

# Missouri Minimum Standards

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- ✓ Missouri Society of Professional Surveyors
- ✓ “Minimum Standards Workshop”
- ✓ Lake Ozark , Missouri
- ✓ July 15, 2006
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- ✓ State Land Surveyor

# History of Standards

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- ✓ 1964: MARLS adopted survey standards
- ✓ 1 1/2 pages long.
- ✓ 1973: Missouri State Land Survey Authority-State Surveyors Office developed and adopted 1st.set of modern survey standards.
- ✓ 1975: Original “Minimum Standards” filed with Secretary of State.
- ✓ 1982-1989: Minimum Standards revised and refilled 5 times by DNR

# History continued

- ✓ 1993: Missouri Board for Architects, Professional Engineers, and Land Surveyors (APELS) issued their set of Missouri Standards for Property Boundary Surveys and Real Property Reports.
- ✓ 1994: DNR-LSP and APELS jointly promulgate Missouri Minimum Standards for Property Boundary Surveys and all other Surveying CSR's
- ✓ 2003: Minimum Standards revised and reissued by DNR & APELSLA

# Current Missouri Minimum Standards

## Effective Date: October 30, 2003

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- ✓ Purpose and Application - These minimum standards 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, engineering surveys, geodetic surveys, cartographic surveys, or Surveyor's Real Property Report. Any individual or corporation registered with the Board to perform land surveying services in this state shall be familiar with and comply with these minimum standards.

# Current Missouri Minimum Standards

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- ✓ Purpose - **The Missouri Minimum 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 minimum standards. If the survey deviates from these “Minimum 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 minimum standards.

# Current Missouri Minimum Standards Organizational Outline

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- ✓ Definitions
- ✓ General Land Surveying Requirements
- ✓ Accuracy Standards
- ✓ Use of the Missouri Coordinate System 1983
- ✓ Approved Monumentation
- ✓ Detail Requirements for Resurveys
- ✓ Detail Requirements for Original Surveys
- ✓ Detail Requirements for Subdivision Surveys
- ✓ Detail Requirements for Condominium Surveys
- ✓ Location of Improvements and Easements

# Minimum Standards Definitions

- ✓ **Block** - A group of lots existing within well-defined and fixed boundaries, usually being surrounded by streets or physical barriers and usually having an assigned number, name, letter, or other identifier through which it may be identified.
- ✓ **Controlling Corners** - The corners that determine the location of the record title boundary
- ✓ **Exterior Corners** - The corners that define the shape and size of the parcel.
- ✓ **Property Description** - A description of real property by government survey, metes and bounds, or lot numbers of record. The description must be complete enough so a particular parcel of land can be located and identified.
- ✓ **Linear Error of Closure** - The square root of the sum of the squares of the error in north coordinates (y) and in east coordinates (x).

# Definitions

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- ✓ **Material Variations** - Material variations are those 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 judgement of the surveyor , substantial and important to the location of the subject survey.
- ✓ **Physical Monument** - Refers to both natural and artificial physical objects which are accepted and used to mark boundaries and corners.



# Definitions

## ✓ Property Boundary Surveys

- **Original Survey** - A survey which creates a new parcel out of a larger parent tract for the purpose of conveying the new parcel. Boundary adjustment plats, consolidation plats, riparian plats, lot splits, and minor subdivisions are examples of original surveys.
- **Resurvey** - A survey executed to remark, reestablish, restore, or delineate the boundary line or corners of a parcel previously created by a deed, survey, or subdivision.
- **Condominium Survey** - A survey executed to create and define condominium property in accordance with Chapter 448 RSMo.
- **Subdivision Survey** - A subdivision survey is the partition of land into two or more parcels by platting the divisions of land in accordance with RSMo, 445 and per any appropriate platting procedures and from which parcels are then sold by reference to a plat of record.

