential, and unclassified space. These categories are further described below.

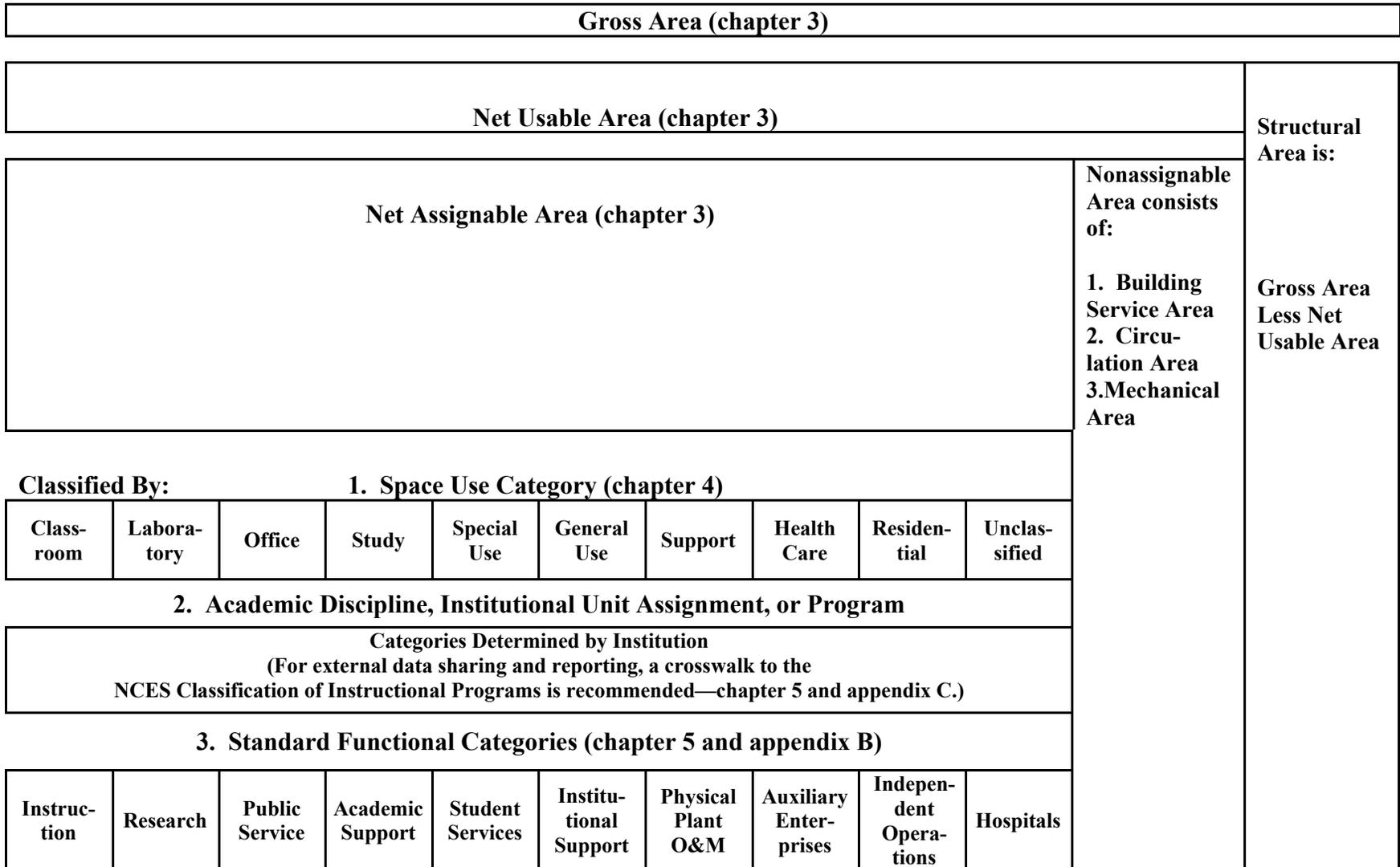
Net Assignable Area = Sum of the 10 Major Space Use Categories of Assignable Space

The amount of space within a building that is essential to the operation of the building but not assigned directly to people or programs is known as the *Nonassignable Area*. The area of a Nonassignable space is the area measured within its interior walls. The Nonassignable Area of a building (or all buildings in an inventory) is the sum of the space allocated to the three major nonassignable space use categories: *building service area*, *circulation area*, and *mechanical area*. These categories are further described below.

*Nonassignable Area = Sum of the Three Major Space Use Categories of
Nonassignable Space*

² This is also conventionally referred to as Net Assignable Square Feet (NASF).

Figure 3-1. Conceptual framework for analyzing building space



O&M = operations and maintenance.

