Minimum Technical Standards for Practicing Land Surveying in the State of New York

Purpose of Minimum Technical Standards

The following Minimum Technical Standards (hereafter referred to as MTS) for Land Surveying in the State of New York have been created to safeguard the health, safety and welfare of the public and to maintain integrity and high standards of skill and practice in the surveying profession and to facilitate increased uniformity and ensure that surveys are performed and documented in accordance with best practices. All land surveyors shall consult with these MTS and be familiar with pertinent New York statutes, rules and regulations regarding the practice of the profession. The MTS shall:

1) Align with the Rules of the New York Board of Regents.
2) Serve as a frame of reference by both the public and practitioners as to what constitutes good practice.
3) Facilitate consumer awareness and knowledge on the part of users of the services of professional land surveyors.
4) Be used in conjunction with the exercise of proper individual skill, professional discretion, and good judgment in fulfilling the legal or contractual requirements of any survey.

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Section 1 - Definitions

Practice of Land Surveying: Per NYS Education Law, Article 145, Section 7203: The practice of the profession of land surveying is defined as practicing that branch of the engineering profession and applied mathematics which includes the measuring and plotting of the dimensions and areas of any portion of the earth, including all naturally placed and man- or machine-made structures and objects thereon, the lengths and directions of boundary lines, the contour of the surface and the application of rules and regulations in accordance with local requirements incidental to subdivisions for the correct determination, description, conveying and recording thereof or for the establishment or reestablishment thereof.

Land Surveyor: Only a person licensed or otherwise authorized under NYS Education Law, Article 145, Section 7204 shall practice land surveying or use the title "land surveyor".

Survey: The result of any professional service or work resulting from the practice of Surveying and Mapping as defined in the NYS Education Law, Article 145, Section 7203, directly supervised by a land surveyor currently licensed and registered in New York State, whether it is measured by direct or remote sensing methods and includes: Boundary Surveys, Topographic Surveys, Control Surveys, Construction Surveys, Environmental Surveys, and Specific Purpose Surveys.

Section 2 - Survey Types and Their Purpose

There are many types of surveys; the land surveyor shall confer with the client to determine the purpose of the survey required and the appropriate deliverables required. The specific type of survey shall be stated in the title of the map and/or noted as a statement upon the map. General types of surveys practiced in New York State are listed below. These survey types may also have specific requirements based on governmental regulations or policies.

Boundary Surveys

A Boundary Survey is any survey which maps, depicts, represents and/or marks upon the ground the boundary lines from title documents which define a parcel of land and the relationship of existing features upon the subject parcel and/or the adjoining parcels to the determined boundary lines.

The following list of survey types practiced in New York are considered to be Boundary Surveys:

- Boundary Surveys (Also known as Instrument Survey, Title Survey, Conveyance Survey, Mortgage Survey, Map of a Survey, Metes and Bounds Survey): The primary purpose of these surveys is to establish or retrace the boundaries of a parcel of land, to show the existing permanent features upon or along the boundaries of the parcel of land and to show the relationship between the two. These surveys are used for the legal conveyance of real property, certificates of occupancy and other purposes in which a map showing the relevance of existing features to the boundary of a parcel are required.
- Subdivision & Re-subdivision Surveys: A survey which shows the boundary of an existing parcel of land and proposes the geometric division of the parcel into two or more separate parcels. These surveys must comply with the New York State Real Property Law. They must also comply with the plans, policies, regulations, and standards of the review agencies which govern over the subdivision and re-subdivision of land.

- ALTA/NSPS Land Title Surveys: ALTA (American Land Title Association)/NSPS (National Society of Professional Surveyors) Land Title Surveys are boundary surveys which meet the special needs unique to title insurance matters. Although these surveys have their own set of published minimum standards which the survey must comply with, the survey must also comply with the minimum technical standards of New York along with the ALTA/NSPS Table "A" checklist of additional optional survey requirements that may be chosen by the client.
- Rights of Way (R.O.W.) and Route Surveys: Boundary Surveys performed for the acquisition and/or definition of rights of way or easements associated with real property.
- Easement Surveys: Define and identify the easement rights pertaining to a parcel of land and the property features associated with those easement rights as noted in title documents and/or as observed by the land surveyor in the field.
- Riparian and Littoral Surveys: *Riparian Surveys* define and identify the boundary of a parcel of land adjacent to or abutting water courses such as navigable streams and rivers. *Littoral Surveys* define and identify the boundary of a parcel of land adjacent to or abutting an ocean, sea or lake.

