

- (1) The subject tract shall be researched to ensure the correctness of the record evidence;
- (2) All abutting tracts shall be researched to ensure the correctness of the record evidence;
- (3) Record evidence of tracts other than the subject tract and abutting tracts shall be examined, or additional information sought, which might relate to the property lines and corners being surveyed whenever necessary;
- (4) In the absence of sufficient record evidence substantiating the property lines and corners being surveyed, attempts shall be made to obtain evidence from unrecorded sources;
- (5) When the property lines and/or corners being surveyed are defined by a specific elevation or coordinates, the description of monuments referencing the vertical and/or horizontal datums upon which the survey is based shall be obtained;
- (6) Preliminary conclusions as to the completeness of data shall be formulated and any inconsistencies in the record information shall be reconciled;
- (7) The consistency of the data shall be tested by plotting and compiling the appropriate record information; and
- (8) A field investigation shall accompany the record research and evaluation, if appropriate.

PART Lan 503 TECHNICAL STANDARDS

Lan 503.01 Terminology. Terminology used in these standards shall be defined herein or when not defined herein shall refer to the 1978 (rev.) edition of "Definitions of Surveying and Associated Terms" as prepared by a joint committee of the American Congress on Surveying and Mapping and the American Society of Civil Engineers.

Lan 503.02 Definitions. The following definitions shall apply:

- (a) "As-built survey" means a survey performed to detail the horizontal and vertical positions of the physical improvements of all or part of a tract, parcel or lot of land.
- (b) "Construction survey" means a survey to position on the ground physical structures and/or improvements that have been designed for a particular tract of land.
- (c) "Dilution-of-precision value" (DOP) means a measure of the accuracy of the readings based on the dispersion of the visible GPS satellites.
- (d) "Elevation mask" means the cut-off angle for tracking satellites, set at 15 degrees above the GPS receiver's horizon.
- (e) "Farmland and woodlot surveys (F)" means surveys of property of unimproved or improved lands used as farmland, woodlots, or wetlands, surveys of land which lie in remote, sparsely populated areas with difficult terrain, or both.
- (f) "Field notes" means the permanent detailed record made by a surveyor as he is in the process of establishing a boundary.

(g) "Geoid model" means the hypothetical surface if water reacted to gravity alone, over the entire surface, used as a base datum for determining heights.

(h) "Global positioning system (GPS) survey" means any survey in which the location of property features, for whatever purpose, are primarily measured using observations of radio signals transmitted from satellites in a GPS. This survey includes all equipment and procedures from the planning stage to the reporting of final results.

(i) "Land title survey" means a survey that conforms to the requirements of a particular land title insuring agency or "Minimum Standard Detail Requirements for ALTA/ACSM Land Title Surveys", adopted 2005 edition American Congress on Surveying and Mapping and the American Land Title Association.

(j) "Least squares" means a mathematical method of the adjustment of observation, based on the theory of probability.

(k) "Line of possession" means a line defined by physical evidence of occupation.

(l) "Linear misclosure" means the straight-line bearing and distance error by which a survey traverse loop fails to close.

(m) "Loop closure" means the comparison to the elements of a polygon of the positional measurements of a survey traverse whose successive instrument set-ups form a loop.

(n) "Monument" means a physical object, natural or artificial in nature, which marks the location of a corner or other survey point.

(o) "Observation rate" means the stipulated short period of time between each of the downloads to storage from a GPS receiver's microprocessor, also known as the sampling rate or data interval.

(p) "Plat" means a plan drawn to scale showing all essential data pertaining to the boundaries and subdivisions of a tract of land, as determined by survey.

(q) "Root collar" means that portion of a tree which is above ground and below the elevation at which the tree becomes merchantable or cylindrical.

(r) "Rural surveys" or (R) means surveys of property that lie outside urban and suburban areas.

(s) "Sideshot" means a reading or measurement from a survey station to locate a point which is not intended to be used as a base for the extension of the survey.

(t) "Standard property survey" means a survey of boundary, easements, rights of way and/or leases performed with research, field survey and analysis of all factors affecting and influencing the location of the boundaries, easements, rights-of-way, and leases of record, within or immediately surrounding the tract, parcel or lot.

(u) "Statistical accuracy data" means results of the comparison of differences between the observed positions and those derived as elements of a network of polygons, using statistical analysis.

