

250 CMR: BOARD OF REGISTRATION OF PROFESSIONAL
ENGINEERS AND LAND SURVEYORS

DRAFT – FOR DISCUSSION PURPOSES ONLY

250 CMR 6.00: LAND SURVEYING PROCEDURES AND STANDARDS

Section

6.01: Elements Common to All Survey Works

6.02: Survey Works of Lines Affecting Property Rights

All land surveying work is considered work of a professional nature and shall be performed in conformance with 250 CMR 6.00, commonly accepted standards of care and 250 CMR 5.00: *Professional Practice*.

The provisions of 250 CMR 6.00 shall be the minimum required for all surveys and shall take precedence over the less restrictive standards of other authorities or sources.

6.01: Elements Common to All Surveys Work

250 CMR 6.00 describes requirements common to all types of survey works, including but not limited to such surveys as Boundary, topographic, construction layout, title insurance, and mortgage surveys.

(1) Presumptions.

- (a) When engaged to provide Work Products, surveyors are presumed to be familiar with other generally accepted standards of care (*e.g.*, *National Map Accuracy Standards*, *Land Title Survey Standards*, land court standards) associated with that type of work and the surveyor's Work Products shall comply with those additional standards to the extent that such standards do not conflict with the provisions of 250 CMR.
- (b) When integrating mapping products provided by others, such as photogrammetric mapping, LiDAR mapping, geographic information systems data layers and hydrographic mapping, the surveyor is presumed to have exercised due care in evaluating the provider's qualifications, establishing the product's conformance with mapping standards, and performing sufficient independent conformance checks.

(2) Measurements.

- (a) Linear measurements shall be expressed in terms of the US Survey Foot or the Meter.
- (b) The intended purpose of a Work Product shall dictate the accuracy and precision of the field measurements, the measuring equipment used and the manner of its use.
- (c) Appropriate corrections shall be applied to measurements to minimize or eliminate systematic errors.
- (d) Redundant observations shall be used to analyze Control measurements and when practical other measurement data, to assess the magnitude of errors associated with those measurements and to determine if the distributions of those errors are within acceptable tolerances.
- (e) After elimination of blunders and a determination that the remaining errors are within acceptable tolerances, the survey Control shall be appropriately adjusted such that

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it conforms to known geometric conditions or other known constraints.

(f) For large and/or complex Control networks, the preferred method of analysis and adjustment shall be the statistically rigorous method of least-squares.

(3) Calibration.

(a) Measuring equipment must be calibrated to insure it continues to meet or exceed manufacturers' specifications and is capable of producing results in conformance with these standards.

(b) The timing of device Calibrations must be such that it can be demonstrated that the device was capable of performing up to the standards of 250 CMR 6.01(3) and manufacturers' specifications at the time the survey was performed.

(c) Appropriate calibration methods shall be employed that include the personnel who normally use the equipment and the accessory devices normally used with the equipment. These methods shall employ redundant measurement techniques capable of developing statistical tests, rather than simple direct comparisons.

(d) Records of compliance with 250 CMR 6.00 shall be exhibited to the Board upon demand.

(4) Horizontal and Vertical Datums.

(a) Horizontal directions shall be tied to some known meridian. When magnetic meridians are used, the date and location where the meridian was observed must be provided.

(b) Horizontal coordinates, when provided, must be referenced to monuments or known and reproducible horizontal datums. The preferred horizontal datum is the Massachusetts Coordinate System North American Datum (NAD).

(c) Elevations, when provided, shall be referenced to a known vertical datum or to an assumed datum for which two monuments (bench marks) have been established. The preferred vertical datum is the current national vertical datum.

(d) Horizontal and vertical Control surveys for construction layout work shall be tied to all Boundary, easement or Regulatory Lines affecting the location of existing or proposed Fixed-works.

(5) Work Products. All deliverable Work Products depicting the survey shall contain the following types of information, except when the only Work Product delivered is on-the-ground markings:

(a) The client's name, the record owner's name, and location of the surveyed premises.

