

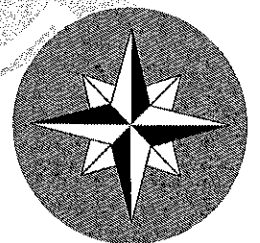
# 60<sup>th</sup> ANNUAL MEETING

OF THE  
MISSOURI SOCIETY OF PROFESSIONAL SURVEYORS

# SURVEYING

# STANDARDS

*Ronnie Heimbaugh, PLS  
Missouri Department of Agriculture*





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**Rules of**  
**Department of Agriculture**  
**Division 90—Weights, Measures and Consumer**  
**Protection**  
**Chapter 60—Missouri Standards for Property**  
**Boundary Surveys**

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**Title 2—DEPARTMENT OF  
AGRICULTURE**

**Division 90—Weights, Measures and  
Consumer Protection**

**Chapter 60—Missouri Standards for  
Property Boundary Surveys**

**2 CSR 90-60.010 Application of Standards**

*PURPOSE: These standards provide the professional land surveyor and recipient of boundary surveys with a realistic guideline for adequate survey performance. This rule describes the types of surveys to which these standards apply.*

The standards in this chapter apply to all property boundary surveys made for determining the location of land boundaries and land boundary corners, but do not apply to preliminary plats or plans, plot plans, design surveys, geodetic surveys, or cartographic surveys. Any individual or corporation licensed with the board to perform land surveying services in this state shall be familiar with and comply with these standards. The Missouri Standards for Property Boundary Surveys are not intended to be used in place of professional land surveying judgment. There may be special circumstances and conditions that make it impractical to comply with some provisions of the standards. If the survey deviates from these standards, this deviation shall be noted, described, and justified on the plat of survey by the professional land surveyor. This provision cannot be used to intentionally circumvent the basic tenets of these standards.

*AUTHORITY: sections 60.510(7), 60.550, and 448.2-109, RSMo 2016. \* Material in this rule was originally covered in 10 CSR 30-2.010. Original rule filed Dec. 1, 2016, effective June 30, 2017.*

*\*Original authority: 60.510, RSMo 1969, amended 2012, 2013; 60.550, RSMo 1969, amended 2013; and 448.2-109, RSMo 1983, amended 1988.*

**2 CSR 90-60.020 Definitions**

*PURPOSE: This rule defines the various technical and legal terms used in this chapter.*

(1) **Condominium Survey**—A property boundary survey that creates and defines condominium property in accordance with Chapter 448, RSMo.

(2) **Controlling Corners**—Those corners that determine the location of the exterior corners of the surveyed boundary.

(3) **Exterior Corners**—Corners that define the shape and size of the parcel.

(4) **Material Variations**—The differences between surveyed lines and lines of possession or measurements called for in the record source of the property being surveyed that are, in the professional judgment of the professional land surveyor, significant enough to warrant particular notice.

(5) **Original Survey**—A survey which creates a new parcel, or parcels, out of a larger parent tract.

(6) **Physical Monument**—Natural or artificial objects which are accepted and used to mark boundaries and corners.

(7) **Positional Uncertainty**—The positive and negative range of values expected for a computed horizontal position as a result of random errors.

(8) **Property Boundary Survey**—Any survey that creates, defines, marks, remarks, retraces, or reestablishes the boundaries of parcels of real property or the subdivision of lands.

(9) **Property Description**—A description of the limits of real property by recitation of metes and bounds or by an aliquot part of the United States Public Land Survey System or by lot or parcel designation referenced to a subdivision, survey, or other document recorded in the public records.

(10) **Random Errors**—Unavoidable errors in measurement that are caused by the inability of the operator to make exact measurements. (Random errors generally follow statistical principles and can be reduced with care in measurement, but can never be completely eliminated).

(11) **Record Title Boundaries**—The limits of real property ownership as evidenced and provable by one (1) or more written means of real property transfer and having provided constructive notification by being duly entered into the public records.

(12) **Rural Property**—Any property that is not urban property.

(13) **Subdivision**—A property boundary survey that partitions land into two (2) or more parcels by platting the divisions of land in accordance with Chapter 445, RSMo.

