

# Building Measurement Services

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*Building owners and landlords need accurate measurements and area calculations to negotiate and prepare commercial office leases. Architects have the core skills and knowledge to provide these building measurement services for their clients.*

Measuring and calculating the areas of properties and buildings is an important part of what architects do. Most often, however, this aspect of the architect's work is performed not as an end in itself but to support other activities and services. For example, determining the area of a building lot, property, or acreage—as well as individual site elements such as roads, parking, and so on—is important in site design and development. In zoning analysis, the size of the property area along with the building area and its footprint are used to calculate the floor-to-area ratio (FAR), required parking spaces, and other zoning benchmarks.

An important use for building area and square foot cost data is in the development of preliminary cost estimates. Building area is also employed—usually with higher levels of detail and accuracy—for detailed cost estimates and development of construction bids. In facility management, building areas are used to track occupancy by department and type of space. This information is used for strategic planning, expense recovery, and cost allocation.

Beyond the uses and applications just mentioned, the calculation of building area can be performed as a stand-alone service. In this case, measurements and calculations are made to determine various factors used in analyzing and developing commercial building leases for which floor area is a primary consideration. This topic discusses the basics of offering building measurement services for these purposes.

## CLIENT NEEDS

Office rents in the United States and Canada are based on a hypothetical unit of measurement known as the rentable square foot (RSF). The RSF is not an actual measure-

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## Summary

### Why a Client May Need These Services

- To determine the rentable area for a lease agreement
- To verify changes in rentable area after remodeling or renovation
- To evaluate suitability of one space over another
- To use as a basis for marketing office space

### Knowledge and Skills Required

- Knowledge of building measurement standards
- Familiarity with local real estate practices
- Proficiency in field measuring
- Ability to construct accurate floor plans
- Ability to perform area computations

### Representative Process Tasks

- Acquire or develop building plans
- Take field measurements
- Calculate area
- Prepare report

ment. Rather, it is a calculation that factors an actual square footage with one or more variables that change from floor to floor or building to building.

The concept of rentable area was developed to give owners a means of recovering the area lost to common corridors, toilet rooms, and mechanical spaces on multiple tenant floors. Eventually, the same rationale was applied to recapture the area of the main building lobby, utility rooms, and mechanical penthouses.

Sometime during this evolution, it also became clear that rentable area could be used as a marketing tool. By controlling its dimensions, landlords are able to adjust both the numerator and denominator of their pro forma rental rates (\$/RSF). As an example, consider two nearly identical spaces, each with 4,000 usable square feet. The owner of the first space deems its rentable area to be 4,320 RSF and offers it at \$20/RSF. The other owner deems its space to be 4,800 RSF and offers it at \$18/RSF. From a marketing standpoint, which landlord has the advantage?

This practice has limits. Tenants can easily discover the landlord's "load factor" and "loss factor" by measuring the usable area of their space. The load factor is the difference between rentable and usable area divided by the usable area. The load factor for the example above would be calculated as follows:

$$\begin{aligned}(4320 - 4000) / 4000 &= 8.0\% \\ \text{and} \\ (4800 - 4000) / 4000 &= 20.0\%\end{aligned}$$

The loss factor is the difference between rentable and usable area divided by the rentable area. Again, the example would yield loss factors as follows:

$$\begin{aligned}(4320 - 4000) / 4320 &= 7.4\% \\ \text{and} \\ (4800 - 4000) / 4800 &= 16.6\%\end{aligned}$$

In addition to the landlord's and tenant's different calculations of load and loss factors, it is worth noting that their definitions of usable area may be different as well. In fact, without clarification, the term "usable area" is almost meaningless.

