



**MISSOURI STANDARDS**  
**63<sup>RD</sup> ANNUAL MEETING**  
**MISSOURI SOCIETY OF PROFESSIONAL SURVEYORS**

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October 23, 2020  
 Presented By: Ron Heimbaugh, PLS

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### Presentation Outline

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- History of Standards for Property Boundary Surveys
- Missouri Standards for Property Boundary Surveys
- Survey Plat Checklist
- United States Public Land Survey Corners
- Checklist for Corner Documents



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### History of Standards

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- 1964: Missouri Association of Registered Land Surveyors (MARLS) adopted survey standards, 1½ pp
  - Information to be shown on the plat
  - Monument corners with iron pins
  - Lists accuracy requirements for field work
- 1973: Missouri State Land Survey Authority - State Surveyor's Office – developed and adopted Missouri's first set of modern survey standards



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### History of Standards

- 1975: Original "Minimum Standards" are filed with Missouri Secretary of State, 5 pp
  - Definition of acceptable permanent monuments
  - Requires two permanent monuments per subdivision block
  - Publication of Results
  - Certification...Survey was executed in accordance with Current Minimum Standards
- 1982-1989: Minimum Standards are revised and filed 5 times by DNR
  - Advancement of surveying equipment

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### History of Standards

- 1993: Missouri Board for Architects, Professional Engineers, and Land Surveyors (APELS) issued set of Missouri Standards for Property Boundary Surveys and Real Property Reports
- 1994: Land Survey Program (LSP) and APELS jointly promulgate Missouri Minimum Standards for Property Boundary Surveys and all other Surveying Code of State Regulations
  - Standards for Property Boundary Surveys are not intended to replace professional land surveying judgment
  - Addition of the rule for the Use of the Missouri Coordinate System

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### History of Standards

- 2003: Minimum Standards revised and reissued by LSP & APELSLA
  - "Legal Description" is replaced with **Property Description**
  - Vertical datum shall be defined on plat
  - Identify adjoining as they appear of record

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## History of Standards

- 2017: LSP and APEPLSPLA jointly promulgate Missouri Standards
  - Elimination of the word **“Minimum”** from the title
  - Inserted a new section called **Deliverables**
  - Suburban accuracy standard renamed to **Rural** and redefined as everything not Urban
  - Note the **adjustment date** on the North American Datum of 1983
  - Include a brief statement of the **method used to obtain positions**

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## Current Missouri Standards Effective Date: June 30, 2017

**Title 2—DEPARTMENT OF AGRICULTURE**  
**Division 90—Weights, Measures, and Consumer Protection**  
**Chapter 60—Missouri Standards for Property Boundary Surveys**

PURPOSE: These standards provide the surveyor and recipient of boundary surveys with a realistic guideline for adequate survey performance

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## Application of Standards

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 registered with the board to perform land surveying services shall be familiar with and comply with these standards.

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### Application of Standards (Cont.)

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 PLS. This provision cannot be used to intentionally circumvent the basic tenet of these standards.

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### Definitions

**Condominium Survey** - A property boundary survey that creates and defines condominium property in accordance with Chapter 448, RSMo. (covers the requirements for condominium property)

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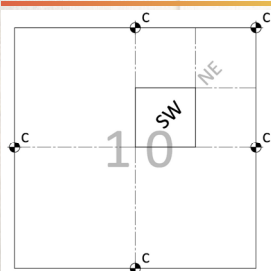
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### Definitions



**Controlling Corners** - Corners that determine the location of the exterior corners of the surveyed boundary

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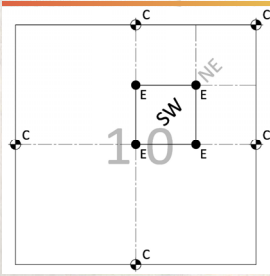
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### Definitions



**Exterior Corners** - Corners that define the shape and size of the parcel

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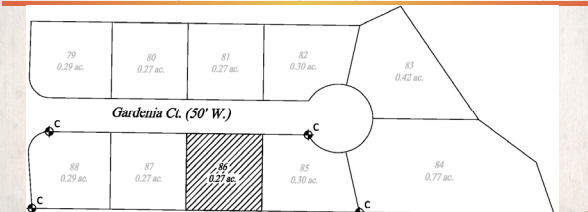
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### Definitions



**Controlling Corners**

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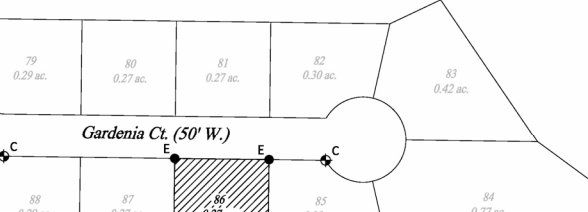
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### Controlling and Exterior Corners



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## Definitions

**Material Variations** - Differences between surveyed lines and lines of possession or measurement of record...in the professional judgment of the PLS, significant enough to warrant particular notice

**Physical Monument** - Natural or artificial objects which are accepted and used to mark boundaries and corners



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## Definitions

**Original Survey** - Survey which creates a new parcel, or parcels, out of a larger parent tract

**Original Survey (preliminary)** – Boundary adjustment plats, consolidation plats, riparian plats, lot splits, minor subdivisions, or any survey that creates a new parcel(s) for conveyance purposes. An original survey must accompany any property description creating a new parcel



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## Definitions

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

**Property Boundary Survey** - Any survey that creates, defines, marks, re-marks, retraces, or re-establishes the boundaries of parcels of real property or the subdivision of lands