Topographic Surveys

A Topographic Survey identifies and maps the elevations and contours of the earth's surface and the existing natural and manmade features above, on or below that surface. Topographic surveys are generally utilized for land planning and quantitative purposes.

The following list of survey sub-types practiced in New York are considered to be a Topographic Survey, local terminology may vary:

- Mining Surveys: Measure, calculate and map existing features and contours of a mine for the purpose of ascertaining and documenting information at all stages from prospecting to exploitation and utilizing mineral deposits both by surface and underground work.
- Bathymetric Surveys: Measures and maps the depth of the bottom lands and contours below the surface of the water.
- Hydrographic Surveys: Measures and maps data relating to bodies of water, such as depth of water and configuration of the bottom; directions and force of currents; heights and times of tides and water stages; and location of fixed objects for charting and navigation purposes. The term may also be applied to the survey of drainage areas and proposed locations of reservoirs for the storage of water.
- Remote Sensing Surveys: Remote sensing is the process of detecting and monitoring the physical characteristics of an area by measuring its reflected and emitted radiation at a distance (typically from satellite or aircraft), including but not limited to:
    - Photogrammetric Surveys: Obtain spatial information from photographic images. Photogrammetrists analyze aerial and terrestrial photographs to obtain information about physical objects and the environment and create topographic mapping.
    - LiDAR: LiDAR which stands for Light Detection and Ranging, is a remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the Earth. These light pulses—combined with other data recorded by the airborne system—generate precise, three-dimensional information about the shape of the Earth and its surface characteristics. LiDAR is commonly used in practices such as:

    - Laser Scanning Surveys - Utilize laser technology for remote sensing to generate 2D civil or architectural drawings, 3D computer models, and final survey documents.
    - Drone/UAV (unmanned aerial vehicle)/UAS (unmanned aircraft systems) Surveys - Drones obtain spatial information to generate imagery and topography from photographic or LiDAR imaging.
- Flood Elevation Certificate Surveys: Determine elevations of a structure and the surrounding grounds and their relativity to FEMA (Federal Emergency Management Agency) determined base flood elevation for flood insurance rating purposes and for LOMA (Letter of Map Amendments).
- FAA (Federal Aviation Administration) 1A and 2C Certification Surveys: Determine and certify to the elevations and locations of telecommunications structures.

Control Surveys

Survey Control is the basis for all types of surveys and serves as the geometric framework for the survey being performed. As a result, the land surveyor shall perform sufficient measurements to ensure quality results appropriate to the project for which the control is being established.

A Control Survey's primary purpose is to establish physical points on the ground with published coordinate values, either horizontal, vertical, or both. Coordinate values can be on an assumed, local, or in a georeferenced datum. The results of a Control Survey can be published as a map, report or combination of both. Upon the map, or within the report, several key pieces of information shall be provided:

- Units of measure
- Datum
- If a georeferenced datum is used, scale factor and convergence values
- Level of precision and/or accuracy achieved
- Description of monumentation (size, type, stamping, etc.)

Methodology, precision and accuracy standards will be determined by client and project needs.

Construction Surveys

Construction Surveys include both pre-construction (layout) and post construction (as-built) services and data.

- Construction Layout: Surveys to establish design feature locations to assist in the construction of improvements. This can include horizontal and vertical positions, as well as, relative measurements for earthwork.
- As-Built Surveys: provide location, elevation and material information of constructed features as measured and observed by the land surveyor. This type of survey is generally required by the governing agency or municipality following construction. Specific requirements may vary depending on locality and project specific needs.

Environmental Surveys

Hazardous Waste Site Surveys: Hazardous waste site surveys are typically performed and may be perpetuated on a site that has been adversely impacted by hazardous substances.