Landlords spend a great deal of time formulating their rentable area figures. In addition to measuring their space, they need to know how to calculate or set their loss factors so the facilities stay competitive. The length of a lease compounds the risk of making a mistake. The 480-square-foot difference in the example above would cost the first landlord \$86,400 over ten years if it was forced to match the other landlord's rate:

$$480 \text{ RSF} \times \$18/\text{RSF} \times 10 = \$86,400$$

## Market for Measurement Services

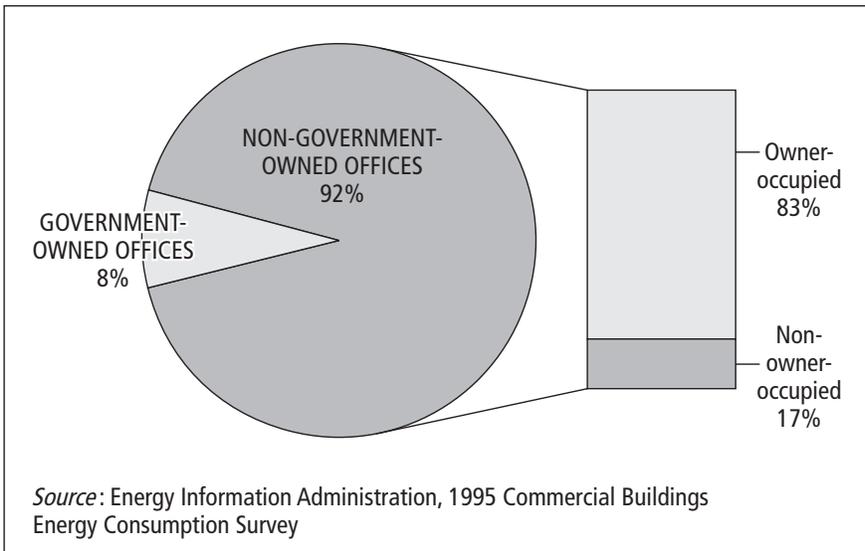
In the last 25 years the total supply of office space in the United States has doubled to almost 12 billion square feet in approximately 800,000 buildings. According to a 1995 survey conducted by the Energy Information Administration, more than 84 percent of all office buildings are owner-occupied. If we consider the 16 percent of office buildings that are presumably leased or available for lease, the market for building measurement services is at least 1.8 billion square feet, or 120,000 buildings and growing.

As the market size has grown, so have the number of firms offering building measurement services. As of 2002, about a dozen firms specialize in building documentation and rentable area calculation. Several hundred architecture and interior design firms also have experience in this field.

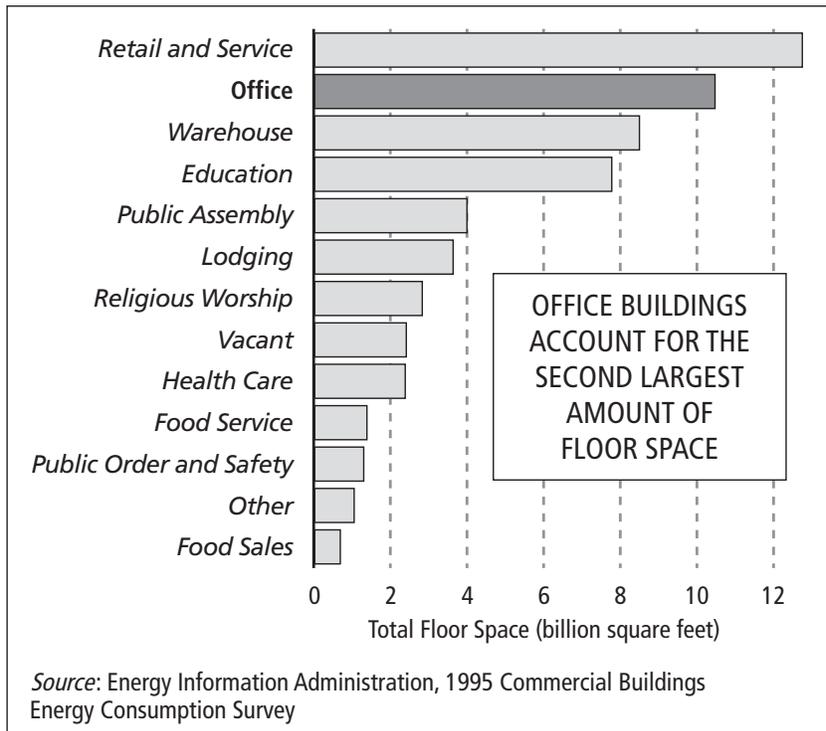
## SKILLS

Architects are well positioned and qualified to provide building owners with building measurement services. However, some architects may need to become more familiar with and knowledgeable about standard methods and variations used to formulate rentable area in commercial offices buildings.

