

SECTION 201

CONSTRUCTION STAKES, LINES AND GRADES (CONTRACTOR ~~GRADE~~FURNISHED STAKING)

201.1 DESCRIPTION

A. General:

This work shall consist of furnishing and placing construction stakes necessary to construct the project. The staking work includes establishing project centerline; re-establishing plan benchmarks; setting additional benchmarks as needed; taking cross sections of all topsoil stockpiles; taking final cross sections for earthwork quantities at the slope stake stations and plus stations or utilizing radial survey methods to establish same; verifying undercut, muck, rock and dig-out removal quantities; staking right-of-way (ROW), easements, and project limits; and miscellaneous construction survey work.

The Contractor shall perform all construction layout and reference staking necessary for accurate control and completion of all structures, grading, paving, drainage, fence, permanent benchmarks, ROW monuments and all other appurtenances required for the complete construction and acceptance of the work. The layout shall include, but not be limited to, staking clearing line; removal limits; slope staking and slope stake referencing; grade staking (blue top dirt grade and base course grade hubs); paving hub staking; staking of water mains, fittings, hydrants and valves; staking of sewer mains, bends, manholes, and services; staking of culvert pipes and structures; re-establishing property corners; and performing the miscellaneous staking as described in the plans and in these specifications.

The City will establish horizontal and vertical control as shown on the City-provided plans for those projects with a bid item for ~~C~~ontractor ~~F~~urnished ~~S~~taking.

To expedite the staking, the Contractor may obtain a conditional Notice To Proceed from the Engineer to begin staking operations prior to actual construction operations. Such conditional approval shall not be considered the start of the project day count. The Contractor shall not begin actual work on the project until a complete Notice To Proceed is received, at which point the project day count will begin.

B. Related Work:

- Section 8 Water Piping Systems
- Section 9 Sanitary Sewers
- Section 11 Utility Excavation and Backfill

201.2 MATERIALS

- A. The Contractor shall furnish all staking materials of adequate quality for the purpose intended, including all stakes, stake chasers, paint, field note books, and all other materials necessary to properly perform the required work.
- B. Stakes shall be suitable for general field construction staking and shall be durable enough to last the duration of the project without undue weathering so as to make the stake illegible or difficult to read or use. Stakes that become illegible shall be remarked or reset at the Contractor's expense.
- C. Paint, when used in lieu of plastic flagging to mark survey stakes, shall be brightly colored or fluorescent to be visible from passing equipment. Paint that becomes faded shall be remarked or reset at the Contractor's expense.

Plastic flagging shall be brightly colored or fluorescent plastic ribbon securely tied to the survey stake. Plastic flagging that becomes faded, torn or dislodged shall be replaced at the Contractor's expense.

- D. Property pins/markers shall meet current South Dakota requirements for legal property monuments and shall be stamped with the licensed surveyor's number.
- E. Field note books shall be made of quality, heavy, water resistant paper and may be bound with a permanent binding or may be in loose leaf binding. Notes shall be made with a waterproof pen or pencil.

201.3 CONSTRUCTION REQUIREMENTS**A. General:**

The work shall be done by or under the supervision of a South Dakota Licensed Land Surveyor or a South Dakota Professional Engineer who is experienced and competent in urban street and road construction surveying and staking. The Land Surveyor or Professional Engineer shall be available to review work, resolve problems and make decisions in a timely manner. A crew chief, who is competent to perform all required surveying duties and who is under the direct supervision of the surveyor or engineer, shall be onsite to supervise and/or perform the staking in the absence of the surveyor or engineer on the project.

The Contractor shall submit qualifications and work experience history of the surveyor or engineer who will be supervising the construction survey work. This information shall be submitted two weeks prior to beginning the staking for review by the engineer.

If necessary, a South Dakota Registered Land Surveyor will be required to re-establish property corners as required by South Dakota Law. The Contractor shall

submit the name and registration number of the land surveyor who will perform the corner and monument relocation work on the project.

The Contractor shall also submit a proposed starting date of the staking and the anticipated surveying work schedule, and these dates must be consistent with the anticipated construction work schedule.

All stakes, references, line, grades, and batter boards required shall be furnished, set, and properly referenced by the Contractor's surveyor or engineer. The survey and staking shall be consistent with standard engineering practices and shall be approved by the Engineer.