# Definitions

- ✓ **Radial Survey Measurement Tolerance** - The computed expected relative accuracy of any distance determined by radial surveying methods. It is computed using an analysis of component distance and direction errors.
- ✓ **Radial Survey Method** - The determination of the coordinate values of points by measuring directions and distances from a central point as opposed to determination of the coordinates of points by traverse. The determination of coordinates by “side shots” from a closed traverse is not considered a radial surveying method.
- ✓ **Record Title Boundaries** - The boundaries of the real estate described in the title of record.
- ✓ **Relative Position Tolerance** - The relative accuracy between all pairs of points in a survey. In practice, it is computed for sampling of pairs of points using either an analysis of component distance and direction errors or from a minimally constrained, correctly weighted least squares adjustment.

# Definitions

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- ✓ **Title of Record - A title to real estate, evidenced and provable by one or more conveyances or other instruments all of which are duly entered on the public records.**
- ✓ **Traverse Closure - The linear error of closure of the traverse computed either from analysis of the component distance and direction errors or from the actual traverse measurements.**
- ✓ **Unites States Public Land Survey Corners - Corners of the U.S. Public Land Survey are those points that determine the boundaries of the various subdivisions represented on the official government plat such as the township corner, section corner, quarter-section corner, blank quarter section corners, center of section, fractional section corners, grant corners, and meander corners.**

# General Requirements for Original, Resurveys, and Subdivisions

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## ✓ Research

- 1) Based on legal/property description of parent tract taken from title of record.
- 2) Insofar as necessary, surveyor shall research and obtain other data, such as adjoining deeds, maps, subdivision plats, GLO plats and field notes.
- 3) Analyze data and determine record title boundaries of parent tract or of parcel to be surveyed.

# General Requirements for Original, Resurveys, and Subdivisions

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## ✓ Field Work

- 1) Search and locate controlling corners and other monuments that are required to define the location of the exterior corners of the parcel to be surveyed.
- 2) Search and locate other real evidence that may affect the parcel including streets, right-of-ways, road, occupation lines, and possibly resident witness information.
- 3) Evaluate reliability of evidence.
- 4) Make measurements to correlate all found evidence. Measurements should be made to the necessary level of precision compatible with the size and geometric shape of the parcel to obtain the desired accuracy needed for the class of property of the surveyed parcel.
- 5) Correlate the facts obtained by the field survey with the record title boundaries of the parcel or parent tract.
- 6) Determine location for Record Title Boundaries and Monument Corners as required.

# General Requirements for Original, Resurveys, and Subdivisions

## ✓ Survey Plat Requirements

- 1) Plats shall be made and provided indicating the results of the survey with seal and signature of surveyor in responsible charge.
- 2) Plat shall be drawn to a convenient scale on the type of material consistent with the purpose and permanency required. AutoCAD or Digital format plats required by client are allowed; however, a hard copy plat will be the official plat and take precedence over the digital data.
- 3) Name of person for whom the survey was made and date shall be noted on plat.
- 4) Multiple plats shall bear the seal and signature on each sheet provided to the client.
- 5) Lettering on plat shall be no smaller than 0.08 in height.
- 6) Boundary lines on plat shall be shown by direct angles, azimuths, or bearings. They shall be based on a bearing system that is retraceable and described on the plat.

# General Requirements for Original, Resurveys, and Subdivisions

## ✓ Survey Plat Requirements (continued)

- 7) Distances, directions, and curves shall be shown for all parcels surveyed or created.
- 8) A prominent north arrow shall be drawn on each sheet of the plat containing graphics.
- 8) Linear dimensions shall be horizontal in feet or meters at the ground's surface.
- 9) A written scale shall be noted on plat. Any plat 8 1/2" x 14" or larger shall also show a graphic scale.
- 10) Vertical dimensions shall be shown by elevations above an established or assumed datum.
- 11) Distances, angles, bearings, azimuths, and calculated areas will be shown on the plat to a number of significant figures representative of the actual precision of the measurements.



