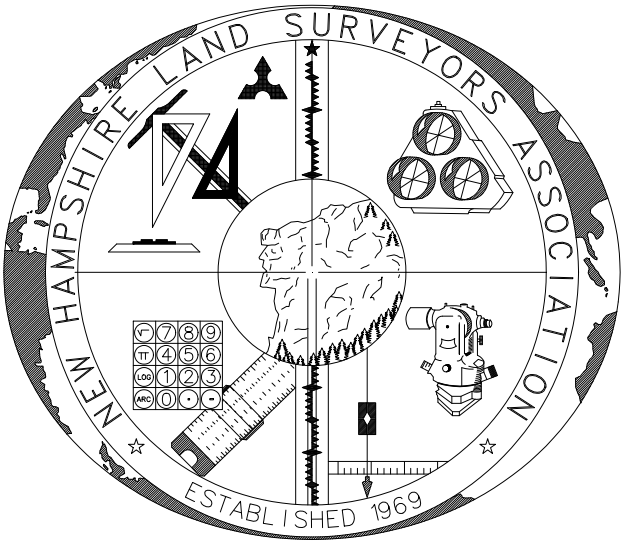


# ETHICS AND STANDARDS

NEW HAMPSHIRE LAND SURVEYORS ASSOCIATION

PREPARED BY:

ETHICS AND STANDARDS COMMITTEE
NEW HAMPSHIRE LAND SURVEYORS ASSOCIATION

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1989 ETHICS AND STANDARDS
NEW HAMPSHIRE LAND SURVEYORS ASSOCIATION

TABLE OF CONTENTS


| Section | | | Page |
|---|---|---|---|
| | INTRODUCTION | | |
| 1.0 | CODE OF ETHICS | | 200 |
| | 1.1 | Definitions | 200 |
| | 1.2 | The Licensed Land Surveyor and the Public | 200 |
| | 1.3 | The Licensed Land Surveyor and the Client | 201 |
| | 1.4 | The Licensed Land Surveyor and Each Other | 201 |
| | 1.5 | The Part-time Practitioner | 202 |
| 2.0 | RESEARCH STANDARDS FOR LAND SURVEYORS | | 203 |
| | 2.1 | Definitions | 203 |
| | 2.2 | Specifications | 203 |
| 3.0 | PROCEDURAL STANDARDS FOR LAND SURVEYORS | | 204 |
| | 3.1 | Definitions | 204 |
| | 3.2 | Field Investigation and Reconnaissance | 204 |
| | 3.3 | Field Survey | 204 |
| | 3.4 | Analysis | 204 |
| 4.0 | STANDARDS OF PRACTICE FOR THE SURVEY OF REAL PROPERTY | | 206 |
| | 4.1 | Definitions and Applications | 206 |
| | 4.1.1 | Definitions | 206 |
| | 4.1.2 | Category | 206 |
| | 4.1.3 | Condition | 206 |
| | 4.1.4 | Urban, Suburban, Industrial and Commercial | 206 |
| | 4.1.5 | Rural | 206 |
| | 4.1.6 | Farmland and Woodlots | 206 |
| | 4.2 | Minimum Requirements for Surveys of Real Property | 207 |
| | 4.3 | Specifications | 207 |
| | 4.3.1 | Standard Property Survey | 207 |


Table of Contents, cont'd.

4.3.1.1 Standard Property Survey, Category 1 Conditions 1 and 2 . . . . . 208
4.3.1.2 Standard Property Survey, Category 1 Condition 3 . . . . . 210
4.3.2 Land Title Survey, Category 2 . . . . . 211
4.3.3 As-Built Survey, Category 3 . . . . . 212

4.3.3.1 As-Built Survey Category 3, Conditions 1 or 2 . . . . . 212

4.3.4 Mortgage Survey, Category 4. . . . . 215

5.0 STANDARDS OF PRACTICE FOR TOPOGRAPHIC AND CONSTRUCTION SURVEYS . . . . . 215

5.1 Definitions . . . . . 215
5.2 Specifications . . . . . 215

5.2.1 Topographic Survey. . . . . 215

5.2.1.1 Topographic Survey Specifications. . . . 216

5.2.2 Construction Survey . . . . . .218

5.2.2.1 Construction Survey Specifications. . . . 218

6.0 MONUMENTATION OF SURVEYS . . . . . 220

6.1 Definitions . . . . . 220
6.2 Specifications . . . . . 220
6.3 Remonumentation. . . . . 221

7.0 PLATS . . . . . 221

7.1 Definition . . . . . 221
7.2 Specifications . . . . . 222
7.3 Certification. . . . . 223

# INTRODUCTION

The New Hampshire Land Surveyors Association, through its Ethics and Standards Committee, has prepared this revised compilation of standards which shall be used by Licensed Land Surveyors practicing in the State of New Hampshire. The Association first prepared its Ethics and Standards in 1972 and later revised them in 1981.

