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Felix Dagnino
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TO: Cochise County Board of Equalization
FROM: Philip S. Leiendecker, Assessor *PSL*
DATE: August 5, 2021
RE: Measurement Policy

The Assessor's Office assessment and valuation policy of using exterior wall dimensions for measuring buildings and structures follows accepted standard appraisal and assessment methodology and is consistent with Arizona Department of Revenue Cost Manuals and State Certification Training policy. It is also consistent with Marshall Valuation Service procedure which is the source of national cost information for appraisers.

Attached are three (3) separate exhibits which reference measuring procedure including Arizona Department of Revenue Appraiser Training and Certification documentation, Arizona Department of Revenue Construction Cost Manual Listing Technique documentation, and Marshall Valuation Service measurement policy documentation. All reference using exterior wall dimensions. The Department Training and Certification manual actually provides photographs of the recommended measurement technique starting at a specific corner of the structure approximately 3 feet above the ground level and measuring in a counter-clockwise direction. None of the below exhibits refer to a "foundation measurement" when determining size or perimeter of a structure. The Department of Revenue further instructs in the Appraisal Certification Training documentation that "specific steps and forms will vary between counties based on your county's procedures".

Exhibit 1: Arizona Department of Revenue, Valuation Concepts and Cost Appraisal Methods TCH 4902 (Appraiser Training and Certification Program – 2018)

Chapter 3 (pg. 199)“measure the exterior of the entire residence”; “begin measuring at a corner of the residence – arrow pointing to corner of exterior wall approximately 3’ above ground level in photo”

Chapter 3 (pg. 200).....”measure in a counter-clockwise direction around the residence – arrow pointing to middle section of exterior wall approximately 3’ above ground level.

Chapter 3 (pg. 202).....diagram showing and text specifying measurement using exterior walls.

Appendix (pg. 253).....Perimeter & Square Footage defined using length and width of all outer sides of structure; multiplying total length and the total width of structure.

Appendix (pg. 259).....”measure exterior living area...making sure the exterior wall opposite each other are the same distance apart”..

Appendix (pg. 260).....”NOTE: specific steps and forms will vary between counties; follow these steps, modified to fit your county's procedures”.

Measurement Policy (pg. 2)

Exhibit 2: Arizona Department of Revenue Construction Cost Manual, Listing Techniques (1991)

Appendix A Glossary (pg. 2).....AREA: square feet of surface in a structure calculated on the basis of outside measurements”.

Appendix A Glossary (pg. 10).....FLOOR AREA: “computed from the outside building dimensions of each floor”.

Appendix A Glossary (pg. 11).....GROUND FLOOR AREA:”area computed using the exterior dimensions of the ground floor”.

Appendix A Glossary (pg. 16).....PERMETER: “equals the distance around the outside of a building”

Exhibit 3: Marshall Valuation Service

Section 3 Page 4 Measuring a building.....”the tape is then drawn taut across the wall being measured and the measurement noted. This process is continued until all wall measurements around the perimeter of the building have been taken”.

EXHIBIT 1

VALUATION CONCEPTS AND COST APPRAISAL METHODS

TCH 4902



**APPRAISER TRAINING AND CERTIFICATION PROGRAM
ARIZONA DEPARTMENT OF REVENUE
LOCAL JURISDICTIONS**

Revised 8/2018

8/4/2020

Measuring *

Very rarely do Arizona county assessor appraisal staff perform interior inspections of single-family residences, therefore all measurements are typically gathered from measuring the residence divided into two separate tasks:

- Measure the exterior of the entire residence including living area and garage, if applicable.
- Measure the interior walls of the garage, if applicable.

Measuring the Entire Residence

The first task is to measure the entire residence including the garage and living area. It is recommended that you begin measuring at a corner of the residence such as the corner that is to your left as you stand facing the front of the building.

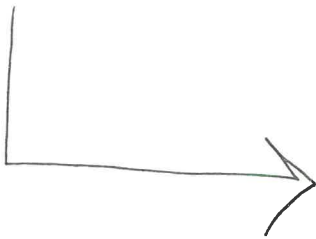


Regardless of where you begin to measure the residence, do your measuring in a counter-clockwise direction around the residence so that the numbers on the tape measure will be facing right side up making it easier to read them accurately.