The aggregate interior area of a building, known as the *Net Usable Area*,³ is the sum of Assignable Area and Nonassignable Area.

$$\textit{Net Usable Area} = \textit{Assignable Area} + \textit{Nonassignable Area}$$

It is also important to know that the *Gross Area*⁴ of a building is the floor area of a structure within the **outside** faces of the exterior walls. This value is either physically measured or scaled from as-built drawings. Figures illustrating all of these areas are provided later in the chapter.

The difference between the exterior or Gross Area and the interior or Net Usable Area is the *Structural Area*, the floor area upon which the exterior and interior walls sit and the unusable areas in attics and excavated basements. Structural Area is calculated as the difference between the Gross Area of a building and the Net Usable Area of that building.

$$\textit{Structural Area} = \textit{Gross Area} - \textit{Net Usable Area}$$

3.2 Definitions of Building Areas

The definitions⁵ and procedures provided in this chapter are intended to clarify and provide guidelines for the most commonly used types of data about buildings that would be collected and compiled. These guidelines are based on the definitions and standards established during the 1960s for the Federal Construction Council and published by the National Academy of Sciences. The Federal Construction Council standards were intended for use by federal agencies, but they have been widely adopted and used by postsecondary institutions.

The definitions and guidelines in this chapter attempt to clarify and update some of the earlier standards by providing additional guidance on how to interpret and apply measurement procedures. The guidelines also are intended to establish a common standard for the minimum amount of data to be included in a building inventory to provide a database that is usable for both intrainstitutional and interinstitutional purposes. Institutions are not precluded by these guidelines from collecting additional building data or from including other types of structures in their facilities inventory.

³ This is also conventionally referred to as Net Usable Square Feet (NUSF).

⁴ This is also conventionally referred to as Gross Square Feet (GSF).

⁵ The source is the National Academy of Sciences, Building Research Advisory Board, *Classification of Building Areas*, Federal Construction Council Technical Report No. 50 (Publication 1235) (Washington, DC: National Academy of Sciences).

3.2.1 Gross Area (Gross Square Feet—GSF) (see figure 3-2)

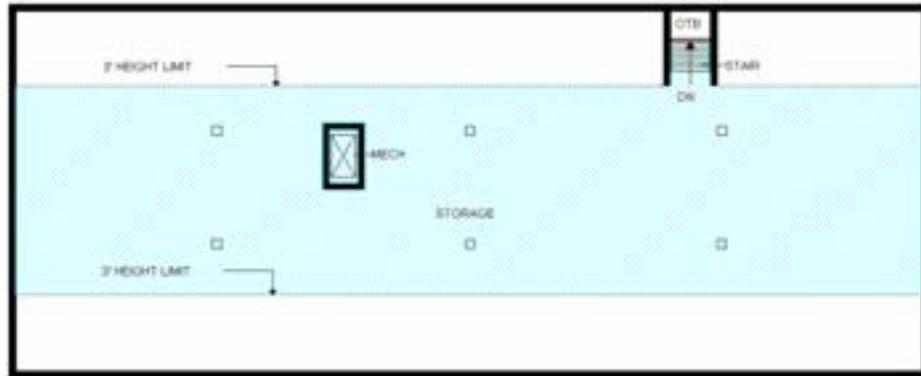
- A. **Definition.** The sum of all areas on all floors of a building included within the outside faces of its exterior walls, including all vertical penetration areas, for circulation and shaft areas that connect one floor to another.
- B. **Basis for Measurement.** Gross Area is computed by physically measuring or scaling measurements from the outside faces of exterior walls, disregarding cornices, pilasters, buttresses, etc., that extend beyond the wall faces. Exclude areas having less than a 3-foot clear ceiling height unless the criteria of a separate structure are met. (See section 2.3, What to Include in a Building Inventory.)

Measured in terms of Gross Square Feet (GSF),

$$GSF = Net Usable Area + Structural Space$$

- C. **Description.** In addition to all the internal floored spaces obviously covered above, Gross Area should include the following: excavated basement areas; interstitial space (i.e., mechanical floor or walkways), mezzanines, penthouses, and attics; garages; covered porches, whether walled or not; inner or outer balconies to the extent of a drip line from a roof or balcony immediately above, whether walled or not, if they are utilized for operational functions; and corridors or walkways, whether walled or not, provided they are either within the outside face lines of the building to the extent of the roof drip line or, if covered, to the extent of their cover's drip line. The footprints of stairways, elevator shafts, and vertical duct shafts are to be counted as gross area on each floor through which they pass.
- D. **Limitations.** Exclude open areas such as parking lots, playing fields, pools, courts, light wells, and portions of upper floors eliminated by spaces or lobbies that rise above single-floor ceiling height. Exclude unexcavated basement areas.
- E. **Exception.** Include top, unroofed floor of parking structures where parking is available. (See the section on Parking Structures after figure 3-8.)