New Hampshire RSA 310-A:54,II defines a land surveyor as "a professional specialist in the technique of measuring land, educated in the basic principles of mathematics, the related physical and applied science, and the relevant requirements of law for adequate evidence and all requisite to the surveying of real property as herein defined." Additionally, New Hampshire RSA 310-A:54,IV defines the term "land surveying" to mean:

> "any service or work, the adequate performance of which involves the application of special knowledge of the principles of mathematics, the related physical and applied sciences and the relevant requirements of law for adequate evidence to the act of measuring and locating lines, angles, elevations, natural and man-made features in the air, on the surface of the earth, within underground workings, and on the beds of bodies of water for the purpose of determining areas and volumes, for the monumenting of property boundaries and for the platting and layout of lands and subdivisions of land, including the topography alignment and grades of streets and for the preparation and perpetuation of maps, record plats, field note records and property descriptions that represent these surveys."

The Ethics and Standards contained herein are the minimum standards to be observed. The standards listed are intended to be a guideline for survey practice. Other methods of survey may be acceptable if they meet the required accuracy and precision of the applicable category and condition. Where other required standards, or condition differ from them, the more stringent shall apply.

SECTION 1.0 CODE OF ETHICS

1.1 Definitions: The Code of Ethics defines the Licensed Land Surveyor's responsibility to and relationship with: the public, the client, and each other. Ethical behavior is not limited to matters covered explicitly in the Ethics; rather it is based on considerations of justice, courtesy, honesty, sincerity and dignity, associated with mutual interest between individuals, and it applies to all areas of professional and business activities. A Licensed Land Surveyor must apply the principles of ethics to all professional activities and shall insist that other surveyors and related professionals act in an ethical manner. Surveying standards include the standards of ethical conduct in no lesser degree than the standards of technical knowledge and performance. In all instances, the terms "he, him, his, they, their, theirs," shall be defined to mean both masculine and feminine forms of the pronouns. The Code of Ethics of the New Hampshire Land Surveyors Association is defined as follows:

1.2 The Licensed Land Surveyor and the Public:

In the relationship with the general public, the Licensed Land Surveyor will:

a) Undertake only those jobs for which he is qualified by education, training, and experience.

b) Not practice in any professional field in which he is not licensed or otherwise authorized to practice.

c) Limit public advertising to a description of the services available.

d) Make reasonable effort to secure right of entry permission from abutting property owners.

e) Report violations of the land surveying laws and/or ethics and standards to the New Hampshire Land Surveyors Association and/or the New Hampshire Board of Licensure for Land Surveyors.

f) Disclose any financial interest in any project presented for approval before any public agency.

g) Recognize that the practice of land surveying by a person, firm, co-partnership, corporation or joint stock association construed to practice or to offer to practice Land Surveying shall be under the direct charge and supervision of a land surveyor licensed by the State of New Hampshire.

h) Not sell or donate the use of his signature or seal to anyone.

i) Not affix his seal or signature to any plat, plan or document not prepared under his direct supervision. This supervision is direct hands-on access to project data and documents throughout the duration of the project.

1.3 The Licensed Land Surveyor and the Client.

In the relationship with the client, the Licensed Land Surveyor will:

a) Act for the client or employer as a finder of facts and will provide the most nearly correct answer to the problem involved.

b) Not accept or execute work on a contingent fee basis.

c) Advise the client of the level of precision most appropriate to the purposes of the survey. In the preliminary negotiations with the client and when estimating jobs, the surveyor shall indicate the procedures he proposes to use. The Licensed Land Surveyor shall also inform the client of the surveyor's obligations to society and parties beyond their contract, particularly with regard to corner monumentation and platting.

d) Avoid all conflicts of interest with his client or employer, but when a conflict is unavoidable, the Land Surveyor shall immediately inform his client or employer of any business association, interest, or circumstances which might tend to influence his professional judgement, decisions, or the quality of his services.

e) Be completely objective and truthful in all professional reports, statements or testimony.

f) Not perform any acts, allow omissions or make any assertions or representations which are fraudulent, deceitful, or misleading, or which in any manner tend to create a misleading impression.

1.4 The Licensed Land Surveyor and Each Other.

In his relationship with other Licensed Land Surveyors, the Licensed Land Surveyor will:

a) Not attempt to injure falsely or maliciously, either directly or indirectly, the professional reputation, prospects, or business of another.

b) Not contract for the completion or extension of another Licensed Land Surveyor's work until the prior surveyor has been consulted.

c) Cooperate with another Licensed Land Surveyor with an interchange of information where such interchange does not conflict with the confidential matters between the surveyor and the client. When a surveyor discovers a situation, which creates what he believes to be a discrepancy with a prior survey, it is recommended that he communicate with the previous surveyor and explain his objection and afford opportunity for discussion, explanation and correction.

d) Strive to encourage contracting on the basis of availability, qualifications, and other like criteria.

