

**UTAH COUNCIL OF LAND SURVEYORS
MODEL STANDARD OF PRACTICE
FOR BOUNDARY SURVEYS**

By the Utah Council of Land Surveyors Committee on Boundary Survey Standards
Adopted by the Utah Council of Land Surveyors Executive Board August 14, 1999

Abstract: These Standards are meant to remind the practitioner what their duty is to themselves, other practitioners, the client, and the public. Standards not only provide threshold limits governing professional behavior and services but in the process reach for recognition through increased responsibility and foster appreciative public recognition of quality services. Further, that these standards may foster cooperation, trust, credibility toward quality services and establish some minimum and reasonable threshold below which discipline or liability should be expected.

This proposed standard is suggested as a model for adoption by municipalities, counties, state departments and local bodies of surveyors who practice Land Surveying within the State of Utah.

Section 1. INTRODUCTION

1. To provide for stability of position and security of title through proper location and delineation of real-property boundaries the Utah Council of Land Surveyors (UCLS) promulgates this proposed "Model Standard of Practice" for performing property boundary surveys for use by surveyors licensed to practice Land Surveying in the State of Utah. This standard recognizes the continual change taking place in land-information systems and surveying technology, and it accommodates various classical and modern surveying methods, whether ground-, aerial-, or satellite-based.
2. UCLS recommends this standard for all surveys relating to creation, establishment, retracement, or resurvey of property boundaries (including easements), whether for public or private lands. This standard provides for public needs such as:
 - a) Surveying, platting, and recording or filing documents to meet requirements of multipurpose cadastres, land-information systems, and statutes.
 - b) Properly describing newly created parcels, including easements.
 - c) Discovering and documenting gaps, overlaps, and encroachments for eventual resolution.
 - d) Setting new monuments to be readily located.
 - e) Surveying to prescribed accuracy for digital data bases for multipurpose cadastres, and for ready restoration and retracement of destroyed monuments.
3. This standard provides surveyors and recipients of a survey with guidance for surveying performance. Wherever this standard refers to a surveyor's duty, it is intended to include all persons who may actually perform tasks under the direction and supervision of the registered professional.
4. It is recognized that those who are dependent upon the Professional Land Surveyor have specific needs, peculiar to the services offered in the establishment, retracement, resurvey, mapping, perpetuation and documentation of property boundaries (including easements) as to matters which would be discoverable from a survey, inspection and other evidence found in the readily available public records. In the general interest of the public and the surveying profession the UCLS promulgate and set forth such details and criteria for standards. It is recognized that the general public is entitled to rely on the survey furnished to them being of the appropriate professional quality, both as to completeness and as to accuracy.
5. Federal, State and local regulations may exist which modify or enhance these standards. The more stringent requirement, when conflicting, should prevail.

Section 2. DEFINITIONS

1. Surveyors should refer to *Definitions of Surveying and Associated Terms* (1978) by the American Congress on Surveying and Mapping and the American Society of Civil Engineers. This is an authoritative source of definitions for surveying and mapping terminology.
2. The following terms are inadequately treated or not included in *Definitions* (1978) and are here defined:
 - a) **Positional Uncertainty** -- The uncertainty in location, due to random errors in measurement, of any physical point on a property survey, based on the 95% confidence level.
 - b) **Positional Tolerance**--the maximum acceptable amount of Positional Uncertainty for any physical point on a property survey relative to any other physical point on the survey, including lead-in courses.

Section 3. GENERAL PROCEDURES

1. Determine Scope

1. Surveyors should obtain sufficient information to understand the client's requirements and to define services. If more information is necessary, surveyors should advise clients that it must be obtained prior to determining the scope of services.

2. Evaluate Capabilities

1. Even though legally qualified by registration, surveyors are still responsible for determining that their own abilities meet special needs of the project. Surveyors must possess proper knowledge, experience, equipment, and resources to undertake contemplated projects, and should determine that their capabilities are adequate.

3. Estimate Cost and Time

1. It is advisable to inform clients before work starts of estimated costs, date when work could begin, and estimated time required to complete the project.

4. Initiate Agreement

1. Before beginning professional services for which payment is expected the surveyor and client should reach agreement to fix the scope of the surveyor's duty, fee basis, and time period involved. For mutual protection, agreement should be documented (e.g. memorandum, services letter confirmation or work ordered, or contract). The agreement may also establish extent of limitations of responsibility.
2. If previously unknown factors are discovered during work that will significantly affect either cost or completion schedule, the client should be informed in a timely manner.

