

**STANDARDS OF PRACTICE MANUAL
FOR SURVEYING
IN SOUTH CAROLINA**

STATE OF SOUTH CAROLINA

CODE OF REGULATIONS
CHAPTER 49, ARTICLE 4
Regulations 400-490

Effective June 26, 2009

Board of Registration for Professional Engineers and Surveyors
Division of Professional and Occupational Licensing
S.C. Department of Labor, Licensing and Regulation

STANDARDS OF PRACTICE MANUAL FOR SURVEYING IN SOUTH CAROLINA

49-400. Purpose.

A. These regulations are intended to establish minimum standards for the practice of surveying in South Carolina.

(1) The standards set forth are to promote uniform requirements for and accurate surveys by surveyors practicing in South Carolina.

(2) The established guidelines will assist a surveyor in meeting the needs of his clients so that surveyed properties henceforth can be readily located, mapped and described in a definitive and easily understood manner.

B. These regulations are also intended to provide guidelines that will assist property owners and others who deal with real property such as those in the legal, banking, and real estate professions.

(1) The manual should be of value to property owners in South Carolina when engaging the services of qualified surveyors to establish corners, boundaries and maps of their respective properties.

(2) The manual should assist the Clerks of Court in the various counties of South Carolina in receiving and accepting for recordation maps that are in compliance with appropriate standards and statutory requirements.

49-410. Compliance.

A. All Surveyors shall comply with these regulations governing minimum standards for the practice of surveying in South Carolina.

B. A surveyor who practices surveying in South Carolina in violation of the minimum standards contained in this manual, on complaint in writing, sworn to by the complainant and submitted to the Board of Registration for Professional Engineers and Surveyors, shall be notified of the complaint and afforded an opportunity to be heard before the Board.

C. The repeated failure to adhere to minimum standards for surveying as contained in this manual may be considered as prima facie evidence of misconduct in the practice of surveying on the part of a Surveyor.

D. The Board will investigate information from Clerks of Court, clients, individuals, and land owners if in the Board's opinion a surveyor appears to have performed surveying which is not in compliance with this manual. When a surveyor obligates himself and contracts to survey real property in South Carolina by virtue of his registration and the license granted him by this State, he accepts the responsibility to comply with minimum standards prescribed by this manual.

E. The Board shall provide for each Surveyor and for each Clerk of Court in this State a copy of the Standards of Practice Manual for Surveying in South Carolina. Copies will be made available, upon request, for other State officials and the general public.

49-420. General.

A. For the purpose of these regulations, the following terms or words are defined as meaning:

(1) The term "Board" shall mean the South Carolina State Board of Registration for Professional Engineers and Surveyors.

(2) The term "manual" shall mean the Standards of Practice Manual for Surveying in South Carolina.

(3) The term "minimum standards" shall mean the standards of practice for surveying in South Carolina.

(4) The term "surveyor" shall mean a surveying practitioner duly registered by the Board for the practice of surveying in the State of South Carolina.

(5) The terms "Clerk of Court", "Register of Deeds" and "Register of Mesne Conveyance" shall refer to the office in the county having responsibility for recording plats, maps and deeds.

(6) The term "seal" shall mean the raised embossed seal of the Surveyor.

(7) The term "accurate" shall mean that degree of accuracy consistent with the standards and tolerances specified in this manual.

B. The proper execution of surveying, platting and mapping procedures and all other details of a survey are the direct responsibility of the Surveyor whose raised embossed seal and original personal signature shall appear on the plat or map to be prepared. The fact that a plat or map is approved by a planning department or accepted by Clerk of Court for recordation in no way relieves the surveyor whose seal appears upon the drawing of the full responsibility to make certain that the plat or map meets the requirements of these standards.

C. The original plat or map shall remain for a period of time required by the statute of repose in the possession of the surveyor whose seal appears thereon. It should, therefore, be professionally and accurately prepared as a permanent record and after prints or copies have been made for recordation or other purposes the original plat should be carefully preserved by the surveyor or his firm along with the surveyor's original field notes, calculations, and work sheets for, at a minimum, the length of time the statute of repose applies. Such material, in original form, is to be made available when required either by the Board or by the courts.

D. The words "course" and "bearing" are used interchangeably in this manual.

E. Where survey requirements are more stringent than those set forth herein, the surveyor shall comply with those standards as mandated by federal, state, or local governmental requirements.

F. Surveys which are performed for a specific stated purpose other than boundary surveys as defined herein shall be permitted where unusual conditions make it impractical or impossible to perform the survey to the standards set forth herein, provided the purpose and conditions shall be clearly stated on the survey drawing. This section is not to be used in any way to circumvent the standards in this manual on a survey which can be performed to these standards.

G. Additions and/or deletions to survey drawings by other than the signing party or parties are prohibited without written consent of the original signing party or parties.

H. The surveyor shall comply with the minimum survey classifications noted herein but has the option to negotiate with each client an agreement for a higher classification.

49-430. Nomenclature.