1.5 The Part-time Practitioner.

It is recognized that the Licensed Land Surveyor has the right to practice the profession on a part-time basis; however:

a) Any practice of land surveying by a person not qualified to do so is hereby condemned as an unlawful act against the public welfare.

b) The part-time practitioner must avoid conflicts of interest or the appearance of a conflict of interest.

c) Since the employer of a part-time practitioner may be held liable under law for the actions of the part-time practitioner, part-time practice (including record research and use of equipment and materials) must not be conducted at the expense, to the detriment, or without the knowledge of the part-time practitioner's employer.

d) Any part-time practitioner is bound by the same rules of ethical conduct and standards as any full-time practitioner, and must accept full responsibility and liability for all actions taken regardless of the compensation received.

## SECTION 2.0 RESEARCH STANDARDS FOR LAND SURVEYS

2.1 Definitions. A Land Surveyor assuming the responsibility of performing a land survey also assumes the responsibility for such research of adequate thoroughness to support the determination of the intended boundaries of the parcel surveyed.

2.2 Specifications. The research standards for surveying real property are as follows:

a) The subject tract shall be researched back to the origin of the tract whenever necessary.

b) All abutting tracts shall be researched as far back as practical to insure the correctness of the property lines and corners being surveyed.

c) Whenever necessary, record evidence of tracts other than the subject tract and abutting tracts shall be examined or additional information sought which may relate to the property lines and corners being surveyed.

d) In the absence of sufficient record evidence substantiating the property lines and corners being surveyed, a reasonable effort should be exerted to obtain evidence from unrecorded sources.

e) Proper research resources include, but are not limited to: current deeds, previous deeds, records of previous surveys, records of highways, records of railroads, records of easements, records of utilities, assessor's maps, topographic maps, aerial photographs, published information such as local histories, genealogies, and court records.

f) 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.

g) Preliminary conclusions should be formulated as to the completeness of data and reconcile any inconsistencies in the record information.

h) The consistency of the data shall be tested by plotting and compiling the appropriate record information.

i) A field investigation shall accompany the record search and evaluation, if appropriate.

## SECTION 3.0 PROCEDURAL STANDARDS FOR LAND SURVEYS

3.1 Definitions. Procedural standards for land surveys include the field investigation of information, field survey, and the later analysis of the information to draw conclusions.

3.2 Field Investigation and Reconnaissance.

a) The monuments and other physical evidence which control the survey shall be searched for in a methodical manner and their reliability weighed.

b) Sufficient check measurements shall be taken to correlate all found evidence.

c) When necessary, parol evidence shall be obtained from persons having significant knowledge of the property lines and corners controlling the survey. Affidavits shall be taken if appropriate.

d) Apparent encroachments, conflicts, protrusions and evidence of prescriptive or limitation rights upon the site shall be located. Comments on the possible age of possessions should be made and verified by parol evidence and/or other evidence.

e) Cemeteries and burial grounds observed within the subject tract shall be field located.

3.3 Field Survey.

See sections 4.3.1.1 through 4.3.1.3, 4.3.3.1, 5.2.1.1, and 5.2.2.1 for appropriate field procedure.

3.4 Analysis.

a) Computations shall be made to test the corrections of the measurements.

b) All evidence recovered shall be evaluated as to its agreement by description with the calls in the relevant record evidence.

c) Calculations shall be performed to aid in the correlation of recovered evidence and to aid in the search for additional evidence.

d) Conclusions shall be reached in accordance with the rules of evidence as to the location of lines and corners using the best available evidence.

e) The surveyor shall assemble all records used in the survey including but not limited to: the field notes, the final plats and research information, and provide for the adequate preservation of such information. Records shall be kept in a manner, which is intelligible to another surveyor.

f) The surveyor should research and familiarize himself on the historical development of surveying in the areas in which he practices including, but not limited to, prior surveying procedural standards, available records of surveyors and units of measurement.

## SECTION 4.0 STANDARDS OF PRACTICE FOR THE SURVEY OF REAL PROPERTY

### 4.1 Definitions & Applications.

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

4.1.2 Category: A unit dividing major professional services of a Licensed Land Surveyor into defined sections of similar nature, procedure and practice. There are four categories of surveys of real property:

1. Standard Property Survey
2. Land Title Survey
3. As-built Survey
4. Mortgage Survey

4.1.3 Condition: Each category is divided into three conditions. A condition is determined by the location and/or use of the site to be surveyed. A condition establishes the tolerances to be met for the survey of a particular tract, parcel or lot. The following conditions shall cover the surveying of all property within the state:

1. Urban, Suburban, Industrial & Commercial
2. Rural
3. Farmland & Woodlot

4.1.4 Urban, Suburban, Industrial & Commercial: Surveys of property lying within or adjoining a developed area of a city or town. Suburban land is generally used for single family residential use or residential subdivisions. This condition also includes the survey of commercial and industrial property, condominiums and multi-unit residential developments.