The Contractor, through the Contractor's surveyor or engineer, shall be responsible for the accuracy of the staking. All errors and discrepancies found on previous surveys, plans, or specifications shall be called to the attention of the Engineer prior to proceeding with further survey and construction work.

The overall supervision of the construction staking personnel shall be the responsibility of the Contractor. Any deficient survey layout or staking performed by the Contractor's surveyor or engineer, or any unreported errors in previous surveys that may result in construction errors, shall be corrected by the Contractor at no additional cost to the City.

Field notes shall be kept in conventional, handwritten note books or in a computerized form acceptable to the Engineer. Notes shall be kept in a clear, orderly and neat manner, with all pertinent information duly noted therein. The note books shall become the property of the City upon completion of the project. The field notes are subject to inspection and review by the Engineer at any time during the project.

If required, final cross sections (terrain data), where required, shall be submitted to the Engineer in an electronic file compatible with City survey and computer equipment. The Contractor shall convert the terrain data, as necessary, to suitable format compatibility at no additional expense to the City prior to submittal. Printed cross sections showing original sections and as-constructed data shall be submitted, where required, to the Engineer upon completion of the project.

The Contractor shall be responsible for the placement and preservation of ties and references to all control points which are necessary for the accurate re-establishment of all benchmarks, base line(s), centerline(s) and property pins and ROW markers shown on the plans or found on or adjacent to the project. Prior to construction, a licensed land surveyor shall verify existing property pins or lost property pins and record his findings for all possible property pin locations within the construction limits.

The establishment of permanent bench levels and permanent alignment points will be furnished as a contract item in the proposal when required. The Contractor shall stake the locations of the benchmarks as called for on the plans or as directed by the Engineer. The City will establish the elevations and coordinates at a later date.

Stakes which are damaged, destroyed or made unusable during construction shall be replaced by the Contractor at no additional expense to the City.

The engineer may check the accuracy and control of the Contractor's survey work at any time. The checks performed by the Engineer will not relieve the Contractor of the responsibility for the accuracy of the survey layout or the construction work.

The level circuit to check the plan benchmarks shall be run the full length of the project.

B. Slope Staking:

Slope stakes shall be set at the catch points. The slope stake reference hubs shall be offset behind the slope stake a sufficient, set, consistent distance to prevent disturbance during construction. Slope stake referencing shall be approved by the Engineer.

Slope stakes shall reference the subgrade shoulder or toe of the back slope and shall be set at intervals consistent with the plans stations. Horizontal curves and vertical curves will require additional slope stakes set at intervals sufficient to maintain adequate grade and line control. Slope stake tolerances shall be ± 0.2 feet (60.0 mm) horizontal and ± 0.1 feet (30.0 mm) vertical. Slope stake reference hubs shall reference the subgrade shoulder and tolerances will be ± 0.2 feet (60.0 mm) horizontal and ± 0.05 feet (15.0 mm) vertical.

The Contractor shall retain the slope stakes and hub references until the grading work is completed and accepted by the Engineer.

C. Grade Staking:

The grade finishing stakes (blue tops) for grade elevations and horizontal alignment shall be set on the roadway centerline and at each shoulder at the top of the subgrade. Where additional lanes are to be constructed, additional blue tops shall be set at the extended shoulder distance at the additional lane edge.

Transverse distance between blue tops shall not exceed 20 feet (6 meters). Intermediate blue tops will be required and shall be approved by the Engineer when transverse distance exceeds this value.

The blue top grade stakes shall be set at station intervals consistent with the plans not to exceed 100 feet on tangents and 50 feet on horizontal or vertical curves (English unit plans) or 20 meters (metric unit plans). The horizontal tolerance is ± 0.2 feet (60 mm) and the vertical tolerance is ± 0.02 feet (6 mm).

The Contractor shall furnish stakes of sufficient length to provide a solid set in the ground. Half length lathe stakes or stake chasers shall be placed adjacent to or on

the blue top hubs for guards. Stakes not meeting these requirements shall be reset at no additional expense to the City.

The Contractor shall retain the shoulder blue tops and guards through placement of the gravel base course material.

When the contractor is required to set grade stakes at the top of the gravel base course surfacing material, the blue tops shall remain in place until the gravel base course surfacing material is finish graded and accepted by the engineer.