## Office Ownership Profiles



## Commercial Floor Space in the United States



## Standards for Building Measurement

The 1996 Building Owners and Managers Association (BOMA) Standard Method for Measuring Floor Area in Office Buildings is a good place to start because of its widespread use. The BOMA standard assigns all spaces within a building to one of five categories (major vertical penetrations, office area, store area, floor common area, and building common area). It defines how each category is measured and how it is used in the calculation of rentable area. This total building approach is the basis for many of the variations used by owners. There is basically just one other standard in frequent use in the United States. It is tagged the “New York method.”

►When BOMA revised its Standard Method in 1996, the potential rentable area of an average building increased overnight by almost 5 percent. This was due entirely to the inclusion of building common area, a class of space previously ignored. Income from this bonus area will not be realized until pre-1996 leases have rolled over.

## Calculation of Usable Area: BOMA vs. REBNY\*

Measurement Procedure	BOMA	REBNY
Exterior walls measured to	Inside "dominant portion"	Outside surface
Corridor wall measured to	Tenant side	Corridor side
Deduct mechanical shafts?	Yes	Not if they serve the floor

\*Building Owners and Managers Association vs. Real Estate Board of New York

The Recommended Method of Floor Measurement for Office Buildings, published by the Real Estate Board of New York in 1987, is used in cities throughout the United States and Canada. Unlike the BOMA standard, it does not require measurement of the entire building. Nor does it rely on physical space to create a loss factor. In fact, with the exception of stores, it doesn't define rentable area at all. Usable area is measured differently, and landlords are allowed to set their loss factor however they want.

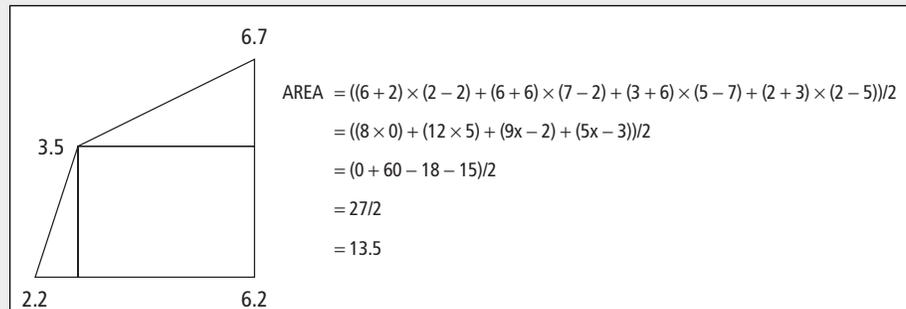
## Building Area Calculation Methods

It is possible to perform area calculations of a floor plan with pencil and paper or by using a hand calculator, but today virtually everyone uses a computer-aided design (CAD) program. This is not because CAD is more accurate; it isn't. It's because CAD is so much faster. This is especially true for buildings with many irregularly shaped spaces.

Most CAD programs use the (x, y) coordinates of polylines to create a two-dimensional computer model of the floor plan. The area and category attributes of these polygons are used to populate the calculation spreadsheet. It is therefore critical for the operator drawing the polygons to have an expert knowledge of the client's preferred method of measurement.

### How do computers calculate area?

Start with any point and move counterclockwise. For each pair of points, multiply the sum of the x-value of the next point and the x-value of the current point by the difference of the y-value of the next point and the y-value of the current point. Add the results for all pairs of points and divide that sum by two.



## Measuring Tools and Equipment

Actual dimensions of constructed spaces rarely if ever are the same as those shown on construction documents. During construction, changes—some of which are significant—may have been made that are not reflected on available drawings. Therefore, in dealing with existing buildings, taking field measurements is always advisable, if not mandatory.

Field measurements can be carried out with standard measuring tapes (e.g., up to 25 feet, 50 feet, and 100 feet) to accommodate varying conditions. However, consider investing in laser measuring devices to supplement conventional tapes. Laser devices only require one hand to operate, are relatively inexpensive, are accurate, can save time

since they don't need to be rewound after each measurement, and may have the ability to provide readings in metric units as well as English units.