Section 4. TECHNICAL PROCEDURES

1. Record Research

Surveyors should:

1. search real-property records of public agencies to obtain title and survey history of subject and relevant adjoining properties. Under the legal doctrine of constructive notice, the surveyor is obligated to make reasonable searches for relevant records. Surveyors having actual notice of other private records should make a reasonable effort to obtain them for consideration in the survey.
2. search for relevant title records which may include, but are not limited to, abstracts, deeds, title reports and opinions, easements and descriptions of neighboring properties. Abbreviated documents such as tax statements are produced for assessment purposes only and are not legal record documents of land ownership. Surveyors are not required to identify errors or omissions caused by defective or fraudulent title records nor are they required to give title opinions.
3. search for relevant survey records which may include, but are not limited to, original government survey field notes and plats, subdivision plats and certificates of survey, deed exhibits, corner recordation forms, and court and county surveyor's records.

2. Preliminary Research Analysis

Surveyors should:

1. examine documents to identify controlling corner monuments,
2. analyze the record data for deed misclosures, gaps, and overlaps, and
3. plan the procedure for performing the field survey.

3. Field Investigation and Survey

Surveyors should:

1. make a reasonable attempt to recover and identify monuments and other physical evidence controlling record boundary location,
2. consider extrinsic (e.g. parol) evidence of position of obliterated corners,
3. locate and describe (e.g. type, age) lines of occupation,
4. make necessary measurements, taking into account positional tolerance that must be achieved for the class of property being surveyed (refer to Section 5),
5. make sufficient check measurements to discover blunders and verify or validate other measurements, and
6. document all information and data collected in an appropriate, understandable form (e.g. field notes, affidavits).

4. Computations and Conclusions

Surveyors should:

1. determine geometric relationships between controlling corners and lines of occupation,
2. evaluate all data and evidence, compare field measurements with record information, determine sufficiency, and supplement with additional data and evidence as necessary (refer to Sections 4.1 & 4.3),
3. make a determination of facts relative to the position of corners to be created or re-monumented,
4. apply proper principles of location for corners in accordance with law or precedent, draw conclusions, and determine the position of lost corners,
5. attempt to resolve disagreements between conclusions and record values,
6. in the event of disagreement with another surveyor's measurements or monument positions, attempt to resolve by consultation,
7. set sufficient monuments to comply with law and to enable retracement of the survey (refer to Section 6), and
8. document the results of the survey. (refer to Sections 7 & 8)

Section 5. POSITION STANDARDS

1. Introduction

1. These Accuracy Standards address Positional Uncertainty and Minimum Angle, Distance and Closure Requirements Boundary Surveys. In order to meet these standards, the Surveyor may either: (1) compute the positional uncertainty for the physical points on the survey and assure that those uncertainties do not exceed their corresponding value in Table 1 for the "Positional Tolerances for Classes of Survey", or (2) apply the Table 2 requirements of "Minimum Angle, Distance and Closure Requirements for Survey Measurements Which Control Boundary Surveys" to the measurements made on the survey.
2. The lines and corners on any property survey have uncertainty in location which is the result of (1) availability and condition of reference monuments, (2) occupation or possession lines as they may differ from record lines, (3) clarity or ambiguity of the record descriptions or plats of the surveyed tracts and its adjoiners and (4) Positional Uncertainty.
3. The first three sources of uncertainty must be weighed as evidence in the determination of where, in the professional surveyor's opinion, the boundary lines and corners should be placed. Positional Uncertainty is related to how accurately the surveyor is able to monument or report those positions.
4. Of these four sources of uncertainty, only Positional Uncertainty is controllable, although due to the inherent error in any measurement, it cannot be eliminated. The first three can be estimated based on evidence; Positional Uncertainty can be estimated using statistical means.
5. The surveyor should, to the extent necessary to achieve the standards contained herein, compensate or correct for systematic errors, including those associated with instrument calibration. The surveyor shall use appropriate error propagation and other measurement design theory to select the proper instruments,

field procedures, geometric layouts and computational procedures to control and adjust random errors in order to achieve the allowable Positional Tolerance or required traverse closure.

6. If radial survey methods are used to locate or establish points on the survey, the surveyor shall apply appropriate procedures in order to assure that the allowable Positional Tolerance of such points is not exceeded.