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## Definitions

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

**Record Title Boundaries** - The limits of real property ownership as evidenced by one or more written means of real property transfer which have been entered into the public records

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## Definitions

**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
- Can be reduced with care in measurement, but can never be completely eliminated.
- Algebraic sign of the error is unpredictable (usually expressed as  $\pm$ )

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## Definitions

**Systematic Errors** - Errors in measurement that conform to mathematical and physical laws and remain the same under set conditions

Systematic errors are detectable and can be minimized by:

- Ensuring proper adjustment of equipment
- Applying appropriate corrections to observations
- Using appropriate observation techniques

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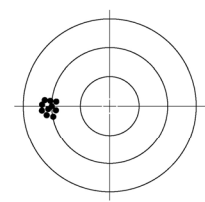
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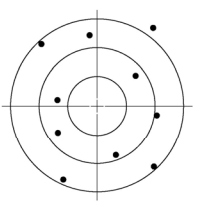
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### Definitions



**Systematic Error**



**Random Error**



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### Definitions

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**Rural Property** - Any property that is not urban property

**Subdivision** - A property boundary survey that partitions land into two or more parcels by platting the divisions of land in accordance with Chapter 445



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### Definitions

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**USPLSS Corners** - Points that determine the boundaries of the various subdivisions of the USPLSS such as Township corner, Section corner, Quarter-section corner, Grant corner, and Meander corner

**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



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## General Land Surveying Requirements

### Records Research:

- Survey shall be based on the property description of the parcel or parent tract taken from the public records
- PLS shall acquire sufficient data to ascertain the record title boundary of the parcel(s)... (such as: adjoining deeds, maps, right-of-way plans, subdivision plats, original plats and notes, and subsequent surveys)
- Does not obligate the PLS to search entire chain of title

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## General Land Surveying Requirements

**Field Investigation:** The PLS or a person under their direct personal supervision shall -

- Search for monuments and accessories at controlling corners and any other physical evidence required to define the location of the exterior corners of the parcel surveyed (such as: location of streets, roads, lines of occupation, and parcel information)

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## General Land Surveying Requirements

### Field Investigation: (Cont.)

- Obtain appropriate and sufficiently redundant measurements to correlate all found evidence
- Evaluate the reliability of the evidence and monuments found and apply proper theory of location in accordance with surveying precedent
- Reach a conclusion on the location of the boundary and set monuments

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## General Land Surveying Requirements

### Monumentation:

- Establish semi-permanent or confirm existing monuments at every exterior corner, except for lines running along streams or lakes where witness monuments must be set along the connected sidelines
- 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 prolongation thereof

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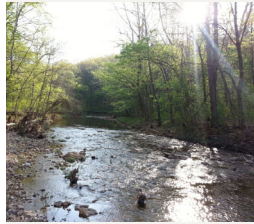
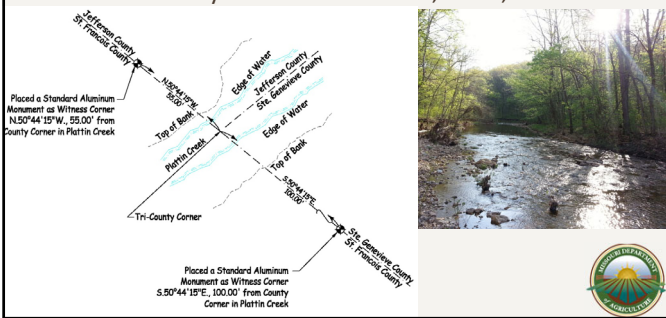
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### Good place for a Witness Corner...or two Tri-County Corner in Section 6, T38N, R6E




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Witness monument located 55 feet northwest of the  
Tri-County Corner along the St. Francois - Jefferson County Line




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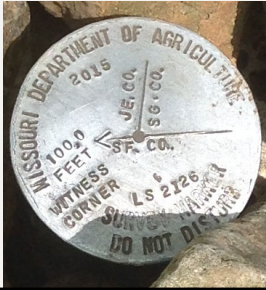
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Witness monument located 100.0 feet Southeast of the Tri-County Corner along Ste. Genevieve - St. Francois County Line



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### General Land Surveying Requirements

#### Monumentation: (Cont.)

- Existing monuments shall be evaluated for permanency by the professional land surveyor. Those needing restoration, preservation or replacement shall be restored in accordance with the requirements in these standards.



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### General Land Surveying Requirements

#### Additional Monumentation for Subdivision Surveys:

- Prior to recording subdivision plat, establish at least two permanent monuments for every four acres of land developed by the subdivision. An exception would be if the survey does not create more than four lots or parcels.



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### General Land Surveying Requirements

#### Additional Monumentation for Subdivision Surveys: (Cont.)

- Set permanent monuments prior to recording the plat or, if likely to be destroyed by construction, monuments may be installed upon completion of construction and no later than 12 months after recording the plat




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### General Land Surveying Requirements

#### Additional Monumentation for Subdivision Surveys (Cont.)

- All lot corners shall be monumented with semi-permanent or witness monuments within the same twelve month period
- When the subdivision is a cemetery, four permanent monuments per block shall be installed and the monumentation of all lot corners shall not be required
- Condominium surveys shall meet the requirements for subdivisions




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### General Land Surveying Requirements

**Publication of Results:** A plat shall be made showing the results of the survey or subdivision and shall conform to the following provisions:

- Plat shall include a drawing made to a convenient scale on reasonably permanent and dimensionally stable material
- Include the name of the person or entity for whom the survey was made and the date of the survey




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### General Land Surveying Requirements

**Publication of Results: (Cont.)**

- Lettering no less than 0.08" in height. All characters shall be open, well-rounded, and of uniform width
- Boundary lines shall be shown by angles, azimuths or bearings with the directional reference system clearly described on plat (e.g., Grid North, Geodetic North, etc.)
- North arrow, written scale and graphic scale shall be shown on every sheet containing graphic survey data

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### General Land Surveying Requirements

**Publication of Results: (Cont.)**

- 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 elements. For non-tangential curves, include directional component to define direction of curve (preferably chord bearing).

