PROCEDURAL AND TECHNICAL STANDARDS

FOR THE

PRACTICE OF LAND SURVEYING

IN THE

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

PREPARED BY

THE RHODE ISLAND SOCIETY
OF PROFESSIONAL LAND SURVEYORS

ADOPTED BY

THE RHODE ISLAND BOARD OF REGISTRATION
FOR PROFESSIONAL LAND SURVEYORS

EFFECTIVE APRIL 1, 1994

Introduction

This revision of the Procedural and Technical Standards for the Practice of Land Surveying in the State of Rhode Island and Providence Plantations (hereinafter "Standards") is based upon previous Standards as adopted 03-05-1984 and the efforts of the previous Standards Committee. The contributions of those Committee members are hereby acknowledged:

Robert A. Murray, Louis Federici and Pierre H. Guillemette

This revision of the Standards represents the combined efforts of a number of dedicated individuals. Their contributions to this undertaking are gratefully acknowledged:

Richard Bzdyra, Richard Lipsitz, Samuel White, James Reddington,
Roger Anthony, John Mensinger, Michael Scanlon and Stephen Souls

Rhode Island Board of Registration for Professional Land Surveyors
Rhode Island Society of Professional Land Surveyors

Connecticut Board of Examiners for Engineers and Land Surveyors
Connecticut Association of Land Surveyors

Massachusetts Board of Registration for Professional Engineers
and Land Surveyors
Massachusetts Association of Land Surveyors and Civil Engineers

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Maine Society of Land Surveyors

New Hampshire Joint Board of Engineers, Architects and Land Surveyors
New Hampshire Land Surveyors Association

Vermont Board of Land Surveyors
Vermont Society of Land Surveyors

Thank you - Alfred W. DiOrio, Chairman

Dedication

These Standards are dedicated to those for whom Standards are not representations of the maximum effort required, but instead, levels of minimum effort to be continually surpassed.

Table of Contents

Section 01.00 Classes of Surveys / Tables

Section 01.01 Identification of Survey Classes and Relationship To Survey Services.

The types of surveying services listed below shall be performed so as to meet or exceed the criteria established for these CLASSES of surveys.

Class of Survey	Type of Survey Services
CLASS I	High Accuracy Surveys

Surveys of developed (or soon to be developed) commercial and residential property, performed to a high degree of positional accuracy. Most urban and suburban boundary surveys, large-scale construction projects, title surveys, and subdivisions of land should be performed to this standard.

CLASS II Moderate Accuracy Surveys

Surveys of undeveloped or less developed property, such as rural parcels, farmland, marshlands, and low-density residential areas, performed to a moderate degree of accuracy. While in all other respects these surveys are comparable to those described in CLASS I, they may employ instruments, methods, and measurement procedures which render their positions with somewhat less accuracy. While these surveys are reliable and cost-effective, their use should generally be limited to those areas where such a moderate level of accuracy is sufficient.

CLASS III Data Accumulation Surveys

Surveys designed to collect and report data, typically for the purpose of evaluation of existing conditions and/or design of future improvements. Such surveys and plans tend to measure and show the relative positions or locations of physical features to a stated graphical scale which is suited to the purpose for which the survey is to be used. This classification includes topographic surveys, photogrammetric surveys, site plans, utility plans, etc. To the extent that property lines are reflected on such plans, they are to be regarded as pictorial only, unless such boundaries are also certified to a CLASS I , CLASS II or CLASS V standard.

CLASS IV Compilation Maps

Types of plan or report compiled from other maps, deeds, and/or other sources of information. Such a plan may or may not be a product of limited field investigations, but in any case is subject to such changes as an accurate field survey may disclose. Such a map is never suitable as a boundary survey, but may be used for the purposes of compilation maps, conceptual and preliminary plans, feasibility studies, tax maps, overlay maps, mortgage loan inspections, etc.

All plans prepared under this class shall carry the following statement which shall be clearly visible on the plan and/or report:

"This plan/report is substantially correct in accordance with a CLASS IV Standard as adopted by the Rhode Island Board of Registration for Professional Land Surveyors. This plan is not to be construed as an accurate boundary survey and is subject to such changes as an accurate boundary survey may disclose."