# General Requirements for Original, Resurveys, and Subdivisions

## ✓ Survey Plat Requirements (continued)

- **12) Curved lines shall show two elements of the curve; however, three is suggested including Radius, Central Angle and length of arc. When curves are not tangent to the preceding or succeeding boundary line the bearing, angle, and direction of the initial tangent, radial line, or long chord shall be shown.**
- **13) The survey shall show sufficient data (distances and directions) to positively locate the parcel within the U.S.P.L.S.S or recorded subdivision. If the survey can not be located by either of these provisions, it must be referred to other lines and points established by record.**



# General Requirements for Original, Resurveys, and Subdivisions

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## ✓ Survey Plat Requirements (continued)

- **14) All controlling corner monuments, either found or set, shall be shown and described on the plat by symbol or note.**
- **15) All controlling corners accepted or restored shall be shown or noted on the plat**
- **16) Accuracy class or property being surveyed shall be noted or shown on plat.**
- **17) Any material variation between measured and record dimensions shall be noted on plat.**
- **18) Plat shall identify title documents for ajoiners. Preference for source shall be by recording book-page.**

# Approved Monumentation

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## ✓ Permanent Monuments

- 1) **Concrete Monuments 4 in.x 24 in. with brass or aluminum cap**
- 2) **Post monument with 1 1/2 in. cap**
- 3) **Steel, coated steel, or aluminum rods 5/8 in. x 24 in. with aluminum cap**
- 4) **Iron Pipes 3/4 in. x 24 in. with aluminum cap**
- 5) **Brass or Aluminum Disks not less than 2 inches in diameter and grouted or cemented into rock or concrete with magnet**

# Approved Monumentation

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## ✓ Semi-Permanent Monuments

- 1) Steel or aluminum rods 1/2 in x 18 in. with plastic or aluminum cap.
- 2) Iron pipes 3/4 in.x 18 in. with aluminum or plastic caps
- 3) Cut '+' or drill hole in concrete, brick or stone paving.
- 4) RR spikes or CP spindles or other similar metal devices suitable that are solid and not easily removed.

# Monumentation

## ✓ General requirements for Monumentation

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- 1) All monuments should be set solid and free from movement
- 2) The precise position of the corner should be marked by a point or cross on the cap.
- 3) The PLS or Corporate registration number shall be inscribed on the cap
- 4) Existing monuments shall be evaluated for permanency. Existing monuments are not required to be replaced if they are solid and free from movement
- 5) Witness or reference monuments shall be set if the actual position of the corner is impractical to monument at a minimum of 5 feet from the actual corner position.

# Accuracy Standards for Property Boundary Surveys

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## ✓ Definitions for Accuracy Standards

- ✓ Urban Survey : Property located in any city, town, village, or any commercial or industrial, condominium, town house, apartment or multi-unit developments.
- ✓ Suburban Survey: Any property that is not urban or is intended primarily for residential use or located between residential areas whose value is influenced by the presence of nearby developed real estate.
- ✓ Rural Survey: Any property that is not urban or suburban.
- ✓ Horizontal and Vertical Accuracy's referred to on any plat are the same standard as the classification noted above. The accuracy standard and vertical datum shall be noted on the plat.

## ACCURACY STANDARDS FOR PROPERTY BOUNDARY SURVEYS

CLASS OF PROPERTY	SIZE OF SURVEY	LINEAR ERROR OF CLOSURE	RELATIVE POSITIONAL TOLERANCE
URBAN	Distances 2000' or less Distances more than 2000'	0.10 ft. or 30 mm. 1:20,000 or 50 ppm.	0.10 ft. or 30 mm. 1:20,000 or 50 ppm.
SUBURBAN	Distances 1000' or less Distances more than 1000'	0.10 ft. or 30 mm. 1:10,000 or 100 ppm.	0.10 ft. or 30 mm. 1:10,000 or 100 ppm.
RURAL	Distances 1000' or less Distances more than 1000'	0.20 ft. or 61 mm. 1:5,000 or 200 ppm.	0.20 ft. or 61 mm. 1:5,000 or 200 ppm.

NOTE: Relative positional tolerance is computed at the 68% confidence level (one sigma).

### DEFINITIONS

Linear Error of Closure:

The linear error of closure is the square root of the sum of the squares of the error in north coordinates (y) and in the east coordinates (z).