A. In surveying work, it is acceptable to employ abbreviations and symbols. When use of such abbreviations and symbols are necessary, the following are acceptable and may be employed in land surveying work in South Carolina:

- (1) Acres: AC
- (2) Acrylonitrile Butadiene ABS
- (3) Angle: Ang
- (4) Avenue: AV
- (5) Azimuth: Az
- (6) Bench Mark: BM
- (7) Catch Basin: CB
- (8) Calculated Course(s): CC
- (9) Calculated Distance: CD
- (10) Corrugated Metal Pipe CMP
- (11) Crimp /Clip/Pinch Top CT
- (12) Curb Face: CF or FOC
- (13) Curb Inlet CI
- (14) Curb and Gutter: CG
- (15) Chord: CH

- (16) Center Line: CL or C/L or CL
- (17) Concrete Monument Con. Mon.
- (18) Continuously Operating Reference Station: CORS
- (19) Degree of Curve: D
- (20) Deed Book: DB
- (21) Deflection Angle: Defl Ang
- (22) Departure: Dep
- (23) Ductile Iron Pipe: DIP
- (24) Drop Inlet: DI
- (25) Drill Hole: DH
- (26) Delta Angle : Δ or I
- (27) Double Meridian Distance: DMD
- (28) Easement: ESMT
- (29) East: E
- (30) Error of Closure: EC
- (31) Elevation: EL
- (32) Edge of Pavement: P
- (33) Foot: Ft.
- (34) Found: Fd. or F
- (35) Global Navigation Satellite System: GNSS
- (36) Global Positioning System: GSP
- (37) Global'naya Navigatsionnava SputnikovavaSistima: GLONASS
- (38) Gutter: Gut
- (39) Highway: Hwy
- (40) Invert Elevation: I.E. or Inv.
- (41) Iron Pipe, Set: IPS
- (42) Iron Pipe, Found: IPF
- (43) Length of Curve: L or Arc
- (44) Latitude: Lat
- (45) Long Chord: LC
- (46) Mag Nail: MN
- (47) Magnetic course: MC
- (48) Manhole: MH
- (49) Mile: Mi
- (50) Marker: Mk
- (51) Monument: Mon
- (52) Nail and Cap: N & C
- (53) New: N or (N)
- (54) Not To Scale: NTS
- (55) North: N
- (56) North American Datum 1927: NAD 27
- (57) North American Datum 1983: NAD 83
- (58) North American Vertical Datum 1988: NAVD 88
- (59) National Geodetic Survey: NGS
- (60) National Geodetic Vertical Datum 1929: NGVD 29
- (61) Offset: O.S. OR O/S
- (62) Old: O or (O)
- (63) On-line Positioning User Service (NGS): OPUS
- (64) Parts Per Million: PPM
- (65) Perimeter: P
- (66) Pavement: Pave

- (67) PK Nail: PK
- (68) Plat Book: PB
- (69) Point of Beginning: POB
- (70) Point of Curvature: PC
- (71) Point of Compound Curve: PCC
- (72) Point on Curve: POC
- (73) Point of Intersection: P.O.I. or P.I.
- (74) Point of Tangent: POT
- (75) Point of Reverse Curvature: PRC
- (76) Point on Tangency: PT
- (77) Point: Pt
- (78) Polymerized Vinyl Chloride: PVC
- (79) Position Dilution of Position: PDOP
- (80) Private: Pvt
- (81) Property Line: PL
- (82) Radius: R
- (83) Reference Point: RP
- (84) Railroad: RR
- (85) Railroad Spike: RRS
- (86) Reinforced Concrete Pipe: RCP
- (87) Register of Mesne Conveyance: RMC
- (88) Railway: Rwy
- (89) Real Time Kinematic Surveying: RTK
- (90) Real Time Network: RTN
- (91) Rebar: RB
- (92) Register of Deeds: ROD
- (93) Right of way: R/W
- (94) Satellite Receiver for RTK or VRS Surveying: Rover
- (95) Satellite Receiver Base Station: Base
- (96) South: S
 - (97) SC State Plane Coordinate-South Zone NAD 27: SC SPCS 27
 - (98) SC State Plane Coordinate NAD 83: SC SPC 83
 - (99) South Carolina Geodetic Survey: SCGS
- (100) Square: Sq
- (101) Square Feet: SF or FT²
- (102) Street: St
- (103) Station: Sta
- (104) Stake: Stk
- (105) Tangent of Curve: T
 - (106) Tack: Tk
- (107) Traverse: Tra
- (108) Track: Trk
- (109) US Bureau of Standards: USBS
- (110) Vertical: Vert
- (111) Vitriified Clay Pipe: VCP
- (112) Virtual Reference Station Network: VRS
- (113) West: W
- (114) Wood: Wd
- (115) Symbols:
 - (a) Degree: °
 - (b) Minute: ′

- (c) Second: ”
- (d) Foot or Feet: ’

B. The following are acceptable abbreviations for metric measures:

- (1) Area: A
- (2) Centimeter: CM.
- (3) Decimeter: DM.
- (4) Hectare: HA.
- (5) Kilometer: KM.
- (6) Meter: M
- (7) Millimeter: MM.
- (8) Square Meter: M²

C. Definitions: The following definitions and terminology shall be used in land descriptions:

(1) Boundary Line: Any line bounding an area or dividing separate properties; adequately dimensioned and described. Such lines may be straight, irregular, circular, or spiral.

(2) Point of Beginning: A well defined, readily located, and permanent point or monument that is the starting point on a parcel for a metes and bounds description; and also is the final point of such description.

(3) Point of Commencement: A well defined, readily located, and permanent point or monument that is the point to which the Point of Beginning is tied for a permanent reference.

(4) Convey: The act of transferring title or rights to a property.

(5) Grantor: A person or party conveying property or rights to a grantee.

(6) Grantee: A person or party receiving title or rights to property.

(7) Title: A written claim or right which constitutes a just and legal cause of exclusive possession.

(8) Metes and Bounds Description: A description in which the boundary lines start from a given point and is described by listing the direction, distance, and description of corners of the lines forming this boundary; in succession and adjoining owners.

(9) Description by Lot Number: A description which identifies a lot or tract of land by reference to a previously surveyed subdivision plat together with other pertinent information.