(14) **Systematic Errors**—Errors in measurement that conform to mathematical and phys-

ical laws and remain the same under set conditions. Systematic errors are detectable and can be removed by ensuring the proper adjustment of equipment, by applying appropriate corrections to observations, and by using appropriate observation techniques to eliminate the effects of imperfection in equipment manufacture.

(15) **United States Public Land Survey Corners**—Those points that determine the boundaries of the various subdivisions of the United States Public Land Survey as set forth in section 60.301(1), RSMo.

(16) **Urban Property**—Any property that is located wholly or partly within the corporate limits of any municipality or any commercial, industrial, or multi-unit developmental property.

*AUTHORITY: sections 60.510(7), 60.550, and 448.2-109, RSMo 2016. \* Material in this rule was originally covered in 10 CSR 30-2.020. Original rule filed Dec. 1, 2016, effective June 30, 2017.*

*\*Original authority: 60.510, RSMo 1969, amended 2012, 2013; 60.550, RSMo 1969, amended 2013; and 448.2-109, RSMo 1983, amended 1988.*

**2 CSR 90-60.030 General Land Surveying Requirements**

*PURPOSE: This rule sets forth standards that apply to all property boundary surveys.*

(1) **Records Research.**

(A) Every survey executed shall be based on the property description of the parcel or parent tract taken from the public records; and

(B) Prior to performing the fieldwork, the professional land surveyor shall acquire sufficient data to ascertain the record title boundary of the parcel(s) to be surveyed (such as: adjoining deeds, maps, right-of-way plans, subdivision plats, original plats and notes, and subsequent surveys). This requirement does not obligate the professional land surveyor to search the entire chain of title.

(2) **Field Investigation.** The professional land surveyor or a person under his/her direct personal supervision shall—

(A) Search thoroughly for monuments and accessories at the necessary controlling corners and any other physical evidence that may be required to define the location of the exterior corners of the parcel surveyed (such as: location of streets, roads, lines of occupation, and parole information);



(B) Obtain appropriate and sufficiently redundant measurements to correlate all found evidence;

(C) Evaluate the reliability of the evidence and monuments found and apply the proper theory of location in accordance with surveying precedent; and

(D) Reach a conclusion on the location of the boundary and set monuments as defined herein.

### (3) Monumentation.

(A) The professional land surveyor shall establish semi-permanent or confirm existing monuments at every exterior corner of the tract being surveyed, except for lines running along streams or lakes where witness monuments must be set along the connected side-lines. When it is impractical to set a monument at a required corner, a witness monument shall be set along a line of the survey or the prolongation thereof;

(B) Existing monuments shall be evaluated for permanency by the professional land surveyor. Those needing restoration, preservation, or replacement shall receive the due care necessary to ensure that their permanency is secured in accordance with the requirements set forth herein;

(C) Additional Monumentation for Subdivision Surveys.

1. In addition to meeting the requirements set forth above, the professional land surveyor shall, prior to the recording of the subdivision plat, establish at least two (2) permanent monuments for every four (4) acres of land developed by the subdivision. This requirement is waived if the survey does not create more than four (4) lots or parcels.

2. The permanent monuments required in paragraph (3)(C)1. shall be set prior to the recording of the plat or if likely to be destroyed by construction, may be installed upon completion of the construction and must be set no later than twelve (12) months after the recording of the plat. The professional land surveyor shall also monument all lot corners in the subdivision with semi-permanent or witness monuments within the same twelve- (12-) month period.

3. When the subdivision is a cemetery, the requirements of subparagraph (3)(C)1. for installation of permanent monuments shall be increased to include four (4) permanent monuments per block and the monumentation of all lot corners required in paragraph (3)(C)2. shall not be required; and

(D) Condominium surveys shall meet the requirements for subdivisions.