(b) The surveyor's full name, firm name, business address, seal, Signature, the date of the Work Product and, when appropriate, a revision date.

(c) Measured quantities shall be shown to a number of significant digits consistent with the accuracy and procedures used to obtain the measurements and appropriate for the item being described.

(d) The Work Product shall identify the survey's meridian by symbol, note its origin and orient the Work Product such that north is generally pointing in an upward direction.

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- (e) The Work Product shall provide ratio and graphic bar scales.
 - (f) When surveys are tied to an existing coordinate system, provide the basis for the ties and, if applicable, the combined scale factor needed to convert the reported distances back to ground measurements.
 - (g) Identify sources and techniques used to develop the mapping information shown, such as contours, site features, utilities, floodplains, *etc.*
 - (h) For information obtained from a specific data layer in a geographic information system, land information system or mapping system, the survey Work Product shall identify the source and positional accuracy of features and/or attributes obtained from said layer.
 - (i) The standard for positional information shown on a survey or other Work Product shall meet the appropriate national map accuracy standard for the compilation scale of the Work Product.
- (6) Archival Requirements. The surveyor shall maintain supporting documentation sufficient to demonstrate compliance with 250 CMR and to substantiate their findings in response to lawful inquiries long enough to meet applicable legal and regulatory requirements.

| **6.02: Survey Works of Lines Affecting Property Rights**

250 CMR 6.02 describes those additional requirements applicable to all survey work ~~Work Products that delineate associated with existing or proposed~~ Boundary lines ~~that~~ affect ~~ing~~ property rights, existing or proposed, such as property lines, lease lines, easement lines, Jurisdictional Lines, Regulatory Lines, including the horizontal and vertical Control necessary to establish such lines.

Additionally, 250 CMR 6.02 applies to the marking or remarking of said lines on-the-ground and those Work Products that relate natural or manmade features to such lines.

(1) Precedence. To the extent that 250 CMR 6.02 may reiterate key aspects of the Laws of Evidence, the intent of 250 CMR 6.02 is to emphasize those aspects of the law, not to create a new standard that would modify or supersede the Laws of Evidence.

(2) Presumptions.

- (a) Surveyors are presumed to know the Laws of Evidence pertaining to the location of lines and are presumed to follow the Laws of Evidence when reproducing lines or creating new lines.
- (b) Based upon equivalent bodies of Evidence and equivalent treatment of that Evidence, that Evidence should lead each surveyor to substantially equivalent determinations.
- (c) When a surveyor agrees to locate a written conveyance, the surveyor also agrees to locate the conveyance in accordance with the laws regulating the interpretations of written conveyances.
- (d) When new lines are being defined, those lines are presumed to be tied to Original

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Lines and/or original monuments authenticated in accordance with the Laws of Evidence.

- (e) Historical documents that created Original Lines are presumed to have been based upon a survey, whether or not the survey was of a professional nature or was prepared by a lay person.
- (f) When the development of a Work Product is based upon a prior survey, the resulting Work Product is presumed to comply with the provisions of these standards, regardless of the standard of care associated with the prior survey.

(3) Research. Record Evidence of public sources and known private sources shall be examined to sufficient depth and scope such that the surveyor is convinced:

- (a) The current description of the subject property and all abutting properties have been identified and acquired.
- (b) The plats and surveys describing the subject property and abutting properties have been identified and acquired.
- (c) The Operative Document that created each line or point on the subject property, or the best available Evidence of that document, has been identified and acquired.
- (d) Conflicting descriptions describing the common lines of the subject property and the abutting property have been identified and investigated.
- (e) Scrivener's errors describing the subject property and the abutting properties have been identified and investigated.
- (f) Appurtenances and/or encumbrances have been investigated when discovered through normal research procedures.
- (g) The source and validity of Regulatory Lines affecting the subject property have been investigated, when applicable.