Remediation Surveys: Remediation surveys include the mapping of the extent of contaminated areas defined by others and observations of areas that confine the spread of environmentally unwanted materials, consolidation and removal of contaminated soils, or covering of historical landfills for reclamation of the land.

Monitor Well Locations: Monitoring wells identify and track subsurface conditions. To ensure accuracy, the wells must be placed on a single horizontal and vertical datum for monitoring.

Wetlands Delineation: Wetlands are first delineated by a qualified professional. These delineated areas are then located and mapped by a land surveyor. They can be shown on their own exhibit or as part of another survey. A boundary survey may be required to show the relationship of the wetlands to the parcel of land.

Tree Location Surveys: Provide the location, type and physical attributes of trees located upon a parcel of land. Requirements vary according to the specific needs of the Tree Survey.

Specific Purpose Surveys

Any type of survey performed for a specific purpose that does not meet the definition of the survey types referred to herein due to unusual conditions that make it impracticable or impossible to perform one of these types of surveys. The purpose of the survey shall be clearly stated upon the map or a survey report and shall include an explanation as to why the survey does not comply with the requirements of the survey types referred to herein.

Section 3 - Research

Research for Boundary Surveys

The land surveyor shall perform due diligence in their research, maintain proper documentation in his/her records and provide field crews with information to search for and locate boundary and other pertinent information in the field. In order to provide a thorough and comprehensive survey, the client should provide the land surveyor with a current Abstract of Title or documents from a Title Search and any other pertinent documents or maps available. In the case that title documents were not provided to support the survey, the land surveyor shall request these documents from the client. In the event the land surveyor does not have the benefit of receiving title documents, the land surveyor shall place the following or similar language as a note on the map:

> "This survey was performed without the benefit of a current abstract of title or documents from a title search and is therefore subject to whatever state of facts that may be revealed in such reports."

When the above referenced research documents are not provided by the client, the land surveyor shall obtain at a minimum the following:

- Deed of record for subject parcel

- Adjoining deeds of record
- Filed maps and records pertinent to the property

For information only: It is realized that in certain localities, an accurate determination of the subject parcel's boundaries cannot be obtained without the aid of the survey records from the original land surveyor, or the entity that may hold said records. Therefore, if a land surveyor elects to practice in such localities where the original survey records are the only source to accurately retrace a property, the land surveyor should attempt to solicit the assistance of the entity that has said original records. The land surveyor or entity holding said original records should in turn be willing to cooperate with other land surveyors to provide a stable land tenure.

Research for Other Types of Surveys

The land surveyor shall perform due diligence in their research, maintain proper documentation in their records and provide field crews with information relevant to the specific type of survey being performed. The land surveyor shall make a concerted effort to acquire appropriate supporting documents and information to support the survey.

Section 4 - Procedures

The land surveyor, within the confines of the law, standards of the profession, and in consultation with or on behalf of the client, shall determine the appropriate technical criteria or standards and the level of effort necessary to support that criteria.

Field

Survey control and boundary points shall be located with sufficient redundant measurements to enable the detection of measurement blunders and ensure consistency which will result in precise measurements correlating with required accuracy. Other field data shall be collected with care and techniques consistent with the established criteria.

Office

Data acquired shall be reduced, adjusted, and analyzed as necessary, consistent with the technical criteria or standards to be met for the project.

Section 5 - Equipment

Fieldwork shall be performed with equipment that is technologically sufficient to support the technical criteria for the project; the equipment shall be capable of meeting the appropriate tolerance standards required for the project. Equipment used by the land surveyor shall be properly maintained, checked, calibrated, and documented to achieve measurements and results compatible with the intended use, required technical criteria and professional land survey standards.

Section 6 - Measurement Standards for Boundary Surveys

The following are basic measurement standards:

- Distance and Elevation – Shall be expressed in US Survey Feet and/or metric units and sub units of the same.

- Angles, azimuths or bearings shall be expressed in Degrees-Minutes-Seconds.
- If another standard of measurement is used, it shall be referenced as such and the conversion factor shall be noted. (i.e. decimal degrees, radians, chains, rods, poles, perches, local area standards.)

Classification of Survey by Land Use

The degree of precision and accuracy necessary for a particular survey shall be based upon the intended use of the land. If the client does not include information regarding the intended use, the classification of the survey shall be based upon the current use of the land.