(10) Recorded: Placed on record in the office of the Clerk of Court, Register of Deeds or Register of Mesne Conveyance for the county in which all or part of the land lies.

(11) Coordinate Description: A description of lands in which the angle points or other points in the boundary are each referred to by grid coordinates on the South Carolina State Plane Coordinate System (current Datum) or similar coordinate system.

(12) Grid Coordinates: Distances measured at right angles to each other in a rectangular system having two base lines at right angles to each other.

(13) Survey: The orderly process of determining data relating to the physical characteristics of the earth, which may be further defined according to the type of data obtained, the methods and instruments used, and the purpose(s) to be served.

(14) Boundary Survey: A survey, the primary purpose of which may include, but is not limited to, the determining of the perimeters of a parcel or tract of land by establishing or reestablishing corners, monuments, and boundary lines for the purpose of describing, or platting or dividing the parcel.

(15) Closing/Loan or Mortgage Survey: A boundary survey of a parcel or lot which includes all improvements obvious and apparent found on the property, to be used in the preparation of a mortgage, loan or deed document.

(16) Topographical Survey: A survey of the natural and selected man-made features of a part of the earth's surface by remote sensing and/or ground measurements to determine horizontal and vertical spatial relations.

(17) Compiled Map: A map drawn from previously recorded or unrecorded documents, photographic material or tax maps which represent the general configuration of the parcel where partial or no actual surveying has been performed by the land surveyor preparing the map.

(18) Right of Way Survey: A Survey of any strip or area of land, including surface, overhead, or underground, granted fee simple for a designated use, such as for drainage and irrigation canals and ditches; electric power, telegraph, and telephone lines; gas, oil, water, and other pipe lines; highways, and other roadways, or other similar uses.

(19) Geodetic Survey: A survey of areas and points affected by and taking into account the curvature of the earth using a nationally defined horizontal and vertical datum. Geodetic surveys may be performed with terrestrial or satellite surveying technology but must be connected to the coordinate realization of the North American Datum 1983 or other recognized datum. All geodetic surveys, both vertical and horizontal, in the State of South Carolina shall conform to the Federal Geographic Data Committee's Geospatial Positioning Accuracy Standards, Part 2: Standards for Geodetic Networks in their most current publication. Geodetic surveys shall be performed by a surveyor licensed by this board.

(20) Geodetic Datum: The recognized horizontal and vertical datum for South Carolina shall be North American Datum 1983 (NAD83) and North American Vertical Datum 1988 (NAVD88) respectively, or later accepted datum if applicable. The National Geodetic Survey no longer publishes relative accuracies such as first, second or third order. Instead, accuracies are now published as relative network positional accuracy stated at the 95% confidence level. These positional accuracies are in complete agreement with the Federal Geographic Data Committee.

(21) State Plane Coordinate System: The official coordinate system for surveying purposes in South Carolina is the South Carolina State Plane Coordinate System, single zone Lambert Polyconic Projection designated by the National Geodetic Survey as Zone 3900. For the purpose of the South Carolina State Plane Coordinate System, the foot is the International Foot with one inch being exactly 2.54 centimeters. To convert metric coordinates to the international feet multiply by 3.280839895.

(22) Hydrographic Survey: A survey having for its principal purpose the determination of data relating to bodies of water, and which may consist of the determination of one or several of the following classes of data; depth of water and configuration of bottom; directions and force of current; heights and times and water stages; and location of fixed objects for survey and navigation purposes.

(23) Wetlands Survey: A survey showing the boundaries of an area delineated as "jurisdictional waters of the US." Wetland Boundaries shall be tied by course and distance to either 1) property corners that are properly monumented, or 2) project boundaries that have been properly monumented, or 3) State Plane Coordinates. This shall be done in a manner that permits future surveyors to readily retrace the wetland boundary. The error of closure of such ties must be consistent with the land use classification of the parcel being surveyed as described in section 49-440 Classification of Surveys. Data collection and platting of these types of wetland boundaries must be performed by or under the direct supervision of a surveyor. A surveyor may not accept wetlands survey data from non-licensed individuals who are not under their direct supervision for the purpose of recording the information on survey plats. If equipment other than survey grade accuracy equipment is used on the survey, a statement indicating the equipment and procedures used for the work must be clearly stated on the plat.

(24) Corner: A point on a land boundary.

(25) Monument: A shaft of ferrous metal, concrete, stone or concrete and metal; placed to designate a fixed point; placed near vertically in the earth; designed for maximum permanency, placed by a land surveyor to mark corners.

(26) Witness Monument: Any monument that does not occupy the same defined position as the corner itself, but whose relationship to the corner is established.

(27) Reference Point: Any defined position that is or can be established in relation to another defined position.

(28) Benchmark: A relatively permanent material object, natural or artificial, bearing a marked point whose elevation above or below a referenced datum is known.

(29) Plat: A diagram drawn to scale showing all essential data pertaining to the boundaries and subdivisions of a tract of land, as determined by a survey and must be signed and sealed by the surveyor.

(30) Map: A representation on a plane surface, at an established scale, of the physical features of a part of the earth's surface, shown by the use of, but not limited to lines, arcs, signs, alpha numeric characters and symbols.

(31) Map of Survey, Plat of Survey, Survey for or other Similar Titles: Any drawing of a parcel or tract of real property used for the purpose of depicting the results of a field survey. Each survey drawing shall state the type of survey it depicts as defined in this manual.

(32) Global Navigation Satellite System (GNSS): Any satellite system which can be used to determine a precise location on the surface of the Earth. The US system is known as NAVSTAR Global Positioning System (GPS). The Russian system is known as the Global'naya Navigatsionnaya Sputnikovaya Sistema or GLONASS. The European Space Agency system is known as GALILEO.