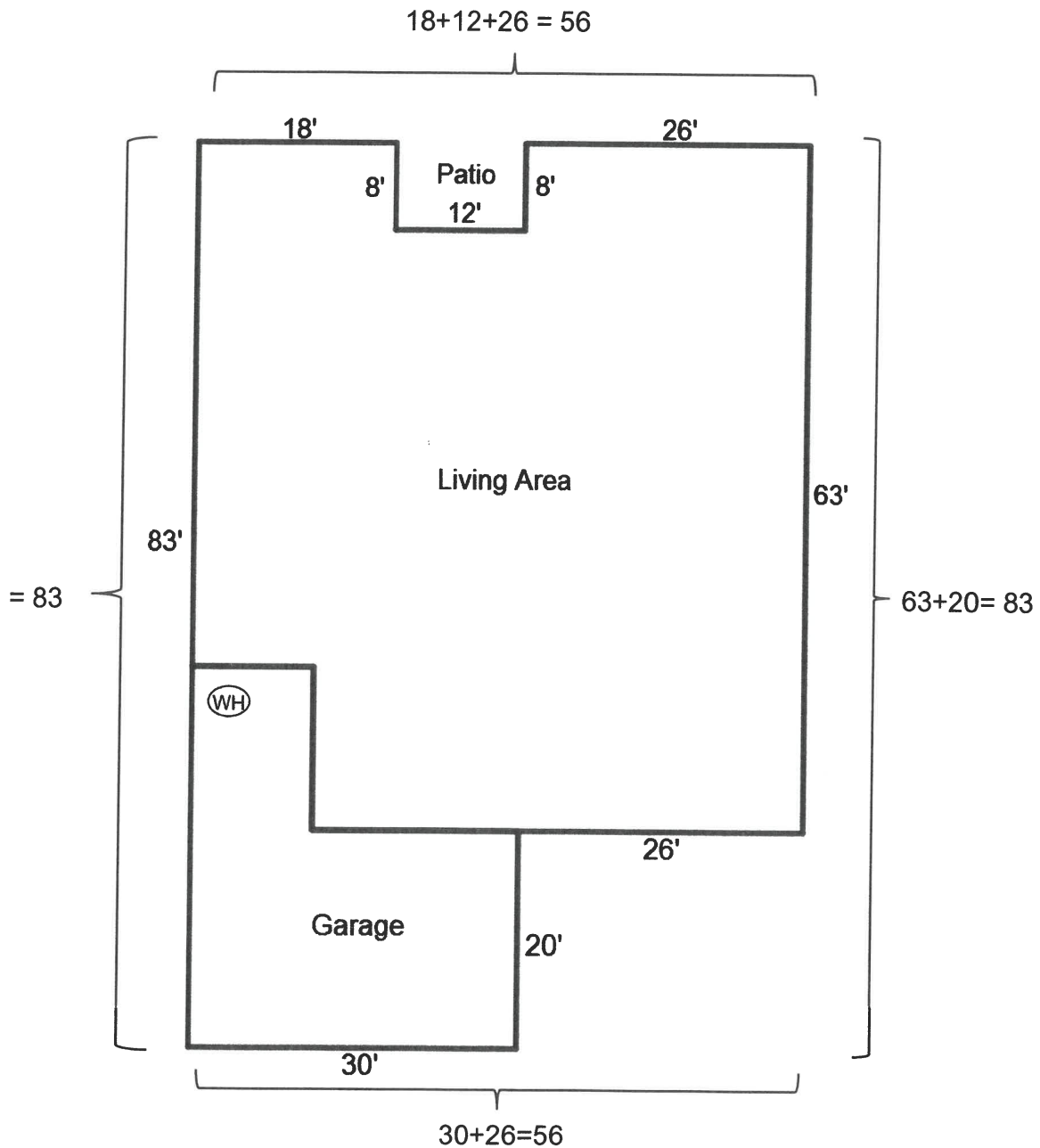
Measure from left to right.



Once the entire residence has been measured, proceed to measure the interior of the garage.



To square the entire residence in this example, including living area and garage, be sure to include the exterior walls that are adjacent to the garage walls outlined above.



The front and the back of the living area square at 56'.

Both sides of the entire residence square at 83'.

- residential, agricultural and some commercial low-rise structures as well as all buildings that do not fit into any other construction class.
- Class **S**. These buildings are characterized by in combustible material and prefab structural members. Exterior walls are generally prefab panels or sheet siding. They are generally referred to as pre-engineered steel buildings.