4.1.5 Rural: Surveys of property that lie outside the urban and suburban areas and can be considered as villages or hamlets.

4.1.6 Farmland & Woodlots: Surveys of property of unimproved or improved lands used as farmland, woodlots, or wetlands and/or surveys of lands which lie in remote, sparsely populated areas with difficult terrain. Said parcels may have limited potential for development at the time of the survey. The minimum requirements for the survey of real property under this condition shall

be permitted for land ten (10) acres or greater in area when predominantly bounded by physical evidence.

4.2 Minimum Requirements for Surveys of Real Property

| Condition: | 1 | 2 | 3 |
|---|---|---|---|
| Unadjusted Linear Closure | 1:15,000 | 1:7,500 | 1:300 |
| Min. Scale Graduation of Instrument | 20/sec. | 30/sec. | 1 |
| Distance Measurement | EDM/Steel tape | EDM/Steel tape | Steel tape/ stadia |
| Elev. Used to Determine Property Lines | 0.2′ +/- | 0.5′ +/- | ---------- |

4.3 Specifications.

4.3.1 Standard Property Survey: The purpose of a Standard Property Survey is to locate, monument, determine the area or volume, prepare a land parcel description, and plat a tract, parcel or lot of real property or easement. In addition, a Standard Property Survey is used to subdivide property and to establish or re-establish political boundaries.

The following types of surveys, but not limited to, are considered Standard Property Surveys:

Lot Survey
Subdivision of Land
Lot Line Revision
Lot Line Elimination
Line Survey
Boundary Line Agreement
Physical Evidence Survey
Easement Survey
Monumentation Survey

A Standard Property Survey is defined as sufficient 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. It shall also include the location of lines of occupation and any possible encroachments.

The guidelines as outlined in Section 2.0, Research Standards; Section 3.0, Procedural Standards; Section 6.0, Monumentation of Surveys; and Section 7.0, Plats; shall be adhered to. Additionally, the technical standards as listed below shall be followed as they apply to each specific condition.

4.3.1.1 Standards Property Survey, Category 1, Conditions 1 and 2

The technical standards for a Standard Property Survey, Category 1, Condition 1 (Urban, Suburban, Industrial, Commercial) and Condition 2 (Rural) are as follows:

a) All survey field work shall be performed with accepted methods of practice and equipment capable of attaining the tolerances specified by these standards.

b) All survey instruments shall be kept in good repair, close adjustment, and operated according to manufacturers' specifications or in compliance with textbook standards.

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 in an accepted field note form. Computer printouts of raw data downloaded from an electronic data collection device are to be considered a form of field notes. All field notes shall indicate location, street names, client, instruments, date, field crew, weather conditions, and purpose of field work.

e) Search 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.

f) Field traverse should be based on a bearing system determined from astronomic 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-quarter of a degree. An alternate method is orientation of the survey to an existing survey. Angular measurements of the field traverse shall

be repeated two or more times. Alternate angular readings shall be made with the telescope in the reverse position.

g) All traverse lines shall be run on the property line where possible or otherwise within a reasonable distance of the property lines being located therefrom.

h) Sideshots from the traverse to monumentation or other physical features controlling the position of a property line should be minimized. Angle measurements to those points should be repeated two or more times. Alternate angular readings shall be made with the telescope in the reverse position. Distance measurements should not be greater than 100 feet when measured with a steel tape. Precision of measurements from the traverse points to sideshot points should be a minimum of one half the horizontal scale reading with distance measured to the hundredth of a foot (0.01′). The exception to this is stone walls and fence posts which may be measured to the nearest tenth of a foot (0.10′) and centerline and edges of water bodies which may be measured to the nearest foot (1′).

i) When feasible, property lines defined as being a specific elevation shall be referenced to the North American Vertical Datum (NAVD) of 1988 once this information becomes available and to the National Geodetic Vertical Datum (NGVD) of 1929 prior to this time.

j) A minimum of two benchmarks shall be established on the subject tract when property lines are defined as being a specific elevation. Benchmarks set as nails in trees should be placed at the root collar of the tree and not the usable portion of the tree.

k) The establishment of benchmarks must be done with care and sufficient redundancy to insure that the elevations are accurate and reproducible. This requires that a minimum of two known benchmarks are included in all level runs and that the level run is either begun and closed on separate marks or is a closed loop. Benchmarks shall be established by differential leveling using an instrument equipped with an automatic compensator or spiral level vials.

