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3300 GENERAL SURVEYING

3300.1 Purpose

This policy sets suggested standards and guidelines and indicates areas of responsibility for people performing office or field survey functions.

3300.2 Definition of Terms

ACHD	Ada County Highway District, political body or authorized agent
BM	bench mark
C	cut
CL	Centerline
Data Collector	Electronic device that records information directly from total station
F	fill
L-Line	location line
PVC	point of vertical curve
PVI	point of vertical intersection
PVT	point of vertical tangent
P-Line	preliminary line
PC	point of curvature
PCC	point of compound curve
PI	point of intersection of tangents
POC	point on curve
PRC	point of reverse curve
PT	point of tangent
RAD PT	radius point
RP	reference point
TBC	top back curb
TBM	temporary bench mark
Total Station (EDM)	Electronic horizontal-vertical circle and distance measuring device

3300.3 Areas of Responsibility

3300.3.1 Survey Coordinator

The person has overall responsibility for the District Survey Section. The Survey Coordinator assigns a project to the Party Chief for the actual work. He thoroughly briefs the Party Chief on all aspects of the project, task description, and schedule. He maintains overall responsibility for completion and quality of the finished product. The Survey Coordinator shall be a Licensed Land Surveyor in the State of Idaho.

3300.3.2 Party Chief

The person is responsible for the field activities required to complete the assigned survey. He receives technical assistance from the Land Surveyor or Survey Coordinator. This person is also responsible for maintenance of survey equipment and vehicles.

3300.3.3 Instrumentman and Rodman

This staff is assigned to the field crew. Their responsibilities are helping the Party Chief complete the survey, and assuring that the survey vehicles are stocked and outfitted with necessary materials. They also assist with the maintenance of equipment and vehicles. It is their duty to assure that radios and batteries for the Total Stations and Data Collectors are charged.

3300.4 Land Surveying

Surveying establishes or re-establishes land lines and property corners. Idaho Code, Title 54, Chapter 12, regulates survey practices, as cited below.

3300.4.1 IC 54-1202(e)

"The term professional land surveyor as used in this act, shall mean a person who is qualified by reason of his or her knowledge of the principals of surveying acquired by education and practical experience to engage in the practice of land surveying and who has been duly registered or licensed as a professional land surveyor by the State of Idaho Board under this Act."

3300.4.2 IC 54-1202(f)

"The term land surveying includes responsible supervision of surveying of areas for their correct determination and descriptions and for conveyancing, or for the establishment or re-establishment of land boundaries and the plotting of lands and subdivisions thereof. Any person shall be construed to practice or offer to practice land surveying within the meaning and intent of this act who engage in land surveying, or who, by verbal claim, sign, advertisement, letterhead, card, or in any other way represents himself to be a professional land surveyor, or who represents himself as able to perform or who does perform any land surveying service or work or any other service designated by the practitioner which is recognized as land surveying."

3300.4.3 Land Surveying Defined

Any surveys associated with property boundaries and right-of-way acquisition are land surveying under Idaho Code, and must meet the provisions of Title 54 and 55. This requires that all District land surveys be supervised by a Land Surveyor licensed in the State of Idaho.

3300.4.4 Monuments

All property monuments within or adjacent to highway rights-of-way must be preserved and protected. If construction will remove or disturb property monuments, they shall be re-established and monumented as part of the construction project. This must be done by a licensed Land Surveyor according to the provisions of the Corner Perpetuation and Filing Act, Idaho Code 55-1601 through 55-1613.

3300.4.5 Contractor's Responsibility

It shall be the contractor's responsibility to protect survey monuments or benchmarks located outside the limits of construction. If such monuments or benchmarks are disturbed, the contractor shall have them replaced by a licensed surveyor at the contractor's sole expense.

3300.4.6 Costs to Retain and/or Replace

All costs associated with maintaining or replacing monuments shall be incidental to the project. No separate payment will be made.

3300.5 Topographic Surveys

Topographic surveys collect field data from which a map is made that shows location of natural and man made artificial features, and elevation of points on the ground.

3300.5.1 Acceptable Topographic Surveys

Acceptable topographic surveys are tied by station and offset from P-line, or are done with electronic data collection. Photogrammetric methods are addressed in special provisions for each project.

3300.5.2 Legal Record

Field notes and office files become legal records of the survey. They must be neat, orderly, concise, legible, complete and prepared in a manner consistent with good survey practice. These records will be subject to interpretation by others, possibly several years in the future. Due to the increased use of data collectors and total stations, hand written field notes are not as prevalent as they once were. Data collectors are valuable and necessary in survey work, but they are not intended to replace hand written field notes. District or consultant surveyors will continue to keep field notes on projects. Notes include, but are not limited to, the following:

1. Levels for benchmarks
2. Construction staking
3. Levels to design features such as curb, pipe, and edge of pavement matches.
4. Reference ties (R.P.'s) to Inter X - 1/4 - 1/16 - section corner, street intersection, etc. and filing CP and F's.
5. Manhole flowline depths and sketches showing direction and size of pipes.
6. All boundary surveys specified elsewhere in this section.
7. All control information, for example P-line, L-line, aerial mapping and topographic surveys.
8. All critical features of a project
9. Stationing on all surveys and plans, unless otherwise approved by the District, shall begin with a minimum station of 10+00 and shall either proceed south to north or west to east.