PERIMETER & SQUARE FOOTAGE - Measuring for a perimeter means adding the lengths of all outer sides of the structure together. Label the result as linear feet (LF). Measuring the living area of a structure involves multiplying the total length and the total width of the structure. Label the result as square feet (). Make sure you use the first story square footage for the Ground Floor square footage. For the Total square footage, use the total living area of all stories.

OF STORIES - Indicate how many stories there are. For this class, it will be single story residences.

AVERAGE STORY HEIGHT - This number should be a whole number.

YEAR BUILT/EFFECTIVE AGE - Enter the year the improvement was built.

PERCENT COMPLETE - Used for new improvements that are not 100% complete as of January 1. This field also accommodates damaged and destroyed improvements. An explanation in the remarks field should accompany this entry if it is other than 100%

PERCENT OWNERSHIP - This field is used where ownership of an improvement is less than 100%. It is usually found when appraising condominiums.

HANDLING PROPERTY OWNER OBJECTIONS

As an appraiser, you might have to deal with property owners who don't want you to see whatever is inside a structure. In those cases, you must respect the property owner's right to privacy. You are within your rights to ask the property owner questions about the structure that will aid with your appraisal. You should also request permission to measure the property on the outside.

that we have the “right” to inspect the property, or that refusing entry will result in your estimating the building size from your vehicle or across the street.

And in all cases, be careful. No job is worth jeopardizing your health or endangering your well-being. If you feel you are in an uncomfortable or dangerous situation, leave immediately and report the circumstances to your supervisor.

3. If you are allowed to perform an interior inspection, walk through the interior and make notes on your field worksheet. Note all information about the interior components, and be watchful for indications of frame/structure type while inside the building. If something is not visible to you during your inspection, make a note of it or circle the item on your form. Prior to leaving the property, ask questions about the individual components in question. Keep in mind that when asking questions about the construction of the building, the individual you are asking may not be informed enough to give you correct answers. Make a note or take a picture of any items you cannot determine.

4. **Measure the exterior living area of the building.** It is usually best to be precise in the original measurements, **only rounding if necessary to “square” the building (making sure the exterior walls opposite each other are the same distance apart).** The rounding of measurements varies from county to county, so check with your supervisor when you return to the office. **For purposes of this class, measurements will be made to the nearest tenth of a foot.**

5. List other components as needed, using your county’s listing form as a checklist. Be wary of “non-living area” wing walls and architectural fenestration that may distort your measurements. Verify the wall height and/or roof slope, measuring from the top of the foundation to the bottom of the roof structure. Take note of oversized roof overhangs and parapet walls, and any other items that may not be part of your checklist, but are worthy of remarks.

6. Note and list all site additions or yard improvements (typically, all improvements not attached to the building, such as concrete, fencing and landscaping).

7. Make certain the field worksheet is complete before leaving the site, as you may be looking at several more buildings before you return to the office. If your form is not completed, you may not be able to remember a missing component, requiring a second trip back to the field to obtain this information.

a. Make sure the building "squares." *

b. Compute the building square footage.

c. Compute the building perimeter.

Note: As long as you remember to "square" the building on the field sketch, it may not be necessary to calculate the total square footage and perimeter linear footage until you return to your office.

8. During your inspection, be sure to take photos of different angles of the improvement, both exterior and interior (if permitted inside), especially if there are components or other items that you are not sure how to list. Having plenty of pictures may save you a return trip to the property.

9. Take inventory of your equipment. Do you have everything with you that you had when you arrived? This also may save a return trip to the property.

FINAL OFFICE PROCEDURE:

Note: specific steps, procedures and forms will vary between counties; follow these steps, modified to fit your county's procedures.

At the office, calculate or double check your perimeter and square footage. Make your final determination as to the occupancy and construction type/exterior wall materials of your improvement. Read the full description of any occupancy codes you have chosen, and select the one that best describes your improvement.

List the individual building components that are appropriate for your listing method.

Read the description of each component chosen. Continue this until familiar with the component and its description. Repeat this procedure with each component on your

EXHIBIT 2

**ARIZONA DEPARTMENT OF REVENUE
CONSTRUCTION COST MANUAL**

VOLUME I

APPENDIX A

LISTING TECHNIQUES

GLOSSARY

ABSORPTION FIELD. A drainage system consisting of a series of pipes laid in trenches filled with sand, gravel, or crushed stone, through which septic tank effluent may seep or leach into the surrounding ground.