The Classifications of Surveys are as follows:

1) Urban Surveys - Urban surveys are performed on land lying within or adjoining a city or densely populated town, and include commercial and industrial properties, condominiums, townhouses, apartments and other multi-unit developments, regardless of geographic location. All ALTA/NSPS Land Title Surveys are included in this classification.
2) Suburban Surveys - Suburban surveys are performed on land lying outside of urban areas and developed for single family residential use.
3) Rural Surveys - Rural surveys are performed on land lying outside of developed urban and suburban areas such as but not limited to farms and wood lots.

Relative Positional Precision Table

Classification of Survey	Acceptable Relative Positional Precision
Urban	0.07 feet plus 50 PPM
Suburban	0.13 feet plus 100 PPM
Rural	0.26 feet plus 200 PPM

Precision is given at the 95% confidence level.

For information only "Relative Positional Precision" as defined by ALTA/NSPS Standards (2016) : "Relative Positional Precision" means the length of the semi-major axis, expressed in feet or meters, of the error ellipse representing the uncertainty due to random errors in measurements in the location of the monument, or witness, marking any corner of the surveyed property relative to the monument, or witness, marking any other corner of the surveyed property at the 95 percent confidence level. Relative Positional Precision is estimated by the results of a correctly weighted least squares adjustment of the survey.

Section 7 - Monumentation for Boundary Surveys

Boundary monuments, physical or referenced, are evidence of the survey determinations made by the land surveyor and provide valuable evidence and information to the client, their agent, the general public and future land surveyors. The setting of boundary monuments allows the land surveyor's work to be retraced and perpetuated.

As part of a boundary survey, monuments representing property corners shall be recovered or set and shown upon the map, when a map is to be provided as part of the survey. The land surveyor shall bear in mind that when performing a boundary survey to these standards they shall set sufficient monumentation so as to physically and clearly define the determined property lines of the subject parcel on the ground, as well as to leave the survey retraceable.

When a map is to be provided as part of the survey, all monuments set or recovered shall be clearly described upon the map as to their type, material, condition and markings. Monuments set shall be made of durable material, shall be solidly embedded and shall include an element that is detectable by a device for finding ferrous or magnetic objects. Monuments set shall have the land surveyor's name (or firm name) and/or license number affixed thereto. In situations when a corner monument or witness monument to be set falls upon impervious materials such as masonry or metal surfaces the land surveyor shall set indelible marks upon these surfaces such as drill holes and/or magnetic nails or similar permanent markings. The land surveyor shall strive to make these marks enduring and retraceable.

In situations where a corner monument cannot be physically set:

- The land surveyor shall set an appropriate witness monument as a point on line (POL) or an extension thereof. The land surveyor shall use their professional judgement in deciding where and how to set witness monuments. When a map is to be provided as part of the survey, all witness monuments shall be noted as such on the survey map along with the offset distance to the property corner.
- In situations where a corner monument or witness monuments to the corners cannot be physically set, the land surveyor shall show upon the map, when a map is to be provided as part of the survey, at least three recoverable corner monuments and/or control points as close to the subject parcel as physically possible. The corner monuments and/or control points shall be set and shown upon the map in a manner that will allow others to retrace and geometrically tie into the boundary shown upon the map.
- The land surveyor shall place a note upon the map explaining why the monument could not be set.

Where an existing monument or multiple monuments are found to be in close proximity to the determined corner location, the land surveyor shall use their professional judgement and/or discretion when evaluating the relevance of said monuments to their boundary determination. Consideration shall be given as to the intent, procedures and equipment used during the time period that the existing corner monuments were established as part of the evaluation. When a map is to be provided as part of the survey, all found monumentation and boundary markers used and relevant to the boundary determination shall be shown upon the map with ties to the determined lines and/or corners. Generally, surveyors should not set multiple corner monuments or practice “pin cushioning” as this only adds confusion to interpretations and future boundary determinations.