The misclosure tolerance between benchmarks shall be $0.05' \sqrt{M}$ where M is the one-way distance in miles. This misclosure tolerance of a closed loop shall be $0.04' \sqrt{M}$ 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 should be submitted to the agency.

m) Where a special survey for horizontal or vertical control is required as a base for a land boundary survey, relevant special publications from appropriate government agencies on the special subject matter will be considered as satisfactory texts to define acceptable field methods.

n) When utilizing Global Positioning System (GPS) equipment as part of a field survey the receiver/processor units shall have the approval of the Federal Geodetic Control Committee (FGCC). The document "Geometric Geodetic Accuracy Standards and Specifications for Using GPS Relative Positioning Techniques" version 5.0 or subsequent versions distributed by the FGCC should be used as a guideline for planning and execution of a GPS survey.

4.3.1.2 Standard Property Survey, Category 1, Condition 3

The technical standards for a Standard Property Survey, Category 1, Condition 3 (Farmland and Woodlot) are as follows:

a) All survey field work shall be performed with accepted methods of practice and equipment capable of attaining the tolerances specified by these standards.

b) All survey instruments shall be kept in good repair, close adjustment, and operated according to manufacturers' specifications or in compliance with textbook standards.

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 in an accepted field note form. Computer printouts of raw data downloaded from an electronic data collection device are to be considered a form of field notes. All field notes shall indicate

location, street names, client, instruments, date, field crew, weather conditions, and purpose of field work.

e) Compass and tape methods may be used provided that the property lines shall be predominantly bounded by physical evidence, shall possess a minimum number of angle points, and have an acceptable length to width ratio. 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 as a backsight. Taping will be accomplished by use of a standard steel tape and corrections for slope shall be made using accepted methods.

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

g) The survey may be based on a magnetic bearing observed with a compass having a scale permitting interpolations to one-quarter of a degree.

h) Where a special survey for horizontal or vertical control is required as a base for a land boundary survey, relevant special publications from appropriate government agencies on the special subject matter will be considered as satisfactory texts to define acceptable field methods.

i) When utilizing Global Positioning System (GPS) equipment as part of a field survey the receiver/processor units shall have the approval of the Federal Geodetic Control Committee (FGCC). The document "Geometric Geodetic Accuracy Standards and Specifications for Using GPS Relative Positioning Techniques" version 5.0 or subsequent versions distributed by the FGCC should be used as a guideline for planning and execution of a GPS survey.

4.3.2 Land Title Survey, Category 2: A Land Title Survey conforms to the requirements of a land title insuring agency and the most current "Minimum Standard Detail Requirements for ALTA/ACSM, Land Title Surveys", prepared by the American Congress on Surveying & Mapping and the American Land Title Association. This survey may include greater detail not normally gathered in the Standard Property Survey. The specifications for the Standard Property Survey (Category 1) shall apply to the Land Title Survey (Category 2).

4.3.3 As-Built Survey, Category 3: The purpose of an As-Built Survey, also known as a post construction survey, is to detail the horizontal and vertical position of the physical improvements of a tract, parcel or lot of land. An As-Built Survey shall meet the requirements of the Standard Property Survey, Category 1, Condition 1.

When applicable, an As-Built Survey shall meet the requirements of Land Title Survey, Category 2. In addition, when the parcel is a condominium, the survey shall meet the requirements of the Condominium Act, N.H. RSA 356-B:20.

The As-Built Survey details at least the following physical improvements:

1) All permanent and temporary building structures.
2) All drainage, sewerage and appurtenant structures.
3) All underground and overhead utilities and appurtenant structures.
4) All pavements, curbings, walkways and fencelines.

The survey shall be extended a reasonable distance beyond the limits of the property to include any physical characteristics on abutting properties that may affect the subject parcel.

Sufficient information shall be shown to compute the mathematical relationship between all permanent buildings on the subject tract and the property lines.

If elevations are required, they shall be shown to the nearest hundredth of a foot (0.01′) for such cultural features as building floor elevations, manhole rims, pavements, curbing and pipe inverts. Elevations shall be shown to the nearest tenth of a foot (0.10′) on natural ground or water surface.

The guidelines as outlined in Section 2.0, Research Standards; Section 3.0, Procedural Standards; Section 6.0, Monumentation of Surveys; and Section 7.0, Plats; should be followed. Additionally, the technical standards as listed below shall be followed.

4.3.3.1 As-Built Survey, Category 3, Conditions 1 or 2

The technical standards for an As-Built, post-construction, survey are as follows:

a) All survey field work shall be performed with accepted methods of practice and equipment capable of attaining the tolerances specified by these standards.

b) All survey instruments shall be kept in good repair, close adjustment, and operated according to manufacturers' specifications or in compliance with textbook standards.