(33) Position Dilution of Precision (PDOP): A numerical measure of the predicted accuracy of a geodetic position determined from GNSS satellites. The term represents the goodness of the geometry of the satellites with respect to the receiver location. A PDOP of 3 or less will generally insure accuracy of the highest survey quality. A PDOP of 5 or less is generally acceptable for most surveying and mapping projects where the distance between Rover and the nearest Base station is less than 10KM.

(34) Multipath: Multipath is an erroneous GNSS distance measurement between a GNSS satellite and either the Rover or Base. The multipath signal results from the receiver using a signal that has been reflected off a structure or water surface on its way to the receiver. The resulting measurement of distance from the satellite to the receiver is longer.

(35) Base Station: The name given to a GNSS receiver located over a known point or geodetic control monument.

(36) Rover: The name given to a GNSS receiver located over an unknown survey point whose coordinates are to be determined or checked against known geodetic control.

(37) Static GNSS Survey: A geodetic survey that uses multiple survey grade satellite receivers each collecting the same satellite data simultaneously. At least one satellite receiver must be on a known geodetic control station. The data is post-processed to yield three dimensional vectors between the known and unknown control stations. Static vectors solutions yield a "no check" solution and therefore by themselves do not meet minimum standards without additional independent checks. An expected relative accuracy of 0.07 foot plus 1:50,000 of the distance separating the Base and Rover can be obtained dependent on the length of time of simultaneous observations, the quality of the receivers, multipath and PDOP of less than 5.

(38) Static GNSS Positioning of Property Corners: If GNSS STATIC survey techniques are used to establish SC State Plane Coordinates on property corners, the corners shall be positioned from the nearest two (2) first or second order horizontal control monuments in the National Geodetic Survey (NGS) data base. Property corners shall be positioned to a horizontal accuracy of at least $0.07' + 1/20,000$ or 0.2 feet (whichever is smaller) with relation to the nearest NGS horizontal control monument.

(39) Real Time Kinematic (RTK) GNSS Survey: A geodetic survey that uses multiple survey grade satellite receivers each collecting the same satellite data simultaneously. At least one Base receiver must be on a known geodetic control station and is capable of transmitting satellite data in real time to other Rover receivers. The data is processed by the Rovers in real time to yield three dimensional vectors between the Base and Rover stations. RTK vectors solutions yield a "no check" solution and therefore by themselves do not meet minimum standards without additional independent checks. RTK surveys require a site calibration to the NAD83 and NAVD88 in the vicinity of the survey. An expected relative accuracy of 0.05 foot plus 1 PPM of the distance separating the Base and Rover can be obtained dependent on the length of time of RTK observations, the quality of the receivers, PDOP of less than 3, a minimum of 5 GPS satellites, multipath and quality of the site calibration.

(40) VRS GNSS Survey: A geodetic survey that uses multiple dual frequency survey grade satellite receivers each collecting the same satellite data simultaneously. Base stations are operated by the SCGS and data is streamed to the Rovers via the Internet and processed in real time to yield three dimensional vectors between the Base Stations and Rovers. VRS vectors solutions yield a "network check" solution and therefore will meet minimum standards without additional independent checks. VRS surveys require

an “independent check” by occupying a known geodetic control point in the National datum in the vicinity of the survey to verify the proper operation of the Rover. An expected relative accuracy of 0.05 foot can be obtained dependent on the length of time of VRS observations, the quality of the receivers, PDOP of less than 3, a minimum of 5 GPS satellites and minimal multipath.

(41) Classification of Geodetic Surveys (Performed using GNSS Technology)

Type	Relative Accuracy (95%)	Max PDOP	Min # of Satellites	Site Calibration
Static GNSS	0.07' + 1:50,000	5	4	N
Property Corner Positions	0.07' + 1:20,000	5	4	N
RTK GNSS	0.07' + 1PPM dist from Base	3	5	Y
VRS GNSS	0.07'	3	5	N

All the above Geodetic Surveys will achieve the required minimum accuracy for Land Surveys

49-440. Classification of Surveys.

A. The accuracy of the measurements for a survey shall be based upon the character of the land, the type of survey and the current use of the land. Unadjusted Ratio of Precision permissible shall be no less than the errors of closure prescribed below. In lieu of an Unadjusted Ratio of Precision, a Relative Positional Accuracy may be used. Relative Positional Accuracy may be tested by: (1) comparing the relative location of points in a survey as measured by an independent survey of higher accuracy or (2) the results of a minimally constrained, correctly weighted least square adjustment of the survey.

B. On the basis of the size and character of the land, boundary surveys for conveying, platting, mapping, or describing property shall be classified as follows:

(1)(Class A) Urban Land Surveys: Urban surveys include land properties which lie within or adjoin city or town limits, or other high valued properties. These lands usually justify higher surveying accuracy. Bearings shall be shown in degrees, minutes and seconds and distances shall be shown to hundredths of a foot.

(2)(Class B) Suburban Land Surveys: Suburban surveys include properties surrounding the urban area of a town or city. The land represented by these surveys is often valuable, but more important it is land whose value is by definition rapidly increasing. Bearings shall be shown in degrees, minutes and seconds and distances shall be shown to hundredths of a foot.

(3)(Class C) Rural Land Surveys: Rural surveys include properties located outside suburban properties. Bearings shall be shown in degrees and minutes or less and distances shall be shown to hundredths of a foot.

(4)(Class D) Farm and Timber Land Surveys: Timber surveys include properties located throughout the State and represent land which may be cultivated; may provide space for farm houses and buildings; or may be employed as timber land. Bearings shall be shown in degrees and minutes or less and distances to the nearest tenth of a foot or less.