Monumentation Along Natural, Man-Made Features and Public/Private Ways

In cases where a boundary line abuts or adjoins a natural or man-made feature and is directly correlated with said feature (such as, but not limited to, a riparian boundary, stonewall, fence line, top of bank, etc.), intermediate boundary monuments need not be set. These natural/manmade features shall be shown upon the map proportionally accurate for the scale used with the appropriate mathematical data to accurately reproduce said boundaries. At a minimum, a note shall be placed upon the map showing the

total distance along such feature with a tie course and distance between the terminuses of the intersecting adjacent lines.

In cases where a boundary line abuts or adjoins a public or private way and is directly correlated with said feature (such as, but not limited to, a highway, roadway, trail, utility corridor, etc.), intermediate boundary monuments need not be set (with the exception of Major Subdivisions). These public or private ways shall be shown upon the map proportionally accurate for the scale used with the appropriate mathematical data to accurately reproduce said boundaries.

Boundary Monumentation in New Subdivisions

As part of the creation of a new subdivision, permanent corner monumentation provides for stable land tenure and allows for the orderly erection of improvements by interested parties. The ability of the subdivision to be accurately retraced by future land surveyors is in the best interests of the general public. In the absence of more stringent local governmental standards, the following minimum monumentation requirements will control.

Minor Subdivisions (consisting of no more than four lots): Property monumentation will be in accordance with the above stated standards and include the setting of all new lot corners.

Major Subdivisions (consisting of more than four lots): In addition to the exterior bounds of the subdivision being monumented in accordance with the above stated standards, all directional changes along all sides of dedicated rights of way created by the subdivision shall be monumented.

Interior lots that will be affected by construction of infrastructure and buildings which may potentially disrupt or remove property monumentation within a Major Subdivision are not required to be set at the time of the initial subdivision. However, the Land Surveyor shall attempt to set as many corner monuments at the time of initial subdivision that in their professional opinion will endure through construction improvements. The specific amount of monumentation to be set at the time of the initial subdivision shall be determined and negotiated between the client and the Land Surveyor as a specific contractual agreement. The land surveyor performing the initial Major Subdivision is not bound to return to set these corner monuments unless it is agreed upon in contract.

Interior monuments that are not set at the time of the initial Subdivision shall be set at the time of the first conveyance of each interior lot after construction improvements have been completed in the area of the subject parcel.

Section 8 - Mapping Requirements for Boundary Surveys

All Boundary Survey maps shall include the following information and all such additional information necessary to visually convey the findings of the survey to the client or their agent, other knowledgeable practitioners and/or the public. All Boundary Survey maps must satisfy the following:

1) Orientation and Datum: A “North” arrow shall be shown with its orientation referenced to one of the following: assumed north, magnetic north with date, a grid reference, a map reference, a datum reference or a deed reference. If a reference datum is used it shall be noted as such upon the map with identification of the scale and any conversion factor necessary.

2) Location: The survey map shall show the following information relevant to the location of the subject parcel (when available):

    - Municipality, County and State
    - Street address
    - Tax map parcel number
    - Approximate distance to nearest intersecting street, intersecting rights of way or to other definite points

3) Measurement Standard: The boundary map shall note the relative positional precision class met as outlined in Section 6 (e.g. "This survey was performed in accordance with the NYS Minimum Technical Standards Section 6 Suburban class").

4) Minimum Geometric Dimensions: The boundary lines and pertinent interior lines shall contain all the data necessary to recreate the parcel being surveyed with mathematical correctness as a closed geometric figure. The area of the subject parcel shall be shown upon the map.

5) Surveyor Authorship: The name and license number of the land surveyor and the name and address of the surveyor's company, or company of employment, shall be shown upon the map.

6) Surveyor's Seal: All final survey maps and/or reports shall bear the land surveyor's professional seal and signature. Any final survey map and/or report without a signature and seal shall be considered not valid.

7) Scale: The survey map shall be drawn to scale and the scale shall be clearly labeled upon the map. Detailed diagrams graphically shown not to scale shall be noted as such.

8) Date: The date of the field survey, map completion and any subsequent field survey or mapping revisions shall be noted upon the map.

9) Reference to Documents: The survey map shall list all publicly recorded documents and or private records used to determine boundary lines, legal lines, rights of way, easements and encumbrances.