Figure 3-2. Gross Area of a building by floor



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3.2.2 Net Assignable Area (Net Assignable Square Feet—NASF) (see figure 3-3)

- A. **Definition.** The sum of all areas on all floors of a building assigned to, or available for assignment to, an occupant or specific use.
- B. **Basis for Measurement.** Net Assignable Area is computed by physically measuring or scaling measurements from the inside faces of surfaces that form the boundaries of the designated areas. Exclude areas having less than a 3-foot clear ceiling height unless the criteria of a separate structure are met. (See section 2.3, What to Include in a Building Inventory.)

Measured in terms of Net Assignable Square Feet (NASF),

NASF = Sum of Areas Designated by the 10 Assignable Major Space Use Categories

- C. **Description.** Included should be space subdivisions of the 10 major space use categories for assignable space—classrooms, labs, offices, study facilities, special use, general use, support, health care, residential, and unclassified—that are used to accomplish the institution’s mission.
- D. **Limitations.** Deductions should not be made for necessary building columns and projections. These small areas are excluded as they represent an insignificant percentage of the total area of an average-sized space. Capturing their area would be unduly burdensome relative to the very small contribution they would make toward precision. Areas defined as building service, circulation, mechanical, and structural should not be included.

3.2.3 Nonassignable Area

- A. **Definition.** The sum of all areas on all floors of a building not available for assignment to an occupant or for specific use, but necessary for the general operation of a building.
- B. **Basis for Measurement.** Nonassignable Area is computed by physically measuring or scaling measurements from the inside faces of surfaces that form the boundaries of the designated areas. Exclude areas having less than 3-foot clear ceiling height unless the criteria of a separate structure are met.

Measured in terms of Nonassignable Area,

Nonassignable Area = Sum of the Areas Designated as the Three Non-assignable Space Use Categories

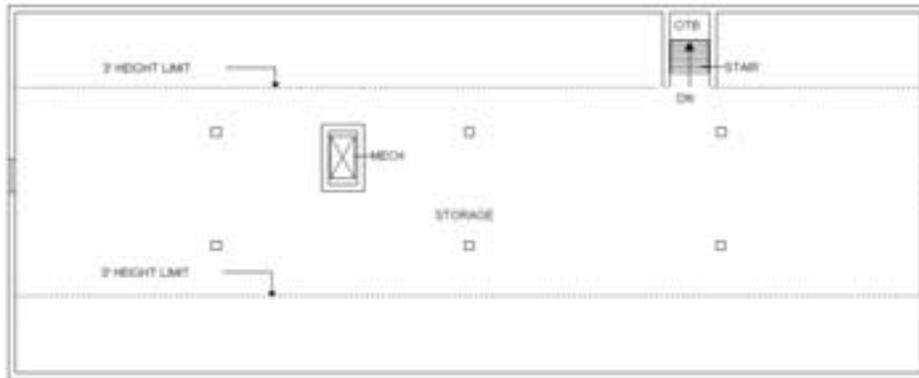
- C. **Description.** Included should be space subdivisions of the three nonassignable space use categories—building service, circulation, and mechanical—that are used to support the building’s general operation.
- D. **Limitations.** Deductions should not be made for necessary building columns and projections. These small areas are excluded as they represent an insignificant percentage of the total area of an average-sized space. Capturing their area would be unduly burdensome relative to the very small contribution they would make toward precision. Areas defined as assignable should not be included.

3.2.4 Building Service Area (see figure 3-4)

- A. **Definition.** The sum of all areas on all floors of a building used for custodial supplies, janitorial sink rooms, janitorial closets, and public rest rooms. (Note: Building Service Area includes all areas previously classified as Custodial Area in the pre-1992 FICM, and public rest rooms previously classified as Mechanical Area in the pre-1992 FICM).
- B. **Basis for Measurement.** Building Service Area is computed by physically measuring or scaling measurements from the inside faces of surfaces that form boundaries of the designated areas. Exclude areas having less than a 3-foot clear ceiling height unless the criteria of a separate structure are met.
- C. **Description.** Included should be janitor closets or similarly small custodial spaces, maintenance material storage areas, trash rooms exclusively devoted to the storage of nonhazardous waste created by the building occupants as a whole, and public rest rooms.
- D. **Limitations.** Deductions should not be made for necessary building columns and minor projections. These small areas are excluded as they represent an insignificant percentage of the total area of an average-sized space. Capturing their area would be unduly burdensome relative to the very small contribution they would make toward precision. Assignable areas classified as Shop (720), Central Storage (730), Central

Supplies (870), or special purpose storage or maintenance rooms such as linen closets and housekeeping rooms in residence halls should not be included. Do not include private rest rooms that should be classified as Office Service (315).