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.

d) All pertinent information, measurements and observations made in the field during the course of the survey shall be recorded in an accepted field note form. Computer printouts of raw data downloaded from an electronic data collection device are to be considered a form of field notes. All field notes shall indicate location, street names, client, instruments, date, field crew, weather conditions, and purpose of field work.

e) Search for evidence believed to be ferrous or magnetic in nature shall be conducted with a magnetic or electronic detector.

f) Field traverse should be based on a bearing system determined from astronomic observations or from geodetic monuments incorporated into the traverse. If neither method is possible, surveys shall be based on a magnetic bearing observed with a compass having a scale permitting interpolations to one-quarter of a degree. An alternate method is orientation of the survey to an existing survey. Angular measurements shall be repeated two or more times. Alternate angular readings shall be made with the telescope in the reverse position.

g) Perimeter traverse lines shall be run on the property line when possible, otherwise within a reasonable distance of the property lines being located therefrom.

h) Sideshots from the traverse to monumentation or other physical features controlling the position of a property line should be minimized. Distance measurements to sideshots should not be greater than 100 feet when measured with a steel tape. Sideshot measurements shall be taken with a precision compatible with the detail being located.

i) When feasible, property lines defined as being a specific elevation shall be referenced to the North American Vertical Datum (NAVD) of 1988 once this information becomes available and to the National Geodetic Vertical Datum (NGVD) of 1929 prior to this time.

j) A minimum of two benchmarks shall be established on the subject tract when elevations are required as part of the as-built survey or when property lines are defined as being a specific elevation. Benchmarks set as nails in trees should be placed at the root collar of the tree and not in the useable portion of the tree.

k) The establishment of benchmarks must be done with care and sufficient redundancy to insure that the elevations are accurate and reproducible. This requires that a minimum of two known benchmarks are included in all level runs and that the level run is either begun and closed on separate marks or is a closed loop. Benchmarks shall be established by differential leveling using an instrument equipped with an automatic compensator or spiral level vials.

The misclosure tolerance between benchmarks shall be $0.05'\sqrt{M}$ where M is the one-way distance in miles. The misclosure tolerance of a closed loop shall be $0.04'\sqrt{M}$ 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 should be submitted to the agency.

m) Where a special survey for horizontal or vertical control is required as a base for an as-built survey, relevant special publications from appropriate government agencies on the special subject matter will be considered as satisfactory texts to define acceptable field methods.

n) When utilizing Global Positioning System (GPS) equipment as part of a field survey the receiver/processor units shall have the approval of the Federal Geodetic Control Committee (FGCC). The document "Geometric geodetic Accuracy Standards and Specifications for Using GPS Relative Positioning Techniques" version 5.0 or subsequent versions distributed by the FGCC should be used as a guideline for planning and execution of a GPS survey.

o) All buildings, structures, or foundation locations must have the perimeter closed or the diagonals measured (if possible).

p) At least two corners of a building or large structure shall be tied to the property boundary.

4.3.4 Mortgage Survey, Category 4: Mortgage Surveys shall be performed in accordance with the minimum standards of Section 4.0, Standard Property Survey, Category 1, as they apply to the appropriate condition.

## SECTION 5.0 STANDARDS OF PRACTICE FOR TOPOGRAPHIC AND CONSTRUCTION SURVEYS

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

5.2 Specifications.

5.2.1 Topographic Survey: The purpose of a topographic survey is to gather relevant information that will be represented on a topographic or existing conditions plan. A topographic plan is used for, but is not limited to, the following: land development for residential subdivision, industrial and commercial development, utility design, route design, hydrographic analysis, surface mining, architectural design, and landscape architecture.

A topographic survey is defined as the determination of the configuration, relief or elevation of a portion of the earth's surface, including the location of natural and/or man-made features thereon. A topographic survey can be prepared from an on-ground field survey and/or from controlled photography.

When performing a topographic survey, all applicable existing plans should be examined and utilized. These should include, but are not limited to, property plats, utility plans, aerial photographs, and right-of-way or easement plans, whether existing or proposed.

The guidelines as outlined in Section 2.0, Research; Section 3.0, Procedural Standards; Section 6.0, Monumentation of Surveys; and Section 7.0, Plats; shall be followed when applicable. Additionally, the technical standards for topographic surveys are as follows:

5.2.1.1 Topographic Survey Specifications

The technical standards for topographic, existing conditions, surveys are as follows:

a) All survey field work shall be performed with accepted methods of practice and equipment capable of attaining the tolerances specified by these standards.

b) All survey instruments shall be kept in good repair, close adjustment, and operated according to manufacturers' specifications or in compliance with textbook standards.