Relative Positional Tolerance:

The relative position tolerance is the relative accuracy between all pairs of points in a survey. In practice it is computed for sampling of pairs of points using either an analysis of component distance and direction errors or from a minimally constrained, correctly weighted least squares adjustment.<sup>1</sup>

# Detail Requirements for Original, Resurveys and Subdivision Surveys

Minimum Standard Detail Requirements	Original Surveys	Resurveys	Subdivision Surveys
<b>Monumentation</b>			
Semi-Permanent Monuments at all Exterior Corners	Yes	Yes	Yes
2 Permanent Monuments per Block	N/A	N/A	Yes
4 Permanent Monuments per Block	N/A	N/A	Yes (Cemeteries Only)
Semi-Permanent Monuments at all Lot Corners	N/A	N/A	Yes (Within 12 months of recording. Cemeteries excluded)
<b>Publication of Results</b>			
Record Source of Parent Tract (Book and Page)	Yes	N/A	Yes
Prepare Property Description	Yes	N/A	N/A
Deed Reference (Book and Page)	N/A	Yes	N/A
Non-Recorded Description	N/A	Noted on Plat	N/A
Book and Page of Ajoiners	Yes	Yes	Yes
<b>Certification</b>			
Certification or Declaration shall include statement that Survey was made according to the current Missouri Minimum Standards for Property Boundary Surveys.	Yes	Yes	Yes
<b>Material Variations</b>			
Between Measured and Record Dimensions	Yes	Yes	Yes
Between Surveyed Lines and Lines of Possession	No	Yes	N/A

# Detail Requirements for Condominium Surveys

## – Monumentation:

- The out boundary of the condominium shall be monumented similar to a Subdivision Survey.

## – Plat:

- 1) The name of the condominium and a schematic map of the condominium in its entirety. Additional phases shall be referenced to the recorded location for the original condominium plat.
- 2) Location and dimensions of real estate not subject to development rights are subject only to development right to withdraw and the location and dimensions of existing improvements within the real estate according to Chapter 448.
- 3) The legal description of the real estate subject to development rights and label to identify the rights applicable to each parcel.
- 4) \* Any encroachments onto the condominium property.



# Detail Requirements for Condominium Surveys

## – Plat (continued):

- **5) \* A description of all easements serving or burdening any portion of the condominium.**
- **6) Unless shown on the plans of the units, the location and dimensions of the vertical unit boundaries and the unit's identifying number.**
- **7) Unless shown on the plan of the units, the location with reference to an established datum, the horizontal unit boundaries, and the unit's identifying number.**
- **8) A description of any real estate in which the unit owners own an estate to be labeled as (lease hold real estate).**
- **9) The distance between non-contiguous parcels and real estate comprising the condominium.**
- **10) Location and dimension of limited common elements, including porches, balconies, patios, and other parking spaces, or other limited elements unless shown on plans.**

# Detail Requirements for Condominium Surveys

## – Plat (continued):

- **11) The plat shall clearly define the elevation datum used. The surveyor will set a permanent monument and show its location in relationship to the unit and its elevation on the plat. The plat may also show the intended location and dimensions of any contemplated improvements within the condominium. Any contemplated improvement must be labeled as either “shall be built” or “need not be built.”**
- **\* The location of easements and improvements are to shown only when requested by the client.**

## – Certification

- **1) The condominium plat shall contain a certification or declaration that the plat contains all the information required by Missouri Revised Statutes, Chapter 448-2-109 and the survey and plat are in compliance with the current Missouri Minimum Standards for Property Boundary Surveys.**

## Location of Improvements and Easements

- ✓ Improvements and Easements are to shown on the Survey when specifically requested by the client or required by ordinance.
- ✓ Improvements: Locate by a minimum of three dimensions all permanent structures having fixed foundations, concrete slabs, footings, in ground swimming pools, concrete or permanent walls and buildings. Dimensions are to be made perpendicular to straight property lines and radial to curved property lines.

## Location of Improvements and Easements

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- ✓ Easements: Easements shown on property boundary surveys shall be those shown on subdivision plats and any evidenced by record documents which have been delivered to the surveyor by the client.