## PROCESS

Several options and combinations for carrying out building measurement services are available to accommodate the tasks and activities required by the nature and needs of a particular project. Following are brief discussions of these opportunities.

### Service Options

The scope of measurement services will depend on the type, amount, and accuracy of information supplied by the client. The nature of the project and the information provided by the client influence which measurement services are suitable. The following represent possible clusters of building measurement services:

- Area calculations and reports from client-supplied CAD drawings
- Creation of CAD drawings from client-supplied dimensioned, as-built drawings
- Creation of CAD drawings from plans and spot measurements
- Creation of CAD drawings entirely from on-site field measurements
- Survey of existing corridors and tenant demising walls
- Integration of lease information into rent books for landlords (for tracking vacancies, renewal options, rate escalations, subtenants, etc.)

### Process Increments and Tasks

The options listed above may embody some or all of the increments described below. While many tasks within these increments are performed sequentially, some may be carried out concurrently or in an overlapping fashion to respond to opportunities to access spaces, schedule requirements, staff availability, etc.

#### *Acquiring or Developing Plans*

If a client says building plans for spaces to be analyzed are not available, take time to look for them. Hundreds of hours of surveying time can be saved if plans can be located. Look behind the boiler or in the attic storage. Try contacting the original architect and engineer, the local building department, or historical archives. If drawings are not available, they will have to be created from field surveys and measurements of the floor areas for which area calculations are needed.

#### *Field Measurement*

Preparation is key. Create a checklist of necessary items, including existing drawings, tenant lists, contact and key personnel information, clipboard, measuring devices, camera, flashlight, and so on. If you are traveling out of town, take a laptop computer so you can prove your measurements before you leave. Speak with the building manager at least a week before your arrival so that he or she will have time to notify sensitive tenants and schedule one or more workers to accompany you throughout the building. In some cases, your access may be limited to weekends or times after normal business hours.

Measuring demising walls on multitenant floors can be challenging. To avoid incremental rounding errors, always start at a window mullion or some other fixed position on the exterior wall and work toward the corridor. Double-check your dimensions by measuring to a door or corner on the corridor wall.

#### *Area Calculations, Analysis, and Space Allocations*

Computerized area calculation usually involves drawing closed polylines around the spaces being measured. Care must be taken not to overlap other polylines, since that would prevent the sum of the parts from equaling the whole. (You can test for this by drawing a polyline around the perimeter.) Area is one of the displayable properties of a polyline. It can be manually entered into a ledger or linked to another drawing object

using attributes (category, space type, room number). The advantage of linking is that a program can be written to extract this data directly into a database or spreadsheet.

Adequate time should be given to analyzing the results of your rentable area calculations. It is important, for instance, to be sure the usable and rentable areas of like floors are the same. In cases where there are minor differences, you should be able to explain this. Did a shaft become narrower? Was there a setback on this floor? If there is no physical reason for the difference, you may want to check the polylines in your floor plan file or the accuracy of your allocation factors. Sometimes changing the factors from three to five decimal places solves this problem.

### ***Report Preparation***

At a minimum, the client expects to receive a tabular report showing the amount of space on every floor, by category, along with the supporting documentation and formulas used to calculate the rentable area. You may want to include a set of color-coded or crosshatched drawings that clearly identify how each space was categorized and where it was measured. These are often bound in a notebook or file folder along with a photograph of the building. BOMA offers a computer program, StandardWare, that incorporates the spreadsheet and drawings into a single file that can be delivered on disk or by e-mail.

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The AIA provides a contract document designed especially for alternative architectural services.

**B102–2007, Standard Form of Agreement Between Owner and Architect without a Predefined Scope of Architect’s Services.**

AIA Document B102–2007 is a standard form of agreement between owner and architect that contains terms and conditions and compensation details. B102–2007 does not include a scope of architect’s services, which must be inserted in Article 1 or attached as an exhibit. Special terms and conditions that modify the agreement may be included in Article 8.

The separation of the scope of services from the owner/architect agreement allows users the freedom to append alternative scopes of services.

AIA Document B102–2007 replaces and serves the same purpose as AIA Document B141–1997 Part 1.

For more information about AIA Contract Documents, visit [www.aia.org/contractdocs/about](http://www.aia.org/contractdocs/about)

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