Paving hubs for Portland Cement Concrete paving shall be set at a maximum longitudinal distance of 25 feet (8 meters). Closer spacing which may be required by the paving contractor will be at no additional expense to the City. Horizontal and vertical tolerance is ± 0.02 feet (6 mm).

Grading, blue top and paving hub notes will become the property of the City.

D. Structure Staking:

Stake and reference bridges and box culverts to ensure adequate horizontal and vertical control of the substructure and superstructure components. Stake and reference the bridge chord or the bridge tangent. Stake and reference the centerline of each pier, bent, and abutment. Stake the centerline for pipe or box culverts in both transverse and longitudinal directions.

If retaining wall design is required as part of the construction, the wall designer must be provided with original ground profile data prior to beginning the design. The Contractor shall set adequate stakes for vertical and horizontal control during retaining wall construction.

Stakes for structures and retaining walls shall have a horizontal tolerance of ± 0.04 feet (12 mm) and a vertical tolerance of ± 0.02 feet (6 mm).

E. Re-establish Property and ROW Markers:

All property corners, ROW markers and bench marks shall be carefully referenced and replaced by a licensed land surveyor. Known property corners, ROW markers and bench marks are shown on the plans. Other monuments may exist within or adjacent to the project limits and shall be referenced as they are found and replaced as necessary at no expense to the City. Prior to construction, a licensed land surveyor shall verify existing property pins or lost property pins and record his findings for all possible property pin locations within the construction limits.

F. Miscellaneous Staking:

Miscellaneous staking shall include the following work:

- a. Final earthwork (or terrain data) cross sections at the same intervals, stations and plus stations as the original cross sections;
- b. Approach road/driveway staking;
- c. Topsoil measurement;
- d. Special ditch/drainage staking;
- e. Staking and/or measurement of sub-excavation, muck excavation, rock excavation, undercut excavation and dig-outs;
- f. Staking of signs, pavement markings, guardrail, curb and gutter, light poles, conduit, junction boxes and irrigation systems, and related items;
- g. ROW staking;
- h. Water and sanitary sewer mains and services including pipe, manholes, valves, bends, fittings and related items;
- i. Mark limits of removal items (trees, foundations, curb and gutter, sidewalk, etc.);
- j. Storm pipe culvert and storm sewer staking including drop inlets, manholes and related items.

Minor location and grade adjustments that are necessary to properly stake the pipe shall be approved by the Engineer prior to the pipe installation. Set reference stakes for the storm sewer inlet and outlet locations. Stake ditches and special inlet and outlet grades to ensure proper drainage.

The horizontal tolerance for water and sanitary sewer main and storm sewer staking is ± 0.05 feet (15 mm) and the vertical tolerance is ± 0.03 feet (9 mm).

201.4 METHOD OF MEASUREMENT

Staking shall be lump sum when shown as lump sum in the proposal. When staking is stated as an hourly item, the Contractor shall submit and certify a daily log of hours worked by each survey crew on the project. Removing and resetting Property Pins shall be per each when shown in the proposal. If not included in the proposal, removing and resetting Property Pins shall be considered incidental to the Construction Staking bid item and no separate measurement will be made. Verification of property pin locations will be considered incidental to the item for removing and resetting property pins and no separate measurement will be made.

201.5 BASIS OF PAYMENT

Staking will be paid at the lump sum unit price established in the bid proposal where such work is proposed as a lump sum item. Where such work is proposed as an hourly item, staking will be paid at the contract unit price per hour. When the number of hours is fixed in the bid proposal, final staking quantity will not exceed the contract quantity. Removing and resetting property pins will be paid at the per each unit price established in the bid proposal where such work is proposed as a per each item.. If not included in the proposal, removing and resetting Property Pins shall be considered incidental to the Construction Staking bid item and no separate payment will be made. Partial payment of lump sum unit price, when allowed, shall be made according to the following schedule:

Percentage of Contract Amount Completed (Excluding Construction Staking Itself)	Percentage of Construction Staking Paid
Five Percent (5%)	Twenty-Five Percent (25%)
Twenty Percent (20%)	Fifty Percent (50%)
Thirty-Five Percent (35%)	Sixty Percent (60%)
Fifty Percent (50%)	Seventy Percent (70%)
Seventy-Five Percent (75%)	Ninety Percent (90%)
One Hundred Percent (100%)	One Hundred Percent (100%)

END OF SECTION