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### General Land Surveying Requirements

**Publication of Results: (Cont.)**

- Vertical measurements shall be shown as elevations above an established or assumed datum in feet or meters
- When elevations are shown, clearly define the elevation datum, the location of, and elevation of the benchmark
- Measurements and calculated areas will be shown on the plat to number of significant figures representative of the actual precision of the measurements

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### General Land Surveying Requirements

#### Publication of Results: (Cont.)

- Plat shall display either a property description for the parcel(s) and/or parent tract or reference the source document from which property description was taken
- Any new parcel created by survey shall have its property description shown on plat
- Subdivision plats shall identify all lots, per Section 445.010, RSMo.

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### General Land Surveying Requirements

#### Publication of Results: (Cont.)

- Plat shall show sufficient data (distances and directions) to locate parcel within the USPLSS, or within the recorded subdivision. If the survey cannot be located by either, it must be referenced to other lines and points established by record.
- All controlling and exterior corner monuments that were found or set shall be identified on plat.

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### General Land Surveying Requirements

#### Publication of Results: (Cont.)

- Any material variation between record and measured dimensions and between surveyed lines and lines of possession at all exterior corners shall be shown on the plat
- Plat shall reference the source document(s) for any pertinent data obtained during the records research
- Plat shall also reference property type (**Urban** or **Rural**)
- Plat shall identify record title documents for adjoining properties

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## General Land Surveying Requirements

### Publication of Results: (Cont.)

- In addition to the above, all condominium surveys shall show information required in section 448.2-109, RSMo, and descriptions of easements serving or burdening the condominium
- Include statement that survey, or subdivision, was executed in accordance with the *Missouri Standards for Property Boundary Surveys*
- Condominium plat shall also include declaration that plat contains all information required by section (448.2-109, RSMo.)

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## General Land Surveying Requirements

### Deliverables:

- Furnish to the client a plat containing the drawing and other pertinent information identified above
- Each sheet shall bear the signature and seal of the PLS in responsible charge
- 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 representatives

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## Accuracy Standards

- Surveyor shall make an effort to detect and remove systematic errors
- Systematic errors are defined as those errors whose magnitude and algebraic sign can be determined
- Systematic errors are present in all measurements where conditions depart from a standard either from the environmental viewpoint or in the adjustment of the measuring instrument

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### Accuracy Standards

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**Examples of Systematic Errors:**

- Applying the incorrect temperature and/or pressure corrections
- Using incorrect instrument heights and/or target heights
- Incorrect prism offset, or phase centers
- Prism pole out of adjustment
- Optical or laser plummet out of calibration

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### Accuracy Standards

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**The effects of systematic errors can be minimized by:**

- Properly leveling the surveying instrument and targets
- Balancing foresight and backsight observations
- Entering the appropriate environmental correction factors
- Entering the correct instrument heights, target heights, and prism offset
- Regularly calibrating surveying equipment

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### Accuracy Standards

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**Random errors**

“Random errors are those that remain in measured values after mistakes and systematic errors have been eliminated. They are caused by factors beyond the control of the observer, obey the laws of probability, and are sometimes called *accidental errors*. They are present in all surveying observations.”

From *Elementary Surveying*, by Paul R. Wolf and Charles D. Ghilani, 10<sup>th</sup> ed., p. 48

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## Random Error Theory

“The primary cause of random errors is the inability of the observer to make exact measurements. Although perhaps attempting to be exact, the observer will read, point, or otherwise respond somewhat to one side of the true value, sometimes to the other side, the errors varying in magnitude, and rarely if ever being zero. The algebraic sign of random errors is, by nature, plus or minus. Due to the accidental nature of random errors, small errors are more likely to occur than large ones.”

From *Surveying Measurements and their Analysis*, by R. B. Buckner, pp. 88-89

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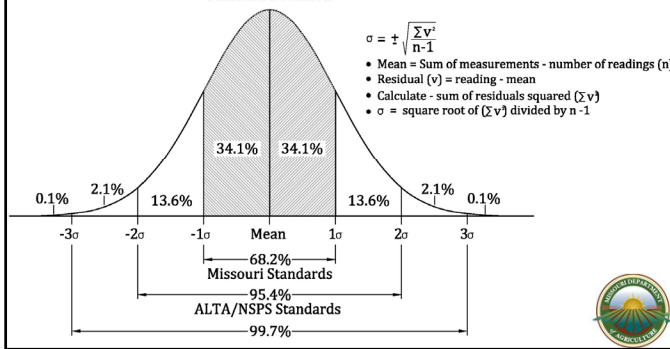
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Standard Deviation




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## Accuracy Standards

Parts Per Million (PPM) can be used to express:

- Instrument specification e.g. Hiper V – RTK H: 10 mm + 1 ppm
- Measurement of error due to temperature and atmospheric pressure
- Resulting error in measurement, based on comparison to another measurement or the mean of a group of measurements

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### PPM

Converting PPM to Ratio:  $50\text{ppm} = \frac{50}{1,000,000} = \frac{1}{20,000}$