2. Survey Classes by Land Use

1. The degree of precision and accuracy necessary for a particular property survey shall be based on the intended use of the land. If the client does not provide information regarding the intended use, it shall be based on the present use of the land.
2. The following four survey classes for Boundary Surveys are defined using land use classifications:
 - a) **Urban Surveys** - Surveys of land lying within or adjoining a city or town, and including commercial and industrial properties, condominiums, townhouses, apartments and other multi-unit developments, regardless of geographic location.
 - b) **Suburban Surveys** - Surveys of land lying outside urban areas and developed for single family residential use.
 - c) **Rural Surveys** - Surveys of land such as farms and other undeveloped land outside urban and suburban areas which may have a potential for future development.
 - d) **Mountain and Marshland Surveys** - Surveys of land normally lying in remote areas with difficult terrain and normally having a limited potential for development.

3. Computation of Positional Uncertainty

1. The Positional Uncertainty of any physical survey monument on a survey, whether the location of that point was established using GPS or conventional surveying methods, may be computed using a minimally constrained, correctly weighted least squares adjustment of the points on the survey.

4. Application of Minimum Angle, Distance and Closure Requirements

1. The combined precision of a survey can be statistically assured by dictating a combination of survey closure and specified procedures for a particular class of survey. ACSM, NSPS and ALTA have adopted specific procedures in order to assure the combined precision of a particular survey class. The statistical base for these specifications is on file at ACSM and available for inspection. The surveyor shall employ, in his or her judgement, proper field procedures, instrumentation and adequate survey personnel in order to achieve accuracies comparable to those adopted for a designated class of survey.

Table 1
Positional Tolerances for Classes of Survey

Urban Surveys	0.07 feet (or 20 mm) + 50 ppm
Suburban Surveys	0.13 feet (or 40 mm) + 100 ppm
Rural Surveys	0.26 feet (or 80 mm) + 200 ppm
Mountain Marshland Surveys	0.66 feet (or 200 mm) + 200 ppm

Table 2
Minimum Angle, Distance and Closure Requirements
for Survey Measurements Which Control Boundary Surveys
(See Note 1)

	Urban	Suburban	Rural	Mountain/Marshland
Direct Reading of Instrument (Note 2)	20" <1'>10"	20" <1'>10"	20" <1'>20"	1' <1'> 1'
Instrument Reading Estimated (Note 3)	5" <0.1'> NA	10" <0.1'> NA	NA	NA
Number of Observations Per Station (4)	2 D&R	2 D&R	1 D&R	1 D&R
Spread from Mean of D&R Not to Exceed (5)	5" <0.1'> 5"	10" <0.2'> 10"	20" <0.3'> 20"	30" <0.5'> 30"
Angle Closure Where N = No. of Stations Not to Exceed	10" \sqrt{N}	15" \sqrt{N}	20" \sqrt{N}	30" \sqrt{N}
Linear Closure (6)	1:15,000	1:10,000	1:7,500	1:5,000
Distance Measurement (7)	EDM or Double tape With Steel tape	EDM or Steel tape	EDM or Steel tape	EDM or Steel tape
Minimum Length of Measurements (8), (9), (10)	(8) 81m, (9) 153m, (10) 20m	(8) 54m, (9) 102m, (10) 14m	(8) 40m, (9) 76m, (10) 10m	(8) 27m, (9) 51m, (10) 7m

Note (1) All requirements of each class must be satisfied in order to qualify for that particular class of survey. The use of a more precise instrument does not change the other requirements, such as number of angles turned, etc.

Note (2) Instrument must have a direct reading of at least the amount specified (not an estimated reading), i.e.: 10" = Micrometer reading theodolite, <1'> = Scale reading theodolite, **10" (boldface)** = Electronic reading theodolite, 20" (*italic*) = Micrometer reading theodolite, or a vernier reading transit.

Note (3) Instrument must have the capability of allowing an estimated reading below the direct reading to the specified reading.

Note (4) D & R means the Direct and Reverse positions of the instrument telescope, i.e., Urban Surveys require that two angles in the direct and two angles in the reverse position be measured and meaned.

Note (5) Any angle measured that exceeds the specified amount from the mean must be rejected and the set of angles re-measured.

Note (6) Ratio of closure after angles are balanced and closure calculated.

Note (7) All distance measurements must be made with a properly calibrated EDM or Steel tape, applying atmospheric, temperature, sag, tension, slope, scale factor and sea level corrections as necessary.

Note (8) EDM having an error of 5mm, independent of distance measured (Manufacturer's specifications).