ACOUSTICAL TILE. A ceiling or wall tile finishing material with an inherent property to absorb sound; usually made of mineral, fiber, or insulated metal materials.

ACTUAL AGE. The number of years that have elapsed since the original structure was built. Generally synonymous with historical or chronological age.

ADDITION. Part of a building added or joined to an existing building. For example, living area built onto a residence after the original construction; has a single wall in common with residence and usually only one door connects the two.

AD VALOREM. According to value.

AD VALOREM TAX. A tax varying with the value of goods or commodities. A real estate tax based on the value of property.

AGGREGATE. Any of various hard, inert materials like sand, gravel, or pebbles added to a cementing or bonding agent to make concrete, plaster, etc.

ALTERATION. Construction within a structure or to its exterior closure which does not change the overall dimensions. Alteration includes remodeling.

ANIMAL UNIT. A mature beef animal or a dairy cow.

ANGLE IRON. L-shaped steel structural member classified by the thickness of the stock and the length of the legs.

ARCHITECT. Designation reserved, usually by law, for a person or organization professionally qualified and duly licensed to perform architectural services, including but not limited to analysis of project requirements, creation and development of the project design, preparation of drawings, specifications, bidding requirements, and general administration of the construction contract.

ARCHITECTURAL FEE. The cost of architectural services to an owner, usually a percentage of the total contract. The fee varies according to the services provided and the complexity of the project.

ARCHITECTURE. The art and science of designing and building structures.

AREA. (1) A measurement of a given planar region or of the surface of a solid. (2) The surface of anything, measured in square units. (3) The number of square feet of surface in a structure calculated on the basis of outside measurements.

ASBESTOS SHINGLES. Fire-resistive shingles composed principally of asbestos fibers.

ASHLAR. A wall facing of masonry slabs (stone, terra cotta) applied over the bearing exterior walls.

FIREPROOFING. The use of incombustible materials to protect structural components of a building so it can withstand a complete burnout of contents without losing structural integrity.

FLAT PLATE DECK. (1) An elevated concrete slab, usually supported by columns, which is similar to a two-way (beamed) slab but does not have beams between the columns, (2) Slabs reinforced to span like a flat plate between supporting columns.

FLAT ROOF. Roof with pitch or slope with less than 1'0" of rise for each 12'0" of run.

FLOAT FINISH. The surface of concrete finish by a continuous spreading of the material with a flat board.

FLOATING OR MAT FOUNDATION. A heavily reinforced concrete slab, usually four to eight feet thick, covering the entire foundation area of a structure.

FLOOR AREA. Total horizontal surface of a specific floor (or the total area of all floors in a multi-story building), computed from the outside building dimensions of each floor. Balcony and mezzanine floor areas are computed separately and added to the total floor area.

FLOOR FINISH. Top, or wearing, floor surface made of hardwood, linoleum, terrazzo, tile, or other finish materials.

FLUE. The duct or space within a chimney through which combustible gases and smoke are allowed to escape.

FOLDED PLATE DECK. A pleated type of roof structure, usually of concrete, consisting of inclined intersecting planes and used to span large areas.

FOOTING. The projecting course at the base of a foundation wall which ties the foundation into the ground to prevent lateral shifting and setting. Distributes the superstructure load over a greater area.

FOUNDATION. (1) The supporting part of a wall or building. (2) The substructure below the ground or basement floor on which the superstructure rests.

FOYER. The lobby of a theater or hotel; the entrance hall of a house.

FRAME CONSTRUCTION. A building where the exterior walls, bearing walls and partitions, and the structural floors and roof and their supports are wholly or partly of wood or other combustible material. This includes buildings in which the combustible materials are combined with other materials to form composite components such as wood stud walls with brick or stone veneer, stucco, or metal siding.

FREE-STALL. Individual stall where cow may enter, lie down, or leave at its will.

FUNCTIONAL OBSOLESCENCE. A loss in value occurring within a structure caused by changes in design, overcapacity, or inadequacy; e.g., high ceilings, old-style fixtures or cabinets, poor floor plan.

FURRING. The strips of wood or metal applied to a wall or other surface to make it level, to form an air space, or to provide fastening surface for a finish covering.

GABLE. The wall at the end of a building above the eaves and between the slopes of a rigid roof.

GAMBREL ROOF. A ridged roof, with sides having two pitches or slopes.