(v) "Survey classification" means a specific survey type based upon the location and/or use of the site to be surveyed.

(w) "Topographic survey" means a survey to determine the configuration, relief or elevation of a portion of the earth's surface, including the location of natural and/or man-made features thereon.

(x) "Urban, suburban, industrial, commercial, condominium and multi-unit residential surveys (U)" means surveys of property lying within or adjoining a developed area of a city or town.

Lan 503.03 Survey Requirements.

(a) When the parcel is a condominium, the survey shall meet the requirements of RSA 356-B:20.

(b) Construction surveys shall include but shall not be limited to the layout of structures and physical improvements.

(c) Although not considered surveys of real property, construction surveys shall adhere to the minimum technical standards as outlined in Lan 503.06, Specifications.

(d) For a survey to fall under the "farm or woodlot survey" classification as outlined in Table 500.1, Survey Classification, Precision and Accuracy, the property shall be 10 acres or greater in area, shall be bounded by physical evidence, and shall have limited potential for development at the time of the survey.

(e) A standard property survey plat shall show all data required for a complete and accurate description of the land which it delineates.

(f) Standard property survey specifications, as outlined in Lan 503.06, Specifications shall apply to locate, monument, plat, determine the area or volumes, and prepare a land parcel description of a tract, parcel or lot of real property or easement. Standard property surveys shall include the location of lines of occupation and any possible encroachments.

(g) Standard property surveys shall include but are not limited to the following:

- (1) Lot survey;
- (2) Subdivision of land;
- (3) Lot line revision;
- (4) Lot line elimination;
- (5) Line survey;
- (6) Boundary line agreement;
- (7) Physical evidence survey;
- (8) Easement survey;
- (9) Monumentation survey; and
- (10) Establishment or re-establishment of political boundaries, or both.

(h) Topographic survey specifications, as outlined in Lan 503.06, Specifications shall apply when gathering relevant information that will be represented on a topographic or existing conditions plan.

Lan 503.04 Classifications of Real Property Surveys. Every survey of real property in this state shall fall under one of 3 classifications. These classifications and minimum requirements shall be as specified in Table 500.1, Survey Classification Precision and Accuracy.

Table 500.1 Survey Classification, Precision and Accuracy

SURVEY CLASSIFICATION	U for Urban- Suburban Industrial	R for - Rural-	F-for Farmland Woodlots
	Commercial		
	Condominium		
	Multi-unit residential		

PRECISION MEASUREMENTS (conventional closed traverse)

Unadjusted Linear Misclosure	1:10,000	1:5,000	1:300
Min. Scale Graduation of Instrument	20 sec.	30 sec.	1 deg.
Distance Measurement	EDM/Steel tape	EDM/Steel tape	Steel tape/stadia
Elev. Used to Determine Property Lines	0.2' +/-	0.5' +/-	n/a

ACCURACY MEASUREMENTS (GPS survey or survey adjusted using least squares)

Minimum positional tolerances of land property corners computed least squares adjustment at the 95% confidence level as set forth in appendix b of the Geometric Geodetic Accuracy Standards and Specifications For Using GPS Relative Positioning Techniques, Federal Geodetic Control Committee.

	U (urban)	R (rural)	F (farmland)
Local Accuracy of directly occupied corners	0.05 ft (1.7cm) + 1:10000	0.25 ft (8cm) +1:5000	1.6 ft (50cm) +1:300

Local Accuracy of
control supporting
the survey 0.03 ft (1cm) + 1:10000 0.13 ft (4cm) + 1:5000 0.66 ft (20cm) + 1:300

Lan 503.05 Specifications. The minimum specifications per Lan 503.06 shall be adhered to for all surveys of property within this state.

Lan 503.06 Applicable Specifications. The following minimum applicable specifications shall apply to all survey classifications unless listed below:

(a) All survey field work including GPS work shall be performed with methods of practice and equipment capable of attaining the tolerances as specified in Table 500.1, Survey Classification Precision and Accuracy providing for:

- (1) Elimination and reduction of known systematic errors and mistakes;
- (2) Sufficient redundancy to clearly state that the accuracy requirements have been achieved;
- (3) Analysis of field procedures and data processing to achieve the accuracy and precisions; and
- (4) Documentation verifying compliance with these standards.

(b) All survey instruments shall be kept in good repair, close adjustment, and operated according to manufacturers' specifications.