## **Use of the Missouri Coordinate System 1983**

**– When required by law, ordinance or contractual agreement the surveyor shall utilize and show State Plane coordinates as follows:**

- All coordinates shall be based on the “Missouri Coordinate System of 1983”**
- The coordinates determined by the survey shall be based on a first or second order control station as defined in 10 CSR 30-4 or 4 CSR 30-18.**
- The one kilometer distance limitation in section 60.461 RSMo. is waived.**

# **Use of the Missouri Coordinate System 1983 NAD 83**

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- **The plat or corner document shall show a table or tie with grid bearings and distances or the relative positional tolerance of the coordinates in relationship to the control station.**
- **The plat or corner document shall show what control stations, the coordinates of the station, and the grid factor used.**
- **Only “Missouri Coordinate System of 1983” coordinates can be recorded on any public land record or deed.**

# Changes from 1994 to 2003 “Minimum Standards”

- ✓ Class of Property for Accuracy Standard moved from Definitions to Accuracy Standards section of CSR
- ✓ Material Variations definition revised to be clearer when the PLS is required to show them on Plat
- ✓ Term Legal Description changed to Property Description
- ✓ Accuracy Standard for Vertical Dimensions defined
- ✓ Requirement to show Ajoiners to surveyed parcel shall be noted on Plat
- ✓ Minor grammatical corrections and some reorganization
- ✓ Subdivision Survey definition added to standards

# Minimum Standards Checklist

## ALL SURVEY PLATS SHALL SHOW THE FOLLOWING:

- 1) Name of person for whom the survey was made
- 2) Date of the survey
- 3) Surveyor's seal with signature and date
- 4) Any additional sheets should include seal, signature and date
- 5) North arrow and reference to bearing system on each sheet with graphics
- 6) Lettering 0.08" or larger in height
- 7) Direction of all lines surveyed
- 8) Horizontal (ground) distances of all lines surveyed in feet or meters
- 9) All curved lines defined with minimum of two (2) elements: radius, central angle or length of curve
- 10) Distance and area dimensions representative of actual precision
- 11) Sufficient data to locate in the property (distance and direction) in USPLSS, recorded subdivision or other lines or points previously established
- 12) All controlling corners accepted or restored noted on plat
- 13) All monumentation noted as found or set
- 14) Written scale on plat; graphic scale for plats 8½ x 14 or larger
- 15) Any material variation between measured and record dimensions
- 16) Plat shall identify title documents for adjoiners as they appear of record
- 17) Accuracy from class of property being surveyed
- 18) Certification that survey is in compliance with Missouri Minimum Standards for Property Boundary Surveys



# Minimum Standards Checklist

## WHEN THE MISSOURI COORDINATE SYSTEM 1983 IS USED:

- 19) Name of first or second order control station used
- 20) Coordinates of control station (in meters)
- 21) Grid factor used
- 22) Table showing traverse connection with grid bearing to control station or statement of relative positional tolerance of coordinates (in meters) obtained

### ADDITIONAL REQUIREMENTS FOR RESURVEYS:

- 23) Semi-permanent monuments at all exterior corners
- 24) Show material variations between surveyed boundary lines and lines of possession or previous surveys and exterior corners

### If surveyed from recorded document:

- 25) Show or reference source of boundary description

### If surveyed from non-recorded document:

- 26) Quote description on plat

### ADDITIONAL REQUIREMENTS FOR ORIGINAL SURVEYS:

- 27) Semi-permanent monuments at all exterior corners
- 28) Show or reference the record source of the parent parcel
- 29) Show property description of parcel created

# Minimum Standards Checklist

## WHEN THE MISSOURI COORDINATE SYSTEM 1983 IS USED:

### ADDITIONAL REQUIREMENTS FOR SUBDIVISION SURVEYS:

#### The Recorded Plat Shall Show:

- 30) Semi-permanent monuments at all exterior corners
- 31) Two permanent monuments per block
- 32) Semi-permanent monuments at all lot corners. Front corners may be monumented by notches or crosses. All monuments shall be set within twelve (12) months from date recorded.
- 33) Show or reference the record source of the parent parcel