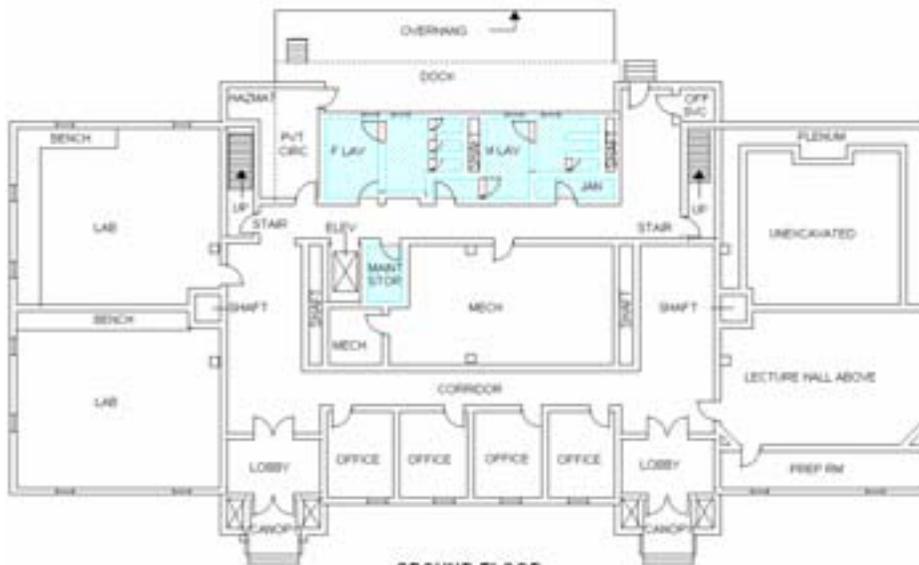
Figure 3-4. Building Service Area of a building by floor



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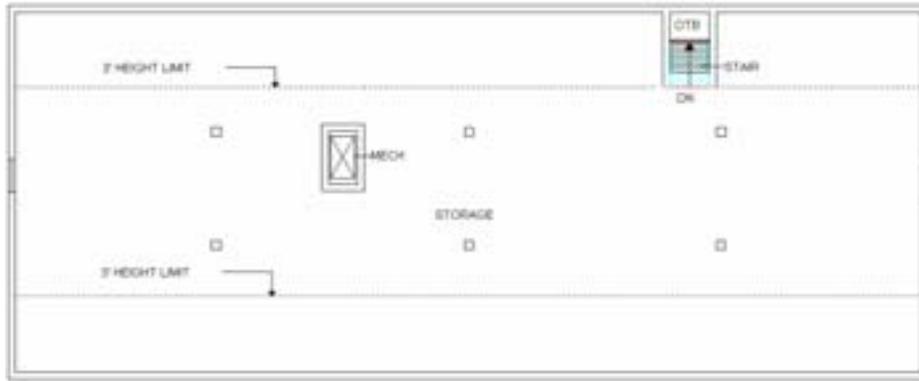
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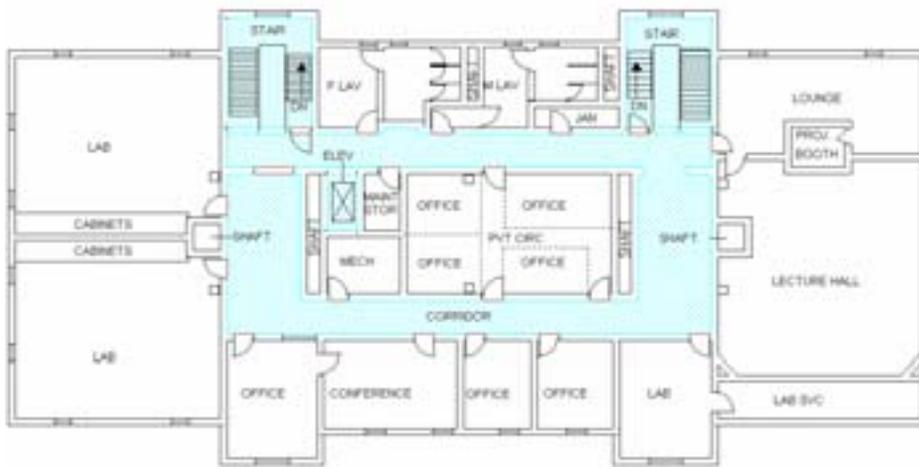
3.2.5 Circulation Area (see figure 3-5)