(5)(Class E) Vertical Control Surveys: Surveys involving vertical control (leveling) for land areas where a common datum is necessary shall be classified on the basis of accuracy.

(a) Urban Control: Control loops employed for commercial, industrial, or urban land surveys shall be executed with a precision or error of closure not to exceed in feet 0.04 times the square root of the number of miles of the level circuit. i.e. $0.04\sqrt{m}$ (m = number of miles in the level circuit)

(b) Other: Other leveling surveys shall be conducted with a precision or error of closure not to exceed in feet 0.10 times the square root of the number of miles of the level circuit. i.e. $0.10\sqrt{m}$ (m = number of miles in the level circuit). The VRS will achieve this accuracy when using when using a dual frequency GNSS receiver, PDOP less than 3 in the absence of multipath.

C. Table of Classifications:

Classification	A Urban Surveys	B Suburban Surveys	C Rural Surveys	D Farm & Timber Surveys
Unadjusted Linear Closure				
Closure (Minimum)	1:10000	1:7500	1:5000	1:3000
Angular Closure (Maximum)	15'' \sqrt{N}	20'' \sqrt{N}	30'' \sqrt{N}	50'' \sqrt{N}
Location of Improvements, Structures, Paving, Etc.: (Tie Measurement)	$\pm 0.1'$	$\pm 0.2'$	$\pm 1.0'$	$\pm 2.0'$

N = Number of Points in Traverse

As an option:

Relative Positional Accuracy

0.07' + 50 PPM or 0.07' + 1/20,000 * Perimeter (95% confidence level).

The VRS can achieve of a Relative Positional Accuracy of 0.07' with a 95% confidence level and therefore can be used for all Classifications

49-450. Plats and Platting.

A. A plat, as defined by this manual, is an accurate graphical representation, neatly lettered and properly dimensioned, report of a survey made by a Surveyor of a finite piece of real property, including pertinent data and appropriate information.

B. A survey requiring a plat should be accurately presented and should reveal all of the pertinent information developed by the survey.

49-460. Survey Types and Requirements.

A. General Property Surveys: The following general requirements apply to all survey types included in this manual, other than GIS Surveys and Photogrammetric Surveys (see section 49-450-D and section 49-450-E of these standards for the general requirements of these surveys).

(1) The size of the plat should conform to the requirements of the Clerk of Court, Register of Deeds or the Register of Mesne Conveyance of the county in which the plat is to be recorded with minimum size to be eight and one-half inches by eleven inches. (2) A plat shall be a print or tracing, signed and sealed with the surveyor's impression seal.

(3) All survey plats shall have a title and contain the following information:

(a) The embossed seal and the signature of the Surveyor responsible for the full conduct of the survey;

(b) A location map and/or adequate descriptive location of the property surveyed;

(c) The state, county and/or city in which the property is located;

(d) The name of the owner, company or agent of the property who requested the survey document;

- (e) The date the field survey was completed;
- (f) A graphic scale;
- (g) A numerical scale;
- (h) The name, registration number, address and phone number of the land surveyor.
- (i) A certification executed by the Surveyor which will contain a statement of the class of the survey performed as follows:

"I hereby state that to the best of my professional knowledge, information, and belief, the survey shown hereon was made in accordance with the requirements of the Standards of Practice Manual for Surveying in South Carolina, and meets or exceeds the requirements for a Class __ survey as specified therein."

(j) The area of the parcel of tract surveyed will be shown consistent with the class of survey or at least to the nearest one-hundredth (0.01) of an acre.

(k) At least one corner of the property surveyed shall be referenced so as to form a tie-line which can be used to help establish or verify the correct location of the property.

(l) The distances to the nearest intersections of a street or right-of-way shall be shown on the survey document.

(m) The North arrow shall be shown and shall be accurately correlated with the courses so that it is accurately positioned and designated as astronomic, grid or magnetic.

(n) All property lines shall be defined by bearings and horizontal distances and plotted to the scale indicated on the plat.

(o) Bearings and distances shall be shown consistent with the class of the survey.

(p) The Land Surveyor shall retrace the boundaries of the property being surveyed and set or reset monuments or corners consistent with the class of survey and accepted practices of boundary retracement. All monuments found or placed must be described in detail on the survey plat or drawing, with data given to show their location upon the ground in relation to the boundary lines. When a property corner is inaccessible and cannot be set, a witness or reference monument shall be placed on the boundary line and the offset distance noted on the survey document, plat or drawing. Control corners, monuments or property corners, on adjoining properties, used in the establishment or verification of property corners, shall be identified, located and defined, by course and distance, to an accuracy consistent with the class of survey.

(q) All new or re-established corners shall be:

1. Metal, concrete, or other durable material and detectable with conventional instruments for finding ferrous or magnetic objects;
2. No less than ½ inch in diameter for metal corners and 4 inches in diameter for concrete;
3. No less than 24 inches in length;
4. If the corner location falls on pavement, concrete, or other material where one of the above cannot be placed, it is permissible to use nails, spikes, scribes, etc. in or on the surface;
5. In place prior to the signing, sealing and issuance of the plat.

(r) Where a boundary is formed by a curved line, the curve will be defined by curve data to include the radius, delta arc length and the long chord, by course and distance. The curve may also be defined as a traverse of chords around curve. Chord shall be defined by course and distance.

(s) All visible items across the property line shall be indicated with their extent shown or noted on the survey plat/map. The use of the words projection or encroachment shall be at the discretion of the surveyor.