All original field notes and computer files stored on floppy disk will become the property of the District.

3300.5.3 Topographic Survey Details

Topographic surveys shall include all detail for 100 feet beyond the proposed right-of-way, or as conditions warrant. They shall extend further if special design, construction or right-of-way considerations are anticipated. Surveys shall include, for example: aboveground and underground utilities and warning signs; buildings; asphalt and concrete walks; curbs; vehicle facilities and names of each; approaches; fences; irrigation structures; lawn sprinkler and irrigating facilities; flow and direction of free drainage; laterals; canal structures and names of each; storm drain and sanitary sewer facilities with rim elevations of manholes; all traffic signals, control boxes, and signs, commercial signs and landscaping, including notations identifying trees and/or bushes with trunk and drip line diameter. All pipe inverts and sizes shall be shown indicating type of facility.

3300.5.4 Cross Sections (X-sections)

X-Sections shall be taken at right angles to P-line or L-line and normal to curves at 50-foot stations or less. They shall include breaks, driveways, approaches and other unusual conditions. X-sections shall be extended 50-foot outside expected cut or fill slopes, the proposed right-of-way line, or as conditions warrant. X-sections may be gathered by electronic data collection methods with post processing software that provides a report with station, distance left or right of centerline and elevation of point. Traditional methods of gathering data for X-sections are also acceptable.

3300.5.5 Centerline Profiles

Centerline profiles shall be at a minimum 50-foot stations, or as needed to properly reflect breaks on P-line or L-line, by differential level methods. This will be in addition to the profiles completed by data collector methods.

3300.6 Route Surveys

Route surveys are for location of highways, pipe lines, canals, railroads, utility lines, etc.

3300.6.1 P-line

Preliminary line, controlled by land corners, includes necessary control to perform topographic activities. All pk nails, or other monuments used in preliminary control that could be confused with L-Line monumentation, shall be removed at time of staking L-Line.

3300.6.2 L-line

The location line, designed centerline of route is controlled by land corners. It includes 100-foot stations, PC, PT, PI, and street intersections physically staked in the field.

3300.7 General Construction Surveys

These are surveys that provide locations and grades for constructing roadways and structures.

3300.7.1 Construction Staking

Construction staking shall include but not be limited to staking lines, grades, pipes, minor structures, curb and gutter, sidewalk, manholes, and drop inlets. The District or Consultant may check grade at periodic intervals to assure compliance with the contract. The contractor shall provide a laborer to hold the level rod as directed by the owner's representative during grade checks. Remeasurement work or proof of correct staking shall be done if the District determines that any portion does not conform with line, grade and dimensions shown on the plans or as directed.

3300.7.2 Provided to Contractor

Construction staking shall be provided to the Contractor as follows: One set of construction control stakes will be provided by the District or a Consultant to establish reasonable horizontal and vertical control to sufficiently delineate the work to be accomplished. The District or consultant will provide project staking sheets to the Contractor for use by his personnel and subcontractors.

3300.7.3 Notice Required for Staking

At least twenty-four (24) hours notice is required for construction staking. In some circumstances, forty-eight (48) hours will be required.

3300.7.4 Sub-Grade Elevation

Sub-grade elevation shall be checked at the request of a District representative. It shall be the Contractor's responsibility to check grade from the provided reference hubs, slope stakes, or curb and gutter construction stakes.

3300.7.5 Slope Stakes & Reference Hub and Stake

When necessary, slope stakes and reference hub and stake shall be established at cut and fill catch points on both sides of centerline at 50-foot stations. Cut or fill catch points shall be marked "cut bank" or "toe." Each slope stake shall be referenced with hub and stake; with offset distance to slope stake; and offset distance and grade to top back of curb or edge of pavement at that station. In taper sections centerline also shall be referenced on stake. More traditional methods may be used, depending on a contractor's request.

3300.7.6 Finishing Stakes or Blue Tops

Finishing stakes or blue tops shall be set when base course is within 0.2-foot of final grade. The stakes shall be set to the nearest 0.02 of a foot of the design grade line. Blue tops shall be set at 50-foot stations on centerline and at edge of pavement line if curb and gutter are not being constructed. Where roadways are 44-feet or greater in width, quarter crown stakes also will be set.

3300.7.7 Top of Pit Run

Top of pit run will be checked at centerline and at each shoulder or lip of gutter line. Cut or fill (C/F) should be painted on the surface or use hub and "red-

tops." Where roadways are 44-feet or greater in width, quarter crown stakes also will be set.