- A. **Definition.** The sum of all areas on all floors of a building required for physical access to some subdivision of space, whether physically bounded by partitions or not.
- B. **Basis for Measurement.** Circulation Area is computed by physically measuring or scaling measurements from the inside faces of surfaces that form the boundaries of the designated areas. Exclude areas having less than a 3-foot clear ceiling height unless the criteria of a separate structure are met.
- C. **Description.** Included should be fire towers, elevator lobbies, tunnels, bridges, and each floor's footprint of elevator shafts, escalators, and stairways. Also included are public corridors or walkways, whether walled or not, provided they are either within the outside face lines of the buildings to the extent of the roof drip line or, if covered, to the extent of their cover's drip line. Receiving areas, such as loading docks, should be treated as circulation space. Any part of a loading dock that is not covered is to be excluded from both Circulation Area and Gross Area.
- D. **Limitations.** Deductions should not be made for necessary building columns and minor projections. These small areas are excluded as they represent an insignificant percentage of the total area of an average-sized space. Capturing their area would be unduly burdensome relative to the very small contribution they would make toward precision. When determining corridor areas, only spaces required for public access should be included. Restricted access private circulation aisles used only for circulation within an organizational unit's suite of rooms, auditoria, or other working areas should not be included. A loading dock, or portions thereof, that is also used for central storage should be regarded as assignable area and coded as Central Storage (730).

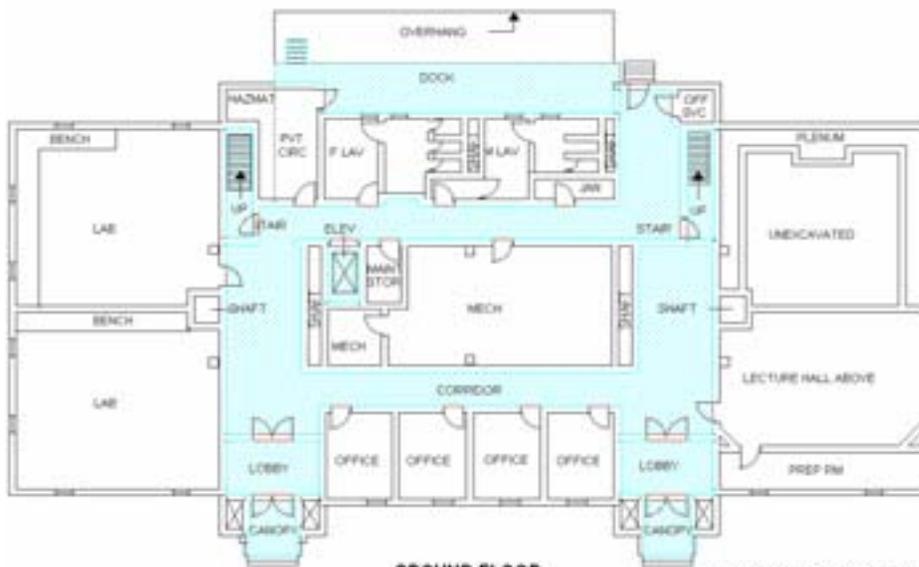
Figure 3-5. Circulation Area of a building by floor



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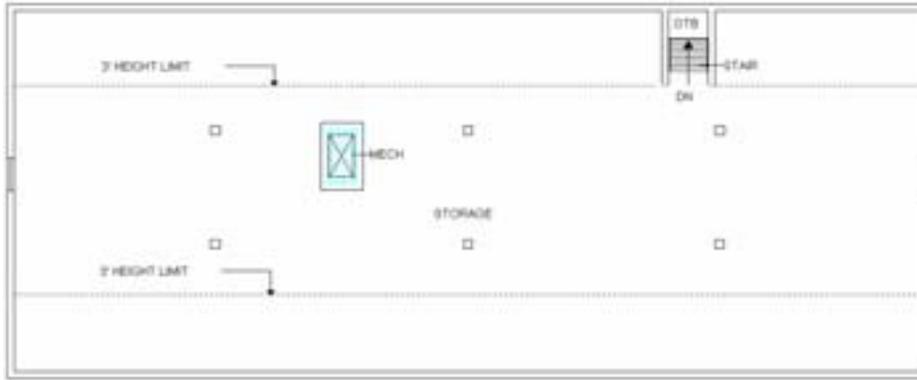
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3.2.6 Mechanical Area (see figure 3-6)

- A. **Definition.** The sum of all areas on all floors of a building designed to house mechanical equipment, utility services, and shaft areas.
- B. **Basis for Measurement.** Mechanical Area is computed by physically measuring or scaling measurements from the inside faces of surfaces that form the boundaries of the designated areas. Exclude areas having less than a 3-foot ceiling height unless the criteria of a separate structure are met.
- C. **Description.** Included should be mechanical areas such as central utility plants, boiler rooms, mechanical and electrical equipment rooms, fuel rooms, meter and telecommunications closets, and each floor's footprint of air ducts, pipe shafts, mechanical service shafts, service chutes, and stacks.
- D. **Limitations.** Deductions should not be made for necessary building columns and projections. These small areas are excluded as they represent an insignificant percentage of the total area of an average-sized space. Capturing their area would be unduly burdensome relative to the very small contribution they would make toward precision. Areas designated as public toilets are not included in this category but are included under Building Service Area.