(4) Publication of Results: A plat shall be made showing the results of the survey or

subdivision and shall conform to all of the following provisions:

(A) The plat shall include a drawing that shall be made to a convenient scale on a reasonably permanent and dimensionally stable material;

(B) The plat shall include the name of the person or entity for whom the survey was made and the date of the survey;

(C) Lettering shall be no less than eight-hundredths of an inch (0.08") in height. All characters shall be open, well-rounded, and of uniform width;

(D) The direction of boundary lines shall be shown by angles, azimuths, or bearings with the directional reference system clearly described on the plat;

(E) A north arrow, a written scale, and a graphic scale shall be shown on every sheet containing graphic survey data;

(F) Complete dimensions (distances, directions, and curve data) of all parcels surveyed or created. All linear measurements shall be shown as horizontal distances at the ground surface in feet or meters. Curved lines shall show at least two (2) elements. For non-tangential curves, a directional component shall be included to help define the direction of the curve (preferably the chord bearing);

(G) All vertical measurements shall be shown as elevations above an established or assumed datum in feet or meters. When elevations are shown, a clearly defined elevation datum shall be shown, including the location and elevation of the benchmark used to establish the project datum;

(H) Measurements and calculated areas will be shown on the plat to a number of significant figures representative of the actual precision of the measurements;

(I) The plat shall display either a property description for the parcel(s) and/or parent tract surveyed or a reference to the source document from which the property description was taken. Any new parcel created by survey shall have its property description shown on the plat and must be complete enough so that the parcel can be located and clearly identified. Subdivision plats shall identify all lots for sale by numbers, as set forth in section 445.010, RSMo;

(J) The plat shall show sufficient data (distances and directions) to positively locate the parcel surveyed within the United States Public Land Survey System (USPLSS), or within the recorded subdivision. If the survey cannot be located by either of the previously mentioned provisions, it must be referenced to other lines and points sufficiently established by record;

(K) All controlling corner monuments that were found and exterior corners that were

found or set shall be identified on the plat;

(L) Any material variation between record and measured dimensions; and any material variation and the extent of such variation between surveyed lines and lines of possession at all exterior corners shall be shown on the plat. Material variation will include, but is not limited to, survey monuments, fences, obvious occupation (i.e., mowed) lines, walls, or other structures whether on the property surveyed or on adjacent property;

(M) The plat shall reference the source document(s) for any pertinent data obtained during the records research provision set forth above. The plat shall also reference the property type (Urban or Rural);

(N) The identity of the record title documents for adjoining properties, consistent with the records research provision set forth above, shall be shown on the plat, including their record source;

(O) In addition to the above, all condominium surveys shall show the pertinent information required in section 448.2-109, RSMo, and the legally sufficient descriptions of easements serving or burdening the condominium; and

(P) The plat shall include a statement that the survey and or subdivision were executed in accordance with the Missouri Standards for Property Boundary Surveys as set forth herein. The statement on a condominium plat shall also include a declaration that the plat contains all information required by section 448.2-109, RSMo.

(5) Deliverables. The professional land surveyor shall furnish to the client a plat containing the drawing and other pertinent information identified above. Each sheet of the plat shall bear the signature and seal of the professional land surveyor in responsible charge. This signed and sealed plat shall be the official plat and shall take precedence over any other formatted data that may be delivered to the client or his/her representatives, successors, or assigns.

*AUTHORITY: sections 60.510(7), 60.550, and 448.2-109, RSMo 2016. \*Material in this rule was originally covered in 10 CSR 30-2.030. Original rule filed Dec. 1, 2016, effective June 30, 2017.*

*\*Original authority: 60.510, RSMo 1969, amended 2012, 2013; 60.550, RSMo 1969, amended 2013; and 448.2-109, RSMo 1983, amended 1988.*



## 2 CSR 90-60.040 Accuracy Standards for Property Boundary Surveys

*PURPOSE: This rule sets forth the accuracy standards for all property boundary surveys.*

(1) The professional land surveyor shall make an effort to detect and remove systematic errors.

(2) Precision Requirements for Urban Property.

(A) The uncertainty due to random errors of any dimension of direction or distance shown on the plat shall not exceed fifty parts per million (50ppm) or one tenth of a foot (0.10') for distances less than two thousand feet (2,000') at the sixty-eight percent (68%) confidence level (one (1) sigma); and

(B) The positional uncertainty of any coordinates shown on the plat relative to the control that is held fixed, shall not exceed fifty parts per million (50ppm) or one tenth of a foot (0.10') for distances less than two thousand feet (2,000') at the sixty-eight percent (68%) confidence level (one (1) sigma).