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.

d) All pertinent information, measurements and observations made in the field during the course of the survey shall be recorded in an accepted field note form. Computer printouts of raw data downloaded from an electronic data collection device are to be considered a form of field notes. All field notes shall indicate location, street names, clients, instruments, date, field crew, weather conditions, and purpose of field work.

e) All topographic surveys shall have a reliable horizontal and vertical control system and should be comprised of closed and adjusted traverses and level loops with closures suitable to the type of work being performed.

f) Grid lines for detailed cross-section work should be closed and tied to the control system.

g) Any method of accumulating field data should include running secondary traverses or level loops that begin and end at points on the control system.

h) When aerial photogrammetry is to be used to compile a topographic map the horizontal and vertical photo control points should be incorporated in the control traverse and level loop.

i) When feasible, vertical control shall be referenced to the North American Vertical Datum (NAVD) of 1988 once this information becomes available and to the National Geodetic Vertical Datum (NGVD) of 1929 prior to this time.

j) A minimum of two temporary benchmarks shall be established on the site whether the datum is assumed or known. Benchmarks set as nails in trees should be placed at the root collar of the tree and not in the useable portion of the tree.

k) The establishment of benchmarks must be done with care and sufficient redundancy to insure that the elevations are accurate and reproducible. This requires that a minimum of two known benchmarks are included in all level runs and that the level run is either begun and closed on separate marks or is a closed loop. Benchmarks shall be established by differential leveling using an instrument equipped with an automatic compensator or spiral level vials.

The misclosure tolerance between benchmarks shall be $0.05'\sqrt{M}$ where M is the one-way distance in miles. The misclosure tolerance of a closed loop shall be $0.04'\sqrt{M}$ 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 monuments, then a report, following the agency's guidelines, on the condition of the mark should be submitted to the agency.

m) Where special surveys for horizontal or vertical control are required as a base for a topographic survey, relevant special publications from appropriate government agencies on the special subject matter will be considered satisfactory texts to define acceptable field methods.

n) When utilizing Global Positioning System (GPS) equipment as part of a field survey the receiver/processor units shall have the approval of the Federal Geodetic Control Committee (FGCC). The document "Geometric Geodetic Accuracy Standards and Specifications for Using GPS Relative Positioning Techniques" version 5.0 or subsequent versions distributed by the FGCC should be used as a guideline for planning and execution of a GPS survey.

o) Measurements to physical features or improvements shall be taken with a precision compatible with the detail being located:

1) Linear measurements shall be taken to the nearest foot when locating features such as streams, ditches, wetlands, poles, pavements, curbing, ledge outcrops, boulders, manholes, catch basins, culverts, and signs.

2) Horizontal and vertical angles to such features shall be taken to the nearest minute.

3) Elevations shall be taken to the nearest hundredth of a food on building floors, manhole rims, curbing, pipe inverts, pavements, etc. Natural ground elevations, water levels, etc. shall be taken to the nearest tenth of a foot.

4) The correctness of the topography and mapping shown shall meet National Map Accuracy standards.

5.2.2 Construction Survey: The purpose of the construction layout survey is to position on the ground physical structures and/or improvements that have been designed for a particular tract of land. This includes but is not limited to the layout of transportation structures, utility structures, communication structures, buildings, sewerage and drainage and physical improvements.

5.2.2.1 Construction Survey Specifications

The technical standards for Construction Layout Surveys are as follows:

a) All survey field work shall be performed with accepted methods of practice and equipment capable of attaining the tolerances specified by these standards.

b) All survey instruments shall be kept in good repair, close adjustment, and operated according to manufacturers' specifications or in compliance with textbook standards.

c) All steel tapes and electronic distance measuring devices shall be routinely compared to a distance traceable to the National Bureau of Standards. A written 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 in an accepted field note form. Computer printouts of raw data downloaded from an electronic data collection device are to be considered a form of field notes. All field notes shall indicate location, street names, clients, instruments, date, field crew, weather conditions, and purpose of field work.

e) All monuments, lines, or objects indicated by the construction documents as the intended references for the project's horizontal and vertical datum should be verified. When additional horizontal and vertical control is established, it shall be comprised of closed and adjusted loops.

f) Measurements shall be taken to a precision compatible with the construction tolerances for the project. Sufficient checks shall be taken to verify that the work is satisfactory.

g) Construction layout monuments shall be of a type, 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 therefrom. Monuments shall be witnessed in a manner that shall be easily discoverable by the user. Any stakes that show offsets and/or cut and fill data shall also show sufficient information to identify the horizontal position of the point being referred to.

h) All buildings, structures, or foundation layouts must have the perimeter closed or (in the case of a rectangle) the diagnosis measured.

i) A minimum of two temporary benchmarks should be established on the site when elevations are required as part of the construction layout survey. Benchmarks set as nails in trees should be placed at the root collar of the tree and not in the useable portion of the tree.

j) Whenever possible, vertical control should be referenced to the North American Vertical Datum (NAVD) of 1988 once this information becomes available and to the National Geodetic Vertical Datum (NGVD) of 1929 prior to this time.

k) The establishment of benchmarks must be done with care and sufficient redundancy to insure that the elevations are accurate and reproducible. This requires that a minimum of two known benchmarks are included in all level runs and that the level run is either begun and closed on separate marks or is a closed loop. Benchmarks shall be established by differential leveling using an instrument equipped with an automatic compensator or spiral level vials.