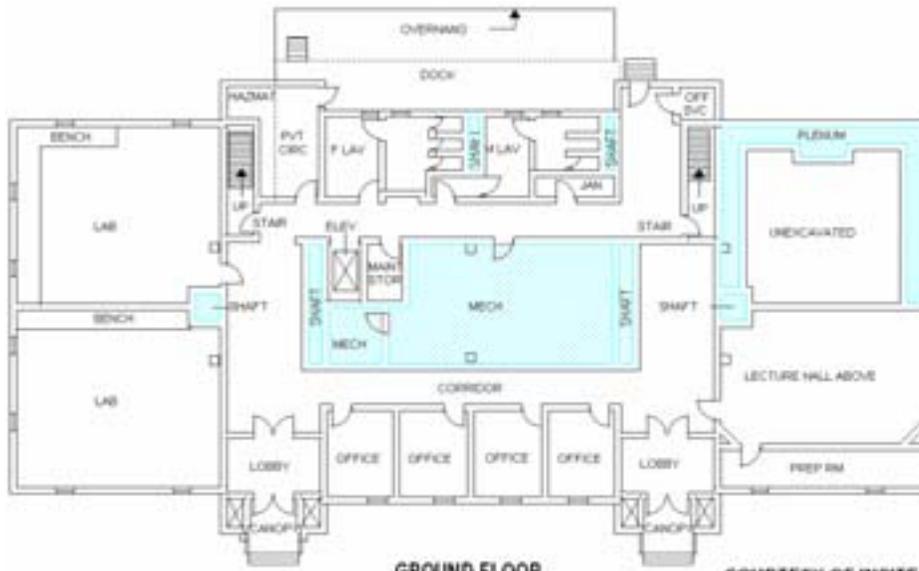
Figure 3-6. Mechanical Area of a building by floor



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3.2.7 Net Usable Area (Net Usable Square Feet—NUSF)

- A. **Definition.** The sum of all areas on all floors of a building either assigned to, or available for assignment to, an occupant or specific use, or necessary for the general operation of a building.
- B. **Basis for Measurement.** Net Usable Area is computed by summing the Net Assignable Area and the Nonassignable Area.

Measured in terms of Net Usable Square Feet (NUSF),

$$NUSF = Assignable Area + Nonassignable Area$$

- C. **Description.** Included should be space subdivisions of the 10 assignable major space use categories and the 3 nonassignable space categories.
- D. **Limitations.** Deductions should not be made for necessary building columns and projections. These small areas are excluded as they represent an insignificant percentage of the total area of an average-sized space. Capturing their area would be unduly burdensome relative to the very small contribution they would make toward precision. Areas defined as structural should not be included.

3.2.8 Structural Area (see figure 3-7)

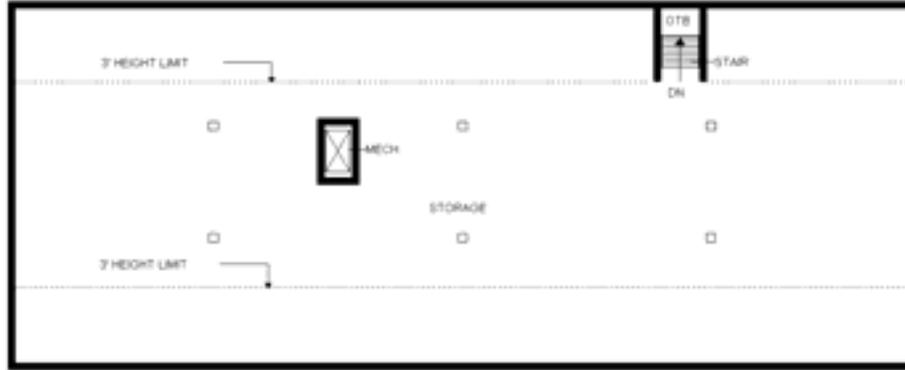
- A. **Definition.** The sum of all areas on all floors of a building that cannot be occupied or put to use because of structural building features.
- B. **Basis for Measurement.** Precise computation by direct measurement is not possible under this definition. It is determined by calculating the difference between the measured gross area and the measured net usable area.