(t) Visible indications of easements and rights-of-way on the site (i.e. power lines, etc.), obvious and apparent at the time of the survey or known to the surveyor, shall be shown and shall include their widths, if known.

(u) Cemeteries and burial ground located within the premises surveyed shall be located and shown upon the drawing, plat or map if obvious and apparent observed by the surveyor at the time of the survey, or if knowledge of their existence and location is furnished to the land surveyor prior to or during the performance of the survey.

(v) Lot and block numbers and/or the full names of adjoining land owners, and the names and/or numbers of principal highways, roads, streets or railroads, shall be shown, on the plat, with their rights-of-way. The plat book and page number of the subdivision as recorded by the Register of Mesne Conveyance, Register of Deeds or Clerk of Court of the county where the survey document is recorded should be included, if known.

(w) Boundaries formed by water courses shall be located and plotted to scale as shown in the title.

(x) If calculated lines are not shown, traverse lines and/or off-set lines used to close water course boundaries shall be shown, plotted to scale, and defined by course and distance. Note "Creek the line" where applicable.

(y) Maps prepared partially or entirely from reference or source data, such as compiled maps, do not represent land surveys as defined herein, and shall be clearly marked accordingly. Compiled maps must have a prominently displayed statement that the said document does not represent a land survey and is unsuitable for deeding of property or recordation.

(z) Plot plans representing planned locations prepared for city, county, state, federal governmental or other uses may be signed and sealed. A prominent statement shall be placed on the face of the document stating "This plot plan does not represent a land survey, was not prepared for recordation, and is not suitable for deeding of property. No ground survey was performed."

B. Closing/Loan or Mortgage Surveys: In addition to the requirements set forth in Section 49-460 A., General Property Surveys, the following applies to closing/loan or mortgage surveys:

(1) If a survey is all or a portion of a lot which is part of or adjoining a recorded subdivision, lot and block numbers or other designations including those of adjoining lots must be shown on the drawing.

(2) Structures shall be dimensioned to show size and location in relation to the boundary.

(3) Location distances are to be measured perpendicular from the closest side and front lines.

(4) Types of construction should be noted.

(5) Physical features obvious and apparent at the time of the survey to the surveyor such as storm drains, power lines, etc. on the subject property shall be shown and plotted to scale.

(6) Accuracy requirements of residential lots shall be consistent with the class of survey or a maximum closure of 0.05 foot, whichever is less restrictive.

(7) A certification shall be executed by the Surveyor as follows:

"I hereby state that to the best of my professional knowledge, information, and belief, the survey shown herein was made in accordance with the requirements of the Standards of Practice Manual for Surveying in South Carolina, and meets or exceeds the requirements for a Class __ survey as specified therein; also there are no visible encroachments or projections other than shown."

C. Topographical Surveys: The following applies to topographical surveys:

(1) Structures shall be shown in relation to the boundary.

(2) Physical features obvious and apparent at the time of the survey to the surveyor such as storm drains, sanitary sewers, power lines, gas lines and water lines on the subject property shall be shown and plotted to scale.

(3) Elevations may be shown as spot elevations and/or contours.

(4) Contour intervals shall be noted.

(5) The vertical and horizontal error of contour lines and physical features shown shall not exceed one-half the contour interval.

(6) An on-site temporary bench mark shall be established with reference to datum, preferably NGVD and plotted to scale as shown on the title.

(7) The following items from Section 49-460 A. (3) shall be used when a general property survey is not made in conjunction with the topographic survey: a through h, l through n, and t through w.

(8) Where the property boundaries are not surveyed, the source from which the boundary data was taken must be clearly noted thereon.

(9) A certification shall be executed by the Land Surveyor which will contain a statement as follows:

“I hereby state that to the best of my professional knowledge, information, and belief, the survey shown herein was made in accordance with the requirements of the Standards of Practice Manual for Surveying in South Carolina, and meets or exceeds the requirements as specified therein.”

D. Geographic Information System Surveys: The following applies to Geographic Information System Surveys.

(1) Purpose: The purpose of these standards is to provide the Surveyor with a guideline for surveys that provide the location of infrastructure information used in a geographic information system (GIS). The primary objective of this standard is to insure that surveyed information in a GIS is reliable and can be used to make definitive decisions. These standards are not to be used in place of professional judgment.

(2) The Survey: Geographic information system (GIS) surveys are defined as the measurement of existing surface and subsurface features for the purpose of determining their accurate geospatial location for inclusion in a GIS database. All GIS surveys as they relate to property lines, rights-of-way, easements, subdivisions of land, the position for any survey monument or reference point, the determination of the configuration or contour of the earth's surface or the position of fixed objects thereon, and geodetic surveying which includes surveying for determination of the size and shape of the earth both horizontally and vertically and the precise positioning of points on the earth utilizing angular and linear measurements through spatially oriented spherical geometry, shall be performed by a Surveyor who is a licensee of this Board.

The Surveyor shall select the proper equipment and methods necessary to achieve at least the Minimum Horizontal and Vertical Accuracy required in Sections 5a and 5b of these standards. The survey work will be executed in a professional manner by the Surveyor or by personnel under the direct personal supervision of the Surveyor. In the event that more stringent survey requirements are required for a given project than what is provided for herein, the more stringent requirements shall be adhered to.

(3) Coordinate values: Coordinate values should be in the South Carolina State Plane Coordinate System or Geographic Positions based on the National Coordinate System. Horizontal coordinate values should be in the North American Datum of 1983 (NAD 83) 2007 or the most current datum published by the National Geodetic Survey (NGS). Vertical coordinate values should be in the North American Vertical Datum of 1988 (NAVD 88) or the most current datum published by the National Geodetic Survey (NGS). If coordinates are not referenced to the National Coordinate System, identify the local coordinate system used and its relationship to the National Coordinate System. Coordinates shall be given in either metric or English units. The English unit in South Carolina is the international foot.