Converting Ratio to PPM:  $\frac{1}{10,000} = \frac{x}{1,000,000}$   
 $x = \frac{1,000,000}{10,000} = 100\text{ppm}$




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### Accuracy Standards

Precision requirements for Urban Property:

- Uncertainty due to random error in *direction or distance* shown on the plat shall not exceed 50 ppm or 0.10 ft for distances less than 2,000 ft at the 68% confidence level (one sigma or  $\sigma$ )
- Positional uncertainty of any *coordinates* shown on the plat relative to the control that is held fixed, shall not exceed 50 ppm or 0.10 ft for distances less than 2,000 ft at the 68% confidence level (one  $\sigma$ )

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Uncertainty due to random errors  
 50 PPM or 0.10' for distances less than 2000'  
 50 PPM =  $50/1,000,000 = .00005$   
 At 68% confidence level (one sigma)

Direction or distance:  
 2400' x .00005 = 0.12' (or 0.12'/2400' x 1,000,000)  
 1000' x .00005 = 0.05' (Minimum 0.1')  
 400' x .00005 = 0.02' (Minimum 0.1')  
 1200' x .00005 = 0.06' (Minimum 0.1')

A 10 second error in the bearing along the north line will cause a 0.12' difference in the position of the northeast corner of this tract.




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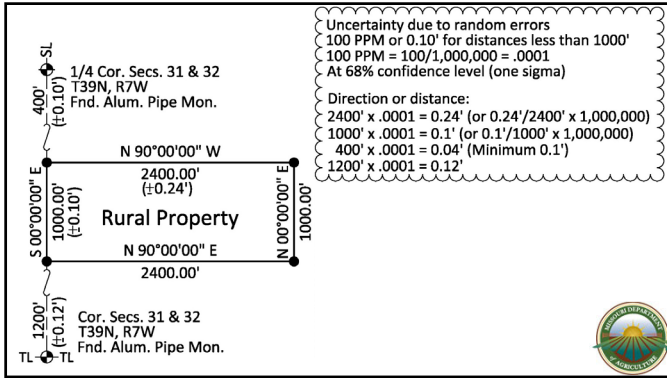
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### Use of Missouri Coordinate System of 1983

When the PLS is specifically requested or required to reference land boundary corners to the Missouri Coordinate System of 1983

- Position of corner shall be based upon a geodetic control station having a horizontal accuracy of second order (as defined in 20 CSR 2030-18) or higher order
- Survey connecting the corner to the geodetic control station shall meet the accuracy standards for property boundary surveys

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### Use of Missouri Coordinate System of 1983

The plat or other publication of results shall note the following:

- Geodetic control station(s)
- Coordinates for those control station(s)
- Appropriate adjustment date or realization designation on the North American Datum of 1983
- Epoch date when applicable
- Brief statement of the method used to obtain positions
- Grid factor used

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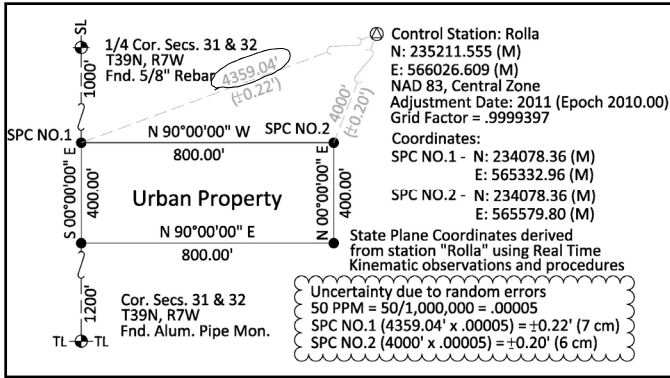
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### Approved Monumentation

- Select a type of monument providing a degree of permanency consistent with 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 encased in concrete

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### Approved Monumentation

- Except for drill holes and cut crosses, the precise position of the corner shall be marked by a point on a cap
- Cap shall be inscribed with the licensure number of the professional land surveyor in responsible charge, or corporate licensure number or name of the company
- A monument marking the location of a PLSS corner will be stamped to identify the corner

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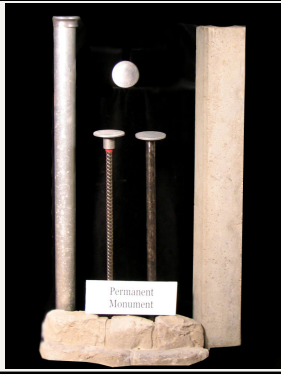
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### Permanent Monuments

- Concrete monuments 4" square or diameter by 24" long with a brass or alum. cap
- Commercial cast iron or aluminum survey markers no less than 24" in length
- Steel, coated steel, or aluminum rods 5/8" diameter by 24" long with a permanently attached cap
- Iron pipes 3/4" inside diameter by 24" long with a permanently attached cap
- Brass or aluminum disks not less than 2" in diameter and grouted or cemented into rock or concrete with magnet




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### S 1/4 Corner of Section 32, T46N, R10W



- 1816: Deputy Surveyor Robbins – Set post
- 1857: County Surveyor Bird – Stone
- 1882 & 1888: County Surveyor Halley – References corner




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### Semi-Permanent Monuments

- Iron pipe 3/4 inch outside diameter by 18 inches long with plastic or metal cap
- Steel or aluminum rods 1/2 inch diameter by 18 inches long with plastic or aluminum cap
- Cut "+" or drill hole in concrete, brick or stone paving
- In asphalt paving, cotton picker spindles, railroad spikes (center punched or chiseled cross), semi-permanent 1/2" rebar, and magnetic spikes (minimum of 8" in length) that are solid and not easily removed or destroyed