(4) Fieldwork. Physical Evidence shall be investigated to a sufficient depth and scope such that the surveyor is convinced:

- (a) The physical Evidence necessary to base a conclusion has been identified and located.
- (b) Any recognizable Evidence of occupation (*e.g.*, fences) has been identified and located at intervals sufficient to delineate the directions and distances of the primary lines and angles.
- (c) The visible appurtenances and encumbrances to the subject property have been identified and located.
- (d) Apparent encroachments onto the subject property or onto adjacent properties have been identified and located.
- (e) Natural and manmade features crossing, near or within the subject property, that help identify the surveyed lines, have been identified and located.

(5) Computations and Analysis. In performing the analysis of the record and physical Evidence, the surveyor shall:

- (a) Make interpretations of the record and physical Evidence and draw conclusions based upon the Laws of Evidence.
- (b) Evaluate and use the Evidence based upon the original creating units of

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measurement, not in terms of modern units of measurements, unless a contrary intent is indicated by the Laws of Evidence.

- (c) Assign no more weight or dignity to one recited point of a prior survey than any other recited point, unless a contrary intent is indicated by the survey.
- (d) Test the mathematical integrity of record Evidence and use the results in a manner consistent with the Laws of Evidence.

(e) Use computer software products responsibly by carefully examining output and making appropriate checks.

(f) Consider parol Evidence whenever the collected Evidence is insufficient to draw a conclusion and, when relied upon, consider obtaining affidavits.

(6) Monumentation. Lines shall be marked on-the-ground such that, in combination with the monuments recovered:

(a) Sufficient monuments exist to enable future surveyors to reliably reproduce the lines as surveyed, even if some of the referenced monuments are compromised over time. Referencing coordinates are not a substitute for setting physical monuments.

(b) The size, composition and material of newly set monuments shall:

1. Be sufficient to minimize the likelihood of disturbance due to acts by mankind or natural causes;
2. Be stable enough to adequately meet the accuracy standards of the survey;
3. Have a life expectancy of 25 years or more under normal circumstances;
4. Be detectable using generally employed surveying techniques; and
5. Be identifiable, with reasonable certainty, as having been set by ~~the~~ a surveyor.

(7) Work Products. In addition to those elements common to all survey Work Products noted in 250 CMR 6.01, the following additional requirements are applicable to all Work Products classified under 250 CMR 6.02:

(a) Identify the current record owner of the subject parcel and all abutting parcels thereto by title reference.

(b) Delineate both directly and indirectly measured quantities describing surveyed lines and points with significant figure and decimal place values appropriate to commonly accepted accuracy requirements for such surveys and to provide an adequate means of accurately reproducing said lines or points.

(c) Report the area of each surveyed parcel in appropriate units of measure and number of significant digits to express the value accurately.

(d) Reference other pertinent surveys of record describing the subject premises and any abutting premises.

(e) Provide references to the key Evidence used to base conclusions.

(f) Delineate any Evidence of occupation material to the owner's title.

(g) Delineate visible Evidence of apparent appurtenances and encumbrances.

(h) Delineate visible Evidence of apparent encroachments by abutters onto the subject property and by the owner of the subject property onto adjoining properties.

(i) Clearly distinguish between monuments found and monuments set along with their

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physical composition and description, which includes their mathematical relationship to the property.

(j) Provide sufficient course and distance redundancy to allow testing for mathematical correctness for the outbounds of the subject property and each parcel contained within the subject property.

(k) Report the actual observed measurements (either directly and/or indirectly) that describe the Evidence appearing on the survey and parenthetically show record measurements for comparison, when appropriate.

(l) Provide a vicinity map or reference the subject property to well-known geographic features, such as street intersections, rivers, or railroads.

(m) Show the location of objects (*e.g.*, streams, fences, structures) that are informative as to the general location of the boundaries of the property.

REGULATORY AUTHORITY

250 CMR 6.00: M.G.L. c. 112, §§ 81D through 81T; c. 13, §45.