(c) All steel tapes and electronic distance measuring devices shall be routinely compared to a distance traceable to the National Bureau of Standards. A record of these comparisons shall be maintained by the surveyor.

(d) All pertinent information, measurements, and observations made in the field during the course of the survey shall be recorded as field notes in (e) below. Computer printouts of raw data downloaded from an electronic data collection device shall be considered a form of field notes.

(e) All field notes shall indicate:

- (1) Location;
- (2) Street names;
- (3) Client;
- (4) Instruments;
- (5) Date;
- (6) Field crew;
- (7) Weather conditions; and

(8) Purpose of field work.

(f) Searches for evidence believed to be ferrous or magnetic in nature shall be conducted with a magnetic or metal detector when evidence is possibly buried or not visible.

(g) Survey traverses shall be based on a bearing system determined from astronomic observations, GPS observations, or from geodetic monuments incorporated into the traverse. If neither method is practical the survey shall be based on a magnetic bearing observed with a compass having a scale permitting interpolations to one-half of a degree. An alternate method shall be orientation of the survey to an existing survey. Except for farmland surveys, angle measurements of the field traverse shall be repeated 2 or more times and each set of angular measurements shall be made with the telescope both in the direct and inverted by 180 degree position.

(h) Sideshots from the traverse to monumentation or other physical features controlling the position of a property line shall be minimized. Except for farmland surveys, angle measurements to those points shall be repeated 2 or more times. Distance measurements to those points shall not be greater than 100 feet when measured with a steel tape. Precision of measurements from the traverse points to sideshot points shall be a minimum of half the horizontal scale reading with distance measured to the hundredth of a foot. The exceptions to this shall be stone walls and fence posts which may be measured to the nearest tenth of a foot, and centerline and edges of water bodies which may be measured to the nearest foot.

(i) When feasible, vertical data shall be referenced to the North American Vertical Datum of 1988, or to the National Geodetic Vertical Datum of 1929.

(j) When vertical data is required, a minimum of 2 benchmarks shall be established on the subject tract. Benchmarks set as nails in trees shall be placed at the root collar of the tree and not the usable portion of the tree.

(k) The establishment of benchmarks shall be done with care and sufficient redundancy to ensure that the elevations are accurate and reproducible. Whenever possible and practical, a minimum of 2 known benchmarks shall be included in all level runs. All level runs shall either begin and close on separate known marks, or shall be a closed loop beginning and ending on the same known mark. Benchmarks shall be established by differential leveling using an instrument equipped with an automatic compensator or spirit level vials. The misclosure tolerance between benchmarks shall be $0.05'$ square root of M where M is the one-way distance in miles. The misclosure tolerance of a closed loop shall be $0.04'$ square root of M where M is the distance of the loop in miles.

(l) If a benchmark set or maintained by a government agency is utilized, and if that government agency seeks input from the public sector regarding the status of such monument, then a report, following the agency's guidelines, on the condition of the mark shall be submitted to the agency.

(m) Compass and tape methods may be used provided that the property lines shall be predominantly bounded by physical evidence, and shall possess a minimum number of angle points. Compass surveys shall be performed with compasses having a scale permitting interpolations to one-quarter of a degree. When compass surveys are employed, traverse lines shall be observed both as a foresight and a backsight. Taping shall be accomplished by use of a standard steel tape and corrected for slope.

(n) All topographic surveys shall be referenced to a vertical control system comprised of closed level loops.

(o) Grid lines for detailed cross-section work shall be closed and tied to the control system.

(p) Secondary traverses or level loops shall begin and end at points on the control system.

(q) When aerial photogrammetry is to be used to compile a topographic map the horizontal and vertical photo control points shall be incorporated into the horizontal and vertical control system.

(r) Measurements to physical features or improvements shall be taken with a precision compatible with the detail being located as follows:

(1) Linear measurements shall be taken to the nearest foot when locating feature such as:

- a. Streams;
- b. Ditches;
- c. Wetlands;
- d. Poles;
- e. Pavement;
- f. Curbing;
- g. Ledge outcrops;
- h. Boulders;
- i. Manholes;
- j. Catch basins;
- k. Culverts; and
- l. Signs;

(2) Horizontal and vertical angles to the features shall be taken to the nearest minute;

(3) Elevations shall be taken to the nearest hundredth of a foot on building floors, manhole curbing, pipe inverts, pavement; and

(4) Natural ground elevations and water levels shall be taken to the nearest tenth of a foot.