(3) Precision Requirements for Rural Property.

(A) The uncertainty due to random errors of any dimension of direction or distance shown on the plat shall not exceed one hundred parts per million (100ppm) or one tenth of a foot (0.10') for distances less than one thousand feet (1,000') at the sixty-eight percent (68%) confidence level (one (1) sigma); and

(B) The positional uncertainty of any coordinates shown on the plat relative to the control that is held fixed, shall not exceed one hundred parts per million (100ppm) or one tenth of a foot (0.10') for distances less than one thousand feet (1,000') at the sixty-eight percent (68%) confidence level (one (1) sigma).

*AUTHORITY: sections 60.510(7), 60.550, and 448.2-109, RSMo 2016. \* Material in this rule was originally covered in 10 CSR 30-2.040. Original rule filed Dec. 1, 2016, effective June 30, 2017.*

*\*Original authority: 60.510, RSMo 1969, amended 2012, 2013; 60.550, RSMo 1969, amended 2013; and 448.2-109, RSMo 1983, amended 1988.*

## 2 CSR 90-60.050 Use of Missouri Coordinate System of 1983

*PURPOSE: This rule sets forth the requirements for referencing land boundary corners to the Missouri Coordinate System of 1983.*

(1) When the professional land surveyor is specifically requested or required to reference land boundary corners to the Missouri Coordinate System of 1983, the professional land surveyor shall comply with the following requirements:

(A) The position of the corner shall be based upon a geodetic control station having a horizontal accuracy of second order (as defined in 20 CSR 2030-18.020) or higher order;

(B) The survey connecting the corner to the geodetic control station shall meet the accuracy standards for property boundary surveys set forth in this chapter; and

(C) The plat or other publication of results shall identify the geodetic control station(s) that were used to determine the position of the corner(s), along with a list of the coordinates of those control station(s); the appropriate adjustment date or realization designation on the North American Datum of 1983, along with the epoch date when applicable; a brief statement of the method used to obtain those positions; and the grid factor used.

*AUTHORITY: sections 60.510(7), 60.550, and 448.2-109, RSMo 2016. \* Material in this rule was originally covered in 10 CSR 30-2.050. Original rule filed Dec. 1, 2016, effective June 30, 2017.*

*\*Original authority: 60.510, RSMo 1969, amended 2012, 2013; 60.550, RSMo 1969, amended 2013; and 448.2-109, RSMo 1983, amended 1988.*

## 2 CSR 90-60.060 Approved Monumentation

*PURPOSE: This rule prescribes the approved type of monumentation to be used on property boundary surveys.*

(1) The professional land surveyor shall select a type of monument providing a degree of permanency consistent with that of the adjacent terrain and physical features and as required by these standards. All monuments shall be solid and free from movement. They shall be set in the ground at least to the depth of the length given unless they are encased in concrete. With the exception of drill holes and cut crosses, the precise position of the corner shall be marked by a point on a cap and the cap shall be inscribed with the licensure number of the professional land surveyor or in responsible charge or the corporate licensure number or name of the company.

(2) Permanent monuments shall be selected from the following:

(A) Concrete monuments consisting of reinforced concrete at least four inches (4")

square or in diameter and no less than twenty-four inches (24") in length with its precise position marked by a point on a brass or aluminum cap not less than one and one-half inch (1 1/2") in diameter;

(B) Commercial cast iron or aluminum survey markers not less than twenty-four inches (24") in length. Nonferrous markers shall have ceramic magnets attached to aid in recovery;

(C) Steel, coated steel, or aluminum rod markers not less than five-eighths inch (5/8") in diameter, iron pipe markers not less than three-quarter inch (3/4") inside diameter and not less than twenty-four inches (24") in length. These monuments shall have a permanently attached cap of the same metal or of a dissimilar metal if the metals are insulated with a plastic insert to reduce corrosion. Nonferrous rod markers shall have ceramic magnets attached to aid in recovery; and

(D) Brass or aluminum disks not less than two inches (2") in diameter, countersunk and well-cemented in a drill hole in either solid rock or concrete. Ceramic magnets shall be attached or installed with the disk to aid in recovery.