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### Location of Improvements and Easements

- When the PLS is specifically requested by the client to locate the improvements on the property surveyed
- 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 dimensions
- Dimensions shall be parallel, perpendicular or radial to the property lines




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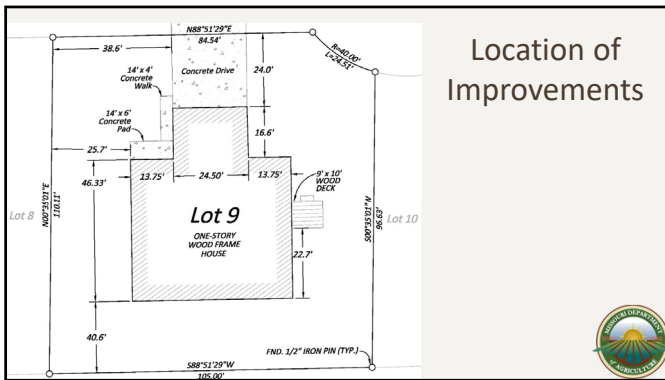
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### Location of Improvements




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### Location of Improvements and Easements

- When the PLS 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 surveyor by the client
- If requested by the client to locate any easements on the ground, he/she will do so in accordance with the standards




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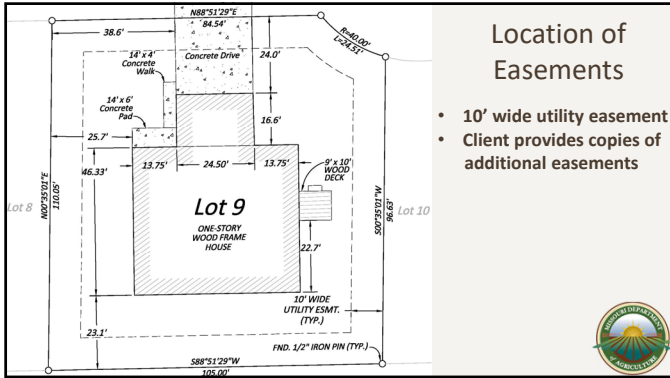
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### Location of Easements

- 10' wide utility easement
- Client provides copies of additional easements

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### SURVEY PLAT CHECKLIST GENERAL LAND SURVEY REQUIREMENTS

ALL SURVEY PLATS SHALL SHOW THE FOLLOWING:

- 1) Name of person 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

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### SURVEY PLAT CHECKLIST GENERAL LAND SURVEY REQUIREMENTS

- 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 benchmark used
- 10) Distance and area dimensions representative of actual precision
- 11) Show or reference source of boundary description
- 12) Show property description of parcel created

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**SURVEY PLAT CHECKLIST**

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13) Subdivision plats identify all lots  
 14) Sufficient data to locate the property (distance and direction) within the USPLSS, or within record subdivision  
 15) Identify all controlling corners and exterior corners found or set  
 16) Any material variation between measured and record dimensions and or between measured and lines of possession

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**SURVEY PLAT CHECKLIST**

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17) Reference source document(s) for pertinent data obtained in records research

**Survey and Deed References:**

- Private survey record by...from...archives noted as Book 13, Page 42
- Maries County Record Book 1, page 38
- Certified Land Corner Document 600-86212
- Missouri Land Survey Document 750-19433
- Maries County Deed Book 113, page 621

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**SURVEY PLAT CHECKLIST**

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18) Accuracy from type of property being surveyed (Urban or Rural)  
 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

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SURVEY PLAT CHECKLIST

TITLE BLOCK – 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)

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SURVEY PLAT CHECKLIST

TITLE BLOCK: (continued)

- 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
- 28) The printed name, discipline, and certificate of authority number of the corporation as defined in Section 327.011, RSMo

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SURVEY PLAT CHECKLIST

WHEN THE MISSOURI COORDINATE SYSTEM 1983 IS USED:

- 29) Name of first or second order control station(s) 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

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SURVEY PLAT CHECKLIST

ADDITIONAL REQUIREMENTS FOR SUBDIVISION SURVEYS:

- 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

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SURVEY PLAT CHECKLIST

ADDITIONAL REQUIREMENTS FOR CONDOMINIUM SURVEYS:

- 38) Name of condominium
- 39) Survey or general schematic map of entire condominium
- 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

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SURVEY PLAT CHECKLIST

ADDITIONAL REQUIREMENTS FOR CONDOMINIUM SURVEYS:

- 44) Unless shown on plans, note the following:
  - Location and dimension of vertical unit boundaries
  - Location and dimension of horizontal unit boundaries
  - Unit identifying number
- 45) Location and dimension of limited common elements
- 46) Statement that plat contains information required by Section 448.2-109

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**SURVEY PLAT CHECKLIST**

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LOCATION OF IMPROVEMENTS - (when requested):


47) Permanent structures located by:

- Minimum of three dimensions
- Dimensions parallel or perpendicular to straight lines
- 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

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**SURVEY PLAT CHECKLIST**

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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

Survey Plat Checklist:  
<http://agriculture.mo.gov/weights/landsurvey/>

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**Chapter 61**  
**United States Public Land Survey Corners**

Title 2—DEPARTMENT OF  
AGRICULTURE

Division 90—Weights, Measures and  
Consumer Protection

Chapter 61—United States Public Land  
Survey Corners

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### Missouri Revised Statutes Chapter 60

Lost corners, monumentation, procedure--violation deemed misconduct.  
60.321. For the purpose of perpetuating the corners of the United States public land survey, every surveyor who reestablishes a lost corner or restores an existent corner shall monument the corner and shall file an instrument showing such reestablishment or restoration with the Missouri department of agriculture, in accordance with the specifications and procedures adopted by the Missouri department of agriculture. Any surveyor who willfully and knowingly fails to perpetuate corners in accordance with this section is guilty of misconduct in the practice of land surveying.