(4) Results: The results of the survey shall be transmitted to the client in the form of a drawing in a digital format. The following information shall be included in the drawing or in the Federal Geographic Data Committee (FGDC) Metadata and certified to by the Professional Surveyor in responsible charge;

(a) The accuracy classification to which the data was gathered.

(b) The methods and procedures used to obtain the data, including but not limited to: equipment, (i.e. global positioning system, theodolite and electronic distance meter, transit and tape), documentation of positional inaccuracies, control points, bench marks, and PDOP levels for GPS surveys.

(c) Date of the survey work.

(d) Datum used for the survey.

(5) Accuracy - General: The minimum positional accuracy of the survey data is a Geospatial Positional Accuracy that is relative to the mapping scale, and therefore it is the accuracy of the base map on which the GIS is based. The reporting methodology shall be in accordance with the Federal Geographic Data Committee, Geospatial Positioning Accuracy Standards, Part 1 Reporting Methodology. The Geospatial Position Accuracy shall be reported by positional accuracy as defined in two components: horizontal and vertical. Horizontal Positional Accuracy is the radius of the circle of uncertainty, such that the true or theoretical location of the point falls within that circle 95-percent of the time. Horizontal Accuracy may be tested by comparing the planimetric coordinates of surveyed ground points with the coordinates of the same points from an independent source of higher order. Vertical Positional Accuracy is a linear uncertainty value, such that the true or theoretical location of the point falls within +/- of that linear uncertainty value 95-per cent of the time. Vertical Accuracy may be tested by comparing the elevation of

surveyed ground points with the elevations of the same point determined from a source of higher accuracy.

(a) **Horizontal Accuracy:** The horizontal accuracy is based upon the American Society of Photogrammetry and Remote Sensing (ASPRS) Standard for Class 2 and reported in agreement with the National Standard for Spatial Data Accuracy. The NSSDA Horizontal Positional Accuracy Statistic at the 95% confidence level is determined by multiplying the Root Mean Square Error (RMSE) of the data set by 1.7308.

Acceptable	
Base Mapping Scale of LIS/GIS	Positional Accuracy Statistic of Survey Data
1"= 20 ft.	0.7 feet
1"= 50 ft.	1.7 feet
1"= 100 ft.	3.5 feet
1"= 200 ft.	6.9 feet
1"= 400 ft.	13.8 feet
1"= 500 ft.	17.3 feet
1"= 1000 ft.	34.6 feet
1"= 2000 ft.	69.2 feet

(b) **Vertical Accuracy:** The vertical accuracy is based upon the ASPRS Standard for Class 1 and reported in agreement with the National Standard for Spatial Data Accuracy. The NSSDA Vertical Positional Accuracy Statistic at the 95% confidence level is determined by multiplying the Root Mean Square Error (RMSE) of the data set by 1.9600.

Acceptable	
Base Mapping Contour Interval	Positional Accuracy Statistic of Survey Data
1 foot	0.7 feet
2 feet	1.3 feet
5 feet	3.2 feet
10 feet	6.5 feet
15 feet	9.7 feet

(6) **Certification:** A certification shall be executed by the Surveyor which will contain a statement of the class of survey performed as follows:

"I hereby state that to the best of my professional knowledge, information, and belief, the GIS survey shown herein was made in accordance with the requirements of the Standards of Practice Manual for Surveying in South Carolina, and meets or exceeds the requirements as specified therein."

E. **Photogrammetric (Airborne and Spaceborne) Surveys:**

(1) Airborne and spaceborne surveys are defined as the use of photogrammetry, LIDAR, IFSAR, or other similar measurement technologies for obtaining reliable information about physical objects and the environment, including terrain surface, through the process of recording, measuring, and interpreting images and patterns of electromagnetic radiant energy and other phenomena. This Rule establishes minimum allowable photogrammetric production procedures and standards for photogrammetric mapping and digital data production.

(2) Production procedures for topographic and planimetric mapping surveys shall be in accordance with the standards established by Chapter 3 of the Federal Geographic Data Committee (FGDC) Geospatial Positioning Accuracy Standard and applicable extensions and revisions. These standards are incorporated by reference including subsequent amendments and editions.

(3) Topographic or planimetric maps, orthophotos, or related electronic data, unless clearly marked as "Preliminary Map," shall meet contractually specified FGDC Standards for horizontal and vertical accuracies (in the absence of specified standards, the National Map Accuracy Standards apply) and shall be sealed, signed and dated by the licensee.

(4) When the issued product is a digital (electronic) data set, or a map or document consisting of more than one sheet or otherwise cannot be signed and sealed, a project report shall be certified, signed and sealed. Such report shall be clearly marked "Preliminary" if applicable.

(5) Ground control for topographic and planimetric mapping projects shall be in South Carolina State Plane Coordinate System grid coordinates, NAD83/2007, and distances in International feet or meters. A minimum of one permanent project vertical control point shall be shown.