CLASS V Control Surveys

Surveys of extremely high order accuracy, typically required by Federal, State or municipal agencies for the purposes of large-scale geodetic control, or extremely high accuracy construction projects, such as bridges and tunnels. The complexity of such surveys, their high cost, and the likelihood that they will be of only marginal additional value to a property owner, are all factors which make them generally unsuitable for ordinary boundary surveys.

Section 02.00 Specifications for Survey Clases.

Section 02.01 Specifications for Horizontal Surveys.

MEASUREMENT STANDARDS FOR SURVEYS

DESIGNED SPECIFICATIONS: It shall be the responsibility of the surveyor in responsible charge to design specifications for field survey procedures sufficient to satisfy the accuracy standards for distance and angular measurements for the designated Class of Survey in order to assure that the required nominal positional accuracy (*Pn*) will be achieved. The specifications shall include the selection of appropriate instrumentation and observation procedures to be employed by field observers. **Table I is to be used in conjunction with the section of the Technical Manual to Accompany Procedural & Technical Standards for the Practice of Land Surveyors in the State of Rhode Island and Providence Plantations titled "Accuracy Standards"**

TABLE I
1 SIGMA HORIZONTAL ACCURACY FOR TRAVERSE SURVEYS,

CLASS	NOMINAL POSITIONAL ACCURACY (*Pn*) *EXPRESSED AS RATIO*	ALLOWABLE PRECISION FOR DISCRETE DIRECT MEASUREMENTS *LINEAR PRECISION* (E_d) $_1$	*DIRECTIONAL PRECISION* (E_a) $_2$
I	1: 10,000	+/- 0.01 FT	+/- 10"
II	1: 5,000	+/- 0.02 FT	+/- 20"
III	1: 300	+/- 1 FT	+/- 15'
IV	COMPILATION OF EXISTING DATA - NOT A PRODUCT OF FIELD SURVEY.		
V	1: 25,000	+/- 0.01 FT	+/- 05"

1. E_d may exceed tabular value for linear precision provided s/E_d expressed as ratio is greater than required nominal positional accuracy (Pn) for class of survey.

2. The tabular values for E_a are sufficient to satisfy the required directional element for the nominal positional accuracy *(Pn)* for each class of survey. The above not withstanding it is recommended that E_a be kept in balance with E_d to avoid unnecessary degradation of actual positional accuracy.

3. This standard provides for the same allowable precision for measurements in a traverse circuit (either open or closed) and also any associated side shots.

TABLE II
ACCURACY STANDARDS FOR VERTICAL CONTROL SURVEYS

CLASS	LEVEL LOOP CLOSURE	MAXIMUM SIGHT DISTANCE
I	+/- 0.035' $\sqrt{MILES}$	300 FEET
II	+/- 0.050' $\sqrt{MILES}$	350 FEET
III	PHOTOGRAMMETRIC CONTROL - SEE NOTE 1	
IV	+/- 0.20 FEET - SEE NOTES 2 and 3	
V	+/- 0.020' $\sqrt{MILES}$	250 FEET

Notes:

1. See Specification at Section 04.02, page 15
2. This specification is specifically for the representation of elevations on plans for Individual Sewage Disposal System (ISDS) applications/ designs. As such, these measurements are not required to be the result of level loops or networks.
3. The maximum sight distance for specification shall ensure repeatability within 0.2 feet.

Section 03.00 Control, Original and Retracement Surveys

Section 03.01 Procedural Standards

A. **Research and Preliminary Analysis.** The surveyor shall:

1. Review legal description(s) of the property to be surveyed.
2. Review legal descriptions of all abutting properties.
3. Perform deed research so as to analyze related senior and junior rights for the property to be surveyed and for all abutting properties.
4. Review copies of recorded (land evidence) documents affecting the survey.
5. Where feasible, search for abutting/adjoining unrecorded survey information.
6. Review from utility companies, public offices, title companies and other appropriate sources of information, including known private sources, the available plans, documents and field notes affecting the survey.
7. Where applicable, obtain copies of the state and municipal ordinances which pertain to the area of the survey.
8. Examine and analyze the data.
9. Form preliminary conclusions as to the completeness of data and identify inconsistencies in the record information.
10. Plan procedure for performing the field survey.