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### Definitions

**Alteration of a corner:** Changing the physical monumentation of a corner or adding witness accessories

**Corners of the USPLSS:** Those points that determine the boundaries of the various subdivisions represented on the official plat such as the township, section, quarter-section, fractional section, center of section, grant, lot, and meander corners.

**Date of field work:** Date when monument was physically altered or removed and referenced



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### Definitions

**Existent corner:** A corner whose position can be identified by verifying the evidence of the original monument or its accessories, or by some physical evidence described in the field notes, or located by an acceptable supplemental survey record or some physical evidence thereof, or by testimony. The physical evidence of a corner may have been entirely obliterated, but the corner will be considered existent if its position can be recovered through the testimony of one (1) or more witnesses who have a dependable knowledge of the original location. A legally reestablished corner shall have the same status as an existent corner.



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### Definitions

**Lost corner:** A corner whose position cannot be determined, beyond reasonable doubt, either from traces of the original marks or from acceptable evidence or testimony that bears upon the original position.

**Monument:** The physical object which marks corner point determined by surveying process. The accessories, such as bearing trees and objects, reference monuments, stone mounds, and similar objects that aid in identifying the corner position, are also considered part of a corner monument.

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### Definitions

**Reestablishment of a corner:** The monumentation of a lost corner whose position has been determined by proportionate measurement.

**Reference monuments:** A monument set in such a manner and location that the position of the actual corner can be located from it by direction and distance or by two (2) distances when two (2) reference monuments are set

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### Definitions

**Removal of a corner:** The complete elimination of an existing corner monument .

**Restoration of a corner:** Alteration of an existent corner

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### Authorization for Removal/Alteration of Corners

- Only a PLS is authorized to remove, alter, restore or reestablish a corner of the United States Public Land Survey
- Any PLS who removes, alters, restores or reestablishes a corner of the USPLSS shall report his actions by filing approved document with the MDA, LSP within 90 days from the date of field work
- Permission required (60.550, RSMo) is granted upon filing the approved document with the MDA/LSP

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### Procedure for Filing Documents

- Approved documents shall be filed with the Department of Agriculture, Weights, Measures and Consumer Protection Division, Land Survey Program, PO Box 937, Rolla, MO 65402-0937
- Documents filed with the county recorder must first be filed with the Department of Agriculture
- Certified Land Corner Document and Resident Witness Affidavit forms may be obtained in a reasonable number from (address above)
- There is no fee for filing these documents.
- Filing of corner documentation with the Department of Agriculture does not create an implied warranty by the professional land surveyor or the Department of Agriculture as to conclusive evidence of the corner location.

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### Monumentation

- All corner monuments, witness monuments, and reference monuments shall be permanent monuments of a type providing a degree of permanency consistent with the adjacent terrain and physical features. Monuments shall meet the requirements for a permanent monument in accordance with the Missouri Standards for Property Boundary Surveys.
- If placement of a required corner monument at its proper location is impractical, it shall be permissible to set a reference or witness monument or mark near that point, and if such reference monument or mark is set, its location shall be properly shown on the certified land corner document.

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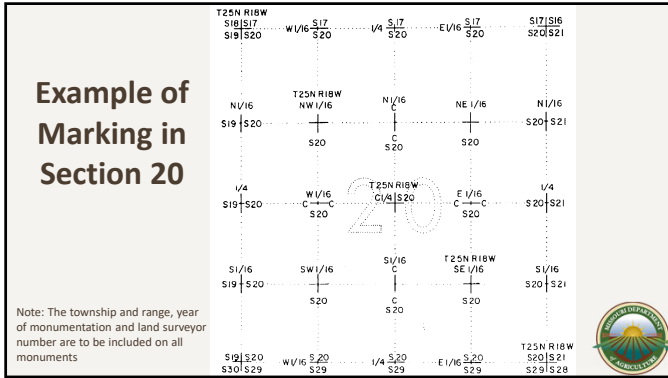
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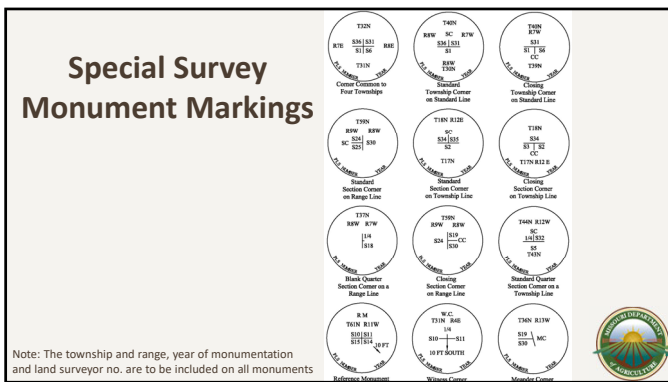
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### Monumentation

- Where possible, provide four reference ties (distance and direction) to durable objects to assist in restoring the position of the marked corner if the monument is disturbed. Durable objects include, but are not restricted to: house corners, marks on concrete structures or pavement, marks on ledge or bedrock, trees, additional permanent monuments, fence posts, utility poles, and crosses on curbs. All durable objects and reference ties shall be fully described on the document.