Measured in terms of area,

$$Structural Area = Gross Area - Net Usable Area$$

- C. **Description.** Examples of building features normally classified as structural areas include exterior walls, fire walls, permanent partitions, unusable areas in attics or basements, or comparable portions of a building with ceiling height restrictions.

Figure 3-7. Structural Area of a building by floor



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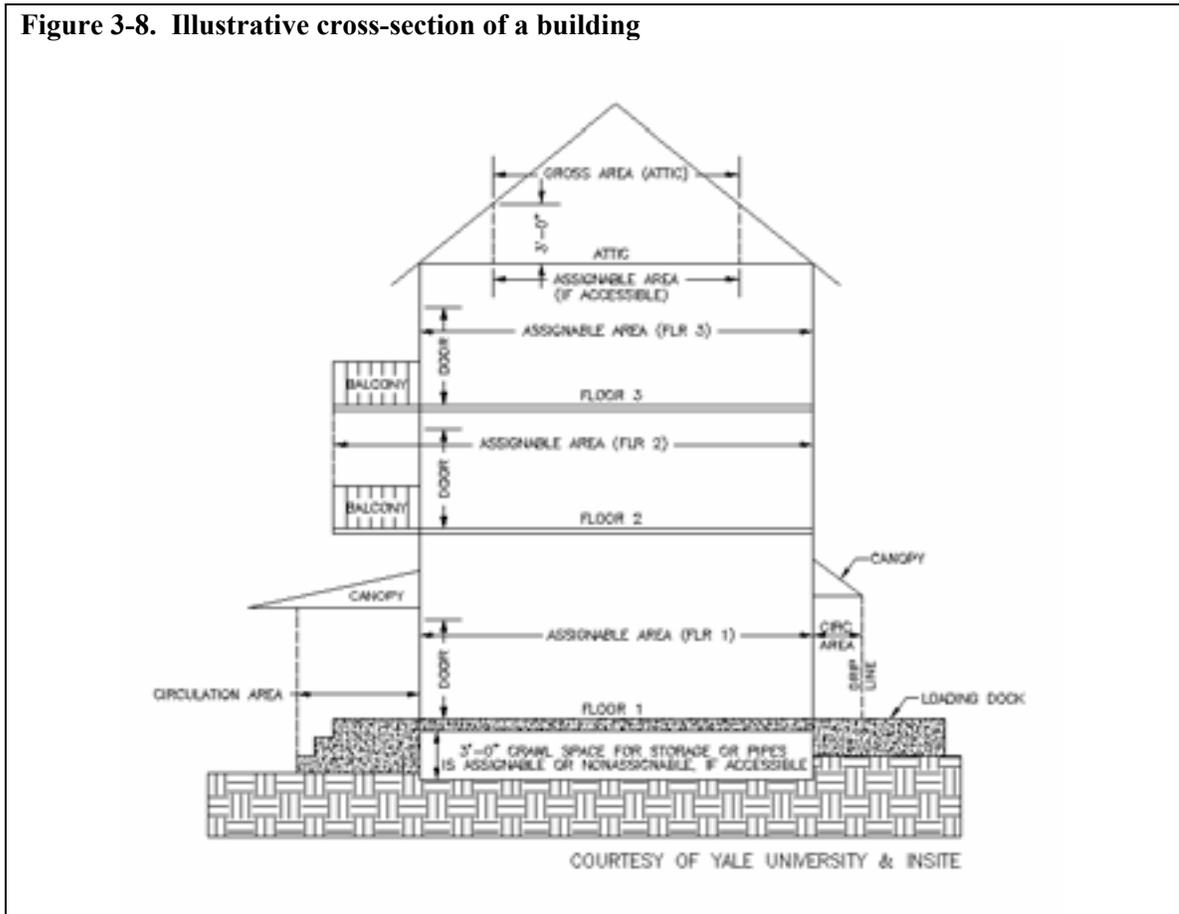
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NOTE: Structural areas are indicated in solid black.

3.2.9 Illustrative Cross-Section of a Building

- The diagrammatic cross-section of a building (figure 3-8) has been included to better illustrate the area measurement descriptions for less common situations such as exterior balconies, overhung egress areas and loading docks, and the new 3-foot ceiling height rule for including floor areas.



3.2.10 Parking Structures

Due to the absence of specific guidance in previous editions of this manual, parking structures or decks are classified differently by institutions across the country. Because these structures may represent a large portion of campus facilities space, the specific method for classifying these areas can have significant impacts on campus-level statistics. For internal accounting of the maintenance and operational activities such structures require, campus parking surveys, and interinstitutional comparisons, it is recommended that data on parking structures be maintained and reported as are the data for any other campus building. Two different methods of classifying parking structures are suggested.