GIRT. A secondary horizontal framing member extending between columns or studs to stiffen the framing system; also to provide support for the siding or sheathing.

GRADE. The plane of the natural or finished surface of the ground.

GRADE BEAM. A horizontal load-bearing foundation member. End supported like a standard beam, not ground supported like the foundation wall.

GRAVEL STOP. Ridge on perimeter of roof to retain gravel on a built-up roof system.

GROSS AREA. The total enclosed floor area of a building measured from the outside surface of the exterior walls.

GROUND AREA. The area computed from the exterior dimensions of the ground area.

GROUND FLOOR. The floor of a building which is approximately level with the ground.

GROUND FLOOR AREA. Area computed using the exterior dimensions of the ground floor, or that floor which is approximately level with the ground.

GYPSUM WALLBOARD. A prefabricated sheet used in drywall construction as a substitute for plaster. May be made of gypsum covered with paper which can be painted, textured, or wallpapered.

HALL. (1) A room at the entrance of a building or a passage providing access to various parts of a building. (2) A large room used for public gatherings.

HARDBOARD. Boards formed by combining shredded wood chips and glue with pressure.

HARDWOOD. Wood from broad-leafed deciduous trees.

HEADER. (1) A rectangular masonry unit laid across the thickness of a wall so as to expose its end. (2) A lintel. (3) A member extending horizontally between two joints to support tailpieces. (4) Structural members used to span an opening above doors, windows, etc.

HEATER. A general term including ceiling hung heating units, stoves, appliances and other heat producing units.

HEARTH. The floor of a fireplace.

HEAT EXCHANGER. Cylinder with coils in it; used to transfer heat from one gas or liquid to another.

HEAT PUMP. An all-season system which provides either heating or cooling as required.

PARQUET FLOORING. A floor covering composed of small pieces of wood, usually forming a geometric design.

PARTITION. A dividing wall between rooms or areas.

PARTY WALL. A wall built along the dividing line between adjoining buildings for their common use.

PENTHOUSE. A structure or enclosure on a roof normally used for housing the stairway to roof, elevator machinery, a utility room, cover for a water tank, or residence.

PERIMETER. The total length of the periphery of a given area: e.g., equals the distance around the outside of a building.

PILASTER. An upright pier or column attached to, or projecting from, a wall.

PILE. A timber, steel, or concrete shaft which is driven into the ground to serve as support for a foundation.

PITCH. The slope or incline of a roof, expressed in inches of rise per foot of length, or by the ratio of the rise to the span.

PLASTER. A mixture of lime, sand, and water. Used as a finished surface for walls and ceilings.

PLYWOOD. A fabricated wood product constructed of three or more layers of veneer joined with glue, usually laid with grain of adjoining plies at right angles.

POLE FRAME. Building structural skeleton consisting of cylindrical timbers generally with the bark removed, and treated with preservative.

PORCH. A roofed structure providing shelter at the entrance of a building.

POST. A vertical structural member carrying stresses in compression, used where strength in bending is not a requisite.

POWER FEED WIRING. The main electric power line entering a building from a utility or private source; supplies electric power to machinery and equipment through main bus ducts or heavy wiring in conduit. Does not include branch feed lines or controls from main line to machinery.

PRECAST CONCRETE. Concrete structural components which are cast separately, either at a separate location or on a building site, not formed and poured in place in the structure.

PRE-ENGINEERED BUILDING. A building constructed of pre-designed, pre-manufactured, and pre-assembled units such as wall, framing, floor, and roof panels. Pre-engineered units are simply erected at the construction site.

PRESTRESSED CONCRETE. A structural member with reinforcing strands placed under tension either before or after the concrete sets.