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### Monumentation

- In some special cases where an existing monument is found and it is deemed appropriate to preserve the monument in its original location, a reference or witness monument may be installed nearby.
- At locations where a stone, iron pin, pipe, or other monument is to be replaced by a permanent monument, the existing monument will be removed and buried or placed alongside the permanent monument in such a manner that it will not be confused with the permanent monument.

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### Missouri Coordinate System of 1983

- When the corner that is removed, altered, restored, or reestablished is required to be referenced to the Missouri Coordinate System of 1983, the corner coordinates shall be shown on the Certified Land Corner Document form.

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### Missouri Coordinate System of 1983

- Coordinates referenced to the Missouri Coordinate System of 1983 and shown on Certified Land Corner Document forms shall comply with the following requirements:
- The position of the corner shall be based upon a geodetic control station having a horizontal accuracy of second order (as defined in 2 CSR 90-62) or higher order;
- The survey connecting the corner to the geodetic control station shall meet the accuracy standards set forth in the Missouri Standards for Property Boundary Surveys; and

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### Missouri Coordinate System of 1983

- The following information shall be included on the Certified Land Corner Document form:
  - 1. The geodetic control station(s) that were used to determine the position of the corner;
  - 2. The coordinates of the geodetic control station(s) used and the appropriate zone designation;
  - 3. The appropriate adjustment date or realization designation on the North American Datum of 1983 along with the epoch date, when applicable;
  - 4. A brief statement of the method used to obtain the position; and
  - 5. The grid factor used

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### Missouri Coordinate System of 1983

#### Examples of the method used to obtain positions:

- Coordinates were established on a local control point using the National Geodetic Survey's (NGS) Online Positioning User Service (OPUS). Measurements were taken from the local control using Real-Time Kinematic (RTK) survey techniques to establish the State Plane Coordinates for this survey.
- State Plane Coordinates were derived from the Missouri Department of Transportation's Real-Time Network.
- State Plane Coordinates derived from a Real-Time Kinematic (RTK) Survey, utilizing Missouri Geographic Reference System control marks.

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### Missouri Coordinate System of 1983

- Coordinates referenced to the Missouri Coordinate System of 1983 may be used to reference corners in lieu of monuments.

FY2020: 1922 documents filed

- 69% Provided SPC
- 48% MoDOT RTN
- 11% OPUS
- 10% Passive control

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### Approved Documents

- An approved document may be any one (1) of the following:
  - Certified Land Corner Document form; or
  - Special form approved by the Department of Agriculture




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### Approved Documents

- Preparation of Certified Land Corner Document Forms. All information (except drawings) will be typed or completed in black ink. Lettering or typing shall not be less than 0.08" in height. Drawings may be made in black pencil so long as all drawings will make sharp and clear copies.
- The following information shall be included on all corner forms:
  - The **description of the original monument, witness ties**, and any **subsequent restorations**, including the **date of the survey**, the **document reference** (book and page and/or microfilm location) and the **professional surveyor of record**. Original survey notes need not be given in urban or built-up areas;




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### Approved Documents

- Signature and seal of the professional land surveyor
- Date of the survey field work
- Basis of bearing system used
- Description of the monument, monument marking, and witness/reference ties
- Comprehensive sketch of the corner location sufficient to find the monument
- Coordinates referenced to the Missouri Coordinate System of 1983, if known




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### Approved Documents

- Additional information for restored corners:
  - Description of the evidence found indicating the corner is existent
  - Resident witness affidavits, when corner is restored from testimony
  - Distance and directions used to retrace prior evidence




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### Approved Documents

- Additional information for reestablished corners:
  - Statement of the method used to reestablish the corner  
*Corner position reestablished by single proportionate measure from the Common Corner of Sections 10, 11, 14, and 15, to the Common Corner of Sections 11, 12, 13, and 14*
  - Distances and bearings used in the reestablishment procedure




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### FY 2020 Certified Land Corner Documents

1922 – Certified Land Corner Documents  
 320 – Corners remonumented through investigations and the County Surveyor/Private Surveyor CO-OP Programs




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## Common Mistakes

- Incomplete GLO and subsequent records
- Found evidence space left blank
- Corner description unclear
- No surveyor's seal and signature
- No courses shown on reestablishment documents
- No or incorrect date of adjustment
- Incorrect corner index number
- No bearing reference
- Old form

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### Land Survey

- Certified Land Corner Document [PDF](#) | [DWG](#)
- EDM Calibration Report EDM Baseline (Horizontal)
  - Cedar City [📄](#)
  - Dexter [📄](#)
  - Jasper County [📄](#)
  - Kirksville [📄](#)
  - Lake City [📄](#)
  - Perryville [📄](#)
  - Pomona [📄](#)
  - River Valley [📄](#)
  - Springfield [📄](#)
  - Squaw Creek [📄](#)
  - Taylor [📄](#)
  - Vichy Reversed [📄](#)
- Observation Log [📄](#)
- Horizontal and Vertical Control Recovery Form [📄](#)
- Surveyor Contract Qualification Questionnaire [📄](#)
- Plat Review Checklist [📄](#)
- Checklist for Corner Documents [📄](#)

## Checklist

select the Land Survey page...click on "Forms"...scroll down to "Land Survey"



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### CHECKLIST FOR CORNER DOCUMENTS

(Used with the MDA Land Survey Program)