(6) A project map or report shall contain the applicable following information:

(a) Date of original data acquisition;

(b) Altitude of sensor and sensor focal length, as applicable;

(c) Date of document or data set compilation;

(d) If hard copy product is produced, the maps shall contain a north arrow, map legend, final document scale, including barograph, and contour interval, as applicable;

(e) Coordinate system for horizontal and vertical denoting SI (System International English units (i.e., NAD83 and NAVD 88, assumed, or other coordinate system);

(f) A list or note showing the control points used for the project. The minimum data shown for each point shall include: physical attributes (i.e. iron rod, railroad spike, etc), latitude and longitude (or Easting and Northing Grid coordinates), and elevation, as applicable;

(g) If other data is included, the source and accuracy of those items must be clearly indicated;

(h) A statement of accuracy complying with contractually specified FGDC standards consistent with Paragraph (c) of this Rule;

(i) For topographic maps or data sets, contours in areas obscured by man-made or natural features shall be uniquely identified or enclosed by a polygon clearly identifying the obscured area. The accuracies of the contours or of features in this obscured area shall be noted "No reliance is to be placed on the accuracy of these contours";

(j) A vicinity map depicting the project location shall appear on the first sheet of all hard copy maps or in the report accompanying digital files;

(k) Company name, address and phone number; and

(l) The name of the client for whom the project was conducted.

(7) A certificate, substantially in the following form, shall be affixed to all maps or reports:

"I hereby state that to the best of my professional knowledge, information, and belief, that this photogrammetric project was performed in accordance with the requirements of the Standards of Practice Manual for Surveying in South Carolina, and meets or exceeds the requirements as specified therein."

(*) Documents transmitted electronically shall have the computer-generated seal removed from the original file and a copy of the project report shall be signed, sealed and sent to the client. The electronic data shall have the following inserted in lieu of the signature and date:

"This document originally issued and sealed by (name of sealer), (license number), on (date of sealing). This electronic media shall not be considered a certified document. See the project report for certificate and seal."

F. Right of Way Surveys: Right-of-way surveys are surveys of the boundaries of a strip, area or parcel of land being used for some designated public or private use. When these rights of way are taken in fee simple, the surveys and plats shall be performed in accordance with the requirements of Section 49-460-A "General Property Surveys."

49-470. Methods of Marking Property Boundaries.

A. Corner Tree: "X" and three (3) chops on the sides where the line enters and leaves the tree.

B. Corner Witness Tree: One (1) blaze and three (3) chops or three (3) chops facing the corner.

C. Side Line Tree: Two (2) chops facing the property line.

D. Property Line Tree or Center Line Tree: One (1) blaze and two (2) chops, at points where the line enters and leaves the tree.

E. Inaccessible Point: In the event a corner cannot be marked or monumented, one or more witness monuments or metal stakes shall be placed on the boundary line and described by bearings and/or distances so that the inaccessible point may be located accurately on the ground.

F. Boundary Monument or Witness Monument: It is recommended that every new boundary monument or witness monument be identified with a durable marker or cap bearing the name of the surveying company or the land surveyor in responsible charge of the survey. In the event the location falls on pavement, concrete, or other material where it cannot be marked with a cap, it is permissible to use spikes or scribes in or on the surface.

49-480. Land Descriptions.

A. Land Description: A land description is the detailed statement of appropriate information necessary to locate, relocate, or define the boundaries of a certain area or tract of land.

(1) A land description can be part of a land survey and can be used in connection with the preparation of deeds or similar documents.

(2) It is the surveyor's responsibility to make certain that the surveyor's description is complete and proper. The fact that some element or object which should be described is not included in the above does not justify the surveyor's omitting it from the description.

B. Preparing a Description: In a land survey the land description may be prepared by the surveyor. The writing of a deed is the practice of Law and is not the practice of surveying. In a description the full name, address and signature of the surveyor, his registration number and seal, the date the land description was prepared, and the date of survey from which the information was procured, or the book and page number of the recorded map or deed, if it is used in preparing the description, shall appear as part of the document.

C. Types of Land Descriptions and Their Content: In describing a lot located in a subdivision by number; the plat or map must be referenced with the name of the subdivision, the surveyor's name, the date, the township and the general location of the property. In addition, the book and page number in which the particular lot is recorded shall be included.

D. Metes and Bounds Description: A metes and bounds description shall include the general location of the tract or lot with sufficient accuracy such that the tract can be readily located on the ground. This is commonly known as a "being clause" and it should also include the source of title of the tract or lot. The point of beginning must be selected such that it can be readily and accurately located from some previously established monument or corner of record and can be readily described. The description shall include the names of adjoining property owners on all lines and at all points. The monument or marker at each corner shall be described. A metes and bounds description shall describe all courses in logical sequence around a tract or lot in a clockwise direction such that the ending point is the beginning point. All lines adjacent to streets, roads, or other rights-of-way shall be referenced to these and all pertinent distances and curve data shall be listed in addition to the parcel's area.

49-490. Instruments and Apparatus.

A. Surveyor's Instruments: Surveying in South Carolina shall be conducted in the field with properly calibrated equipment appropriate for the tolerance of work being performed. The equipment shall be tested at regular intervals and adjusted to maintain its optimum accuracy.

B. Tapes: All tapes shall be of alloy or carbon steel and shall be certified as USBS quality with a known coefficient of temperature and tension corrections, and graduated in feet and decimal parts of a foot or calibrated to another tape or means that has been certified by the USBS or NGS.

C. Baselines: Baselines have been established by NGS throughout the state for the purpose of calibrating electronic distance measuring devices. Some of these baselines have 100' monuments to calibrate tapes. Surveyors shall utilize these baselines to insure calibration of their electronic measuring equipment and

tapes. Calibration records for each instrument and tapes shall be maintained by the Surveyor and shall be made available when required by the Board or the courts.

Editor's Note: This Manual is the same as Article 4 of the S.C. Regulations governing the practice of engineers and surveyors. It is excerpted here and published separately as the Standards of Practice Manual for Surveying in South Carolina. The Board makes this Manual available on the web site for easy access and downloading by licensees and citizens. It is not available as a printed document.