B. **Field Investigation.** The surveyor shall:

1. Search for physical monuments and weigh their reliability.
2. Investigate possible parole and written evidence (i.e. unrecorded deeds) supporting positions of lost control monuments.
3. Take measurements to correlate existing evidence.
4. Whenever feasible, connect the survey (applying proper adjustments) to the Rhode Island State Plane Coordinate System.
5. Take sufficient check measurements to verify the observations.

6. Locate physical occupation lines (e.g. fences, hedges, walls, etc.) between abutting properties. Where applicable, advise client to review with legal counsel statutes pertaining to adverse possession, the laws of acquiescence and other unwritten rights

7. All field notes, measurements and observations made during the course of the survey shall be recorded in an appropriate form, and in a manner that is intelligible to other surveyors. These notes should indicate site location, street names, personnel, instrument identifications, date of observations, and weather conditions affecting measurements. Nothing herein shall preclude the use of electronic data collectors for the recordation of field notes.

C. **Computations, Conclusions**. The surveyor shall:

1. Compute and compare field information with record data.

2. In the event of substantial disagreement with the work of another professional, the surveyor shall make reasonable efforts to contact that professional and investigate the disagreement.

3. Evaluate the data in accordance with law and/or precedent, and determine the location of property lines.

4. Provide sufficient monumentation to enable the reproduction of the survey on the ground in accordance with Section 3.02-B. herein.

5. Retain all records that may be used to substantiate conclusions.

03.02 Technical Standards

A. **Measurements**

1. Measurements shall be taken to a precision compatible with the particular problem involved and with the size and geometric shape of the parcel involved.

2. All linear measurements shall be taken with a properly calibrated measuring device with a record of calibration maintained for future reference.

3. Any parcel of land which has an irregular boundary or a mathematically indefinable boundary shall have a closing tie line in the general vicinity of the irregular boundary. The closing tie line observations shall be angles/bearing and distances along lines between accessible property lines.

B. Monuments & Markers

1. "Monuments" as used in these Standards shall be deemed to be physical objects of reasonable longevity and permanence such as:

   -Stone or concrete bounds with minimum dimensions of four (4) inches square by thirty (30) inches long, with drill holes, crosses or disks marking the point.

   -Metallic disks, marked with a cross or punch hole, cemented firmly into an immovable object not subject to short term deterioration. The disk shall be produced from a material that will not rust or deteriorate from oxidation or atmospheric pollution;

   -Drill holes of sufficient depth placed in sound, immovable objects;

   -Iron pipes or solid rods produced from ferrous or non-ferrous metals/materials;

   -Foundation and building corners of stone, granite, brick, concrete or similar materials not subject to change or renovation, used as offsets;

2. "Markers" as used in these Standards shall be deemed to include nails, wooden and plastic stakes and other materials possessing a similarly limited life span.

3. A sufficient number of control points shall be marked by physical monuments which will allow for the accurate reproduction of the survey, as follows.

   (a) For surveys of residential parcels of land, one acre or less in area, a minimum of two (2) monuments on the boundary must be set or recovered. Should, at the discretion of the surveyor, it be more appropriate that only markers be set on a survey of residential parcels of land, one acre or less in area, then all corners and angle points must be marked.

   (b) For surveys of residential parcels of land greater than one acre in area, and for all non-residential parcels of land, a sufficient number of monuments, but not less than three (3), must be set or recovered at property corners or angle points to accurately define the property and to permit reproduction of the survey.

   (c) Land divisions and/or subdivisions regulated by municipalities are excepted from the monumentation requirements of these standards, and monumentation shall be as directed by the municipality. It is not the intent of these standards to require the monumentation of individual subdivision lots prior to their sale by the subdivider.

4. Markers may be set at any point not requiring a monument. Markers may be set in place of monuments where transitional site conditions dictate these as appropriate.

5. When a survey is performed which is based entirely on non-record monuments, lines of possession, and other evidence which render the locations of boundaries uncertain, the surveyor shall so inform the client, and shall prepare a plan in accordance with Section 3.02-C. herein which indicates the basis of the boundary opinion drawn.

6. When conditions require setting a monument on an offset rather than at the true corner, the surveyor shall prepare a plan in accordance with Section 3.02-C. herein.

7. In the event that monuments cannot be set and are not recovered at property corners or angle points, the surveyor shall prepare a plan in acordance with Section 3.02-C. herein showing the control monuments which reference the boundary location .