### REQUIREMENTS FOR CONDOMINIUM SURVEYS:

- 34) Name of condo
- 35) Schematic of entire condo
- 36) Recorded location of original condo plat
- 37) Location and dimension of property not being developed and location of existing improvements
- 38) Legal description of property being developed
- 39) Extent of any encroachments
- 40) Location of all easements
- 41) Unless shown on plans, the following:
  - Location and dimension of vertical unit boundaries
  - Location and dimension of horizontal unit boundaries
  - Unit identifying number

# Minimum Standards Checklist

## WHEN THE MISSOURI COORDINATE SYSTEM 1983 IS USED:

### REQUIREMENTS FOR CONDOMINIUM SURVEYS (continued):

- 42) Location and dimension of limited common elements
- 43) Definition of elevation datum
- 44) Location and elevation of bench mark used
- 45) Required monumentation

### LOCATION OF IMPROVEMENTS - (WHEN REQUESTED)

- 46) Permanent structures located by:
  - Minimum of three dimensions
  - Dimensions perpendicular to straight lines
  - Dimensions radial to curved lines

### LOCATION OF EASEMENTS - (WHEN REQUESTED)

- 47) Easements shown on subdivision plat
- 48) Easements shown on other recorded documents and provided to surveyor by client

### USPLSS CORNERS RESTORED OR REESTABLISHED

- 49) Permanent monuments set for GLO corners and filed with the Land Survey Program

1/6/04

A spiral-bound notebook with a light brown, textured cover and a dark brown border. The spiral binding is on the left side. The text is centered on the cover.

# Test on Minimum Standards

Five Minutes

# Minimum Standards Test

✓ 1. The PLS is only required to sign, seal and date the 1st the sheet of a multi page survey document.

✓ False

✓ 2. Minimum Standards require the PLS to produce a plat only for original surveys.

✓ False

✓ 3. If special circumstances make it impractical to comply with all the requirements of the Minimum Standards the PLS shall not include any certification on his plat.

✓ False

# Minimum Standards Test

- ✓ 4. The PLS is required to indicate material variations between deed and survey dimensions on the plat of a surveyed parcel. ✓ True
- ✓ 5. The PLS is not required to show controlling corners either set or found on the final plat. ✓ False
- ✓ 6. Semi permanent monuments are required for the exterior corners of a subdivision. ✓ True
- ✓ 7. A 5/8" x 24" iron bar with a plastic cap is considered a permanent monument. ✓ False

# Minimum Standards Test

- ✓ 8. The relative positional accuracy requirement of 0.10' or 1:20,000 for distances greater than 2,000' (urban accuracy) is calculated at the 2 sigma (95%) confidence level. ✓ False
- ✓ 9. When the PLS is required or requested to determine Mo. State Plane Coordinates on the survey corners of any subdivision, re-survey, new parcel of the USPLSS he is required to note the coordinates in NAD 1983, show the 1st or 2nd order control station used, the scale factor and elevation factor utilized on the survey. ✓ False



# Minimum Standards Test

- ✓ 10. If the original survey plat prepared by the PLS meets the 0.08" size for lettering it is acceptable to photographically reduce the original plat prior to filing or recording it. ✓ False
- ✓ 11. Linear dimensions and area determinations should always be noted on the plat to a minimum precision of 0.01' or 0.001 m and 0.01 acre or 0.10 sq. ft. ✓ False



# Minimum Standards Test

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- ✓ 12. Original surveys creating new parcels shall have a property description included on the face of the plat or on an attached page. ✓ True
- ✓ 13. Encroachments or material variations between surveyed lines and lines of possession need not be noted on the final plat if requested by the client. ✓ False

# Minimum Standards Test

✓ 14. All permanent and semi-permanent monumentation for lot and block corners need not be set when the final plat is recorded, but must be set within 18 months of the recording date of the plat.

✓ False

✓ 15. Record documents for parcels adjoining the surveyed property shall be researched and noted on the plat of survey.

✓ True

# 2006 Missouri Minimum Standards

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- ✓ End of Program
- ✓ Questions
- ✓ Discussion
- ✓ Power Point Presentation available at [www.dnr.mo.gov/geology/lnsrv/](http://www.dnr.mo.gov/geology/lnsrv/)