3300.7.8 Pipe and Ditch Staking

Pipe and ditch staking shall be with hub and stake on an offset line. This shall not fall within trench excavation. Offsets shall be to centerline of pipe or structure and marked with cut or fill (C/F) to flow line (FL). Where new construction is connecting to existing structures or flowlines, all existing horizontal and vertical locations shall be checked before final grade setting.

3300.7.9 Minor Structures

Minor structures such as irrigation structures, sand and grease traps, and manholes shall be staked to the centerline of structure with reference hubs and stakes.

3300.7.10 Major Structures

Major structures such as bridges, shall be staked by setting hub and tack or other suitable monument with guard stakes on each side of the major structural parts and centerline control. The District may request a different system.

3300.7.11 Curb and Gutter Staking

Curb and gutter hub, tack and stakes shall be placed every 50-feet. It shall include extra points for grade breaks/changes, high/low point on vertical curves, PC, PT, and radius points for curves with a radius under 50-feet, or where practical. Curves with larger radii shall have stakes every 25-feet or less, where practical or required, and shall have offset distance to top back of curb (TBC) and cut or fill (C/F) to TBC. Where new construction is connecting to existing curb and gutter the horizontal and vertical locations shall be checked before final grade setting.

3300.8 Provisions for Consultants Performing Construction Staking

3300.8.1 Field Notebooks and Forms

All field notebooks and forms used for construction staking shall become the property of the District upon completion of the work. Field notebooks used for the work shall be made available to a District representative upon request at any time during the job. Such requests may be made verbally or in writing.

3300.8.2 Field Note Format

Field notes shall be kept in a standard format on "rite in the rain" weatherproof field book or approved equivalent. Corrections shall be made by lining out. Crew names, positions, and dates shall be recorded in the field books on the beginning sheet of each day's work. A Land Surveyor licensed in the State of Idaho, shall sign and seal all notes.

3300.8.3 Qualifications of Personnel

The Consultant shall employ enough qualified personnel experienced in highway and construction surveying to do the work. Supervision of such personnel is the responsibility of the Surveyor, and any errors by such personnel shall be corrected at the expense of the Surveyor.

3300.8.4 Surveyor Responsibility

The Surveyor is responsible for calculation of the grades and alignments for staking. Any discrepancies in grade, alignment locations, or dimensions detected by the Surveyor shall be shown to the Engineer. Major differences between the horizontal or vertical alignment data on the plans and the alignment shown on the ground shall be referred to a District representative. Staking of these areas shall be delayed until differences are reconciled. The Surveyor shall compare the staked centerline cut and fill depth with the design data. Differences exceeding 1-foot at two or more consecutive points shall be reported to the Engineer for evaluation and revision.

3300.8.5 District Responsibility

The District may check the accuracy of the construction stakes, lines, grades, and layouts. It is not responsible for the accuracy of the final result of the construction stakes, lines, and layouts.

3300.8.6 Consultant Responsibility

The Consultant shall furnish all stakes, surveying equipment, and other devices necessary for setting, checking, marking and maintaining the required points.

3300.8.7 Lumber

All lumber shall have the following minimum dimensions in inches:

- Hubs 1 x 2 x 8
- Lath ½ x 2 x 48
- Stakes ½ x 2 x 16

3300.8.8 Plastic Flagging

Flagging shall be plastic supplied in red, white, blue, yellow and orange. Paint of a highly visible type, may be used on the top 2" of stake. If plastic flagging is used, stakes shall be marked as follows:

TYPE OF STAKE	COLORS
Right-of-Way	Yellow
Control Points	Red/White
Pipe Stakes	Blue
Centerline	Red
Reference Points	White
Easements	Orange

All stakes shall be legibly marked with a permanent black marker or stake pencil.

3300.9 Basic Survey Control

The specifications for traverse, triangulation and leveling are given in attached Exhibits as is the order of accuracy. The survey points for the project control network shall normally be second order level of accuracy. For all other survey points such as Photogrammetric picture points, structure control points, location surveys and project details, third order accuracy is acceptable. Construction staking control can be less than third order accuracy unless otherwise directed by the District.

3300.9.1 Vertical Control

All projects shall be referenced to District bench mark datum, unless otherwise stated. The District bench mark book will be available on request to consultants working on District projects. Additional bench marks set by consultants will be typed on 8½"x11" sheet showing origin of bench circuit that is the District bench mark that initiated the additional bench marks. The 8½"x11" typed sheets plus the original field notes will become the property of the District.

3300.9.2 Horizontal Control

All projects shall be referenced to land corners; i.e., section corners, 1/4 corners, 1/16 corners, 1/64 corners, street intersections or lot and block corners. Local coordinate systems are acceptable. In some cases the District will provide Ada County Base Map coordinates for control corners of a project.