<p>NAME OF SURVEYOR: _____ DATE OF FORM: _____</p> <p>REVIEWED BY: _____ DATE: _____</p> <p>CORNER LOCATION: TOWNSHIP: _____ RANGE: _____ INDEX NO. _____</p> <p><b>ALL CORNER DOCUMENTS SHALL SHOW THE FOLLOWING:</b> <b>312 302 2A</b></p> <p>1) Check box for restoration, reestablishment or reestablishment</p> <p>2) Lettering or typing not less than 1/8" in height</p> <p>3) Lettering or typing in black ink</p> <p>4) Diverge clear and sharp</p> <p>5) Description of original monument and accessories</p> <p>6) Description of any subsequent surveys</p> <p>7) Surveyor's seal with date and signature on front and back sheet</p> <p>8) Date of survey field work</p> <p>9) Book of bearing system used</p> <p>10) Description of existing or reestablished monument and accessories</p> <p>11) Comprehensive sketch of corner location (reference sheet)</p> <p>12) Check it is in accordance with MDC CSR 118.61.000</p> <p>13) True north-south, if known</p>	<p><b>RESTORATION OR ALTERATION OF EXISTING MONUMENT:</b> <b>312 302 2A</b></p> <p>13) Description of evidence found and used in restoration</p> <p>14) Restored witness affidavit</p> <p>15) Distance and direction used in restoration</p> <p><b>FOR REESTABLISHED MONUMENTS:</b></p> <p>16) Statement of method used to reestablish corner</p> <p>17) Distance and direction used in the reestablishment procedure</p> <p><b>VERY IMPORTANT! SEE INSTRUCTIONS</b></p> <p>18) Coordinates of corner to center</p> <p>19) Relative positional tolerance of coordinates obtained for corner monument</p> <p>20) Date of corner coordinates</p> <p>21) Proper grid factor used</p> <p>22) Coordinates of 1" and 2" Outer Control Station used</p> <p>23) Control station coordinate single input(s)</p> <p>24) Coordinates of control station(s)</p> <p>25) Date of adjustment or epoch date, if control station(s)</p> <p>26) Date of control station(s)</p> <p>27) Brief statement of the method used to obtain the position</p>
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## Land Survey Program

- Department of Agriculture
- Weights, measures and consumer protection
- [agriculture.mo.gov/weights/landsurvey](http://agriculture.mo.gov/weights/landsurvey)
- Land Survey Program  
1251A Gale Drive  
PO Box 937  
Rolla, MO 65402-0937  
Phone: (573) 368-2300  
Fax: (573) 368-2379  
Email: [landsurv@mda.mo.gov](mailto:landsurv@mda.mo.gov)

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**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:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**GENERAL LAND SURVEY REQUIREMENTS**

<b>ALL SURVEY PLATS SHALL SHOW THE FOLLOWING</b>	<b><u>YES</u></b>	<b><u>NO</u></b>	<b><u>NA</u></b>
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	_____	_____	_____
<b>TITLE BLOCK CHECKLIST – 20 CSR 2030 – 2.050</b>			
<b>The title block must, at a minimum, contain the following information</b>			
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	_____	_____	_____



	<u>YES</u>	<u>NO</u>	<u>NA</u>
43) Legally sufficient descriptions of all easements	_____	_____	_____
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			
_____	_____	_____	_____
_____	_____	_____	_____

# CHECKLIST FOR CORNER DOCUMENTS

(Filed with the MDA Land Survey Program)

NAME OF SURVEYOR: \_\_\_\_\_ DATE OF FORM: \_\_\_\_\_

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

CORNER LOCATION: TOWNSHIP: \_\_\_\_\_ RANGE: \_\_\_\_\_ INDEX NO. \_\_\_\_\_

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**ALL CORNER DOCUMENTS SHALL SHOW THE FOLLOWING:**    **YES**    **NO**    **NA**

- |   |       |       |       |
|---|-------|-------|-------|
| 1) Check box for restoration, establishment or reestablishment        | _____ | _____ | _____ |
| 2) Lettering or typing not less than 0.08" in height                  | _____ | _____ | _____ |
| 3) Lettering or typing in black ink                                   | _____ | _____ | _____ |
| 4) Drawings clear and sharp   | _____ | _____ | _____ |
| 5) Description of original monument and accessories                   | _____ | _____ | _____ |
| 6) Description of any subsequent surveys                              | _____ | _____ | _____ |
| 7) Surveyor's seal with date and signature on front and back sheet    | _____ | _____ | _____ |
| 8) Date of survey field work  | _____ | _____ | _____ |
| 9) Basis of bearing system used                                       | _____ | _____ | _____ |
| 10) Description of existing or reestablished monument and accessories | _____ | _____ | _____ |
| 11) Comprehensive sketch of corner location (reference ties)          | _____ | _____ | _____ |
| 12) Sketch is in accordance with MO CSR 2 90-61.080                   | _____ | _____ | _____ |
| 13) State coordinates, if known                                       | _____ | _____ | _____ |

**RESTORATION OR ALTERATION OF EXISTING MONUMENT:**    **YES**    **NO**    **NA**

13) Description of evidence found and used in restoration                                           

14) Resident witness affidavits           

15) Distance and direction used in restoration           

**FOR REESTABLISHED MONUMENTS:**

16) Statement of method used to reestablish corner            

17) Distances and directions used in the reestablishment procedure                                    

**WHEN COORDINATES ARE SHOWN:**

18) Coordinates of corner in meters            

19) Relative positional tolerance of coordinates obtained for corner monument                            

20) Zone of corner coordinates           

21) Project grid factor used            

22) Coordinates of 1<sup>st</sup> and 2<sup>nd</sup> Order Control Station used            

23) Control station coordinate origin (agency)            

24) Coordinates of control station(s)            

25) Date of adjustment or epoch date, of control station(s)                                              

26) Zone of control station(s)            

27) Brief statement of the method used to obtain the position