8. Monuments shall be witnessed in such a manner as to be easily discoverable, and may have the name of the firm or the surveyor responsible for the survey affixed thereto.

C. **Plans**

1. When a plan is prepared, it shall include the following:

a. A title block containing the category of the survey, the geographic location (Assessor's Plat and Parcel Number, street name, town and state) of the parcel surveyed, month/day/year, scale, graphic scale and name and address of the firm or surveyor responsible for the survey. Revisions shall be noted near the title block with reference number, date, description and initials of the responsible surveyor.

b. All lines and lettering sizes for plans shall be of such dimensions and widths as to be clear and legible when the plan is reproduced.

c. A vicinity map should be provided.

d. North arrow and notation as to its reference (e.g. Grid, Magnetic or Assumed) shall be shown on each sheet. Magnetic bearings shall show the date of the observation.

e. All pertinent bearings or angles, linear dimensions and areas shall be indicated to the accuracy of the measurements observed. One course of the survey shall be represented with a bearing referenced to the meridian.

f. The minimum data for all curve segments along the perimeter of the parcel is: central angle, radius, and the arc length. When lines are not radial or not tangent, the angle-to-chord or chord bearing and the chord dimension shall be shown.

g. Sufficient data shall be shown on the plan to allow the retracement of all lines and points.

h. Name(s) of record property owner, and names of record abutting property owners shall be shown. Abutting property identification shall include: tax assessor's plat and parcel number and subdivision parcel number, where applicable.

i. When a planametnc or topographic feature controls the location of a line or point found or created, the relationship of the feature to the line or point shall be shown. Benchmarks and datum plane shall be indicated when vertical control is required or stated.

j. Map closures should be consistent with the CLASS of survey performed.

k. Any parcel of land which has an irregular boundary shall have a closing tie line in the general vicinity of said irregular boundary. The closing tie line shall be provided with all angular and linear dimensions required to mathematically close the survey.

l. Significant discrepancies between measured or calculated data and record data shall be depicted on the plan. The plan shall disclose which of these values has been utilized in the computations.

m. A legend shall be included indicating the definitions of all abbreviations and symbols used.

n. Monumentation of the parcel being surveyed and monumentation of public ways which provide useful reference orientation shall be indicated. Reference monumentation utilized in developing the plan shall be indicated. Monument notations shall include the character, type and condition of the monument and shall indicate whether the monument was "found" or "set". If known, the origin of found monuments shall be shown. When there is no available reference, this shall be so stated.

o. Streets, roads, easements of record and/or usage (e.g. public, private or right-of-way) shall be shown. Names and route numbers of streets and ways within the plan area shall be indicated. References to Highway Plats shall be included, where applicable. Stationing and offset ties to stationing shall be shown, where applicable.

p. Utilities, overhead and underground, where apparent and applicable, shall be shown.

q. Observed encroachments and/or record evidence of easements shall be shown.

r. Location of buildings and other important physical features shall be shown, where appropriate. All observed cemeteries and burial grounds shall be shown.

s. Evidence of fences, walls, trees, etc. that appear to indicate a boundary line or corner shall be shown or noted. This evidence may be dimensioned using offset lines from the property lines

t. Where appropriate and feasible, the corners of the parcel shall be referenced to the Rhode Island State Plane Coordinate System.

u. The area of the parcel(s) shall be shown in English units.

v. The surveyor shall recommend that the client file the plan in the Land Evidence Records of the Town or City in which the property is located.

w. Classifications for both horizontal and vertical surveys shall be indicated. The seal, signature, and the following statement, signed by the surveyor, shall appear on every plan:

This survey and plan conform to a CLASS ___ Standard as adopted by the Rhode Island Board of Registration for Professional Land Surveyors

By: _____
Registered Professional Land Surveyor Date

Section 3.03 Additional Standards and Specifications Which May Apply:

1. "Minimum Standard Detail Requirements for ALTA/ACSM LAND TITLE SURVEYS" as adopted by American Land Title Association and American Congress on Surveying & Mapping, 1992, as may be amended.

Section 04.00 Data Accumulation Surveys.

Data Accumulation Surveys are topographic surveys, photogrammetric surveys, utility surveys, site surveys, hydrographic surveys and other surveys designed to report physical data.