Note (9) EDM having an error of 10mm, independent of distance measured (Manufacturer's specifications).

Note (10) Calibrated steel tape.

Section 6. MONUMENTATION

1. Each and every corner on the boundaries of the parcel or tract of land being surveyed should be monumented. Where monuments exist but are not of a durable material they should be replaced. In such cases where the placement of a required monument at its proper location is impractical, it is permissible to set a reference monument close by the point, and if such reference monument is set its location shall be properly shown on the plat of survey. When conditions warrant setting a monument on an offset, the location shall be selected so the monument lies on a line of the survey or on the prolongation of such line. Offsets should not be in fractional feet unless a physical obstruction affects their location.
2. Artificial monuments should be constructed of durable material capable of being detected by commonly used magnetic locators. Where practical, monuments shall be solid and substantially free from movement. These monuments shall have affixed thereto a cap or other device bearing the registration number of the surveyor in responsible charge, or the regular business name or the governmental agency legibly stamped or imprinted thereon. Unless extenuating circumstances dictate, the minimum size monument should be not less than 5/8 inch in diameter, the minimum length should be 24 inches.

Section 7. GRAPHIC REPRESENTATION OF LAND SURVEYS

1. Plats of Survey

Surveyors should:

1. complete and file plats or certificates with proper local authority, in accordance with Utah Code 17-23-17 or other local regulations,
2. prepare survey records on stable, durable media capable of reproduction, recording, digitizing, and permanent storage,
3. clearly and understandably portray conflicting monuments or property lines showing gaps or overlaps with adjoining properties and inform clients, of their existence,
4. show actual measured values on plats and certificates, to enable their future retracement. Values from the record should be shown in record units for comparison,
5. clearly indicate lines of occupation, and the extent of any encroachment relative to parcel boundaries, and
6. label adjoining properties with owner's name if known, include reference to documents of record.

2. Survey Certification

Surveyors should:

1. Identify the record legal descriptions of the parcels being surveyed giving reference to the recordation information (i.e. Book, Page and Entry Number) of the document relied upon for the record description,
2. when establishing new boundaries not previously of record, include reference to the parent parcel description together with the description of the created parcel. Include a description of the remainder of the parent parcel if known, and

3. when preparing a composite description of several surveyed parcels, identify the record legal descriptions of the parcels (See paragraph 1 above) and include a statement of purpose for the composite in the narrative of the survey.

3. Survey Narrative

Surveyors should:

1. explain and identify the purpose of the survey and its intended use such as, construction of improvements, determination of encroachments, transfer of ownership, parcel division, etc.,
2. clearly indicate two existing monumented fixed points of reference relied upon for the basis of bearings defining the orientation for the lines of the survey,
3. include reference to documents of record relied upon for preparation of the survey,
4. include methods of interpretation of deed elements and physical evidence upon which conclusions were reached, and
5. indicate the theory of location for corners utilized to resolve record conflicts and to draw conclusions in accordance with law or precedence (refer to Section 4.4).

4. Legal Descriptions

Surveyors should:

1. include a sufficient caption, body, and where applicable, augmenting and qualifying clauses when preparing a legal description,
2. state clearly the relationship between the real property being described and the survey control or basis of unique location,
3. state clearly the basis of bearings or language which otherwise makes definite the method of direction and orientation for the lines of the subject property being described and the survey control related thereto when applicable,
4. make full and complete citation to maps, plats, documents, and other matters of record, fact or pertinence, which are intended to be incorporated into and made a part of the legal description by reference thereto,
5. call for complete and detailed descriptions of physical monuments, both natural and artificial, such as to facilitate future recovery and to enable positive identification,
6. when appropriate, incorporate either directly or by citation, sufficient data to enable a check of mathematical closure for the subject property being described, and
7. affix their validated land surveyor's seal to the legal description.

Section 8. CORNER RECORDATION

Surveyors should:

1. file a written record in accordance with Utah Code 17-23-17.5 for each government corner used as control unless the record currently reflects the existing conditions,
2. set a monument of durable quality witnessed by at least four reference monuments when rehabilitating a government corner,
3. set a witness monument wherever the nature of the ground will not allow the setting of a monument at the exact corner,
4. carefully describe the monument and all references including their bearings and distances,
5. include the state plane coordinates of the corner pursuant to Utah Code 57-10, Utah Coordinate System, if known, and
6. utilize a form which portrays the information in a clear fashion as suggested on the attached monument recordation form.