    All references to documents shall include (when available) sufficient information to locate said documents, such as:

    - Title of the map
    - Map preparer's name
    - Date of the map, last revision of the map
    - Drawing number
    - Filing information
    - Title document designation

10) Visible evidence or information obtained by the surveyor at the time of the field survey that may indicate a use on the parcel which could constitute a license or easement by prescriptive use (unwritten rights) shall be shown or noted upon the map.

11) Legal Description: The reference to the legal description for the subject parcel shall be shown on the drawing.

12) Real Property Improvements: Real property improvements which are pertinent to the purpose of the survey and are affixed or anchored to the ground shall be located and shown graphically upon the map. The relationship of these improvements shall be shown with perpendicular or cardinal direction ties to the closest property lines when appropriate for the purpose of the map. Depending upon the purpose of the survey, and the size and location of the subject parcel, certain survey maps may not require all interior improvements to be located and/or shown upon the map. If improvements remote from the property lines are shown, they should be plotted to a scaled position. The land surveyor shall become knowledgeable regarding the local and municipal governing requirements pertinent to the specific survey they are performing.

13) Occupation and Possession: The location and character of readily apparent evidence of occupation and possession which may affect the subject property shall be shown upon the map and shown with perpendicular or cardinal direction ties to the closest property lines when appropriate for the purpose of the map. All improvements within three feet of each side of the property lines of the subject property shall be shown with perpendicular or cardinal direction ties to the nearest property lines. Where improvements are located within an inaccessible area or on an adjoiner's property that is inaccessible, a note stating such shall be placed upon the map.

14) Measurements of Record: When the record measurement differs from the survey measurement, it shall also be shown upon the map with reference to the record measurement (including tie measurements from point of commencement).

15) Legal Lines of Streets and Rights of Way: Where legal lines of streets or rights of way are established by a municipality, they shall be shown. The width of the street or rights of way where established shall be shown.

16) Ties Between Separated Parcels: When two or more non-adjacent parcels are shown, ties shall be shown upon the map that geometrically connect said parcels.

17) Cemeteries or Burial Grounds: When apparent physical evidence of cemeteries or burial grounds are encountered, it shall be located and shown upon the map. When a record of cemeteries or burial ground is supplied, this information shall be noted.

18) Gores, Gaps and Overlaps: The survey map shall show all gores, gaps and overlaps discovered or revealed related to the subject parcel with a description of the situation as known to the land surveyor. Sufficient mathematical information shall be given to describe the gore, gap or overlap and tie it into the subject parcel's geometry.

19) Sub-surface Improvements: For sub-surface structures shown on the map, but not physically located, the map shall include a note citing the source of the information and a comment that they were not physically located.

20) Improvements Under Construction: If construction of any improvements shown on the survey map was apparently incomplete from exterior physical evidence at the time of the field survey, this fact shall be noted upon the map.

21) Special Conditions: If the premises were surveyed when the weather or other conditions might have concealed physical features or appurtenances, this fact shall be noted upon the map.

Required Map Notes (Hardcopy and/or Electronic)

The following notes or comparable notes shall be placed upon the survey drawing:

1) “Unauthorized alteration or addition to a survey map bearing a licensed land surveyor's seal is a violation of section 7209, sub-division 2, of the New York State Education Law.”
2) “Only boundary survey maps with the land surveyor's signature and seal are genuine true and correct copies of the land surveyor's original work and opinion.”

Certifications

The sole purpose of certifying a survey is to confirm the opinion of the land surveyor and that the map was prepared in accordance with the current existing NYS Minimum Technical Standards (MTS).

Section 9 - Survey Reports

A Survey Report, if prepared, shall provide the following:

1) Surveyor Authorship including**:** the name and license number of the land surveyor and the name and address of the land surveyor’s company, or company of employment, shall be shown upon the report.
2) The issued report shall bear the land surveyor’s professional seal and signature. Any report without a signature and seal will be considered not valid.
3) Narrative description of the project.
4) Detailed description of the procedures.
5) Record information used.
6) Survey data, calculation results, and/or findings and the basis of the findings.
7) Any maps or diagrams included in the report shall follow the map requirements listed above where applicable.