04.01 Procedural Standards

A. **Research and Preliminary Analysis**. The surveyor shall:

1. Determine the purpose of the survey, the specific items of data to be accumulated and the degree of completeness and accuracy necessary.

2. Obtain from public agencies and utility companies, and local land evidence records copies of available deeds, maps and plans pertinent to the survey.

3. Review the available descriptions of monuments referencing the horizontal and vertical datums upon which the work is to be based.

4. Observe Section 3.01-A.-8 through 10.

B. **Field Investigation.** The surveyor shall:

1. Search for and verify monuments referencing horizontal and vertical datums.

2. Establish, adjust and monument necessary control lines to which the survey is to be referenced.

3. Extend the survey a reasonable distance beyond the limits of the project to include physical characteristics that may affect the site.

4. Observe Section 3.01-B.-5. and 7.

C. **Computations, Conclusions**. The surveyor shall:

1. Make any reductions and compilations necessary.

2. Make necessary computations to verify correctness of measurements

3. Evaluate and edit collected data, where applicable.

4. Prepare in an appropriate form, the results of the survey in a concise manner to minimize misinterpretation.

04.02 Technical Standards

A. **Measurements**

1. Observe Section 3.02-A.-1. and 2.

2. Vertical:

a. Whenever feasible, elevations shall be referenced to the National Geodetic Vertical Datum (current revision) or another locally recognized datum.

b. For the purpose of establishing bench marks, level loops shall close to a minimum accuracy of 0.05 feet times the square root of the length of the level run in miles (CLASS "II" - see page 7). A statement shall be made on all associated mapping as to the CLASS Standard of the level run.

c. A minimum of two (2) project bench marks shall be established on each site, and their locations, elevations and datum base shall be shown on the final plan. The reference bench mark upon which the project bench marks are based shall also be indicated.

3. Topographic (manual):

a. Measurements shall be taken with a precision compatible with the nature and specifications of the project.

b. Vertical measurements shall be taken to the nearest hundredth of a foot when locating such cultural features as building floor elevations, manholes, curbing, pipe inverts, pavement, etc.

c. Vertical measurements shall be taken to the nearest tenth of a foot on natural ground, water levels, etc.

4. Topographic (aerial):

a. Photogrammetric surveys shall conform to the standards of the American Society for Photogrammetry and Remote Sensing, entitled:

"ASPRS Interim Accuracy Standards
For Large-Scale Maps",
dated 1988, as may be amended.

B. **Monuments**

1. The control lines or points to which the survey is referenced shall be marked with physical monuments set in a manner providing a degree of permanence consistent with the terrain, physical features and purpose of the survey.

C. **Plans**

1. The client may be furnished the results of the survey in an appropriate form (e.g. plans and sketches, cross-sections, diagrams, tabulations, etc.) as follows:

a. Observe Section 3.02-C.-1.-a,b,c,d,m,o,p,r,and w.

b. A statement describing the data accumulation methods employed (ie. field survey, aerial photogrammetry, other existing mapping) shall be included. Compiled data shown shall indicate the source of the data and to what extent the information was verified.

c. Identification of horizontal and vertical datums to which the measurements are referenced shall be included.

d. If property boundaries are shown, a statement of their CLASS shall be made.

Section 05.00 Construction Surveys.

05.01 Procedural Standards

A. **Research and Preliminary Analysis** The surveyor shall:

1. Obtain from the client the approved specifications and plans setting forth the project for which the layout survey is to be conducted.

2. Review from known private and public sources available copies of data affecting the project.

3. Determine the appropriate number of control points to be established and the relationship of said points to the proposed construction.

4. Observe Section 3.01-A.-8. and 9.

5. Plan the procedure for performing the construction layout.

B. **Field Procedures.** The surveyor shall:

1. Search for and verify monuments, lines or objects indicated by the construction documents as the intended references for the project's horizontal and vertical datums.

2. When appropriate, establish, adjust and monument control points and lines required for the final layout surveys.

3. Observe Section 3.01-B.-5. and 7.

4. Immediately bring to the attention of the client and the author of the design plan (where appropriate) any inconsistencies disclosed by the survey or by examination of the plans.