The misclosure tolerance between benchmarks shall be $0.05'\sqrt{M}$ where M is the one-way distance in miles. The misclosure tolerance of a closed loop shall be $0.04'\sqrt{M}$ 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 monuments, then a report, following the agency's guidelines, on the condition of the mark should be submitted to the agency.

m) Where special surveys for horizontal or vertical control are required as a base for a topographic survey, relevant, special publications from appropriate Government Agencies on the special subject matter will be considered satisfactory texts to define acceptable field methods.

n) When utilizing Global Positioning System (GPS) equipment as pat of a field survey the receiver/processor units shall have the approval of the Federal Geodetic Control Committee (FGCC). The document "Geometric Geodetic Accuracy Standards and Specifications for Using GPS Relative Positioning Techniques" version 5.0 or subsequent versions distributed by the FGCC should be used as a guideline for planning and execution of a GPS survey.

## SECTION 6.0 MONUMENTATION OF SURVEYS

6.1 Definitions: A monument is a physical object, natural or artificial in nature, which marks the location of a corner or other survey point. Monument and corner are not synonymous, though the two terms are often used in the same sense.

6.2 Specifications: The Licensed Land Surveyor shall set monuments so that upon completion of the survey each corner of the property will be physically monumented.

When it is impossible or impractical to set a boundary monument on a corner, the Licensed Land Surveyor shall set a reference monument, similar in character to a boundary monument, and set it 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.

Every boundary and/or reference monument set by the Licensed Land Surveyor

a) 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 twenty-five (25) years. Monuments include but are not limited to the following:

1) Iron rod or iron pipe (min. 1/2″ diameter)
2) Concrete or stone bound (min. 4″ x 4″)

3) Drill holes or other identifiable marks in stone or concrete (ex. chiseled ′x′)
4) Brass or aluminum disc (min. 2′′ diameter)

b) should be marked with either:

1) The license number of the Licensed Land Surveyor in responsible charge;
2) The name of the responsible firm;
3) The name of the responsible government agency.

6.3 Remonumentation. Adequate monuments shall not be disturbed. Inadequate monuments may be replaced with a well set and substantial monument in accordance with Section 6.2. 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.

## SECTION 7.0 PLATS

7.1 Definition. A plan drawn to scale showing all essential data pertaining to the boundaries and subdivisions of a tract of land, as determined by survey or protraction.

A plat should show all data required for a complete and accurate description of the land which it delineates, including the bearings and lengths of the boundaries of each subdivision. A plat may constitute a legal description of the land and be used in lieu of a written description.

7.2 Specifications. The results of all surveys shall be platted on a permanent reproducible medium. It is recommended the plat be made part of the public record to perpetuate the evidence of a survey unless a recorded plat already exists. The plat must 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. A survey plat shall contain the following but is not limited to:

a) The client’s name, municipality, date, scale, bar scale, Category and Condition of the Standards to which the survey conforms. It should contain enough information to be properly indexed in the appropriate county registry of deeds in which it should be recorded.

b) The name and address of the company which prepared the plat and the name and seal of the Licensed Land Surveyor in responsible charge.

c) Owner of record with mailing address, assessor's parcel number, and title reference.

d) Meridian arrow and origin with the date of observation or referenced plat.

e) Vicinity map with same meridional orientation as plat.

f) Bearing and horizontal distances on all pertinent property lines. Curved boundary lines to show radius, delta, and length. If nontangent curve, course and distance of either the initial tangent, radial line or long chord should be shown.

g) Irregular boundaries without curves, such as rivers or streams, or with curves which have no definable geometry, are to have sufficient information to mathematically close the plat. Tie lines are to be noted that they are not property lines.

h) All monuments set or found and description of such along with: date monument was set, relation of monument to the surveyed lines and corners, monuments with tie lines and evidence of possession beyond the surveyed premises on which establishment of the corners of the surveyed premises are dependent.

i) Lines of possession where they affect the surveyed boundaries.

j) Differences in distance from record plats or deeds.

k) Abutters with title reference and assessor's parcel number.

l) Easement and right-of-way limits, references to all easements and encumbrances whether private or public, and evidence of any unwritten interests observed.

m) Revision dates and purpose.

n) Legend (unless symbols are clearly identified within the plat).

o) Zoning district in which the tract is situated.

p) Man-made structures pertinent to the surveyed premises.

q) List of all documents, plats and data relevant to the survey.

r) Any cemeteries and burial grounds observed within the premises being surveyed, or a note stating record evidence of one was found.

s) The area of the subject tract or parcel expressed in acres. Tracts less that two acres may have the area expressed in square feet.

t) If a boundary, easement, or right-of-way shown on the tract is an elevation, the referenced datum should be noted on the plat along with two permanent benchmarks with reference elevations. The benchmarks shall be adequately described to enable them to be recovered at a later date.

7.3 Certification. The plat shall be sealed and signed in accordance with N.H. RSA 310-A:67II.