(3) Semi-permanent monuments shall be selected from the following:

(A) Iron pipe markers not less than three-fourths inch (3/4") outside one half inch (1/2") inside diameter, at least eighteen inches (18") in length, and having a plastic or metal cap;

(B) Steel or aluminum rod markers not less than one-half inch (1/2") in diameter, and not less than eighteen inches (18") in length, and having a plastic or aluminum cap;

(C) A cross-cut or drill hole in concrete, brick, stone paving, or bedrock at the precise position of the corner or on a prolongation of a boundary line; and

(D) In asphalt paving, cotton picker spindles, railroad spikes (center punched or chiseled cross), semi-permanent half-inch (1/2") rebar, and magnetic spikes (minimum of 8" in length) that are solid and not easily removed or destroyed.

*AUTHORITY: sections 60.510(7), 60.550, and 448.2-109, RSMo 2016. \* Material in this rule was originally covered in 10 CSR 30-2.060. Original rule filed Dec. 1, 2016, effective June 30, 2017.*

*\*Original authority: 60.510, RSMo 1969, amended 2012, 2013; 60.550, RSMo 1969, amended 2013; and 448.2-109, RSMo 1983, amended 1988.*

## 2 CSR 90-60.070 Location of Improvements and Easements

*PURPOSE: This rule sets forth how and what*



*improvements and easements are to be located and shown on a property boundary survey.*

(1) When the professional land surveyor is specifically requested by the client to locate the improvements on the property surveyed, the professional land surveyor shall locate, by measurement, all permanent structures having fixed foundation, slabs, or footings and shall reference them to the property boundary on the plat with a minimum of three (3) dimensions. Dimensions shall be parallel, perpendicular, or radial to the property lines.

(2) When the professional land surveyor is specifically requested by the client to show easements on a property boundary survey, he/she shall show by graphic representation all easements appearing on the recorded subdivision plat and all easements provided to the professional land surveyor by the client. If the professional land surveyor is specifically requested by the client to locate any easements on the ground, he/she will do so in accordance with the standards defined herein.

*AUTHORITY: sections 60.510(7), 60.550, and 448.2-109, RSMo 2016. \* Material in this rule was originally covered in 10 CSR 30-2.110. Original rule filed Dec. 1, 2016, effective June 30, 2017.*

*\*Original authority: 60.510, RSMo 1969, amended 2012, 2013; 60.550, RSMo 1969, amended 2013; and 448.2-109, RSMo 1983, amended 1988.*

**CHECK LIST FOR REVIEW OF SURVEY PLATS  
FOR COMPLIANCE WITH  
MISSOURI STANDARDS FOR PROPERTY BOUNDARY SURVEYS**

**NAME OF SURVEYOR:** \_\_\_\_\_ **DATE OF SURVEY:** \_\_\_\_\_

**REVIEWED BY:** \_\_\_\_\_ **DATE:** \_\_\_\_\_

**DESCRIPTION OF SURVEY:** \_\_\_\_\_

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**GENERAL LAND SURVEY REQUIREMENTS**

**ALL SURVEY PLATS SHALL SHOW THE FOLLOWING**

	<u><b>YES</b></u>	<u><b>NO</b></u>	<u><b>NA</b></u>
1) Name of person or entity for whom the survey was made	_____	_____	_____
2) Date of the survey	_____	_____	_____
3) Lettering 0.08" or larger in height	_____	_____	_____
4) Direction of all lines surveyed with directional reference	_____	_____	_____
5) North arrow, written scale and graphic scale on each sheet containing graphics	_____	_____	_____
6) Horizontal (ground) distances of all lines surveyed in feet or meters	_____	_____	_____
7) All curved lines defined with minimum of two (2) elements Additional directional component for non-tangential curves	_____	_____	_____
8) Definition of elevation datum	_____	_____	_____
9) Location and elevation of bench mark used	_____	_____	_____
10) Distance and area dimensions representative of actual precision	_____	_____	_____