C. **Computations, Conclusions.** The surveyor shall:

1. Make necessary computations to verify the accuracy of measurements.

2. In the event of the discovery of any discrepancies between the construction documents and the layout as surveyed, notify the client, and indicate the corrective measures that were taken, if any.

3. Observe Section 3.01-C.-5.

05.02 Technical Standards

A. **Measurements**

1. Measurements shall be taken to a precision compatible with the particular problem involved and with the size and nature of the project involved.

2. Observe Section 3.02-A.-2.

B. **Monuments**

1. Construction layout monuments shall be of a type and character and set in a manner providing a degree of permanency consistent with the terrain, physical features and intended use.

2. Sufficient monuments and offset information shall be provided to enable the user to check the accuracy of any points or lines established therefrom.

3. Monuments shall be witnessed in a manner that shall be easily discoverable. Any stakes that show offsets and/or cut and fill data shall also show sufficient information to identify the horizontal position of the referenced point.

05.03 Additional Standards and Specifications Which May Apply:

1. "Manual On Construction Layout", DRAFT Revision #2, Dated 02-19-1992", as may be amended.

Section 06.00 Global Positioning Systems (GPS) Standards

The use of Global Positioning System surveys in the State of Rhode Island shall conform to those standards and specifications as set forth in:

"Geometric Geodetic Accuracy Standards and
Specifications for Using GPS Relative
Positioning Techniques
Federal Geodetic Control Committee
Version 5.0 May 11, 1988
Reprinted with correction: August 1, 1989",
as may be amended.

Section 07.00 General Presumptions of Practice

The following presumptions shall be utilized unless sound evidence exists to justify alternative practices:

Section 07.01 Walls and Fences

1. The center of a wall or fence shall be the dividing line between abutting properties when neither is a public way, unless otherwise defined.

2. The face of a wall or fence nearest the center line of a public way shall be taken as the limit of the right-of-way, provided either of the following conditions exist:

   a. both faces of the wall or fence are exposed to the same height or

   b. the wall or fence retains land abutting the public way.

3. The exposed face of every wall or fence that supports a public way shall be the boundary line of the right-of-way.

4. The exterior face of a wall or fence enclosing a cemetery or burial ground shall delineate the boundary line of the cemetery or burial ground unless one or more of these walls or fences is of the type enumerated in Section 07.01-1. through 3. above, whereupon those assumptions shall be utilized.

5. The surveyor is advised to consider the extension of title lines to the centerline of the public right-of-way.

Section 07.02 Side Shots

1. All locations made and/or set from any traverse are to be accomplished using the same procedure and equal or better precision as that utilized for the primary traverse and the CLASS of precision shall be stated.

2. All side shots made from any traverse shall be made in accordance with practices and techniques which ensure confident locations.

3. A traverse run to locate or set angles or line points on boundary lines should be located as closely as practical to the presumed boundary lines. The surveyor shall have the flexibility to increase the separation distance between the primary traverse and the boundary lines in those instances where instrumentation may yield greater precision from said increased separation distance.

4. It is suggested that all distances be laid-out or observed a minimum of two (2) times. All angles and repetitions of angles shall be turned and read in the direct and indirect positions and all observed data shall be recorded.

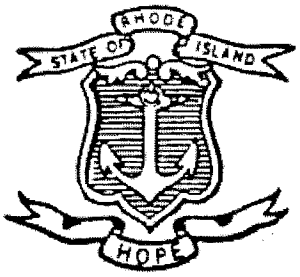
5. Prior to the establishment of the primary traverse, a diligent search shall be made for all angle points on boundary lines initially presumed to be along stone walls, fences or other physical evidence. Walls, fences or other physical monuments of a similar nature shall be observed along their entire length for angle points and deflections.

6. The surveyor shall be responsible for determining which deviations from a straight line will constitute angle points in the boundary line and which may be the result of vandalism or the ravages of time. The surveyor shall locate and record those deviations determined to be angle points.

Section 08.00 Deviation From Published Standards

08.01 Nothing contained in these Standards shall prohibit reasonable deviations from the specific requirements of a particular Section when, in the prudent professional opinion of the land surveyor in responsible charge, an alternative approach or methodology will yield equal or better results, or is dictated by the particular circumstances of the survey activity involved; provided that such alternative approach or methodology shall comply with the overall intent of the procedural and technical standards as outlined herein.

END



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