(s) Measurements shall be taken to a precision compatible with the construction tolerances for the project.

(t) Construction layout monuments shall be of a type and character and set in a manner so as to provide a degree of permanency consistent with the terrain, physical features and intended use. Sufficient monuments and offset information shall be provided to enable the user to check the accuracy of any points or lines established there from. Any stakes that show offsets and/or cut and fill data shall also show

sufficient information to identify the horizontal position of the points to which they refer.

(u) All buildings, structures, or foundation layouts shall have the perimeter closed, or in the case of a rectangle, the diagonals measured.

(v) Accuracies and classification of GPS surveys shall be as specified in Lan 503.04 Table 500.1, Survey Classification Precision and Accuracy.

Lan 503.07 Metric System. The metric system of measurement may be used to measure or report any dimension, area or volume required by a survey. When the metric system is used, the technical standards established herein shall be translated to metric equivalents.

Lan 503.08 Monumentation Of Boundary and Subdivision Surveys.

(a) Monuments shall be set so that upon completion of the boundary and subdivision survey, each corner of the property will be physically monumented.

(b) When it is impossible or impractical to set a boundary monument on a corner, a reference monument shall be set, similar in character to a boundary monument, on the line of the survey or a prolongation of such. When an offset monument is set, it shall be clearly identified as such on the plat.

(c) Every boundary or reference monument set shall be composed of a durable material and set in a fashion to assure permanence. A permanent monument shall be any mark or marker which, if left undisturbed, will remain recoverable and identifiable, in place for a period of at least 25 years.

(d) Monuments shall include but not be limited to the following:

(1) Iron rod or iron pipe, 1/2" diameter minimum, marked with the license number or name of the surveyor;

(2) Bound made of concrete or stone, minimum 4" x 4";

(3) Drill holes or other identifiable marks in stone or concrete; or

(4) Brass or aluminum disc, 2" diameter, at a minimum.

(e) Adequate monuments shall not be disturbed. Inadequate monuments may be replaced with a well set and substantial monument. Double monuments shall be avoided whenever possible. The monument being replaced shall be noted in the field notes and on the plat, if one is prepared. When an inadequate monument is remonumented, the adjacent land owner(s) shall be notified.

Lan 503.09 Plats.

(a) For results of a survey where a plat is prepared, the plat shall be drawn on reproducible medium. The plat shall identify the tract or parcel and contain enough information so that the boundaries of the parcel of interest can be located with certainty in the future by a competent land surveyor.

(b) As appropriate to the purpose of the survey, a survey plat shall contain but not be limited to containing the following:

(1) The municipality, date, scale, bar scale, and description or purpose of the

plan;

- (2) The name and address of the company and or individual which prepared the plat, or both, and the name and seal of the licensed land surveyor;
- (3) Owner of record with mailing address, assessor's parcel number, and title reference;
- (4) Meridian arrow and origin with the date of observation or reference plat;
- (5) Vicinity map;
- (6) Bearing and horizontal distances on all pertinent property lines;
- (7) Curved boundary lines showing radius, delta, and length;
- (8) On non-tangent curves, a course and distance of the long chord shall be shown;
- (9) Irregular boundaries without curves, such as rivers or streams, or with curves which have no definable geometry, shall have sufficient information to mathematically close the plat;
- (10) Tie lines, when used, shall be noted that they are not property lines;
- (11) All monuments set or found, including monuments with tie lines on which establishment of the corners of the surveyed premises are dependent;
- (12) Monuments shall be described as to material, and the relation of the monument to the surveyed lines and/or corner;
- (13) Lines of possession where they affect the surveyed boundaries;
- (14) Abutters with title reference and assessor's parcel number;
- (15) Easement and right-of-way limits, references to easements and encumbrances of record, whether private or public, and evidence of any unwritten interests observed; to the extent that they have a physical effect on the land;
- (16) Revision dates and purposes;
- (17) Legend, unless symbols are clearly identified within the plat;
- (18) Man-made structures pertinent to the purpose of the surveyed project;
- (19) Plats and data relevant to the survey;
- (20) Any record evidence of a cemetery or burial ground shall be duly noted on the plat unless such cemetery or burial ground is located on the plat;
- (21) The area of the subject tract or parcel, expressed in acres, unless the area is less than 2 acres, in which case the area may be expressed in square feet;