	<u>YES</u>	<u>NO</u>	<u>NA</u>
11) Show or reference source of boundary description	_____	_____	_____
12) Show property description of parcel created	_____	_____	_____
13) Subdivision plats identify all lots for sale by numbers	_____	_____	_____
14) Sufficient data to locate the property (distance and direction) within the USPLSS, or within record subdivision	_____	_____	_____
15) All controlling corners found and exterior corners found or set identified on plat	_____	_____	_____
16) Any <u>material</u> variation between measured and record dimensions and or between measured and lines of possession	_____	_____	_____
17) Reference source document(s) for pertinent data obtained in records research	_____	_____	_____
18) Accuracy from type of property being surveyed	_____	_____	_____
19) Plat shall identify title documents for adjoiners as they appear of record (Including their record source)	_____	_____	_____
20) Statement that survey is in compliance with Missouri Standards for Property Boundary Surveys	_____	_____	_____

**TITLE BLOCK CHECKLIST – 20 CSR 2030 – 2.050**

The title block must, at a minimum, contain the following information

21) The name of the licensee either as a sole proprietor, partnership, corporation, limited liability company, or other appropriate entity	_____	_____	_____
22) The licensee's address and phone number	_____	_____	_____
23) Name or identification of project	_____	_____	_____
24) Address/location of project (city/county and state)	_____	_____	_____
25) Date prepared	_____	_____	_____
26) Space for the licensee's signature, date and seal	_____	_____	_____
27) The printed name, discipline, and license number of the person sealing the document	_____	_____	_____



	<u>YES</u>	<u>NO</u>	<u>NA</u>
28) The printed name, discipline, and certificate of authority, number of the corporation as defined in Section 327.011, RSMo.	_____	_____	_____

**WHEN THE MISSOURI COORDINATE SYSTEM 1983 IS USED**

29) Name of first or second order control station used	_____	_____	_____
30) Coordinates of control station (in meters)	_____	_____	_____
31) Adjustment date and or epoch date	_____	_____	_____
32) Brief statement of method used to obtain position	_____	_____	_____
33) Grid factor used	_____	_____	_____

**ADDITIONAL REQUIREMENTS FOR SUBDIVISION SURVEYS**

The recorded plat shall show

34) Semi-permanent monuments at all exterior corners	_____	_____	_____
35) Two permanent monuments for every four acres developed (Unless survey does not create more than four lots)	_____	_____	_____
36) Semi-permanent monuments at all lot corners. All monuments shall be set within twelve (12) months from date recorded	_____	_____	_____
37) If Cemetery four (4) permanent monuments per block and no semi-permanent monuments required	_____	_____	_____

**REQUIREMENTS FOR CONDOMINIUM SURVEYS**

38) Name of condo	_____	_____	_____
39) Survey or general schematic map of entire condo	_____	_____	_____
40) Location and dimension of property not being developed, and location and dimensions of all existing improvements	_____	_____	_____
41) Legal description of property being developed	_____	_____	_____
42) Extent of any encroachments	_____	_____	_____

43) Legally sufficient descriptions of all easements \_\_\_\_\_

YES NO NA

44) Unless shown on plans, the following:

a) Location and dimension of vertical unit boundaries \_\_\_\_\_

b) Location and dimension of horizontal unit boundaries \_\_\_\_\_

c) Unit identifying number \_\_\_\_\_

45) Location and dimension of limited common elements \_\_\_\_\_

46) Statement that plat contains information required by Section 448.2-109 \_\_\_\_\_

**LOCATION OF IMPROVEMENTS - (WHEN REQUESTED)**

47) Permanent structures located by:

a) Minimum of three dimensions \_\_\_\_\_

b) Dimensions parallel or perpendicular to straight lines \_\_\_\_\_

c) Dimensions radial to curved lines \_\_\_\_\_

**LOCATION OF EASEMENTS - (WHEN REQUESTED)**

48) Easements shown on subdivision plat \_\_\_\_\_

49) Easements shown on other recorded documents and provided to Surveyor by Client \_\_\_\_\_

**GLO CORNER PRESERVATION AND REQUIRED FILING OF CORNER FORMS**

50) Permanent monuments at GLO corners \_\_\_\_\_

51) The following GLO corners were restored or reestablished and registered with MDA / Land Survey Program \_\_\_\_\_

Township, Range, Corner Index Number

\_\_\_\_\_  
\_\_\_\_\_