1. **Classification With Assignable and Gross Square Footage (preferred method).** This method determines statistics for the structure that are commensurate with all other major inventoried campus buildings (i.e., assignable space, gross square footage, estimated replacement cost, etc.). In this approach, parking space square footage, including upper level unroofed parking areas, is assigned the Vehicle Storage (740) use code. Standard nonassignable areas (Building Service, Circulation, and Mechanical) are appropriately classified. Other standard assignable areas (offices, etc.) are classified with the appropriate space use codes. Ramps and other driving areas are classified as nonassignable Circulation Area.
2. **Classification With Gross Square Footage Only (default method).** Many institutions maintain only the Gross Area and other building-level data for parking structures and do not classify parking areas as assignable space. Standard assignable areas within the parking structure, such as offices, may be appropriately classified. Only the gross area recorded within the building file becomes a significant square footage statistic. Institutions may also maintain parking structure data separately from the formal building and space inventory files.

3.3 Proration and Phantom Walls

When a room serves several purposes or users, the institution may choose to prorate and allocate the square footage between two or more space uses, functions, or organizational units. For institutions with major sponsored research activities, proration of multiple functions is often necessary to identify accurately how each space is used. Other cases may require the recognition of two or more distinctly different architectural uses within a space (e.g., a departmental conference room housing a substantial reference library) or the sharing of an office by two or more departments. Proration can be done either on the basis of the relative time expended on each activity or on the basis of the proportion of the room area dedicated to each activity.

There are two basic approaches to proration. One method is to prorate from floor plans by the insertion of “phantom walls,” indicated by dashed lines or other artificial boundaries on floor plans to separate adjacent uses or assignments. The use of phantom walls requires that each *space* (i.e., each part) of the room be given a unique space identifier, which can be accomplished by adding an additional digit or character to the existing room identifier. For example, Room 210, which is used as a storage room by both Biology and Chemistry, could be identified as Space 210A and Space 210B, and the pro rata organizational assignment and share of space can be identified with each. The other method is to apply percentage figures to each assignment, use, or function being prorated. Whatever method is used, the resulting information should be capable of being summarized into standard space use codes and related categories for external reports, utilization studies, and institutional planning.

3.4 Area Measurement Questions and Answers

1. **Question:** How should I report an area that is covered, but not enclosed, on all four sides?

Answer: Areas that are permanently covered but not enclosed should be inventoried as assignable or nonassignable space depending upon the space use. Bounding the area with “phantom walls” along the drip line of the “cover” defines the area to be measured and added to the building’s gross area as well as to the assignable or nonassignable area, depending upon the use of the space. A space use, whether floored or not, that exists beyond the drip line of the covered area is not reported. Alternately, the area beneath a permanent cover that extends beyond a floored area is also not reported.

2. **Question:** There is a permanent eating area, equipped with tables and chairs, which is located in a covered, unenclosed area of our Student Union Building. Is this space assignable even though the facility only has one wall? Should I count this space as part of the gross area?

Answer: By creating “phantom walls,” you would classify this assignable area as Food Facility (630). This area should also be reported as part of the building’s gross area.

3. **Question:** Should I inventory underground pedestrian tunnels and above-ground pedestrian bridges that connect buildings?

Answer: They should be included as both gross area in your inventory and as nonassignable circulation area.

4. **Question:** On our campus, we have “buildings” that are really contiguous structures built at different times to meet new needs. For example, a library wing was added to a classroom structure, and later a structure housing laboratories was added. However, they all share walls and are physically connected. Should these be inventoried as a single structure or several different buildings?

Answer: It is preferable to treat each addition/wing as a separate structure, depending upon factors such as the source of the funds; the separation of each structure’s mechanical, electrical, or plumbing systems; the age differences of the two joined facilities, etc. If treated as separate structures, commonly shared walls would be prorated one-half with each of the respective facilities.

5. **Question:** We have several houses that were converted into administrative offices. The uppermost usable floor has a vaulted ceiling. The floor to ceiling distance is 4’0” around the perimeter of the exterior rooms. Should the area be calculated from the edge of the kneewall? The ceiling height in the attic is 5’0” and contains HVAC equipment. Should this space be considered a Building Service area?

Answer: The area on the uppermost usable floor with a vaulted ceiling should be included in that floor’s gross area. Since assignable area includes any interior space having 3’0” or more of ceiling height, in your case, the assignable area would be measured from the smallest floor to ceiling distance—the 4’0” kneewall of the space. Attic space used

for administrative offices should be categorized as Office (310). Attic space containing HVAC equipment should be designated as nonassignable Utility/Mechanical Space (Y04).