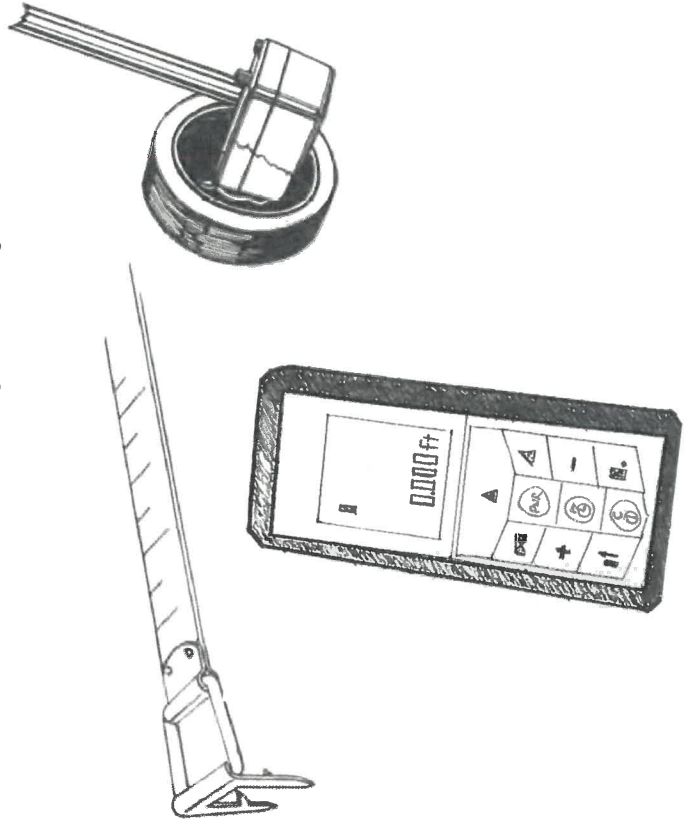
PURLIN. A structural member laid horizontally to support the roof deck and the common rafters.

EXHIBIT 3

MEASURING A BUILDING

Some intangible aspects of building appraisal require judgment, but the measurements of a building are not in this category. The size of a building is something very tangible and easily determined, either from plans or by measurement. An appraiser who makes a mistake in measuring or computing the size of a building will not inspire the confidence of his client, no matter how careful he is otherwise.

There are a number of types of measuring devices. Tape measures come in a variety of materials and lengths and are known as the standard. Wheel devices are very efficient for measuring long distances, but must be closely checked and carefully used. A Laser Distance Measuring Tool, also known as an Electronic Tape Measure, Laser Distance Finders or Digital Measuring Devices, offers laser light for the most accurate measuring. To use a laser distance measuring device, simply point the light at a target such as a wall, house, utility pole, or nearly any object, and the device will show the distance from the tool to the object on its screen. These measuring devices may show multiple units of measure (feet or meters), simply choose your preferred units of measure. Laser devices can also be placed against a wall or floor and will measure from the back of the unit to ensure accurate wall-to-wall or floor-to-ceiling measurements. Laser measuring devices are very precise and also lead to greater productivity. Some laser measuring devices will also calculate the third side of a triangle. This means that you can stand away from a building, point at one corner of the building, take a measurement, point at another corner, take a measurement and the device will calculate the distance from the two points. This is an easy way to accurately measure across the face or the height of a building.



Currently, there are digital software sketching solutions available that are designed for mobile professionals who need to draw floor plans and other sketches, and then calculate areas from measurements they gather on site. Whether you have an iPad, an Android or other such device there is software available to allow the property valuation professional to electronically sketch any building or property out in the field on mobile devices that are becoming increasingly smaller in size.

When measuring a building with a tape measure, a hook may be used on the end of the tape to act as an anchor at one corner of the building; the tape is then drawn taut across the wall being measured and the measurement noted. This procedure is continued until all wall measurements around the perimeter of the building have been taken.

By sketching the building in the field, the appraiser can check his measurements immediately and avoid the possibility making another trip to re-measure the building. He can also add the horizontal and vertical dimensions recorded, to ensure the totals equal the overall dimensions. When a wall is difficult to approach and measure directly because of obstacles or corners to which the hook will not anchor securely, an ice pick or large nail can often be driven into the ground a few feet out, in line with the extension of the wall and used as an anchor.

MEASUREMENT OF HEIGHT

To effectively use the costs given in the Calculator Section of this manual, it is necessary to determine the average height of each story. This is easily accomplished by measuring the total height of the building and dividing by the number of stories. The height of a building must also be measured to properly modify and apply some of the costs given in the Segregated Cost Section of the manual. Note that parapets are disregarded in measuring the average height per story. See Section 10 for further discussion on height measurement and effective height calculations.

The following figures illustrate several methods of measuring building height:

- 1 Use a Laser Distance Measuring tool that calculates the third side of a triangle.
- 2 From the roof, by lowering a tape.
- 3 Measuring down stairwells or similar vertical openings.
- 4 Measuring ceiling heights and adding for any additional thickness above the finished ceiling such as floor or roof and supporting structure.
- 5 By counting the number of brick or concrete block courses in masonry buildings and multiplying by the actual measurements of one or more courses.